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Personal Curation in a Museum

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An established body of work in CSCW and related communities studies social and cooperative interaction in museums and cultural heritage sites. A separate and growing body of research in these same communities is developing ways to understand the design and use of social media from a curating perspective. A curating perspective focuses on how social media is designed and used by people to develop and manage their own digital archives. This paper uses a cultural heritage museum as the empirical basis and setting along with new information visualization methods we have developed to better integrate these bodies of work and introduce the concept of personal curation; a socio-technical practice in which people collect, edit, and share information using personal information devices and social media as they move through physical environments rich with meaning potential. In doing so this paper makes three contributions. First, it illustrates how to combine a spatial focus on people's movement and interaction through the physical environment with an analysis of social media use in order to gain a deeper understanding of practices such as personal curation. Second, it shows in greater detail how visitors to museums and cultural heritage sites use and link digital information with physical information to shape others' understandings of cultural heritage. Third, it suggests how museums and cultural heritage sites may leverage personal curation to support more expansive learning opportunities for visitors.

CCS Concepts: • **Human-centered computing** → **Collaborative and social computing**; **Visualization**; *Empirical studies in collaborative and social computing*; *Visualization application domains*

KEYWORDS

Computer-supported cooperative work; social media; museum studies; learning sciences; information visualization; personal curation; cultural heritage; interaction geography;

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1 INTRODUCTION

An established body of work in CSCW and related communities studies social and cooperative interaction in museums and cultural heritage sites [12, 33, 55, 61, 65]. A separate and growing body of research in these same communities is developing ways to understand the design and use of social media from a curating perspective. In contrast to studying how social media is designed and used to perform identity and manage social relationships (i.e., a “networking perspective”), a

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curating perspective focuses on how social media is designed and used by people to develop and manage their own digital archives [70 also see 34, 41, 43, 67, 71]. In this paper, we integrate these separate bodies of work in order to better understand and potentially design for how people use personal information devices (e.g., smart phones, cameras) and social media as they move through physical environments rich with meaning potential. Likewise, we illustrate concepts and methods particularly relevant to the educational goals of museums and cultural heritage sites.

The setting and empirical basis of this paper is a three-year project to understand how visitors cultivate interests in and learn about the diverse historical and cultural heritage of American Roots and Country music as they visited a nationally renowned museum located in the mid-South region of the United States. Two primary questions guided our work. First, we wanted to understand how people's use of personal information devices and social media was organized over space and time as they moved across and talked together about exhibits and museum gallery spaces. Second, we wanted to study how visitors used personal information devices and social media to collect, edit, and share information from their visit, for example, to share examples of unfamiliar musical instruments with a friend, contribute to a growing historical account of their favorite musician's career, or prepare detailed, close-up samples of textiles from costumes that visitors plan to use as inspiration for their own professional goals.

To answer these questions, we collaborated with museum partners, participating visitor groups/families, and our university's institutional review board (IRB) to collect a purposive sample of complete museum visits across 22 visitor group cases (2–5 visitors per group) over a period of six weeks. Data from these 22 case studies came from three sources. First, we collected continuous, multi-perspective video and audio records (72 hrs total) of each visiting groups' movement, interaction, and social media use through small, unobtrusive cameras worn as necklaces for the duration of the visit with no researchers present (visits ranged from 30 min to 4 hrs). These cameras notably allowed us very close access to how visitors manipulated smart phones, tablets, and cameras that they carried into the museum gallery spaces. Second, following each visit, we conducted 1-2 hr post-interviews with each visitor group. These interviews focused on how visitors used personal information devices and social media during their museum visit as well as in their everyday lives. The post-interviews often included walks back through the museum with researchers present, providing visitors with opportunities to explain points of interest and places where they used personal information devices and social media to collect, edit, and share content during their visit. Third, during post-interviews we also connected with visitors directly on "followable" social media platforms such as Facebook, Instagram, and Twitter (i.e., as a friend or a follower). We remained a friend or follower for 2 weeks after the visit to study the social life of digital content (e.g., photographs, posts, videos) that visitors shared during and after their visit on followable social media.

In this paper we analyze these data using a grounded theory approach [11, 28] and new information visualization methods we have developed to introduce the concept of personal curation; a socio-technical practice in which people collect, edit, and share information using personal information devices and social media as they move through physical environments. In doing so, we make three contributions. First, we illustrate how to combine a spatial focus on people's movement and interaction through the physical environment with an analysis of social media use in order to gain a deeper understanding of practices such as personal curation. Second, we extend existing research to show in greater detail how people use and link digital information with physical information to shape others' understandings of cultural heritage. Third, we suggest

how museums and cultural heritage sites may use concepts and methods in this paper to support more expansive learning opportunities for visitors.

We begin by discussing relevant work in CSCW and related communities and by introducing methods of interaction geography we have developed in prior work at this museum [56, 57] that, in this paper, we use as part of our approach to study personal curation. Subsequently, we describe our methods of analysis. We then report three levels of analysis, starting with a general picture and then moving progressively to a more fine-grained account of personal curation. First, we provide an overview of how visitors across the 22 cases in our study used personal information devices and social media during and after their visits. Second, we use methods of interaction geography to track in a finer-grained way the organization of four families/groups' use of personal information devices and social media across three different museum gallery spaces. Third, we conduct a detailed analysis of one visitor to characterize personal curation as a socio-technical practice. We conclude by discussing three primary contributions of this early work and by critically discussing limitations and next steps.

2 RELEVANT WORK

2.1 Visitor Interaction in Museums & Cultural Heritage Sites

Our study is informed by and contributes to an established body of scholarship that studies social and cooperative interaction in museums and cultural heritage sites. This research uses audio and video-based methods such as conversation or interaction analysis [27, 37] that are “sensitive to social interaction of a moment-to-moment grain size” [17] to illustrate the socially situated nature of visitors' activities [1, 12, 22, 62, 65]. This research produces detailed descriptions of visitors' conversation and interaction (e.g., transcripts of conversation). These descriptions have in turn supported museums and cultural heritage sites' efforts to move away from solely “inward-looking roles” as curated collections to more “outward-looking roles” as places that engage visitors in interactions about the meaning of archival material often in relation to broader societal themes (e.g., climate change) [53]. Likewise, these descriptions have also contributed to a shift in studies of visitor behavior from understanding exhibits and archival content as a fixed curriculum that visitors succeed or fail at understanding towards a view of visitor engagement and interaction as an “enacted curriculum” [14]. Moreover, this body of research as a whole informs the design, development, and assessment of interactive technology in museums and cultural heritage sites (e.g., to customize visits [25, 26], develop and study navigation systems [4, 30], support visitors' access to information [6, 62], and evaluate visitor engagement and learning [51]).

Two acknowledged limitations in this body of research serve as important starting points for this paper. First, this research has not developed methods to link fine grained analyses of visitors' conversation and interaction at single museum exhibits with their spatial interaction and movement across gallery spaces, for example, to support studying and designing for collaborative interaction across exhibits and gallery spaces [62]. Put differently, this body of research remains separate from a related body of work (not reviewed here) that seeks to study and track visitors' activity (e.g., typically movement) across museums and cultural heritage sites at larger scales [see 5, 15, 39, 60, 63, 69]. Second, the types of visitor practices that are occurring within museums and cultural heritage sites continue to expand rapidly: As a result, there is a need “to extend CSCW's nuanced understanding of visitors to include practices of study, work, apprenticeship, voluntary participation, etc., and not simply leisure or informal learning” [13]. More specifically, we suggest

that there is a need to integrate previous research about visitors' "collecting practices" or how visitors collect and keep content as opposed to consuming content [47] with new research that seeks to understand visitors' use of personal information devices and social media during and after their visits to museums and cultural heritage sites.

2.2 Towards a Curating Perspective

A mostly separate body of research in the CSCW and related communities is developing ways to study the design and use of social media from a curating perspective. Three related lines of inquiry within this body of research are advancing a curating perspective. One studies how people's performance of identity and management of social relationships on social media is mediated by the ways in which social media sites perform curatorial roles [8, 10, 16, 18, 19, 20, 45]. Hogan's "exhibitional approach" to characterizing social media sites epitomizes this work [34]. An exhibitional approach emphasizes that social media sites are curators through their algorithmic and visual design. In particular, this approach explicates how the logic by which social media sites filter, order, store, and display digital information (e.g., through Facebook's news feed [21, 49]) mediates how people are able to use social media to perform identity and manage social relationships.

A second line of inquiry shows how users play an equally important curatorial role [29, 64, 70, 71]. For example, Zhao and Lindley's notion of "curation through use" suggests that people use social media to select, organize, annotate, and tell stories with and about information to construct their own personally meaningful digital archives [70]. Likewise, Zhao and Lindley illustrate how social media is part of a broader set of ways in which people archive digital content from their everyday lives. This line of work more specifically considers how people (often unintentionally) use social media to curate content (e.g., collect, organize, archive, display) over longer periods of time [42, 44].

A third line of inquiry explores how social media requires new definitions of curation [35, 38, 43, 46]. Sophia Liu's concept of socially distributed curation is an early and influential example and begins from the premise that people experience curatorial overload (i.e., people are unable to consume the vast amounts of digital information that exist in online settings and on social media) [43]. As a result, Liu suggests, people will increasingly engage with separate but integrative curatorial roles on social media/in online settings. As Liu describes, some of these roles include the *archivist*, who builds collections of digital artifacts, the *editor*, who verifies the authenticity of digital artifacts and collections, the *exhibitor*, who displays and exhibits narratives from artifacts and collections, and the *docent*, who teaches visitors about collections and artifacts [43].

The application of the curating perspective (and other types of digitization initiatives) in settings such as museums and cultural heritage sites is limited in an important way that serves as a starting point for our paper. Namely, existing definitions of curation rarely consider how dimensions of curation (e.g., information gathering, filtering, archiving, displaying, or storytelling) are influenced by in the moment conversation, interaction, and movement through physical spaces as well as the physical design/layout of these spaces [3, 24, 48]. In other words, for museums and cultural heritage sites in particular, the acknowledged potential of the curating perspective is limited by the lack of research describing how visitors' in the moment interactions with personal information devices and social media during visits bridge archival collections with the everyday lives of visitors [27]. Such research necessitates studying how visitors' in the moment interactions during their visit produce opportunities for visitors to create their own digital collections following

their visit. Similarly, such work entails studying how visitors' social media practices and ecologies [66, 68] shape their interactions (e.g., their movement trajectories) during their visit.

2.3 Interaction Geography

The two previous sections raise important and unanswered questions about what methods can link micro-analyses of visitors' interaction and use of personal information devices at exhibits with a) analyses of visitors' interaction and use of personal information devices across gallery spaces and b) larger scale analyses of visitors' use of social media. Figure 1 is a snapshot that begins to illustrate interaction geography, an approach we have developed in previous work (in this museum setting) to describe, represent, and interpret people's interaction as they move within and across physical environments [56, 57]. Interaction geography integrates and extends interaction analysis [37] and time geography [31] and employs methods we have and continue to develop including a) *Mondrian Transcription*, a method to transcribe and map people's movement and conversation over space and time and b) the *Interaction Geography Slicer (IGS)*, a dynamic visualization tool that supports new forms of interaction and multi-modal analysis.

We next explain how to read Figure 1 in order to support analyses that use these methods presented later in this paper. The figure maps the movement of a six-year-old boy, Blake (blue path), and his sister's fiancé, Adhir (orange path), as they visit a museum gallery together. Blake and Adhir are two members of a five-member family that we call "The Bluegrass Family" who participated in this study. Also included in the figure is a rendering showing the gallery space from a point marked on the floor plan.

The left of the figure or "floor plan view" shows Adhir and Blake's movement over a floor plan of the gallery space (i.e., looking down on the space). This view shows where Blake and Adhir go within the gallery space. The right, or "space-time view" [31] extends Blake and Adhir's movement on the floor plan horizontally over time. This view shows how they interact with exhibits and one another over time.

For example, the space-time view shows that after entering the gallery space (top left of the floor plan view and beginning of the space-time view), Adhir and Blake walk together toward an exhibit about Hank Williams (marked on the floor plan). Subsequently, Adhir stands for almost 5 minutes at the Hank Williams exhibit, as indicated by his horizontal orange path in the space-time view that extends from approximately minutes 0–5 and corresponds to the vertical position of the Hank Williams exhibit in the floor plan view. In the meantime, while Adhir is standing, Blake is moving quickly (apparently running) back and forth across the gallery space (i.e., across the semi-circle of exhibits on the floor plan) in multiple attempts to draw Adhir away from the Hank Williams exhibit. After four failed attempts, Blake finally succeeds in leading Adhir on what we describe as a tour of other exhibits in the gallery, indicated by their intertwined paths from approximately minutes 5–6. The change in line pattern in Blake's path distinguishes between three different horizontal areas of space on the floor plan providing some description of horizontal movement on the floor plan in the space-time view. This technique has limitations but becomes more relevant when more people are shown.

Having briefly described how to read these displays, we now turn to describing the methods that were used in the present study.

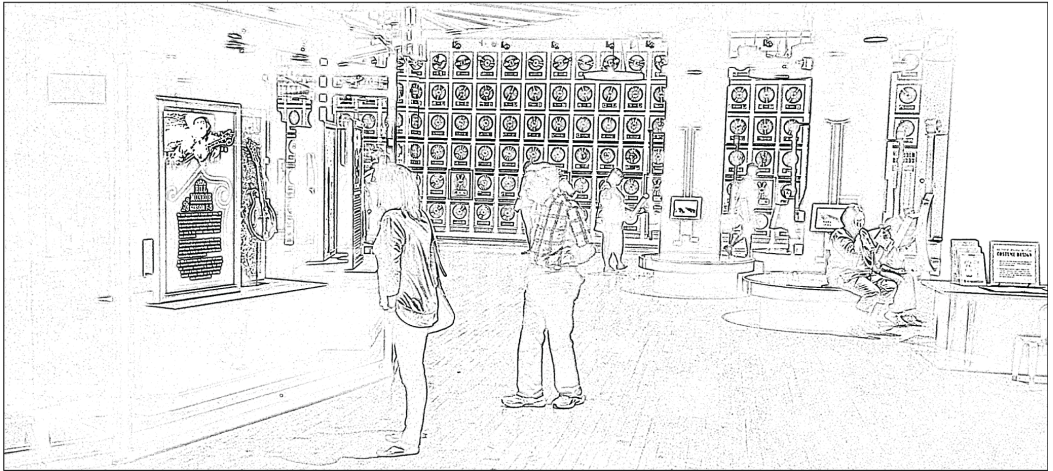
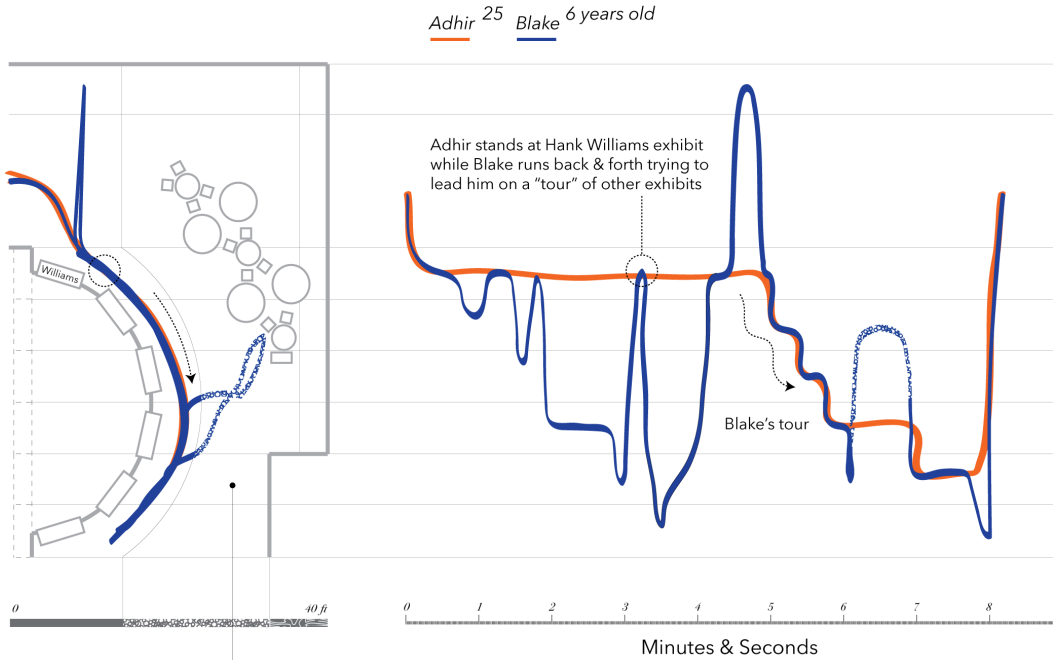


Fig. 1. Adhir and Blake's movement in a museum gallery space is shown over space and space-time.
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3 METHODS

Our initial fieldwork and data collection procedures began with participant observation in the ethnographic tradition. We observed typical visitor activity within exhibit spaces, but we also observed how visitors explored the nearby city and engaged with the museum virtually before and after their visit (e.g., by joining visiting families as they toured nearby sites). Such efforts reflected our efforts to understand this museum as an institution and a networked field site [8, 18].

Following this initial fieldwork, we collected and analyzed the multiple forms of data described at the beginning of this paper. To analyze these data, we followed a grounded theory approach [11, 28]. We constantly and iteratively compared, tested, and refined emergent analytical categories to create stable conceptual categories. We did so through three primary lines of analysis.

First, we synchronized and content-logged all multi-perspective audio and video from museum visits and post-interviews across the 22 visitor group cases in our study. In particular, we identified and categorized the use of personal information devices and social media (e.g., when, where, how long, types of uses, types of social media platforms) during museum visits and triangulated these categories with visitors' reflections on their use of their devices and social media during post-interviews.

Second, we used methods of interaction geography to synchronize visitor groups' use of their devices and social media to their movement and conversation across exhibits and gallery spaces. We used methods of interaction and conversation analysis [32, 37] to conduct micro-analyses of visitors' use of personal information devices and social media during their visit as well as online conversations on social media around shared, digital artifacts following their visit. These efforts align with recent calls in the CSCW community to use methods such as conversation analysis in studies of social media [50].

Third, we logged visitors' social media activity related to their museum visit on followable social media platforms twice a day for a period of two weeks after their visit. This entailed logging information such as when digital artifacts were shared during and after museum visits, how many likes and comments each artifact generated, and analyzing online conversations that developed around artifacts. We also triangulated this analysis with visitors' reflections during their post-interviews on their typical social media practices and ecologies (i.e., use of different social media platforms for particular purposes) and their use or intended/future use of content gathered from their museum visit. There are limitations to this third line of analysis. For example, although we connected with most visitors during the post-interview who shared or intended to share content on followable social media platforms, some visitors may not have disclosed all social media platforms they use. Likewise, we chose to follow visitors as friends or followers for a period of only 2 weeks. As a result, visitors could have shared material after that time; if so, these occurrences were not encompassed by our analysis.

4 ANALYSIS & FINDINGS

4.1 Overview of Visitor Activity

Table 1 provides one way to see the extent and variation in how the 22 visitor groups in our study used personal information devices and social media to collect, edit, and share content during and after their museum visit.

For example, the table shows that over half of these visitor groups including both teens and adults collected photographs/other forms of media (e.g., by taking photos/recording videos), edited these media (e.g., by creating collages/albums), and shared followable social media posts from their visit. Likewise, the table also highlights phenomena such as that the varying levels of likes/comments these posts received, and how in many groups, a single individual or curator appears responsible for sharing content.

Table 1. Overview of 22 visitor groups and followed social media posts. Each row in the table corresponds to 1 of 22 visitor groups. For example, visitor group 1 from Pittsburgh, PA completed their visit together in 1 hour and 40 minutes. Of the 3 people in the group, 2 shared single posts to the followed social media platforms of Instagram and Facebook. Together these posts received 16 likes and comments.

Hometown <i>* family group</i>	Visit Length <i>(hr: min)</i>	People <i>* musician</i>	People w/ Post ○ 40-60 yrs old ● 20-30 yrs old • 10-20 yrs old	Type of Post 📷📱📺 single post/platform x ^x # of photographs 📁 album/collage { } multiple visitors	Likes & Comments
1 Pittsburgh, PA	1:40	●●●	●●	{📷} {📱}	16
2 Fresno, CA	1:09	●●	●	{📷📱📺}	101
3 Staten Island, NY	47	●●●*			
	1:04	●*			
	1:08	●*			
4 South Korea	0:52	●			
	0:56	●	●		
5 TX *	3:43	●●●●	●	📱 ¹⁰	29
6 Nova Scotia & MI	1:37	●●●*	●	📱 ⁶⁷	7
7 Cordele, GA	1:34	●●●			169
8 Holland, MI	1:09	●●●●	●	📱 ²⁵ 📱 ³⁰	5
9 Staten Island, NY	44	●●	●●	{📷} {📱}	58
10 Iowa City, IA *	1:46	●●●			
11 St. Mary's, PA *	1:09	●●●●	•	📱	4
12 Owings, MD *	1:16	●●●●	●●●	{📷📷📷📷📷}{📷📷📷}{📱📱📱}	103
13 London, UK *	1:07	●●●●			
14 Atlanta, GA	1:39	●			
	2:12	●			
15 GA & England	1:05	●●●●			
16 Hazlet, NJ *	1:25	●●●●			
17 Washington, D.C.	58	●●	●●	{📱} {📱}	58
18 Big Sur, CA *	0:49	●●●●*	●●	{📱}{📷📷📷📷📷}{📱📱📱}	55
19 Sunrise, FL *	1:56	●●●			
20 Milwaukee, WI *	1:08	●●●●	○	📱 ¹²	5
21 Port Charlotte, FL *	1:04	●●●●	●○	{📷}{📱 ² }{📱 ¹⁵ }	98
22 Chicago, IL *	0:38	●*			
	1:33	●●	○	{📱 ⁹ }	8
Range:	38 to 3:43	2 to 5	1 to 3	0 to 13 Online Postings	4 to 169

Our analysis of audio and video records and post-interviews from each groups' visit provides more detailed information to further interpret and extend the meaning of Table 1. All visitor groups collected photographs of exhibits and artifacts, ranging from 3-245 photographs per group. Some visitors also collected videos, but this was not common. To collect information from their visit, visitors used a variety of personal information devices, including smart phones, iPads, cameras, and, in one instance, a polaroid camera that printed pictures during their visit. For example, one visitor in visitor group 14 used her smart phone and camera (often simultaneously) to take nearly 200 photographs during her 1 hr and 39 minute visit. As Table 1 shows, these photographs were not shared on followable social media. Not followable social media typically included Snapchat, various group text applications (e.g., WhatsApp), and note-taking applications (e.g., Endnote).

Visitors edited and shared collected digital content at a short-term timescale (i.e., the same day often during their visit) for two primary purposes. First, visitors did so to perform identity and managed social relationships. For example, visitors edited (e.g., by cropping photographs or annotating media with captions/messages) and shared (i.e., by posting to followable and not

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followable social media) collected content to highlight their efforts to pose with museum exhibits [51]; to involve others not present in their museum experience; to geolocate or indicate and even show off that they were visiting this particular museum; and to voice their personal opinions about the museum. Second, visitors edited and shared collected digital content at a short-term timescale to interpret information in the physical museum environment. For example, visitors conducted web searches to translate museum signs/information and answer questions about museum content, composed and received messages from others to help locate artifacts in the museum, and occasionally used music streaming services to locate/listen to music while visiting exhibits. In our view, these uses of personal information devices and social media are consistent with existing research in the curating perspective that describes activities like these as "...the curation of representations of physical place and mobility to perform identity online" [54].

Visitors also edited and shared collected digital content at a larger timescale (i.e., days or weeks after their visit) for two different reasons. First, visitors edited collected digital artifacts from their visit (e.g., to create a collage or album) that, as they described in their post-interviews, served to memorialize their museum visit/experience. These artifacts or micro-collections were intended to archive visits and experiences in ways consistent with descriptions from the curating perspective. But, in addition, visitors described how they shared edited and collected digital content from their museum visit to develop their own personal digital archives in order to teach/educate others or to pursue their own interest-driven learning [36]. For example, in their post-interview, Mika and Olivia, who were middle school teachers (visitor group 2 in Table 1), described their intentions to display and discuss digital content collected during their visit on their online teaching channels in order to advance their classroom teaching. In particular, Mika and Olivia described how they collected many photographs of notebooks with handwritten song lyrics by famous musicians displayed throughout the museum. These notebooks provided cues about how musicians revised their songs (e.g., by crossing out lyrics). As Mika described, *"The revisions...and I could see using something like this in my classroom, where getting the kids to understand that oftentimes when they write something they think, I already wrote it it's good, it's good enough... NO, even people who... this is what they do; they revise something until it is good enough."*

Another visitor, Helen, collected nearly 60 photographs across her visit. These photographs focused on (i.e., zoomed in on) the construction details of many different types of instruments (e.g., the design of frets and fretboards on guitars). She explained she did so because she builds acoustic guitars as a hobby and that this museum was a rare place for her to collect information that illustrated how older guitars were built. She additionally reported that she intended to further edit these photographs by organizing them into mini-collections for her own reference/personal learning and to share and discuss these collections with her Korean crafting group upon her return to her home in South Korea.

A different visitor, Marion (of visitor group 14) also collected many detailed photographs of the characteristics of artifacts throughout her visit. Unlike Helen however, Marion's photographs focused on the stitching patterns of clothing because, as she explained in her post-interview, the clothing featured in this museum was very rare and revealed historical stitching patterns she had not previously seen. Moreover, she described how she intended to share some of these photographs on a section of her personal business website that teaches others about the history of sewing. At the time of our study, Marion was building this website to begin selling clothing as a hobby and potentially a full-time business.

In summary, in this section we provided an overview of how visitors in our study used personal information devices and social media extensively to collect, edit, and share information in a variety of ways both to perform identity and to develop their own personal digital archives, often for the purposes of teaching or learning.

4.2 Using Interaction Geography to Analyze Visitor Activity

Our previous analysis further highlights the need for new methods to more specifically characterize how people collect, edit, and share information with their personal information devices and social media as they move across exhibits and gallery spaces. Figures 2 and 3 are screenshots from the Interaction Geography Slicer (IGS). They use conventions of interaction geography described previously to integrate the movement of four visitor families/groups across three different gallery spaces with their use of personal information devices and/or social media. Figure 2 shows continuous movement for each family/group whereas Figure 3 shows traces of movement where visitors are using personal information devices and/or social media to collect, edit, and/or share content (in ways described previously) from the museum. Columns in each figure distinguish each visitor group/family, while rows indicate different gallery spaces. All displayed information across these figures is set to the same scales. Since the “Taylor Swift Family” (they expressed intense interest in Taylor Swift) did not visit the Rotunda Gallery, we have combined all visitor groups’ movement or use of personal information devices and social media on a floor plan drawing of the entire museum.

These figures extend our previous analysis in four ways. First, they are a new way to see and study the extent and variation at individual and group levels of visitors’ use of personal information devices and social media to collect, edit, and share information across exhibits and gallery spaces. For example, in Figure 3 shorter lines or “points” of movement in the space-time view for each family/group in each gallery space are typically moments where visitors collect information (e.g., a single photograph). Longer lines or “path segments” are typically sequences where visitors also edit this information (e.g., apply a filter to a photograph, compose a message or caption), and/or share this information by posting it to social media. For example, the Business Partners (3rd column and visitor group 6 in Table 1) and especially Andy (orange path) collect many single photographs in the Folk Roots Gallery, as indicated by the many points of movement in the space-time view (3rd column, 1st row). However, in the Bluegrass and Rotunda Galleries the many longer lines of movement shown in the space-time view indicate how Andy in particular is using personal information devices and/or social media for much more extended periods of time. During many of these sequences Andy is editing photographs of artifacts in this gallery space that he has collected by annotating them with messages and subsequently sharing these edited photographs with up to twenty-four followers at once on social media platforms such as Snapchat.

Second, these figures illustrate how the use of personal information devices and social media occurs alongside more commonly studied communication practices, such as movement and conversation (see [56] for figures that show conversation). In other words, interaction geography provides one way to study how the use of personal information devices and social media is organized in relation to how people interact with one another as they move through physical environments.

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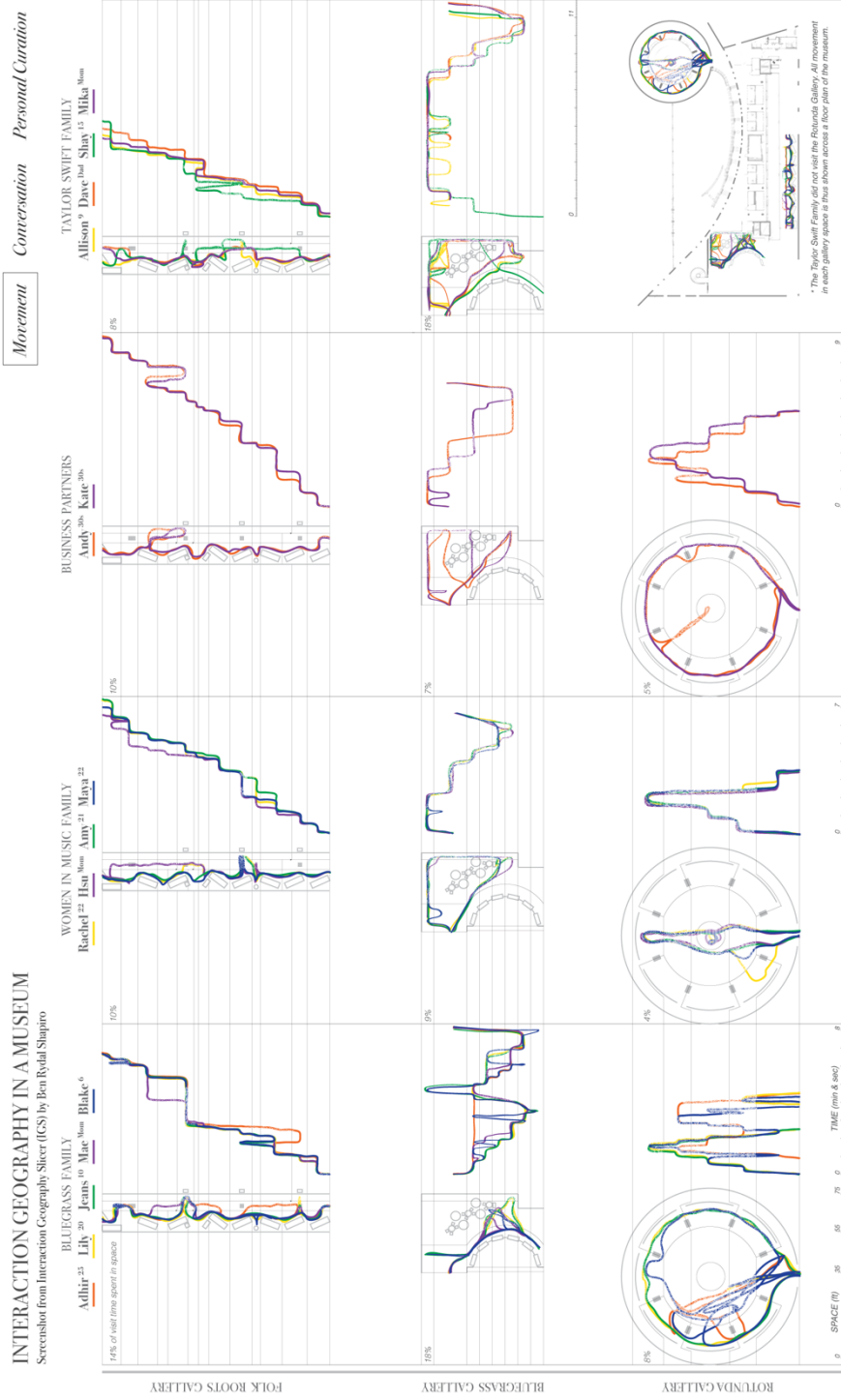


Fig. 2. IGS screenshot of visitor movement. © Ben Rydal Shapiro. Reprinted by permission

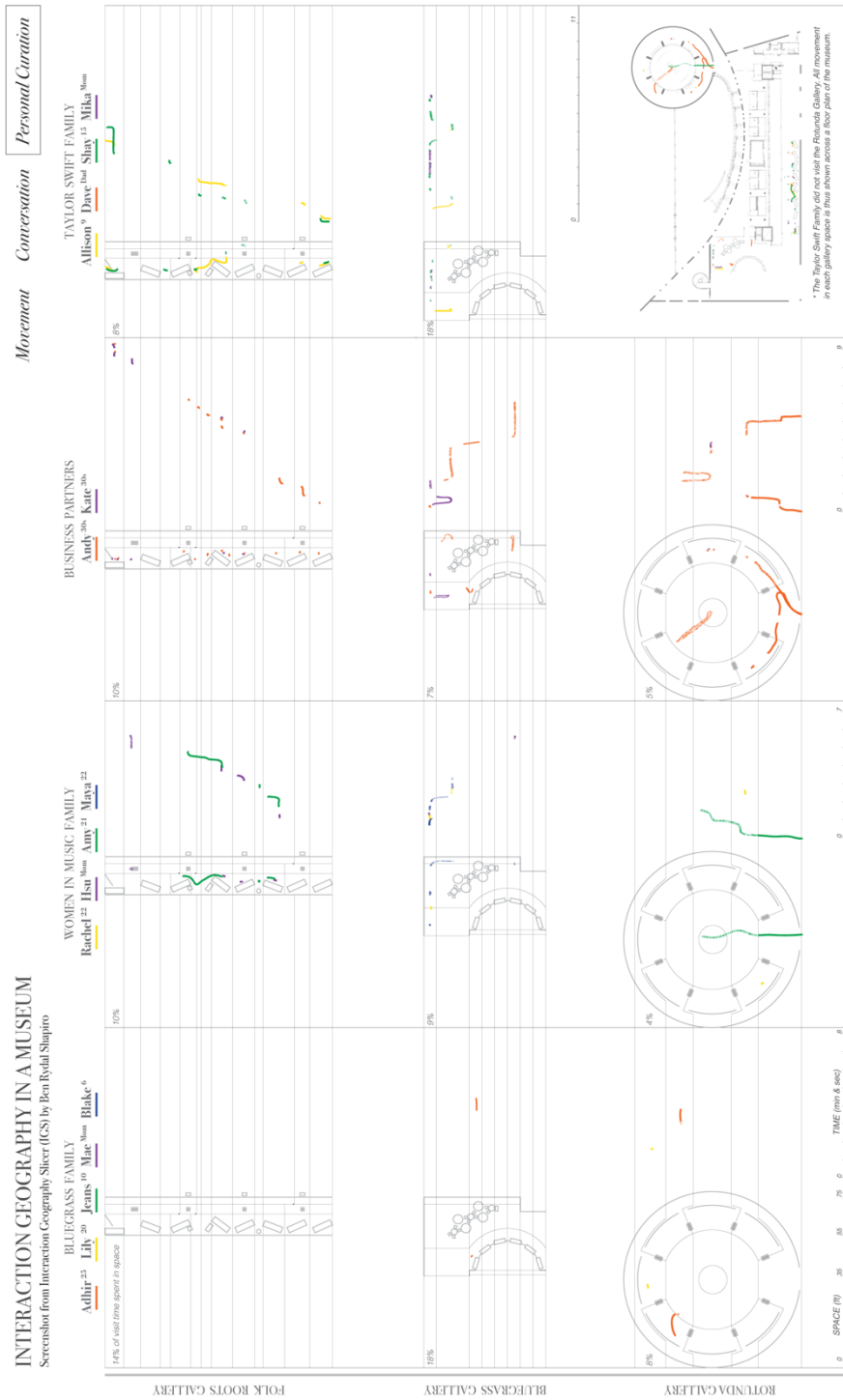


Fig. 3. IGS screenshot of visitor device/social media use. © Ben Rydal Shapiro. Reprinted by permission

Personal Curation in a Museum

Moreover, although these images are static, they are produced by highly dynamic tools (i.e., the IGS) that allow for more dynamic ways to study different types of communication practices simultaneously across scales. For example, one can use the IGS to select and rescale sequences of movement, conversation, and/or social media use over space and time, visualize and read conversation turns from each visitor at or across exhibits, and watch video of visitors' interaction and use of personal information devices and social media from the perspective of each visitor that was gathered as part of this research.

Third, the figures begin to highlight how interaction geography provides a means to understand the spatial organization of how people use personal information devices and social media to collect, edit, and share information as they move through the physical environment. For example, *Points* (as described above) are places and moments where people primarily collect digital content by taking photographs whereas *Path Segments* are places in the physical environment and sequences of interaction along which people edit and share collected digital content often while conversing with others not physically present while *Regions* refer to hot spots where visitors repeatedly use personal information devices and social media to collect, edit, and/or share content, in this study, around particular exhibits or regions of gallery spaces. The ability to describe the spatial organization of visitors' use of personal information devices and social media in this manner provides new ways to study how visitors' social media practices and ecologies shape their interactions (e.g., their movement trajectories) during their visit.

Fourth, for those who are familiar with these gallery spaces (e.g., museum curators, exhibit designers), the figure also highlights how these points, path segments, and regions provide insights about visitors' alignments to exhibit content across gallery spaces. For example, both figures show that much of the Women in Music Family's movement and use of personal information devices and social media focuses on museum content that features female artists. As described by this family in their post-interview, their visit was heavily influenced by the portrayal of female artists in this museum. Consistent with this statement, Figures 2 and 3 show the family likely uses their movement and social media to interact with exhibits and gallery spaces featuring female artists. Put differently, interaction geography provides one way to see how individuals/families can experience a personally edited version of a physical environment [40].

4.3 Personal Curation

Together, our previous analyses provide different ways to see the products and dimensions of personal curation (collecting, editing, sharing) that arise as a result of people's interaction and movement through physical environments rich with meaning potential. However, our analysis has not yet fully described personal curation as a socio-technical practice where people collect, edit, and share information through social media to contribute and manage their own digital archives.

To illustrate personal curation, we focus our analysis on Andy (one member of the Business Partners) whom Figure 3 indicates uses personal information devices and social media extensively across his visit. Andy, who is 31 years old, owns a small business that sells drum and percussion equipment. Music and drums have been Andy's lifelong passion. During our study, he visited this museum with a business partner, Cindy (33 years old). As Table 1 shows, Andy and Cindy (visitor group 6) completed their visit together in 1 hr and 37 min. During their visit, Andy took 165 photographs and, as shown in Table 1, after his visit, shared 5 of these photographs across Instagram, Twitter, and Facebook. These online posts together accumulated 169 likes and

comments. On six other occasions during the visit, Andy also collected, edited, and shared photographs through texts and Snapchats with up to twenty-four people at once.

4.3.1 Collecting Information. Figure 4 is a transcript of Andy and Cindy’s interaction with one another at a museum exhibit that features a drum kit. The transcript conveys how Andy approaches this exhibit, takes 2 photographs (this data comes from the video camera worn by Andy), and subsequently, draws Cindy (who is standing at a nearby exhibit) to join him (line 1 of the transcript) at this exhibit for a conversation that lasts almost 2 minutes.

Andy’s first photograph captures the entire drum kit in the exhibit, while his second focuses on one part of the drum kit, the cymbal. The transcript also shows that Andy and Cindy’s conversation (beginning at line 6) focuses primarily on who made the cymbal on the drum kit. In this case, who means not what individual, but which cymbal company, such as Wuhan or Zildjian (cymbal companies whose equipment Andy sells). Their conversation shows that they are unable to determine who made this cymbal, either from their observations and prior knowledge of the drum kit/percussion equipment or through signs provided by the museum, which provide no information about the origins of this cymbal. The conversation ends with Andy saying he will have to put the photo up on Instagram to see if anybody can “guess what it is” (line 23).



Andy: ((captures photographs 1 and 2))

- 1 A: this..this china cymbal ((points to cymbal)) is is
- 2 Cindy: WOW!
- 3 A: it's like so ancient
- 4 C: oh my goodness!
- 5 A: it's kind..kind of like the wu..look like the wuhan ones you..
- 6 C: I'd be curious to know who made that!
- 7 A: I don't know
- 8 C: like what what was a similar around in the 20s and 30s?
- 9 A: ((crouching)) it's nothing..I know its nothing ((stands up)) not
no zildjian or nothing like that
- 10 C: ((points)) look at all the..NAILS in it
- 11 A: yea those are the rivets
- 12 C: so they put rivets in them back then to?
- 13 A: I guess
- 14 C: look at the ((points)) bass drum skin there
- 15 A: its uh.. it looks ((crouches)) I wonder is it like a cow skin?
- 16 C: what is it?
- 17 A: is it like a cow skin like you know ((gestures cow skin on drum))
- 18 C: yea its like um animal skin right?
- 19 A: yea
- 20 C: like calf skin but that's the
- 21 C: that's cool
- 22 A: (stands up) I wonder who made the kit (laughs)
- 23 A: I'll have to put this up like on instagram see if..anybody can
guess what it is
- 24 C: laughs
- 25 C: yea that would be a good spot for it to
- 26 A: yea

Fig. 4. Transcript of Andy and Cindy’s engagement at a museum exhibit.

This analysis provides a detailed example of how visitors collect information from the physical environment through their movement, interaction, and use of personal information devices in ways that also begin to elaborate and personalize the meaning of content to align with their own interests and cultural identities.

4.3.2 *Editing & Sharing Information.* Figure 5 is a post that Andy shared on his professional Instagram page (i.e., an Instagram account he uses to support his business) four days after his visit. Information on Andy's Instagram page is publicly available without being a friend or follower, which is an additional reason we have used his experiences as a case in our analysis. Nevertheless, we have removed all identifying information to preserve Andy's and others' anonymity. The figure shows the photograph of the cymbal that Andy collected during his visit, accompanied by a caption titled, "Anyone know who makes this Cymbal? Was display at the [name of museum]."

The title illustrates how Andy has edited and repurposed the photograph and overarching question from his conversation with Cindy during their museum visit in a post to his Instagram followers. Within two days after the image was posted on Instagram, it received 85 likes along with 6 comments from Andy's followers who provided different suggestions about the company that made this cymbal. The figure shows some of these comments, as well as Andy's responses to them, which at one point, even attempt to solicit interaction from Zildjian (i.e., by tagging the company).



Fig. 5. An edited and shared digital artifact from Andy.

Altogether, this post illustrates how Andy has edited information that draws from content and his interaction with Cindy during their museum visit and shared this information on his professional Instagram page.

4.3.3 *Developing Personal Digital Archives.* Figure 6 shows Andy's professional Instagram page. The figure depicts only a few of the 247 photographs on his Instagram page shortly after his visit to this museum. These photographs primarily display cymbals and other percussion equipment. One of the many photographs in the figure is the post analyzed previously. In his post-interview, Andy described that he owned his professional Instagram page for a year and a half at

the time of his visit. He began this page when he decided to open his own business selling percussion equipment, an enterprise that required a strong social media presence. Andy also described that he utilizes his professional Instagram page to “*spark interest that could lead to a sale and for people to just appreciate the stuff like a museum.*” In other words, Andy highlights that Figure 6 illustrates part of a personally meaningful digital archive that Andy uses both to sell products and to enhance visitors’ appreciation of percussion equipment.

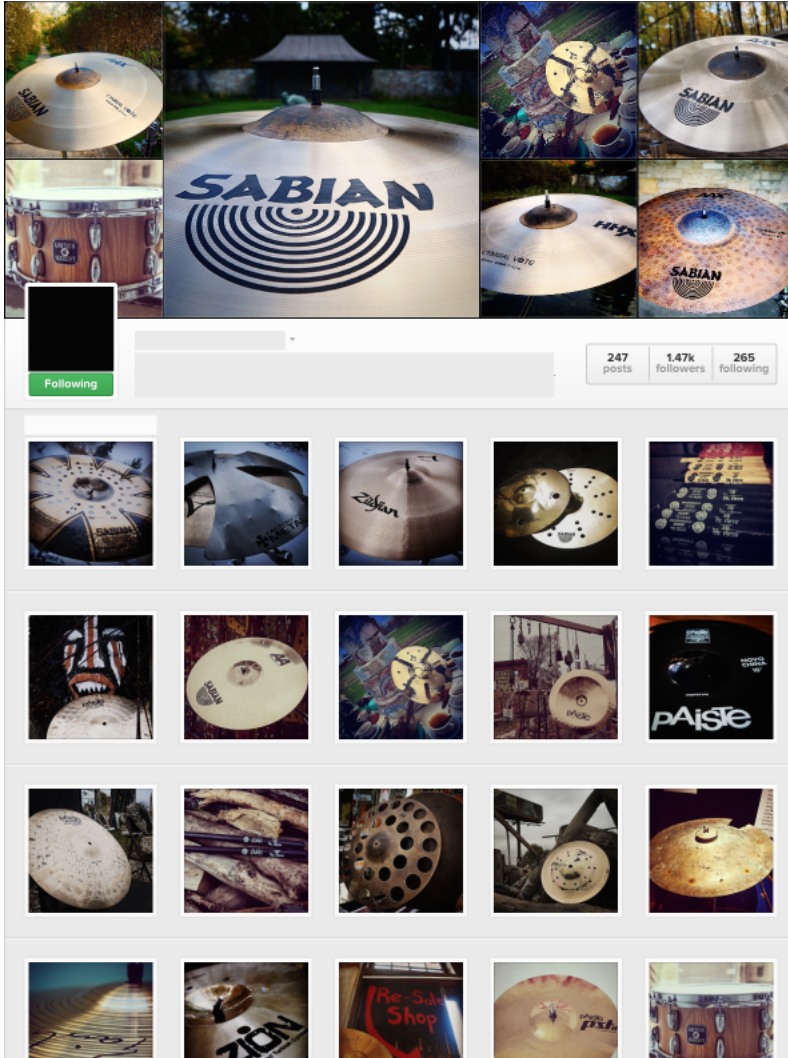


Fig. 6. Andy’s professional Instagram page.

4.3.4 *Situating Personal Curation as a Socio-Technical Practice.* Following is a sequentially organized progression of posts (i.e., captions and hashtags) from Andy, starting from when Andy began posting on his professional Instagram page. We have replaced names of percussion equipment in captions and hashtags with references to guitar equipment to preserve Andy’s

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anonymity while maintaining a focus on the progression of his posts. Moreover, accompanying each post are photographs that are not shown here, but reflect a progression in photographic techniques (e.g., framing percussion equipment, lighting).

Originally, Andy started by simply posting hashtags, which quickly evolved to include description and price:

#fender #vox #reverb #5" #bright finish #fast #proto #guitar old

*Check out this discontinued #fender #alpha #japan #crash #thick 15" #effects they are on
blowout prices for \$275 on our #ebay site #happyfriday #keepplaying #guitars #gibson guitar
#percussion #guitarhead #rockandroll #strings #guitarlife #gear #design #japanmade
#fenderguitars*

He then progressed to asking questions and relating these questions to special deals:

*Anyone looking for the Fender hyper Beta guitars? We have a few left on special, [website
link] #fender #guitars #fenderguitars #strings #guitars #tightknot #design #city #mahogany
#veryrare*

After nearly a year and a half, Andy often weaved photographs alongside questions, descriptions, complex deals, links to emails and other social media pages:

*Anyone remember the original vibroverb effects guitars? They made vintage guitars and
custom pickguards before they were in style like nowadays. We have a few rare ones, but
here's the deal, I'll send you a free Gibson pickguard with any original vibroverb effects guitar
bought on our website, Fender, Gibson, G&L or even Taylor guitars. Send us an email.
#Factorywood #Fender #gibson #gandl #taylorguitars #guitareffects #guitars*

Near the time of his visit, Andy began to write posts that were not focused on deals but, instead, attempted to elicit interaction and feedback from his social network:

*What you're thoughts on the Fender Custom Made Pick's? Come on guys, let's hear what you
are thinking! #Fender #guitars #guitarmade #strings #guitars #guitargear*

The progression illustrates an emerging socio-technical practice in which Andy is refining his ability to: a) collect information from his everyday life through personal information devices; b) edit this information by using photographs, captions, and hashtags to highlight, describe, and orient his followers/social network to specific features of edited information; and c) share this information to develop a personally meaningful digital archive that advances his professional goals, but also serves as a museum for others to learn about and appreciate percussion equipment.

5 DISCUSSION & CONTRIBUTIONS

We began our analysis by providing an overview of how visitors in our study used personal information devices and social media to collect, edit, and share information from their museum

visit. We illustrated how, at certain timescales, people did so to perform identity and manage social relationships while, at other timescales, people did so to develop or contribute to their own personal digital archives. Subsequently, we used methods of interaction geography to situate this analysis with more detailed descriptions of how visitors used personal information devices and social media to collect, edit, and share digital content across different gallery spaces. Finally, we used methods of interaction geography to help identify a case (Andy), which we used to more specifically characterize visitors' use of personal curation; a socio-technical practice in which people collect, edit, share information as they move through physical environments rich with meaning potential in ways that can be used to develop personal digital archives.

Altogether, our analysis advances a definition of curation that is rooted in people's interaction as they move through physical environments such as museums but also considers how these interactions are extended to and shaped by people's social media ecologies and practices. Put differently, personal curation integrates work that studies people's social and cooperative interaction with work in the curating perspective, in this paper, to understand and potentially design for how people collect, edit, and share archival material from museum galleries both during and after visits. We highlight three particular contributions of this work.

Contribution 1. Our analysis illustrates how to combine a spatial focus on people's movement and interaction through the physical environment with an analysis of social media use in order to gain a deeper understanding of practices such as personal curation. In particular, methods of interaction geography provide a way to see and study how people use personal information devices and social media in a manner that links fine grained analyses of people's interaction with larger scale analyses of social media. For example, in this paper, we used these methods to describe how social media practices influence visitors' trajectories of movement and patterns of interaction at exhibits and across gallery spaces. Likewise, we also used these methods to identify and study how dimensions of curation (e.g., collecting, editing, sharing) can occur not only in online settings as is typically the focus of the curating perspective, but also during in the moment interactions of a museum visit.

Contribution 2. Our analysis extends existing research to show in greater detail how people use and link digital information with physical information to shape others' understanding of cultural heritage. Our analysis illustrates the variability of ways that visitors in this study used personal curation to shape others' understandings of cultural heritage based on their own personal interests and professional, cultural, or familial identities. Mika and Olivia, Helen, Marion, and Andy each illustrate different examples of how visitors used personal curation to repurpose different types of cultural heritage content (e.g., song lyrics, construction details of instruments) to shape others' interpretation of that content in different types of settings (e.g., schools, professional social media networks, crafting groups). These examples provide a starting point to begin to describe a variety of ways that visitors to settings such as museums and cultural heritage sites may potentially use personal curation to shape others' understandings of cultural heritage.

Contribution 3. Museums and other cultural heritages sites widely acknowledge how "the model of the visitor that we posit as the consumer of our products will radically affect how we are enabled to think about how exhibitions should be made" [7]. Our work draws from and extends existing research to inform new visitor models that expand an understanding of visitors solely as passive consumers of intended design. In particular, we suggest personal curation illustrates how some

visitors to museums and cultural heritage sites are increasingly curators in large part due to advances in the design and use of personal information devices and social media. A model of visitors as curators provides new insights/opportunities for museums and cultural heritage sites to support visitors' *participation* with archival collections in ways that are *relevant* and *interconnected* to issues in their everyday lives and communities [2 also see 52]. Particularly, such a model extends emerging design efforts in museums and cultural heritage sites that explicitly leverage location-based technologies and social media to support the *co-curation* of exhibits and interactive installations [7, 13]. Likewise, we suggest such a model may also inform a new design space that leverages visitors' personal curation to bridge or index archival media in museums and cultural heritage sites onto the city neighborhoods these media are about, for example, to allow visitors to make and take walking scale city tours that capture under or untold aspects of a city's public history.

6 LIMITATIONS & NEXT STEPS

Making personal curation visible to the museum in this study had a significant impact on this museum. Namely, the museum developed new social media policies (e.g., hashtag/indexing mechanisms) that encouraged the use of personal curation to learn and teach others about museum content in ways that also advanced the museums' marketing and educational goals. More recently, this museum has begun to explore more personalized ways to support visitors' personal curation, for example, by supporting teachers to use museum content to develop their online teaching profiles.

However, we conclude this paper by emphasizing that this is early work with a variety of limitations. We describe four primary limitations here. First, this work draws from one, small exploratory study. Through the information and examples presented in this paper we hoped to provide a broad definition of personal curation and show the extent and variability of personal curation that may be occurring in one particular museum. With the widespread use of personal information devices by visitors to museums and cultural heritage sites, we suggest visitors to these sites may increasingly leverage personal curation. However, future research is necessary to advance such a claim. Likewise, future research and in particular, comparative research across different museums and cultural heritage sites, is needed to more specifically characterize dimensions of personal curation as well as how visitors use personal curation to develop different types of personal digital archives.

Second, methods of interaction geography are only beginning to be expanded to settings beyond the museum described in this paper (e.g., see [58, 59] for work that has applied the IGS to visualize and discuss New York City's controversial Stop-And-Frisk Program and to support social studies instruction). Future research will need to explore a variety of questions concerning how to generalize methods described in this paper particularly in collaboration with professional practitioners who are in the best position to read and interpret complex visualizations produced by interaction geography.

Third, there are inherent limitations to leveraging personal curation to support new or existing designs in museums and cultural heritage sites. In particular, personal curation depends on the quality and density of contextual information (meta-data) available or displayed within these settings, the degree to which copyright holders are willing to allow fair use by members of the public, and the digital mobilities of visitors.

Finally, there are significant ethical considerations to this work. This study was made possible by many generous visitors who volunteered their time to participate in this research. Concepts and methods in this paper necessitate maintaining ethical guidelines and potentially developing new ethical guidelines (e.g., to address issues of informed consent, fair use of media in public or private spaces, intellectual property) [see 9, 23]. These issues are beyond the scope of this article but remain a serious concern.

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