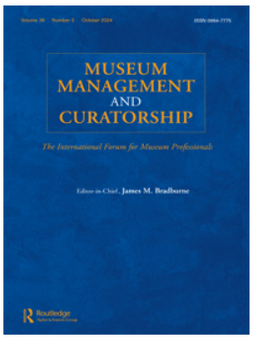

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Practice architectures for bridging the semantic gap in museum documentation

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ABSTRACT

In this paper we address a persistent widespread issue in museum documentation, the semantic gap: a disconnect between how users search online collections and staff apply metadata. By applying a systems-level understanding to documentation practices, we not only interrogate the complexity of the semantic gap, but also envision ways to bridge it. To examine documentation practices in depth, we use the case study of National Museums Scotland, undertaking interviews and a workshop with staff cross-institutionally. We apply practice architectures, initially developed for educational practice, as a systems-level framework, adapting it for the analysis of cultural heritage documentation. Using practice architectures as a lens, we examine and deconstruct different arrangements (encompassing cultural, material, social, and economic resources) that are entangled and prefigure documentation practices. We thus re-envision practice architectures at National Museums Scotland and beyond that transform documentation practices, supporting staff to place users at the centre.

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1. Introduction

One central goal of cultural heritage institutions is to make their collections accessible. This includes providing images of collections through online catalogues and search portals capable of reaching local and international audiences. Studies have shown that the ways users search and use collections online is not always in alignment with how staff apply metadata to collections and the specialist/technical language they use (Chowdhury et al. 2022; Klavans, LaPlante, and Golbeck 2014). This phenomenon, commonly referred to as the 'semantic gap', has been a persistent issue in the cultural heritage sector, accompanied by related challenges in enabling access to online collections.

This gap was recently observed in research undertaken by Chowdhury et al. (2022) at National Museums Scotland (hence referred to as the 'Museums') and National Galleries of Scotland – motivating our research with the Museums which ran from February to June

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2023 (Kist et al. 2024). Chowdhury et al. (2022) reported a gap between collections metadata and user search queries: Specifically, participants in their research labelled collections images with terms/tags that went beyond the cataloguing categories (or 'units of information') of the Spectrum[1] collections management standard used at the Museums and widely in the cultural heritage field, particularly in the UK. Our project with the Museums was therefore, conceived to address this gap and increase access to their online collection images by suggesting the application of new forms of metadata.

The Museums provide a valuable case for exploring the widespread challenge of the semantic gap in a specific context, due to the complexity and breadth of their multiple collections,[2] audiences,[3] and museum staff who are experts in very different collections and types of engagement. Our project undertook an 'inside-out' investigation (reported in Kist et al. 2024), encompassing both the internal practices and views of museum staff regarding access to the online collections, as well as the views and experiences of users and non-users of the online collections.[4] Based on the findings, we proposed a framework for applying captions and keywords to collection image metadata that meet user needs and include terms connected to social identity, context, and sensory and narrative aspects of digitised collections (Kist et al. 2024, section 6), which we refer to as socio-affective terms in the rest of this paper. Following from this research, and focusing primarily on the end users' data, in Kist and Economou (2024) we have argued for the need to shift museum metadata practices to integrate these socio-affective terms.

Complementing the user focus of that paper, here we look internally at the organisation, reporting on the findings from interviews and a workshop with staff members from across the Museums. The main research aim addressed in this paper is to understand the factors that shape staff documentation practices for enabling public access to online collections, contextually situated in the Museums. We pursue this aim through four main research questions:

- RQ 1: How do staff pursue and conceptualise user access to the online collection images? (particularly in the use of metadata/vocabularies)
- RQ 2: What changes in their practices have they made for user access and what were the challenges to providing it?
- RQ 3: What organisational conditions and working practices need to be changed to support staff in enabling user access through documentation?

Shifting approaches to documentation, however, requires changes not only to metadata practices at an individual cataloguer level, but also at an **infrastructural** or **systems** level of metadata application. While research on the semantic gap, often focuses on the practices of museum practitioners, several studies also hint at the tacit and invisible museum structures including technology and available resources which shape documentation practices and in turn, user access (Tran 2021). It is these organisational structures that are the focus of this paper. We analyse these using the framework of practice architectures (Mahon et al. 2017), which we apply to the cultural heritage field using the case study of the Museums to explore them in depth, thus adding a fourth research question:

- RQ 4: How useful is the practice architectures framework for understanding, and therefore transforming, documentation practices?

Practice architectures are arrangements of resources – social, cultural, economic, and material – that prefigure and underpin practices. We argue that understanding current architectures and how they construct documentation practices opens pathways towards transformation, in this case, of access to online museum collections.

2. Literature review

2.1 Overcoming the semantic gap by understanding users

Several studies aimed at increasing accessibility to online museum collections have investigated who users are, their motivations, how they search, and their different vocabularies, to adapt metadata practices. For instance, Villaespesa (2019) studied online visitors to the Metropolitan Museum of Art collections, Clough et al. (2017), visitors to Europeana online collections, and Walsh et al. (2020) online visitors to National Museums Liverpool. These studies reveal a range of motivations for visiting the online collections, providing insight for documentation practices and interface design. Others have focused on understanding one facet of online collections' search and accessibility: user vocabularies. For instance, Hollink et al. (2004), Hastings (1999), and Wells-Angerer (2005) have investigated the types of terms that might be included in collection metadata through user tagging of collection images and recording user queries. Such studies are based on the idea that by understanding users, metadata can be changed/updated to encompass multiple perspectives, meet different user interests, and capture different vocabularies (Navarrete and Owen 2016).

As a result, several suggestions have been made for changing museum documentation practices to increase collections' accessibility. These include clarifying relations between collections and metadata (Jones 2018); opening collections documentation to user participation/plurality (Park 2023); applying more interpretive and contextual metadata (Näslund 2022);[5] and undertaking further research on users of online collections through computational methods (Park 2021), speculative design (Hansson 2023), and by directly involving users to understand their needs (Dobreva, O'Dwyer, and Konstantelos 2011). Our recent publication based on user research at the Museums (Kist and Economou 2024) argues there is a need for museum staff to shift metadata practices from focusing on images as static and neutral information to viewing them as socio-affective forms of communication. However, despite the user research and various suggestions for improving access to online collections, the semantic gap remains a persistent challenge in the sector significantly undermining collections' access and use.

2.2 Overcoming the semantic gap by examining documentation practices

Understanding why the semantic gap persists involves looking beyond users to critically examine the cultural institutions themselves and their practices. Theorisation regarding challenges pertaining to user access created by staff documentation practices is entangled with museum technology, labour, and resources. Histories pertaining to the technological infrastructure of collection systems and ways of describing things can impact current and future possibilities for documentation practices. Previous research has revealed that museum knowledge around collections, including the plurality/diversity of perspectives and the inclusion of more interpretive information, can be impacted and

limited by the technological affordances of collections management systems (CMSs) (Park 2021; Turner 2016). In part, this is because CMSs were originally a tool for institutional accountability rather than public access, carrying these affordances into contemporary documentation practices (Chapman 2015).

Other researchers, like Lawther[6] (citing Hill (2016) in Frost 2020) and Tran (2021) have honed-in on the relation between collection practices, and the emotional labour these require, and limited resources and institutional recognition (Frost 2020; Tran 2021). This body of work highlights the need for changes to documentation practices not only at an individual cataloguer level, but also more broadly at the configurations or systems around staff which can shape those practices.

Various frameworks can be used to draw attention to a systems-level understanding of cultural documentation practices. For instance, a framework of 'infrastructures' (Edwards 2019) has been used in the cultural heritage sector to expose the invisible, sometimes tacit 'structures' such as habits, norms, physical resources, and social policies which impact practices (Tran 2021). However, infrastructures can sometimes over-emphasise a systems approach causing on-the-ground practices to be obscured, while focusing on the perceived materiality of infrastructures can overshadow the social dimensions of practice (Koch 2017).

In digital cultural heritage, the concept of assemblages has been used to understand AI in museums as 'socio-technical ensembles that constitute, stabilize, and transform the constantly changing relations between AI technologies … , human beings … , and real or virtual environments' (Bareither 2023, 101). Assemblages in this case, however, are used to understand how museum practices are transformed by AI rather than why they often remain unchanged.

Comparatively, we found the framework of practice architectures, useful not only for examining museum documentation practices at a systems level but also for deconstructing barriers for change.

2.3 Practice architectures: a framework for deconstructing collections documentation practices

Practice architectures is a theory intended to act as a framework for dissecting and interrogating practices contextually situated, enabling professionals to make judgements, changes, and responses in relation to particular 'conditions and circumstances' (Mahon et al. 2017, 17). As Mahon et al. (2017, 17) describe in the context of education,

> If we put the theory of practice architectures to work analytically in our own sites of practice, it can help us to identify what tools we need to finish the job, or, more accurately, to get on with the never-ending job of transforming education, and transforming professional practice more generally.

Practice architectures encompasses three proposed arrangements that are suggested to contextually prefigure practices, being both in flux and static, overlapping, and simultaneously extending backwards and forwards in time:

(1) The **cultural-discursive** encompasses 'resources' that make possible certain *sayings* in a practice, such as language, norms, and shared meanings (Mahon et al. 2017, 8).

(2) The **material-economical** 'are resources (e.g., aspects of the physical environment, financial resources and funding arrangements, human and non-human entities, schedules, division of labour arrangements), that make possible or shape the *doings* of a practice' (Mahon et al. 2017, 8).
(3) The **socio-political** 'are the arrangements or resources (e.g., organisational rules; social solidarities; hierarchies; community, familial, and organisational relationships) that shape how people relate in a practice to other people and to non-human objects; they enable and constrain the *relatings* of a practice' (Mahon et al. 2017, 8).

We find the theory of practice architectures in its ability to (a) politicise practice; (b) humanise practice; and (c) theorise relationships between practices (Mahon et al. 2017, 14) helpful for critically reflecting on museum documentation. Specifically, it enables us to deconstruct the circumstances and conditions surrounding documentation to identify pathways for change.

3. Methodology and methods

To understand the factors pre-figuring staff documentation practices for enabling public access to online collections and answer the research questions (outlined in the Introduction) we adopted a case study approach. We used qualitative methods which recognise the complexities of participants' perspectives and experiences to reflectively investigate the 'inside' views of the Museum staff (Flick 2022). According to Yin (2018), a case study enables the contextual analysis of a complex problem which has significance for theory and can be extended to have relevance for other institutions. In this case, an initial problem contextualised within professional practice at the Museums (a gap between collections metadata and user search queries) helps to understand the broader research and practice about the semantic gap which is widespread globally in cultural heritage documentation practice.

In discussion with the Museums' Collections Data and Digitisation team, we decided to focus on vocabulary in order to explore further and address findings from previous research by Chowdhury et al. (2022) that reported a gap between the Museums' collections metadata and user search queries.

To incorporate multiple staff perspectives, we carried out a series of interviews and a cross-departmental workshop. Our interviews involved staff from across the following departments:

- Collections Data and Digitisation
- Digital Media
- Marketing and Communications
- Exhibition and Design
- Image Licensing, National Museums Scotland enterprises
- Curatorial
- Learning and Engagement

Interviews lasted approximately one hour and encompassed a combination of individual and group format (with staff from the same department) due to the short timeline of

the project and staff availability. Group interviews enable the quick collection of rich qualitative data through which interviewees can discuss and build on each other's perspectives (Brinkmann 2022, 23). All interviews were semi-structured to enable the exploration of questions relevant to interviewees and the themes addressed by the research questions. A list of themes and the main aims of the research were sent to staff in advance, including participant information sheets and consent forms. Interviews were recorded and later transcribed using the NVivo software.

We also facilitated a workshop at the end of the project in May 2023 with 10 staff from across the Museums' departments in order to evaluate the frameworks we proposed for applying keywords and captions to collection images (Kist et al. 2024, section 6) following the user research. During this workshop, participants applied the proposed frameworks to images of different objects from the collections, evaluated them and suggested minor changes. They also critically discussed the relation between keywords, captions, and current object descriptions for serving the findability and accessibility of the collection. In the discussion, staff reflected on the implications for resources (available staff and time) for implementing and applying these tools, as well as the wider questions about institutional strategies and practices these raised, providing insight on research questions 2 and 3. We took notes throughout the workshop (with participants' permission) and analysed these alongside staff interviews on NVivo.

In the analysis of interviews and workshop notes, we followed an inductive and subsequently, a deductive approach. Initially, we used a thematic analysis protocol with interviews and notes being inductively coded in relation to our research questions. When grouping these codes into larger clusters in the 'construction phase' (Vaismoradi et al. 2015), we identified the potential relevance of a practice architectures framework for interpreting the findings in relation to our research questions. We then deductively organised these clusters to provide insight on their interconnections through the three practice architectures' geographies or themes (cultural-discursive, material-economic, socio-political).[7]

4. Findings

4.1 Cultural-discursive arrangements

4.1.1 Shared goals and ideals of collections documentation

In the practice architectures framework, Mahon et al. (2017), refer to the cultural-discursive arrangements mainly in terms of specialist language that underpins practices. In this case, we use it to refer to the shared 'culture' (goals, ideals, norms) of documentation practices in the Museums. We found this arrangement particularly useful (and expand on the most below) for interpreting our findings at a systems level, revealing how it is perpetuated and entangled with the two other arrangements. Through the culture-discursive lens, we can further understand how the culture of the Museums' Collections Data and Digitisation team intersects with other departments in relation to metadata, and how these together, shape documentation practices, contributing to the semantic gap.

Collections documentation staff at the Museums share common ideals regarding a desire to change documentation practices towards being **increasingly 'user centred' and enhancing user access** through the Search Our Collections (SoC) portal on the

institution's webpage. However, **making these changes is prefigured by what staff describe as a need for both 'accurate' and 'structured' data.**

One of the main motivators for this research was that the Museums' Collections Data and Digitisation team had identified a gap associated with what they perceive as the limited 'object-oriented' focus of their current collection metadata. To the team, this is an issue that hinders the retrieval and access of the related collection images since these are not only about an object but also the ***visual*** components of an image. Such visual components may include more abstract or intangible elements such as emotions conveyed, currently not captured in the metadata they record:

> When an image is created, what we use at the moment is the description of the object, so it's pulled from the collections system into the media record. We are not describing the picture, we are describing the object that's in the image. That's never really sat well with me, but it has been a means to an end—in terms of just giving people an understanding of what the image is about. (Interview, Babes 2023)

Associated with this lack of visual descriptive language regarding collection images, collections staff also perceive another gap in the collection metadata. They describe this as a **lack of general or broad non-specialist language** for describing what is depicted in an image: for example, the term 'dinosaurs' compared to the more technical and specific term 'Tyrannosaurus rex'. As a staff member suggests, to address this gap, the metadata of collection images encompassing a caption and keywords might include:

> Things that describe the image more than the object, and I go back on the shapes and colours because that's more keywording, but [for the caption], definitely more things that paint a *picture* of an object in this situation. (Interview, Norfolk 2023)

Staff perceive the absence of these forms of documentation in the collection metadata as preventing the images of online collections from being surfaced by users in a variety of ways:

> If you have a fan for example, with lots of nice colours in it, the description might say it's predominantly red—but you might have silver, gold, and black and there might be a picture of a peacock [on it] or something like that. There's nothing like that [in the current metadata] to be able to pull those [images from the SoC portal]. (Interview, Babes 2023)

However, in our discussions, importance was placed not only on metadata to collection images that encapsulates visual and general descriptive terms, but also the accuracy and structure of metadata. For instance, one collections staff reflected on the importance of applying metadata that could enable users to find and connect with the collections (e.g., through terms associated with shapes, colours, or emotions), while simultaneously maintaining correctness, viewing these two directions as complementary:

> So, it's a combination of data [that] is human and it's personal and we want people to understand it and feel that it reflects them and other people, but it also has to be accurate as well. So, there are two sides, they go in the same direction, if we sort both things out, they'll get there—they're not against each other. (Interview, Norfolk 2023)

The importance of accurate metadata was associated with staff's role as part of the larger museum in upholding public trust and being perceived as providing 'truthful' information. For some, this could be at odds with the application of more descriptive socio-

affective terms. This was evident through staff's caution to the perceived imposing of interpretation through collection image metadata onto users. For instance, **emotions** conveyed through images were particularly challenging to imagine applying for museum staff in the collections team but also across the Museums' departments:

> I've seen ones [i.e., image metadata] from other collections, where people put [terms] like 'fearful' and 'aggressive' and that's an interpretation that's really interesting and I think that's something that would be really difficult for us to impose as a museum, but if that's what people are seeing, that's what they're seeing. (Interview, Norfolk 2023)

As a lead photographer reflects, because of the subjective nature of this, there would need to be clear guidelines:

> Who decides that's what's going to be going out? I mean my feeling of a picture might be completely different from a curator or to another photographer. So, before we start putting keywords [into collection image metadata], we have to say what are the parameters. (Interview, McLean 2023)

Collections staff also reflected on the need to structure the terms applied to the metadata through **controlled vocabulary**, for instance by using a pre-existing thesaurus. This would make applying and updating collection image metadata manageable for staff but also more impactful for users.

> I think that sort of thing [applying keywords to collection image metadata] only has mileage in it, if we are starting from a vocabulary that already exists which we might need to amend and add to—but just letting it grow organically, we don't really have the capacity to manage. (Interview, Thomson 2023)

On the other hand, the application of a specialised vocabulary was also reflected on as being a potential hinderance for prioritising user-centred terms: 'If we did it [the application of keywords to collection images], I think to bring in specialists … would become too specialized, and you wouldn't get that broader view' (Interview, Babes 2023). As we cover in the discussion in section 5, the use of both crowdsourcing and digital tools like automated image analysis for generating tags may broaden the terms used in collections documentation (Famularo and Denton 2024). However, both approaches require careful consideration of their limitations, and how they fit within existing architectures of documentation practices.

4.1.2 Other departmental 'discursive cultures'

When looking beyond the shared goals of collections staff regarding the need to change documentation practices while maintaining accuracy and structure, it was interesting to observe that the discursive culture of the collections team could collide with the practice arrangements of staff in other departments. As our interviews showed, staff in different departments could have **complementary but different perspectives** regarding how to enable user access through collection image metadata based on their own role and perception of audiences, making honing in on the '**right' documentation practices complex**.

For instance, staff working in both digital and in marketing emphasised the communicative aspects of collection images and their relevancy for contemporary social contexts. Digital content staff were keen to be able to easily find and narrow down on collection

images in order to share these with the public in relation to holidays or social events such as Black History month. They were also interested in the intrigue an image and associated object might have: they might ask for 'juicy details' or if, in a sense, an image conveyed something 'funny' or 'weird'. The digital content staff member described the absence of these details in the collections metadata: 'What it's [the collections metadata] not necessarily saying is why it [the collections object] exists, who made it, and where it's from. It doesn't have that kind of juicy information'.

Comparatively, learning staff emphasised the need to apply language to collection image metadata that is accessible to a 7-year-old, echoing the collections team's desire for more general terms:

> If all the labels are built with a seven-year-old in mind because that's the age range that you go for, isn't it? Like when you're writing labels, then maybe the search our collections should be written with a seven-year-old in mind.

However, the learning staff also referred to the importance of including in the collection metadata, locations and ways to link them online with learning materials created by their team. This would allow school groups to connect the collection images they might view online pre- or post-visit to the content they view in the museum.

Photographers, who experience the collections from their own distinctive perspective, suggested the application of metadata that encompasses things such as touch, weight, texture and equipment used. For example, one photographer suggested, 'I would probably think about the fabric of what you're looking at. So, what the materials, the feel of something – it's not just the visual but the touchy feely of something. What is it like to hold?'

On the other hand, curators interviewed were interested in enabling search by specifics. For example, by clicking on a specific designers' name and narrowing down to the precise object such as a certain handbag or dress. They were also interested in enabling searches by more technical details such as design techniques. As one curator suggested, being able to search by 'country or origin, designer, manufacturer, associated people, decade, like school or style maybe – that could be really useful'.

While the different priorities and interests of these staff members in relation to the collection image metadata are not necessarily in contradiction, together, they make deciding on an integrated approach to image documentation and what terms to prioritise complex. This is made even more challenging when considering a controlled vocabulary that also supports user-centred terms, and an approach to image documentation that staff feels upholds accuracy and trust in the Museums.

These findings show how the cultural-discursive arrangements associated with documentation practices can sustain current ways of doing things even though the Museums' staff recognise the need to shift documentation practices and apply new forms of metadata to collection images. These current ways of doing things are perpetuated by and enmeshed with socio-political and material-economical arrangements we discuss in the next two sections.

4.2 Material-economic arrangements

The second set of arrangements that the framework of practice architectures suggests as contextually prefiguring practices are the material-economic ones. These pertain to

resources, such as 'aspects of the physical environment', financial resources, tools, and technologies 'affecting what, when, how, and by whom something can be done' (Mahon et al. 2017, 8). When applying these to museum documentation practices, they encompass **finite resources and invisible labour** and the **legacies of collection management systems**.

4.2.1 Finite resources and invisible labour

Similarly to other cultural organisations, staff at the Museums must balance numerous priorities when it comes to collections documentation which can be challenging in the face of finite resources. The extensive labour required for these priorities may further, be underestimated due to both departmental silos (discussed in the next section on socio-political arrangements) and the invisible nature of documentation work. Tran (2021) reveals how documentation work and documentation workers are often institutionally 'invisible' and that the amount of labour required to deal with historical legacies while moving documentation forward is often underestimated. The interviews with the Museums' staff showed that both the institutional drive to address racist and outdated language and the need to publish new records to meet targets, on top of the 'bread-and-butter' of collections management 'data-cleaning', requires an immense amount of time and resources.

> [T]he absolute biggest problem is we need the resource to improve information to get fields filled in and fields filled in consistently so we can facilitate that access. And that's a combination of people like [other collections staff] and I, and curatorial expertise … there's a big range of resources that we need to make it really comprehensive. (Interview, Thomson 2023)

This can be particularly challenging because, as discussed earlier, the publication of data from the museum is seen to represent 'truth'; this can make documentation practices emotionally taxing, absorbing staff resources in less acknowledged ways:

> People feel like they should be able to go to a museum website and if they see a term used or they see an object identified as something, then that's true. That's like the encyclopaedias of old—[if it's there,] it's true. And that's a bit scary sometimes when you see records and you think I'm about to publish this. (Interview, Norfolk 2023)

As one staff member described referring to data-cleaning, 'it's quite hidden and its quite hard to see the work in it, if that makes sense? I don't think a lot of people understand what we do and there's also just not enough of us' (Interview, Thomson 2023). As such, staff's work may be misunderstood due to being both very demanding and sometimes invisible, which simultaneously may be underpinned by limited cross-departmental working hindering communication across the institution and embedded approaches to change.

4.2.2 Legacies of collection management systems

Another significant player in the material-economic arrangements which shapes staff's ability to apply collections image metadata includes the collections management system, its legacies, and associated embedded documentation practices. As acknowledged by collections staff at the Museums and other cultural heritage institutions (Chapman 2015), these systems were initially intended to be a tool for internal

management and accountability. Due to shifts in museum goals pertaining to user access, these systems have increasingly become linked with publicly accessible collection webpages and searches but often preserve legacies of their origin. As described by a Museums' collections staff member:

> We also suffer from the problem that these systems weren't ever meant to be accessible to the general public and the last 15 years, all of a sudden, we've had to bend this thing that was very much a management tool into something else entirely and it doesn't fit very comfortably in some instances. (Interview, Thomson 2023)

As a result, staff have to engage with what is already there, rethinking existing categories of data that can be made available to users, appropriate terminologies to apply, and how collections metadata can enable engagement through collection webpages. As such, existing systems and associated ways of working provide the base from which adaptions and changes can be made. As the collections staff member goes on to describe:

> I don't think we've made many concessions to our external users in the way that we catalogue things. I think we think about it a lot more when we are deciding how we will do things now, but feeding that back through 800,000 records and a couple hundred years of several institutions' history and how we've recorded stuff, we've only really just scratched the surface. (Interview, Thomson 2023)

As reflected on by staff, this means that very few categories of metadata have been created with the public users in mind, and interpretation entered within the collections management system is minimal. Similarly, the existing data and language used for some records may be rooted in older ways of describing things, making it challenging to apply metadata not only to images going forward, but also numerous previous records.

4.3 Socio-political arrangements

Socio-political arrangements affecting practices can encompass social roles, organisational positioning of staff, organisational priorities, and organisational rules, including communities and hierarchies (Mahon et al. 2017, 8). In the case of the Museums, the tension between balancing user-centred metadata with accurate and structured data is perpetuated by internal **departmental silos** which create challenges regarding staff's collective agreement on metadata standards. This tension is also pre-figured by the required investment of the collections team's labour and time into certain **institutional priorities** over others.

4.3.1 Departmental silos

The application of user-centred metadata is shaped by the ability of staff to agree on a thesaurus/schema that fits very diverse collections and satisfies different audience priorities. This challenge of meeting a range of interests and needs institutionally is in part associated with departmental silos and their continued legacies across documentation practices and workflows. While staff referenced that there were increasingly **cross-departmental methods of working**, they also acknowledged that this rarely feeds back into documentation practices:

> I think that's something the museum is doing in general: it is trying to get much more cross-departmental work going. And you can see that in lots of initiatives, but I think we need some

> way of feeding that back into the data and this [the application of metadata to images] could be the beginning of that. (Interview, Thomson 2023)

Originally, the data from each collection at the Museums was divided into individual systems, which was eventually moved into a unified museum database. This has led to a **lack of shared categories across all collections** and where these do exist, a **lack of consistency in applying them** across departments. One staff member reflected on this inconsistency: 'our Science and Technology categories are great, so transport is really well categorised but then, if you want Scottish History and Archaeology, it's often just "what category is it?"' (Interview, Norfolk 2023). To have a cohesive approach to collections documentation, metadata, such as those applied to images, must satisfy staff, particularly expert curators across very different forms of subject matter who may not normally collaborate/communicate, while also supporting user needs and interests. As one of the Museums' designers explained:

> It's the same with all junctures between our academic- and visitor-focused side of things: you kind of got to find the terms that both understand and that both are happy enough—so the curatorial are happy enough to use that term to explain it but it's still got to be a term that's understandable by visitors—it's where those Venn diagrams meet, it's maybe not a huge overlap. (Interview, Inglis 2023)

Moreover, as discussed above, **audiences are imagined differently** by various staff and departments, which leads to slightly different ideas regarding how users' access to collections can and should be supported through collection image metadata. During the time this research was undertaken, the Museums were designing an audience development plan, which as staff interviewed from across all departments reflected, was overdue. As the Interim Head of Digital Media (Interview, 2023) explained:

> We are currently going through an audience development process to help us as an organisation to *align our thinking*, because traditionally we have a marketing audience segmentation that's about 10 years old maybe, possibly older—which means it's increasingly less and less relevant to audiences today.

Not having an audience development plan, perpetuates divisions in perceived audiences across departments and ambiguous guesses for how to meet their interests and needs:

> There's been lots of workshops with an external agency who's been working through that process and trying to align us, because … as an organisation [we cater for a wide range of audiences:] [In] my team, we are very focused on online audiences of course, the Marketing team is focused on bringing people into the buildings, Learning and Engagement are focused on school visits and engagement in the spaces with particular groups or underrepresented community groups as well. We are all doing things for different audiences. (Interim Head of Digital Media 2023)

The siloed nature of departments in museums, such as at our case study, may therefore contribute to challenges regarding cohesive approaches to documentation practices by prefiguring disagreements regarding what audience priorities are, and how these should be reflected in collection metadata.

4.3.2 Institutional priorities

Despite ambiguity regarding audience priorities, the Museums staff must balance several pressing institutional priorities. These priorities include not only changing

metadata to be increasingly accessible, but also constantly **updating and changing outdated/colonial language**, such as location/provenance names, and **meeting institutional KPIs**. Due to limits on resources discussed in the previous section on material-economic arrangements, these priorities can sometimes lean more towards one direction than the other.

One staff member reflected that addressing colonial and racist language could and should take precedence over ensuring accessible terms are applied across the collections: 'There's been some concerned projects designed to tackle that kind of stuff [racist language], which is obviously much more pressing than maybe the public not knowing what "crinoline" is' (Interview, Curator, 2023). And such decolonial projects/initiatives can take an immense amount of time:

> We tend to work directly with the relevant curator or curators Interview, – Africa has been the focus of the place name work. But it is a bit long and arduous. And a lot of it sits in excel files for a very long time and doesn't see the database. (Interview, Thomson 2023)

In part, as described by another staff, 'we're sometimes a bit reactionary with this kind of thing because of time' (Interview, Norfolk 2023). Further, a Learning staff member reflected that updating outdate language is an ongoing and constantly evolving process, 'even things like colonialism and colonial history, – the wording around them can change year to year as things progress and so, it's keeping it updated' (Interview, Learning and Engagement staff 2023).

In addition to these decolonial priorities which require a lot of ongoing investment, collections staff must meet certain benchmarks, particularly as the institution works towards ambitious open-access goals. As described by a collections staff member,

> the key performance indicator that we are directly involved in, is the number of additional object and specimen records published online and in the Search Our Collections [portal], and I think it's the number of images – I don't think it's the number of records illustrated. (Interview, Thomson 2023)

Despite a current focus on quantity over quality, this was also being reassessed while the research was being undertaken with staff considering future measures 'like … the completeness of records or the amount of access' (Interview, Thomson 2023). Such institutional priorities prefigure practices to be oriented towards these goals and, considering stretched resources, can sometimes hinder the application of wider and long-term changes to collection metadata for enabling user access.

5. Implications for museum documentation

As made evident through the findings, the persistence of the semantic gap and a need for user-centred metadata is recognised by staff, yet, addressing these is constantly presented as a just-out-of-reach pursuit. This is due to the interplay and tensions within and across different cultural, material, and social arrangements that construct a practice architecture for collections documentation. This architecture prefigures practices and can make applying new metadata to collection images at an individual staff level difficult, requiring larger systems-level alterations. Other cultural heritage institutions face similar challenges; as described by Navarrete and Owen (2016), '[t]echnology allows for complex information dimensions, however, in reality, digitisation strategies still tend to

focus on access to museum collections through images with a brief title (subject) label, thus using a restricted set of possible metadata' (115).

Our findings reveal how goals for enabling user access on the part of the collections team may compete with ideals associated with accurate and structured museum metadata. Such a perspective echoes previous research by Näslund (2022) which theorises that collections staff mainly pursue metadata that encompass accurateness, objectivity, efficiency, and specificity. However, in our case study, the use of the practice architecture framework shows how this tension is entangled with different goals for user access across different institutional departments, making honing-in on how to support user access through metadata challenging (cultural-discursive). This is exacerbated by the legacies of past documentation practices and systems which often create a stubborn base from which to alter documentation data fields and practices both retrospectively and going forward (material-economic). The lack of a common vision on audiences and how to improve user access to online collections may be perpetuated by departmental silos and a lack of cross-institutional working that feeds into documentation practices. Simultaneously, limited resources may lead to responsive projects, as opposed to ongoing long-term changes for supporting collections access (socio-political).

Understanding how these arrangements and their entanglement prefigure staff documentation practices, however, also provides insight into how to adapt them to open pathways for changing documentation practices at the Museums and beyond.

5.1 Pathways for re-shaping practice architectures for user-centred documentation

From mapping out these arrangements and how they create certain conditions for practices, we can infer that changing documentation practices requires altering the surrounding cultural-discursive, material-economic, and socio-political arrangements to support both **cross-institutional working** and **staff agency**. Adapting associated structures can help staff overcome internal tensions within cultural-discursive frameworks and alter the material-economic and socio-political arrangements which support and feed into one another.

One way to overcome many of the challenges associated with applying user-centred metadata to collection images is to embrace cross-institutional methods of working which can disrupt current conditions surrounding documentation practices. Cross-departmental working may enable staff to *cohesively* overcome silos in perspectives regarding who audiences are and what audience-centred metadata may look like. This process is already ongoing at the Museums, with the development of an audience plan developed with cross-departmental staff members. Extending such practices, staff could work to develop a **peer-review system** for the application of image metadata which would help address the tension between user-centred data that might be more interpretive/general and the need to maintain accurate and structured metadata. This might enable staff, whether drawing on a pre-defined thesaurus or staff/user generated terms, to discuss together and feel confident in applying terms associated, for instance, with emotion. This idea was brought up in the cross-departmental workshop we organised, as staff had expressed concern that there is not necessarily a

right way to apply metadata to collection images, but there could be a *wrong* or offensive way:

> If we were to create some keywords from the very beginning, there will still have to be another phase somewhere for someone to check that. And it could be many people checking that; it could be a curator who says, 'I don't get this feeling of love from this picture'. I think with that system, two or three people [would] have to tag with the same tag before it's accepted. (Workshop reflections, Babes 2023)

However, careful consideration of applying interpretive metadata such as emotions and its implementation is needed: Previous research has emphasised the importance of documenting the reason for applying an emotion label, whether crowdsourced or automated (Achlioptas et al. 2021) and contextual information regarding who tagged the images, their personal values, and socio-cultural positioning (Famularo and Denton 2024; Giardina Papa 2020). Tools such as computer vision can be useful for automating digital image analysis, increasing metadata description and collection accessibility, supporting staff in this process (Famularo and Denton 2024; Wu et al. 2023). However, the implementation of such technologies must also be implemented with transparency and a critical awareness of their limitations and risks (Famularo and Denton 2024; Giardina Papa 2020). Breaking departmental silos may also help make visible the invisible labour that is often associated with documentation work, raising institutional awareness of the investment required for not only decolonising, but also making online collections accessible.

Staff recognised that decolonising and changing documentation practices more broadly required an embedded, long-term, *cross-institutional* approach. As one member of staff described these change-making initiatives:

> it's not been embedded in our everyday jobs for the last 100 years of the field existing, so that needs to happen, and what tends to happen in the industry [is that] someone will be hired as a project role and […] they'll do a fantastic job, but they'll leave. Whatever the organisation, they'll go back to their normal work, thinking they've ticked a box—which is a real shame. … [T]his is an institutional thing—there's a desire to change from almost everyone I think, but it's just about moving as one big organisation; but it's hard. (Interview, Norfolk 2023)

Another pathway for changing documentation practices, would be to shift the arrangements surrounding practices to further support **staff agency in being change makers**. Staff need to be empowered to make practical, technical, and social changes to be able to respond to changing users and changing user interests. This could require further staff training on innovative technologies (such as computer vision) and investing in the creation of technology in-house (Craig 2021). Staff recounted the importance of being able to continuously adapt what data both collections documentation systems and practices draw from:

> Most of the time I've been at the museum, I've been responsible for keeping the museum collections management system running and fit for purpose and developing it according to the needs of the museum and its users. (Interview, Kneale 2023)

Moreover, collection staff reflected on their ability to make changes in-house to what data the API of the collection search interface draws on and in turn, publicly displays to users, rather than outsourcing it to a tech company, which was the case several years ago:

> So, I guess, we can start to do something with the firm intention that if this works out, we can make that happen online, without having to go: "okay, now we have this thing we can publish in three years' time, we might get the budget to be able to publish it". So, I think that … makes a difference as well. (Interview, Thomson 2023)

This ability to adapt and change technological tools is an important takeaway for future implementations of search interfaces, but also other technologies such as computer vision. This would require staff who are trained and knowledgeable both about documentation practices, but also AI, and are empowered to work collaboratively to avoid outsourcing and temporary labour (Craig 2021).

This points to a need for institutional arrangements that support staff's agency in terms of their ability to tweak and adapt documentation and documentation systems and continuously pursue change, as opposed to a one-off project. These arrangements include resources, processes, and time for reflecting on institutional legacies and how they impact practices, much work which has already been done in the Museums. As often agreed between collections staff and researchers, updating descriptive metadata of collections is not a one-off activity but dynamic and ongoing Näslund (2022, 13), requiring the suggested shifts in practice arrangements discussed here.

6. Conclusion

In this paper, we deconstruct and re-envision practice architectures at the Museums, to identify two possible pathways for bridging the semantic gap and supporting the application of user-centred metadata: cross-institutional working and privileging staff agency as change makers. Although our research was embedded in the specific context of this case study, it builds on and extends other work that shows that these pathways could be effective towards bridging the deep and wide-ranging impact of the semantic gap across cultural heritage organisations.

Systems-level or organisational/infrastructural conditions can seriously limit the possibilities for change in cultural heritage organisations such as museums, preserving the conditions which sustain the semantic gap. However, moving to a more positive but still critical understanding of these elements that shape documentation practices is key to identifying pathways for transformation and sustainable strategies of working within them. We found practice architectures to be a useful and comprehensive framework for deconstructing how these conditions are interlinked and their dynamic relations which create challenges regarding the application of user-centred metadata to collection images. Focusing on any single dimension, e.g., cultural-discursive in terms of staff goals and ways of doing things, is not sufficient but rather, we need to examine how these arrangements (including the socio-political and material-economic) are all entangled and feed into one another.

Based on our analysis, we advocate for a much-needed shift towards a cohesive fuller-picture and institution-wide approach to collections documentation and user access and suggest here some pathways for implementing this in in practice. This involves deconstructing and re-envisioning practice architectures that place users at the centre of documentation practices and support staff to take sustainable steps to bridge the semantic gap.

Notes

1. https://collectionstrust.org.uk/spectrum/
2. National Museums Scotland cares for over 12.4 million objects from diverse subject areas. Its collections departments include Global Arts, Cultures & Design; Scottish History & Archaeology; Science & Technology; and Natural Sciences. The Search our Collections (SoC) portal (https://www.nms.ac.uk/search-our-collections), which was the focus of this research, includes over 820,000 items that span across these collection areas.
3. The Museums attracted over 2,186,000 physical visits in 2023. This makes them the most visited tourist attraction in Scotland, the most visited museum in the UK outside London (Association of Leading Visitor Attractions, March 2024, https://www.alva.org.uk/details.cfm?p=403&codeid=878) and the 23rd most visited museum in the world (Art Newspaper, April 2024). One of the Museums' strategic aims for 2022–27 is: 'Our audiences will be more diverse, and more people will connect with our collections and their stories.' (National Museums Scotland Strategic Plan 2022–27, 6, https://www.nms.ac.uk/about-us/strategy/strategic-plan). During the time that this research was undertaken (February-June 2023), the Museums were in the process of preparing an Audience Development plan which was meant to create a cohesive approach to communicating with different audiences.
4. For a profile of users and non-users of the Museums' online collections that we investigated in our research (see Kist and Economou 2024; Kist et al. 2024).
5. Originally published as Dahlgren.
6. For more on their research: http://www.kathleenlawther.co.uk/.
7. This project received ethical approval (100220077) by the University of Glasgow Arts Ethics Committee. Museums' staff were given the option to be named, attributed by just their job role, or given a pseudonym in research outputs. We cite staff quotes here following their preferences.

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Data availability statement

The authors confirm that the data underpinning the larger project from which the paper stems, is deposited at the University of Glasgow Enlighten research data repository http://dx.doi.org/10.

5525/gla.researchdata.1490. The transcripts of staff interviews discussed in this paper are not accessible to the public, as participants did not unanimously give consent for this.

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