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Datafying Museum Visitors: A Research Agenda

Pille Pruulmann-Vengerfeldt

Running header: Datafying Museums Visitors

Bio: Pille Pruulmann-Vengerfeldt is a professor in media and communication, at Malmö University, School of Arts, Culture and Communication. Her interests include critical and practical questions of datafication, cross-media audiences, museums, and cultural and democratic participation. She is member of Academia Europaea section of film, media and visual studies.

Abstract: Museums are participating in the capturing of global data for the perceived benefit of improved relationships with the public. This article proposes a framework for critically analyzing the datafication of museum visitors and visitor engagement, combining a critical lens from data studies with a social view of datafication as practice—a set of practices within a socio-technical assemblage that is continuously reproduced by the choices made within and outside the museum. Museums are situated at the intersection of Bourdieu’s economic, cultural, and political fields; thus, I highlight some of the external social and technological pressures driving datafication in museums. Relying on public accounts and previous case studies, I argue that datafication of visitor engagement is made to work through data loops: circular processes between institutional practices of museums and social practices of audiences where data is collected, processed, and decided upon.

Keywords: museum visitors, datafication, Bourdieu fields, social media engagement, data loop.

Data capture has become increasingly normalized. It happens in public spaces with cameras, in shops through loyalty cards, on the numerous digital devices we handle, and on the social media platforms we engage with. The collection and processing of such data to support corporate decision making can be called datafication, which Nick Couldry and Ulises Mejias argue is a new form of colonization—large corporations are systematically turning human lives and relations into input for profit.¹ In other words, companies are mining our lives for data to extract economic value. This process has become so ubiquitous that people participate without critically questioning who benefits from these data-intensive practices, and opting out of the process is almost unthinkable.

Museums, too, are joining commercial social media platforms to engage with visitors, supplying those platforms with incentives for users to spend time and share data, which in turn is mined by technology companies for profit. Museums post pictures on Instagram, host discussions or challenges on Facebook, and make short videos on TikTok, reshaping their activities to suit the data-capturing logic of social media.² Social media also shapes, through prescribed formats, the kinds of engagements museums can have with their online visitors. The apps invite museums to adopt a comprehensive information ecology approach that engrains data in all aspects of museum work and allows for experimentation.³ Comprehensive information ecology, in turn, shapes collection management, organizational practices, communication, and pedagogical practices to fit machine learning, algorithmic investigation, and other aspects of datafication—in effect, these activities adapt to the logic of information technologies rather than the logic of museum work. As such, datafication in museums is another example of the black-boxing that is characteristic of our society.⁴ Frank Pasquale explains that “black box” is a useful metaphor because its dual meaning encompasses recording devices and data-monitoring systems in planes, trains, and cars as well as in systems whose workings are mysterious. In other words, the metaphor reflects how we are being tracked by companies and governments and have no clear idea of what is done with the information.⁵

We still know very little about how datafication works in museums today, particularly how the logics of datafication shape museum organization and to what extent museums are shaping datafication to fit their organizational purposes. Which museums are optimistically embracing these new opportunities, which are bewildered by the marketing pitches of techno-

enthusiasts, which are suspiciously warding off innovation, and which are just waiting on the side-lines? Though some museums have been early adopters of technologies—using information and communication technologies for over fifty years now—a whole range of technology adoption practices exist. There are pioneers, or visionaries, who see digital heritage to be a necessary and welcome evolution; pragmatists who invest in mainstream technologies for the sake of accessibility and engagement; and conservatives who mostly use technology to attract people to see the original, “analog” materials.⁶ Each has used digital platforms in some way and is more or less engaged in datafication via social media platforms to facilitate visitor interaction. We need to understand if museums are in control of datafication processes, whether datafication supports their core mission of heritage custody and communication, or if they are blindly following the logic of the commercial platforms. Datafication in museums refers to practices of capturing and processing large amounts of data and integrating it into museum work and decision-making via partially or fully automated computational methods. External social and technological pressures, organizational possibilities and choices in the museums, and collaborations with museum visitors and audiences all co-create datafication within the museum context.

In what follows, I treat museums as mediamakers and adapt a data loop framework, where institutional and socio-cultural data practices of audiences provide learning and reflection opportunities for both museums and visitors.⁷ Museums as mediamakers are unique in their capacity to collect, analyze, and implement lessons from social-action-related data in both the physical museum and the digital space.⁸ In this article, I propose a framework for the critical analysis of museum visitor and visitor engagement datafication. Drawing on public accounts and previous case studies, using a data studies lens through which data is seen as a “weapon of math destruction,” combined with an organizational and social view of datafication as practice, I move away from a purely technology-focused view of datafication.⁹ In this way, I see datafication as a set of practices within a socio-technical assemblage made to work through a data loop, an assemblage that is continuously reproduced by the choices made within and outside the museum.¹⁰ To build this argument, I first discuss why is it important to understand how datafication is already occurring in museums. Then, to highlight some of the external social and technological pressures driving datafication in museums, I briefly discuss how museums are situated at the intersection of Bourdieu’s economic, cultural, and political fields and how

datafication processes already occurring in those three fields are finding their way into museums.¹¹ Next, I propose an analytical framework that considers datafication processes as a loop of practices and that helps locate the choices of museum actors in the process. This loop makes datafication work in the particular socio-technical assemblage of museums. Here, examples of museum- and visitor-related data and digital practices as well as examples of museums' collection of data and decision-making based on that data (retroactions) are included.

Museums as sites for visitor datafication

David Beer begins his criticism of datafication, *Data Gaze: Capitalism, Power and Perception*, with a reference to Jacques Derrida's concept of the "archon," arguing that when data and metadata accumulate, power is held by those who oversee the storage and retrieval of that data and metadata.¹² Beer goes on to take a critical look at the industry that has emerged around this new data, exploring how data-led processes spread, how data-informed knowledge is legitimized, and how the industry approaches and frames data.¹³ I argue that museums use these data-practices and processes to engage visitors, or use (or opt not to use) the data and knowledge gained in this way. Museums are exceptionally interesting sites to study datafication because they have always collected, classified, and systematized—that is, datafied—culture. The museum is an instrument of control and governance that shapes understandings of ourselves and other societies and cultures through the data it collects.¹⁴ Now, museums have the instruments of data industries at their disposal, which may enhance their control or make them yet another unwitting extension of capitalist data practices in society.

Museums have historically been custodians of enormous amounts of data and metadata, but there is an increasingly critical awareness of their role in, for instance, replicating and perpetuating past (colonial) injustices or continuously excluding marginalized groups.¹⁵ As a response, many museums are changing from being repositories of specialist and closed knowledge to institutions of democratic engagement by making their practices more transparent and engaging visitors in new ways.¹⁶ However, such processes are not set in stone—fierce debates about how to define museums, particularly how to acknowledge and foreground their societal role, remain.¹⁷ As Suyin Haynes summarizes it, "To some, the new wording represents a worthy mission statement: updating a years-old definition and acknowledging that museums

have a role to play in civic society, no matter where they are. But other experts have condemned the new definition's 'political tone,' decrying it as an 'ideological' manifesto and expressing concerns that it doesn't address the traditional functions of a museum."¹⁸

From the beginning, a resistance to change has marked discussions on museums' changing roles.¹⁹ Not everyone is keen on the attitudes of change and improvement that seem to dominate the literature discussing participation and visitor engagement.²⁰ Datafication, alongside other new technologies, intercedes in this tension. Datafication has the potential to serve as a tool for opening up and making museums more engaging but, in the absence of critical reflection, it can also serve as a techno-enthusiastic embrace of black-boxed technologies.²¹ Alternatively, datafication practices also can strengthen museums' authoritative voices by entrusting the knowledge making process to algorithms that only few understand, thus, knowingly or accidentally, excluding and marginalizing certain publics.

Regarding visitor engagement, the notion of who museum visitors are or who constitute relevant publics is not always straightforward. Museums' authority derives from the fact that, through curated presentations of culture, they reproduce structures of belief and experience and a sense of belonging or exclusion.²² Datafication offers museums the possibility to learn about their visitors in novel ways, such as through social media scraping and analysis. When museum professionals (other than front-desk administrators and visitor-experience and educational specialists) use data practices to create and support relations attuned to their visitors' and the wider communities' interests and needs, these practices can fulfil some of the more enthusiastic promises of the new data era. Museums can use data to verify "gut feelings" about engagement, to investigate feelings of belonging in the museum community, or to render visible existing exclusions and address them openly.

In implementing new technologies, museums often aim for openness and participatory engagement—digital platforms can be used to reach wider publics and engage more diverse audiences and potentially bring in people who might not otherwise have visited. However, when museums conform to the logics of technology developers, museums may tacitly reinstate their own authority and black-box their decision-making.²³ Formalizing museum operations for computations can lead to situations where "the computer says no," as developers and museum professionals fail to foresee all possible interactions and situations.²⁴ Additionally, should museums uncritically adopt diverse datafication practices, harmful and unwanted by-products

such as threats to privacy or algorithmic discrimination can arise.²⁵ For example, health algorithms discriminate against black patients, fraud-detection algorithms falsely demand repayment of benefits, and algorithmic grading is a controversial replacement for exams.²⁶ We therefore need to combine experiences from museology and critical heritage studies with emerging work in the fields of critical data studies and data justice to investigate existing museum work practices.²⁷ Developments in critical data studies have raised awareness of how data and algorithmic decision-making is disrupting social equality and inclusion processes, while museology can ensure that such processes are not implemented in museum practice. Examining these critiques allows us to avoid some of the pitfalls and mistakes other public institutions (e.g., health, welfare, and policing) have stumbled on when implementing datafication and algorithmic decision making in their practice.²⁸ Museums, as public institutions with a strong mandate of trust, must be careful when putting datafication processes to work. At the same time, care does not mean outright avoidance—the clever collection and analysis of data also has the potential to engage wider audiences, increase museum participation, and support openness. Jeannette A. Bastian discusses such challenges, outlining museums’ need for a postcustodial perspective.²⁹

Datafication Imperatives from Different Fields

Different external forces are incentivizing museums to change—to adopt new technologies, revise their attitudes towards visitors, and reconsider the usability and utilization of their collections.³⁰ Museums operate at the intersection of cultural, political, and economic fields and, thus, are pressured to follow the demands and developments of all three.³¹ Following the political agendas of efficiency and neo-liberal management; adopting educational mandates of learning, memorizing, testing, and knowledge retention; adapting to the market logics of self-sufficiency and the marketization of free time—these are just some of the pressures museums face. In recent decades, museums struggling to meet these demands have welcomed new experts from the fields of marketing, design, education, and other social sciences, who also bring new languages and methods, including datafication practices. Emerging new data collection and analysis possibilities demand museums adopt new information literacy skillsets and develop greater infrastructural literacy to better understand the interactions between technological and material infrastructures as well as social reproductions of infrastructures as practices.³² While

museums follow the logic of these respective fields, they are also adopting many data practices that proliferate elsewhere.

Pressures from the Economic Field

In the economic field, marketers measure success through “click-through-rates” of their digital advertisements’ “key performance indicators” that include social media followers, and calculations of the “return on investment” include considerations of social media marketing time.³³ Museums, too, are learning about their audiences and understanding the success of their communication messages through social media engagement.³⁴ These platforms offers an unprecedented opportunity to know more about the people behind the screens, but their affordances can also drive engagement elsewhere. Website metrics from Google Analytics or social media “likes” and followers are considered simple and cost effective ways to understand the people who visit museums and to measure and evaluate their efforts on social media.³⁵ A market orientation goes hand-in-hand with the ideas of the communicative museum and the turn to the visitor, and while sometimes the tools and approaches look very similar, the underlying assumptions of the “visitor-customer” versus the “visitor-citizen” are quite different.³⁶ This conflation of the citizen and customer within the context of visitor-facing museum can also have a reductionist result when data collection, analysis, and evidence-based decision-making meet.³⁷ Letting the marketing department and consultants steer curation work is one example of following market trends to appeal to the broader public. Museums potentially cut researcher and curator positions in favor of communication specialists or replace them with project contracts and expensive market-oriented “museum shows.” While not directly linked to the implementation of digital technologies, museums’ decisions to please the public using data-supported market logics can negatively impact the museum’s mission. Jana Reidla has shown that, together with the new museology’s communicative approach, the curator position is changing. Specifically, instead of focusing on curating, maintaining, and caring for collections, curators take on much more administrative, communication-oriented, and perhaps even project-management duties.³⁸ Victoria D. Alexander has discussed the influence of a market orientation in museums and highlighted the threat of self-censorship in planning museum activities; she also notes that curators have lost power and autonomy when their share of the museum work has been

given away to marketing experts, fundraisers, and accountants.³⁹

The extent to which museums' efforts to communicate on social media align or conflict with their mission depends on museum leadership, its resources, and its ideological take on museums as participatory institutions.⁴⁰ The extent to which social media engagement shapes understandings of museums' (digital) visitors is yet to be explored. Ceri Jones observes that "Museums seem to classify and control their audiences in the same way that they classify and control their objects and it comes across as a rather reductive and confining approach."⁴¹ Elsewhere, I have argued that data from such automated systems provides little information about actual content engagement or meaning making processes, and it is therefore important to be aware of how the implementation of such data-based visitor measurement practices support rather than challenge more reductionist and confining approaches.⁴²

Museums need to approach communication, dialogue, activism, and social change as open challenges rather than letting the marketing impetus to measure success through the number of visitors become the dominant argument for visitor-facing museums.⁴³ Responsible data practices must be a part of museums' missions if and when they decide to engage in data analytics, machine learning, and other computational practices related to the ever-growing amount of data they collect. When looking at the numbers, the museum team may sometimes have to make decisions that are in opposition to the "majority," instead using data to zoom in on missing or underrepresented elements. This also means that, instead of outsourcing data analytics and expecting museums' communications departments to handle visitor engagement on digital platforms, more engaged curatorial teams that embrace opportunities for dialogue and utilize new datafication practices are needed. However, this can be a major challenge since, for most curatorial teams, such engagement means new skills must be learned (i.e., understanding computational methods and critical data analysis) and critical, collaborative efforts must be made to make datafication work for the museum's mission.

The Cultural Field

The cultural field and cultural logics are central to museums; as discussed above, their role in heritage care and collection management is fundamental to the definition of culture.⁴⁴ Additionally, museums are places for informal learning, which in turn can increase cultural

capital. Thus, the efficiency of learning during visits has become one of the core questions in museology and visitor studies.⁴⁵ At the same time, educators are datafying learning by measuring points of attention, using eye-tracking to measure views, and quantifying information retention.⁴⁶ New data collection opportunities such as radio signal technologies (e.g., iBeacon, WIFI, or ultra-wideband anchors) can be used to position visitors in a museum space or gallery with increasing precision, creating heatmaps of attention and visitor activity.⁴⁷ Such methods support attempts to quantify visitor movement and learning.⁴⁸

On the positive side, the Internet of Things, with its multitude of available sensors and accumulation of information in digital databases, enables so-called “smart museums,” in which personalized visitor services, knowledge delivery, and visitor activity data collection guide and frame the museum experience.⁴⁹ The personalization and customization of the museum experience can take many forms. The simplest instances involve translating the museum experience into visitors’ native languages, such as the Estonian National Museum’s language cards, which switch eInk-based exhibit labels into different languages, while at the same time collecting and analyzing log data to showcase visitor movement through the space.⁵⁰ This gives museums the opportunity to learn how visitors move, what they notice in the exhibition, and what they miss. However, poorly constructed algorithmic decisions based on such data can mean that personalized recommendation systems prioritize some aspects of the exhibition and neglect others.

On the more negative side, implementation of datafied practices can negatively intervene in the constructivist and holistic understanding of museums’ roles and shift some attention back to functionalist learning. A similar trend can be seen in journalism, where audience metrification has, to a certain extent, instrumentalized news production and set back understandings of audience engagement by several decades.⁵¹ The potential to conduct a computerized analysis of learning may mean that museums, in their desire to demonstrate their public value, focus too much on quantifying museum learning instead of taking a more holistic view of their role in society.⁵² As in many other areas, you get what you measure—that is, if museums metrify a specific kind of learning, their focus may shift to producing information that easily fits those metrics. Thus, when measurable learning becomes the major focus of a museum, understanding and valuing heritage as a cultural process that engages with experience, identity, memory, and performance may not be noticed or valued as an important part of the museum’s work.⁵³

The Political Field

In the political field, funders in both the private and public sectors, along with policymakers, are increasingly pressuring museums to measure their relevance, impact, and success as proof that investments have borne fruit. Datafication intercedes in the collection and production of diverse, quantified indicators of success, such as visitor numbers, socio-demographic composition of visitors, etc. Cultural organizations, among others, are also increasingly searching for new complex and data-intensive ways of measuring policy goal achievement and developing indexes of relevance.⁵⁴ As such, museums are looking for and finding new, evidence-based ways to justify their budgets, buildings, and activities. However, as Richard Rottenburg and Sally Engle Merry point out, even simple forms of counting (e.g., visitors and interactions) and the abstraction of this data into categories are part of proliferating quantification technologies that alter modes of knowledge in intricate, but mostly unobserved, ways.⁵⁵ Additionally, it is easy to confuse performance indicators that measure output with indicators that measure outcomes of cultural organizations, and it is not always easy or clear to determine what is being measured or evaluated.⁵⁶ Knowledge from other fields suggests that the pervasiveness of digital technologies and datafication not only intensifies metrologies but also creates new black boxes of hidden political rationales and agendas.⁵⁷ These black boxes are then encoded into algorithms that lay important foundations for future museum work.

As Caroline Wilson-Barnao discusses, the consequences of reducing the idea of public access—which entails values of diversity and inclusiveness and traditionally includes a range of methods of delivering intellectual, social, and physical museum experiences to multiple publics—to the idea of digital access are grave.⁵⁸ She observes that in seeking digital access, museums also subscribe to the idea of platform-based enclosures endorsing museums being used by technology companies for data collection and profiling. As public institutions share their collections freely on privately owned companies' platforms, the data from these collections as well as visitor engagement feed machine learning algorithms, which in turn capture and regulate people's attention and coordinate cultural experiences.⁵⁹ The political field's missions and imperatives thus push museums towards datafication by mandating accountability of resource use and digitalization in the name of open access, even as the results are in direct opposition to

such access. Museum resources ultimately support private companies' pervasive data-colonialist practices.⁶⁰

Studying Datafication: Looking at the Organizational Decisions and Visitor Influence

Often, when researchers discuss datafication or algorithms, they portray people participating in such processes as powerless in the face of big data players. Research has revealed numerous data injustices but stops short of suggesting productive ways of overcoming these challenges. My interdisciplinary approach combines an analytical, critical data studies focus on data and data practices, a museological focus on museum organizations and visitor engagement, and a science and technology studies (STS) and social informatics focus on socio-technical assemblages. STS and social informatics argue that any new technology is implemented in existing socio-technical systems, or assemblages, and provide methodologies and approaches that untangle these systems. I propose that looking at museums as socio-technical systems or assemblages where datafication as a process is made to work allows us to see both human and technological agents, cultures, and values interacting and, as such, can help restore the balance between different kinds of agents. Such an approach also helps explain how datafication can result in such different outcomes in different institutions. Actor network theory (ANT) can provide rich and nuanced views of datafication for future research and can help restore the agency of human actors by showing where their own practices make datafication work in the museums.⁶¹

Following Rob Kling's ideas on social informatics, technology-in-use and the social world co-constitute the datafication of museums.⁶² When looking at the datafication of visitor engagement in museums, relevant socio-technical systems are made up of people, hardware and software, techniques, support resources, and information structures.⁶³ Researchers and museum practitioners could use ANT as a methodological approach for mapping out these assemblages by following the actors themselves: materially and semiotically tracing associations to see what constitutes the network of connections that make up the actors and how they see themselves as belonging to a functioning unit or whole.⁶⁴ ANT is equalizing in its approach to all kinds of actors, including organizations, human subjects, objects, inequalities, scale, sizes, etc.⁶⁵ Both social informatics and ANT highlight an analytical interplay between the material and immaterial

and the technical and social. While social informatics emerged as a critique of the techno-deterministic implementation of information technologies in organizations (i.e., an overemphasis on the technological), ANT emerged from the other side, as a way of breaking down distinctions and distributions that seemed natural to researchers of the social.⁶⁶ Moreover, both of these approaches seek to balance the role of technology and humans and, as such, can generate surprises and defamiliarizations and can help to open up the black box of datafication, furthering analyses of hidden prejudices and power relations that exert social force.⁶⁷ As Nanna Bonde Thylstrup and colleagues argue, when analyzing datafication, instead of looking for radical transformations, researchers should examine the ways mundane operations and infrastructures are quietly transforming how we see, read, organize, use, and dispose of knowledge.⁶⁸

Because ANT can be seen as a set of sensibilities and practical orientations, and because particular adaptations are often based on researcher's decisions, I propose combining ANT with an additional theoretical framework.⁶⁹ Museums as knowledge organizations are in the early stages of implementing datafication, and situations are changing rapidly, giving us a unique opportunity to study the dynamics of the co-constitution of social and technical aspects of museum datafication. Elsewhere, David Mathieu and I have proposed approaching the study of datafication in media organizations and their audiences as a data loop (Figure 1).⁷⁰ In theorizing the data loop, we argue that data is circulating between the (1) institution's socio-cultural practices, and the (3) audiences' socio-cultural practices. As institutions make decisions about what kind of "media to make," data is being (2) retroacted to audiences, which in turn opens up opportunity for more (4) data collection. In this way, we can see data being made to work both as an input and as an output in datafication practices. Datafication is then made to work by providing both institutions and audiences with reflection and learning opportunities, formative experiences, opportunities to change their practices, and transformative experiences.⁷¹

Others have investigated museums' capacity to engage with different media as well as viewed museums' exhibitions and programs as media.⁷² Ross Parry argues that museums are a medium—a unique, three-dimensional, multi-sensory social medium with a spatial form.⁷³ Jenny Kidd expands on this argument by critically noting that museum professionals seldom own up to the political, philosophical, and ideological implications of their roles as media producers.⁷⁴ Because museums make media in both physical and online media spaces, the data loop is worth adapting to museum practices to investigate how datafication is a dynamic process of co-

construction between museum institution, technologies, external imperatives, and visitors. Museum engagement with visitors is a useful case study for the data loop because data collection and retroaction can happen both on-site in museums and through digital interactions on museum-owned or external platforms. When outlining the data loop, we noticed that many datafication discussions have neglected the role of audiences, considering them as passive victims.⁷⁵ I am thus taking the opportunity to highlight the role of the visitor in co-constructing the datafication process in the museum.

{Figure 1 About Here}

The proposed model presented in Figure 1 combines the data loop with elements of social informatics and ANT into an analytical tool for mapping the different aspects of datafication in museums and for investigating the dynamics of the process—that is, to see what kind of data circulating in the loop is recognized as actionable and as actually changing museum practices. Below, I walk through the model to highlight some examples of what is already known and what can be analyzed further in the context of datafying visitor interactions in the museum. At best, these will be highlights rather than an attempt to present a systematic overview or analysis since no comprehensive investigations that consider all these aspects exist in the literature yet.

(1) Institutional Practices

In investigating institutional practices, we can look at them as socio-technical assemblages. As mentioned above, these assemblages include people—museum staff of different levels, their educational and experiential backgrounds, and their organizational culture and values. Research has shown that museum leaders have different views of implementing social media as a site for visitor engagement according to their resources and ideological stances towards such platforms.⁷⁶ Previous studies have also shown that museums' actions on social media depend on their policies and are guided by different frames or modes of engagement.⁷⁷ Arguably, the ways museums use social media also govern datafication practices. If museums' social media use is supported mainly by their marketing or web departments, the datafication of the visitor also follows the trends and practices of the marketing field. Big social media

platforms (Facebook/Instagram, Twitter, Google/YouTube) also support mostly market-facing practices and provide data in the marketing frame.

The institutional practices of visitor datafication also heavily rely on the technological readiness of the museum. The technologies implemented in the museum space allow for different ways of collecting data (see the Data Collection section below for some examples). However, here again, the staff that maintains those technologies often play a crucial role in the data practices of the museum. Online collections and the websites that mediate them to audiences can be immense amounts of data, but if this info never leaves IT department computers, it can never provide insights for retroaction. Little is known about what happens with the data collected in museums and how it factors into their decision-making processes.

When considering visitor interaction, what makes museums unique are their collections. Collections are also at the core of digital engagement. Digital collections, with their potential to support datafication (e.g., machine learning for image or object recognition, classification algorithms), also engage visitors on external platforms like Google Arts and Culture.⁷⁸ Collections and individual objects, along with their digitalization and storage, inspire numerous datafication instances, such as AI for identifying museum images, assessing aesthetic qualities, classifying archaeological finds, or monitoring the conditions of objects in storage.⁷⁹ Many of these activities are mostly oriented towards research applications, though a few also engage visitors in data collection, classification, or interaction with datafied collections. One example of the latter are robot guides who monitor museum visitors and invite engagement by providing information or provoking questions.⁸⁰ Researchers and policymakers so far have mostly discussed the technological and data-structural side of datafied collections because these issues are very complex and demanding. For instance, collections-related data has raised questions about standardization and the interoperability of databases.⁸¹ Policymakers and practitioners have established FAIR principles in an attempt to draw attention to the importance of Findability, Accessibility, Interoperability, and Reusability in digitalizing collections (and thus providing an infrastructure for datafication).⁸² Resolving these issues is a huge task and a primary obstacle to using more computational methods in the museum context. Collections data management is already challenging—full of legal, ethical, and practical issues.⁸³ To what extent these datafication practices also datafy visitor interactions depends on particular museums, their work cultures, and the interaction between different departments. For instance, engagement on

social media or interactive digital games, which has the potential to yield much information about the online audience, is also heavily dependent on digital collections as input material.

Museum datafication and its relation to visitor interaction also depend on different policy and regulation questions. The EU's General Data Protection Regulation (GDPR), adopted in 2018, ensures that all organizations, including museums, have to deeply and critically examine how they collect and handle personal data—including data about genetic, mental, cultural, economic, and social identity.⁸⁴ This regulation means that many institutions have shied away from explicit collection of visitor data and are only now slowly exploring its possibilities. At the same time, this has not stopped museums from maintaining active social media profiles and exposing their visitors to tech giants' data collection.⁸⁵ As such, there are more examples of intense datafication and algorithm development outside the EU, but the normalization of GDPR regulation on data collection as well as developments in other parts of the world will mean that data collection practices will also find new ways and forms in European museums.

(2) Data Collection

On-site data collection can be systematic, using visitor surveys, mobile positioning, surveillance cameras, or log-files of radio frequency identifier (RFID) cards/tags. Data collection can also be unsystematic and rely on impressions or anecdotes. Online data collection may include log files from the website, statistics from social media engagement, or a designated survey for online visitors. Recent advances in big data allow museums to collect new data types, such as logs from interactive exhibits, information from a diversity of sensors—automated or human-manipulated—or data from networks (including social media).⁸⁶ In turn, such data can be analyzed with the help of machine learning, natural language processing, computational intelligence, and data mining.⁸⁷ Regardless of which methods they use, museums often look for external insights to understand the visitor experience and occasionally attempt to adapt their offerings based on the perceived needs and expectations of visitors. Computational data analysis is not always included in decision making processes.

(3) Socio-Cultural Practices of Audiences

As discussed before, museums are experiencing a paradigmatic shift towards becoming participatory, audience-facing institutions.⁸⁸ We know that people “use” museums to engage with the past and present, craft identities, discover themselves, and affirm—and sometimes confront—existing knowledge.⁸⁹ Visitors “collect” data from museums, but they also retroact knowledge by sharing their memories on Instagram or posting their reviews on TripAdvisor.⁹⁰ As such, the socio-cultural practices of audiences or visitors are becoming more visible to museums, and museums have more opportunities to engage with the data collected on-site or during museum-led online activities. Museums must keep in mind that, like the recollections and reactions left in traditional visitor books, those recorded in digital spaces represent only a limited view of audiences and their reactions. If and how museums use these insights—both computed and those based on impressions and anecdotes—depends again on a diversity of factors. Scholarship about museum visitors has become increasingly rich and diverse, but additional exploration is needed into the roles museums play in people’s digital lives and how sometimes visitors’ fragile and sporadic collaborations with museums can support or be hindered by datafication.

Museum visitors’ role in datafication discussions also depends on the context and motivation of the visit, their peers and social networks, and the visitors’ social media behaviors. As museums lift bans on visitor photography and encourage posting and sharing on social media, visitor engagement is increasingly being taken outside the exhibition and onto digital platforms such as Facebook, Twitter, and Instagram.⁹¹ In museums, Bring Your Own Device (BYOD) allows for interesting visitor interactions but also complicates the relationship between museum objects and omnipresent smart devices.⁹² The fact that visitors’ socio-cultural practices are already colonized by big data should force museums to reconsider their stance and should be a crucial element in museums’ discussions of datafication.

(4) Data Retroaction

The data retroaction moment in the data loop governs the presentation of material to the visitors/publics. For media institutions, examples of retroaction include recommendations, personalizations, shelving, and microtargeting.⁹³ For museums, researchers have observed experiments with chat bots that engage visitors and direct them through the museum, many of

which have met with varied success.⁹⁴ There are also critical-artistic engagements in which artists engage audiences with data that has been collected about them or showcase how machine learning works.⁹⁵ For instance, a group of artists designed *The Classification Cube*, a cubical construction (10 × 10 × 10 ft) wrapped in fabric and equipped with two screens—one presenting a prerecorded video of animated characters and the other presenting a live camera feed of the visitor.⁹⁶ Machine learning classification is shown on the videos, including face detection and estimation of age, gender, emotion, and action. The piece also invites playful interactions such as finding your museum doppelganger on Google Arts and Culture, but provides a different kind of formative experience for the user.⁹⁷ *The Classification Cube* is an excellent example of museums engaging with data collection and retroaction in a critical and awareness-raising manner, giving visitors a chance to interact with algorithms in new ways.

Conclusion

Datafication in museums is a complex topic, one where the historical developments of museum work meet the exciting new opportunities offered by technological developments. At the core of discussions about the pressures of economic, cultural, and political fields are the implications of datafication for retroaction. Whether online or on-site, museum programs, exhibitions, and other productions are more or less informed by the data collected and processed at museums. From curators' "gut feelings" to the perceived expectations of funders, from counting visitor numbers to collecting social media engagement metrics, these factors shape the decisions museums are making about what to produce and how to produce it. Museum professionals must decide, over and over again, whether to use datafied inputs to shape museums into visitor-facing, socially engaged institutions with diverse offerings or to delegate the mandate of openness to private companies and their enclosed platforms.⁹⁸

To understand what kind of role datafication plays in museums, researchers and practitioners must be critically aware of the historical origins of museum collections as well as the institutional histories of museums.⁹⁹ Researchers and practitioners have the opportunity to engage critically with datafication processes as they are being actively implemented in museums, providing unique opportunities for mutual learning. These museum actors also facilitate critical interventions where needed to avoid potential pitfalls that, as some of the examples I have

discussed above show, occur only too easily. The data loop outlined here is a starting point for mapping socio-technical assemblages, and it reminds us that datafication in the museum depends on a diversity of factors, such as visitors and museums' online audiences. Investigations into datafication in museums has shown that museums can succumb to the big data logics of the technology platforms, but museums can cleverly and critically use datafication to provide opportunities to understand visitors and visitor engagement in a more nuanced way. To support the development of beneficial data practices, museum practitioners need to, once again, broaden their skillset and develop their ability to critically question datafication practices.

Notes

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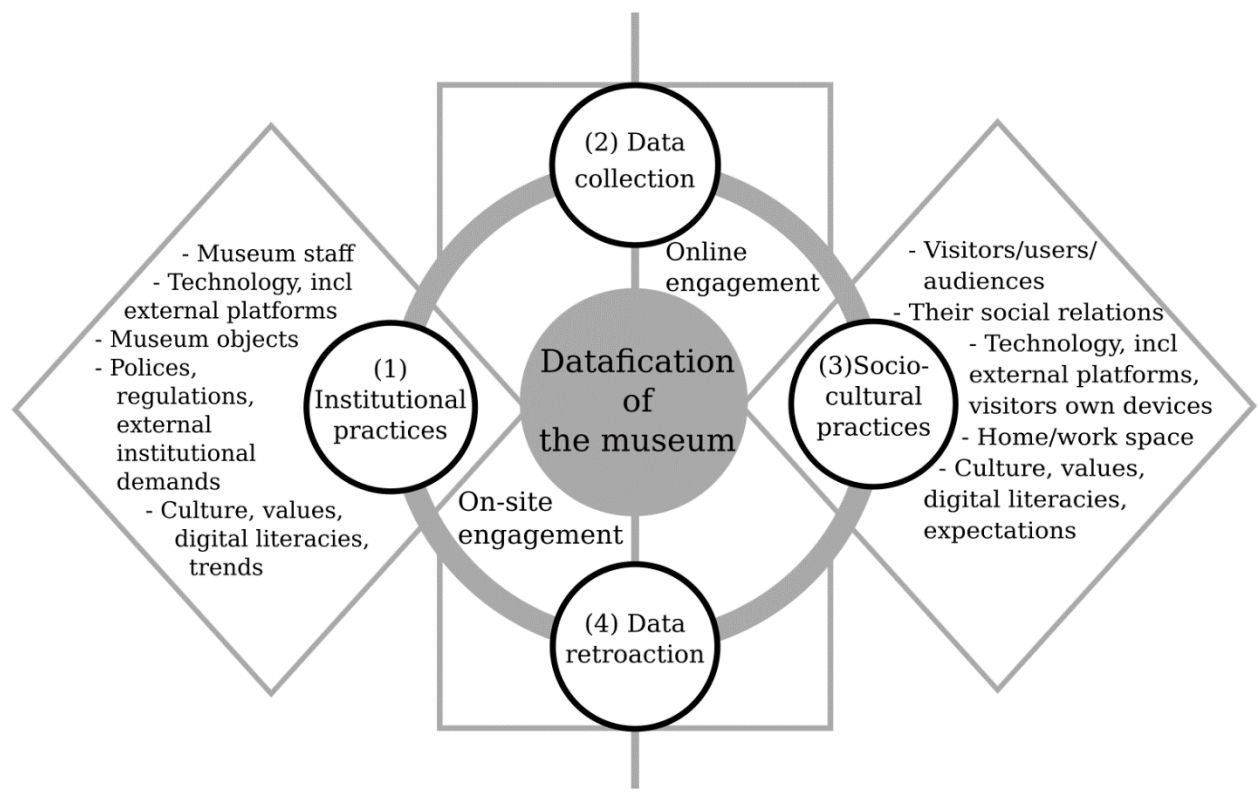


Figure 1: Data loop by Mathieu and Pruulmann-Vengerfeldt adapted by the author to the museum context

POSTIX