Measuring the Visual in the Museum:

Social Meaning Mapping as a Means of Capturing More than Meets the Eye

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Abstract. The duration of visitors' visual engagement with the museum collection has been treated as a proxy for their visual literacy. Researchers draw upon different methods to measure this engagement, including eye-tracking and timing and tracking studies. This chapter presents *Visitracker*, a tablet-app designed to be used in timing and tracking studies, and *Social Meaning Mapping* (SMM), a digital tool embedded in the Visitracker app, designed to be used post-visit by the visitors. For SMM, visitors are invited to recount their experience verbally while marking it on a digital copy of the room's floor plan projected on the tablet. Visitors' audiovisual annotations are recorded by the app and can be accessed later through the Visitracker portal. This chapter argues for the value of coupling timing and tracking with SMM in approaching the museum experience as an embodied and multimodal event, unfolding in specific time and space. Examples from two studies highlight SMM's contribution to a multimodal understanding of visual literacy in which vision is one of the multiple modes enacted.

Keywords: Informal learning, museum experience, multimodal, sociocultural, visitor studies

Art museums are often considered sites of visual consumption where visitors are invited "to look and see" (McClellan, 2003, p. 36). Scholars have argued that repeated exposure to art in museums enhances visitors' *visual literacy* --- that is, their ability to see and read images, allowing them to progress from simple observations to identifying relationships and meanings in images (Rice, 1988; Housen, 2007).

In museum research, visitors' visual literacy has often been measured based on the duration of their engagement with artworks. Different methods have been used to measure visitors' engagement, including timing and tracking, eye-tracking and sensor-based positioning technologies (Chiozzi & Andreotti, 2001; Korn & Jones, 2000; Yalowitz & Bronnenkant, 2009; Yoshimura et al., 2014).

In an systematic attempt to address the ongoing criticism on the validity of data collected about visitors' looking at artworks without including their own views and voices (Adams et al., 2003; Rose, 2012), a digital qualitative method coined Social Meaning Mapping (SMM) (Christidou, 2020; 2019) was designed as part of the tablet application *Visitracker* (Pierroux & Steier, 2016). For SMM, visitors are invited to recount their experience verbally while marking it on a digital copy of the room's floor plan projected on the tablet. Visitors' audiovisual annotations are recorded by the app and can be accessed later through the *Visitracker* portal.

In this chapter, the theoretical underpinnings of both *Visitracker* and SMM are

discussed in detail. Through the analysis of two examples from the National Museum of Art, Architecture and Design in Oslo, Norway (Study A) and the Belvedere in Vienna, Austria (Study B), this chapter illustrates how the maps created by the researcher through timing and tracking and those created by the visitors through SMM can be used in a complementary way to capture aspects of visitors' visual literacy. By combining both maps, visual literacy can be explored as an embodied and multimodal event, unfolding in time and space, in which vision is one of the multiple modes enacted. Moreover, the maps created through SMM provide a multimodal way of representing visual literacy by including visitors' voices in data collection and analysis, offering new insights and enriching existing research methodologies.

MEASURING THE VISUAL IN THE MUSEUM

Art museums are often advertised as places "where our eyes are exercised" (Alpers, 1991, p.32) whereas other senses, such as touching and smelling, are suppressed and prohibited. With "everything in a museum […] put under the pressure of a way of seeing" (Alpers, 1991, p.29), specific regimes of vision and attention emerge, informing visitors' visual literacy in particular ways (Duncan, 1995). With vision standing as a proxy for learning and engagement in museums (Rice, 1988), researchers focused heavily on measuring the duration of visitors looking at artworks in order to capture their engagement with the collection.

Since the early 1930s, timing and tracking studies have been conducted in museums as a way of capturing aspects of visitors' engagement with the artworks. On a copy of the museum's floor plan, researchers note visitors' movement while measuring their pauses and duration of interactions with the exhibits or artworks by using stop watches (Bitgood 2013; 2006; Hooper-Greenhill, 2006; Serrell, 1997; Yalowitz & Bronnenkant, 2009). When used at a larger scale spanning during the whole museum visit, timing and tracking data can provide evidence on visitors' navigation patterns through the whole museum building.

Apart from being time-consuming and labor-intensive, timing and tracking studies have been additionally challenged in terms of the accuracy of the data they provide. As what exactly a visitor might be looking at cannot be determined through the researcher's observations, eye-tracking and sensor-based positioning including Global Positioning System (GPS), Bluetooth and Beacons were introduced in museum research. These technologies afford the collection of precise data regarding visitors' eye movements, positioning and duration of their encounters with different exhibits/artworks (Dim & Kuflik, 2014; Mygind & Bentsen, 2017; Santini et al., 2018; Schwan et al., 2020; Walker et al., 2017; Yoshimura et al., 2014). Despite drawing upon different technologies, all these methods contribute to more accurate measurements of visitors' duration of looking, foregrounding once again the ocular-centric perspective towards the museum experience. Nonetheless, as Carbon (2017) suggests "the impact of viewing *time* on art perception […] is just a part of the whole story of art experience" (p.2, original emphasis).

BEYOND THE VISUAL

Smith (2014) suggests that "in an art museum, […] the unit of analysis is not a work of art. Instead, […] it is the collection of the works of art that a person encounters in a museum visit" (p.35). During these encounters between the works of art and the visitor, museum drama unfolds (vom Lehn, 2013) --- that is, all the nuanced behaviors and interactions unfolding while visitors are approaching or departing from an artwork, including interactions with others sharing the same space. Despite museum drama being an integral part of the museum experience, theories of art perception seem to not take it into consideration (Leahy, 2012; Smith & Smith, 2001; vom Lehn 2013; 2012).

Various methods and tools have been adopted and combined in order to capture these nuanced behaviors and interactions forming the museum drama. For example, visitors'

conversations (Knutson & Crowley, 2010; Leinhardt et al., 2002) along with their embodied performances either in specific galleries or during the whole museum visit have been captured through video-based research (Christidou & Diamantopoulou, 2016; Christidou & Pierroux 2018; Christidou & Steier, 2020; Sanford, 2010; Steier, 2014; vom Lehn et al., 2001). Findings from these studies show that art interpretation encompasses a range of movements for coordinating orientation and direction of attention (Christidou, 2018; Christidou & Steier, 2020), movements for monitoring other visitors' position in the space (Christidou, 2018; vom Lehn 2013; vom Lehn et al., 2001), and movements related to exploring the artworks in depth including pointing gestures and touch (Christidou & Steier, 2020; Christidou & Pierroux, 2018).

This chapter contributes to this ongoing discussion about the multimodality of the museum experience, arguing that visitors' *visual literacy* is the result of a choreography of modes, unfolding in relation to specific artworks and people in specific time and space (Christidou & Diamantopoulou, 2016; Diamantopoulou & Christidou, 2019; McMurtrie, 2013; Roppola, 2012).

BRIDGING RESEARCH AND PRACTICE IN MUSEUMS: THE VISITRACKER APP

Inspired by the longstanding tradition of timing and tracking studies in museums, researchers and programmers at the University of Oslo in collaboration with curators at the National Museum of Art, Architecture and Design in Oslo, Norway, designed *Visitracker*, a tablet-based application (app) and online portal (https://www.visitracker.net). Informed by socio-cultural theories of learning (Vygotsky, 1986; Wertsch, 1991), the app is designed to collect data through surveys and timing and tracking on visitors arriving in groups ranging from two to four members (Pierroux & Steier, 2016).

One first sets up a study on the portal and collects data through the app. The dataset can be then accessed through the portal. During the set-up stage, the user logs in and uploads a digital copy of the floor plan of the room where data collection will take place. A list of potential "actions" and "resources" are then typed in. "Actions" are verbs describing possible actions that a visitor may perform during a museum visit and "resources" include those interpretive resources available in the museum and interpretive resources that visitors might bring with them (i.e., travel books, mobile phones, cameras). An interaction is a combination of any "action" performed by visitors during the time they spent in a specific museum room and any "resource" available in the museum which might involve other visitors or museum staff, artworks and interpretive resources designed by the museum or brought to the museum by those visiting. The app was designed to allow the tracking of numerous types of interaction, recognizing the multimodality of the museum experience that includes among other "a series of embodied performances, such as entering galleries, scanning, perusing, walking, talking, photographing and pointing at exhibits and labels" (Christidou & Diamantopoulou, 2016, p.12).

When collecting data, the floor plan is displayed on the tablet's screen (see Figure 1). Upon visitors' arrival to the room, the researcher assigns each visitor one of the avatars representing an observable gender and age (child-boy, child-girl, male adult, female adult, male senior and female senior). Different avatars can be used to distinguish between two visitors of the same gender and age, or alternatively a distinct observable characteristic of the visitor can be typed in as an additional tag which accompanies the avatar (i.e., glasses, hat).

Every time visitors move or carry out an action, the researcher registers their positioning in the room by tapping on the specific area of the digital floorplan. The avatars involved in each interaction are then selected, followed by the type of interaction performed. To register the interaction, an "action" and a "resource" from the drop-down menus is selected (see Figure 2). The system assigns a "location" and a "time-stamp" (see Figure 3) to each interaction being registered. *Visitracker* uses these time-stamps to calculate the duration of each interaction as

the difference between two consecutive time-stamps. By aggregating all time-stamps created within a single study, the app calculates each group's *dwell* time --- that is, the duration of the time spent in the specific gallery room.

Figure 1. The digital floor plan.

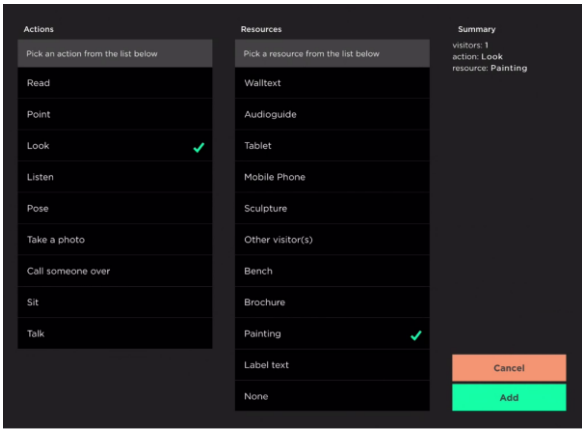


Figure 2. Actions and resources.

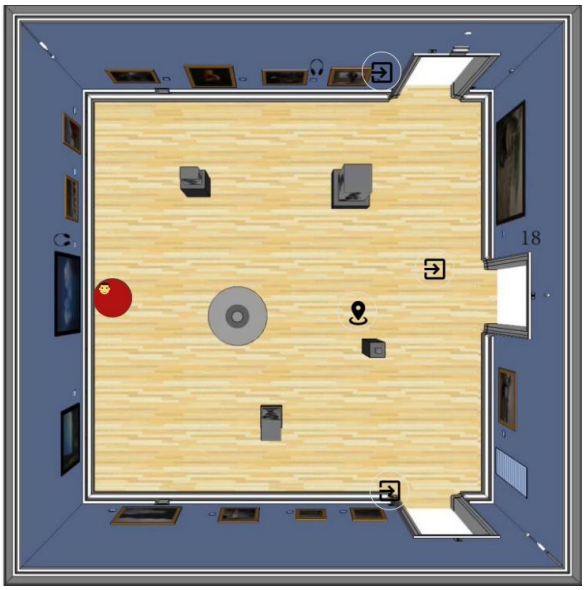


Figure 3. Registering interactions.

The use of the visual mode is very important in *Visitracker*. The digital floor plan is used to register visitors' interactions which then are automatically visualized on the portal through movement maps (see Figure 4a) and heatmaps (see Figure 4b). This automatic aggregation of the data through heatmaps and movement maps allows patterns of movement and social interaction to emerge which in turn facilitate the identification of areas and resources that visitors tend, or not, to occupy and use.

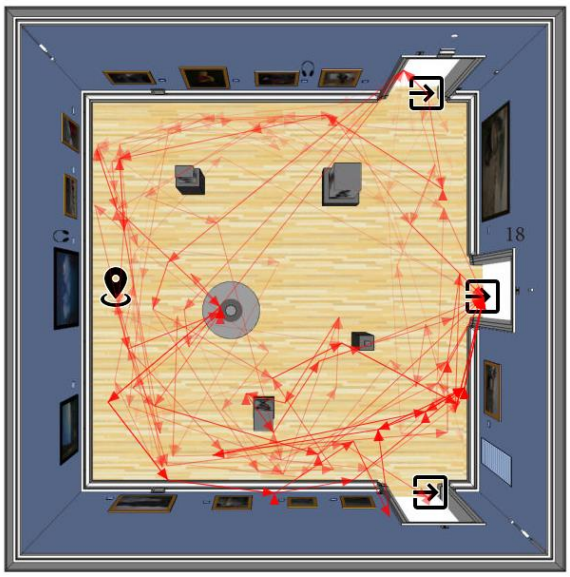


Figure 4a. Movement map of twenty-one visitors.

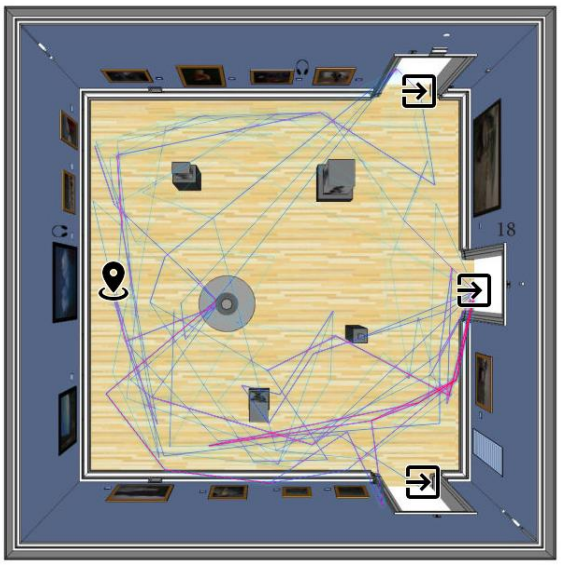


Figure 4b. Heatmap of twenty-one visitors.

Social Meaning Mapping (SMM)

Social Meaning Mapping (SMM) is a digital tool embedded in *Visitracker*. SMM was informed by socio-cultural theories to learning that foreground the social nature of the museum experience (Vygotsky, 1986; Wertsch, 1991) and thus, it is designed to be used by visitors in groups post-visit.

A digital floor plan of a gallery room with the images of the artworks on display is projected on the tablet's screen along with a paint toolbox (see Figure 5a). Visitors are invited by the researcher to recount their experience verbally while marking it on the digital floor plan (Christidou, 2020; Christidou, 2019; Christidou & Reitstätter, 2020). The specific image of the gallery room facilitates visitors in talking about their experience without requiring any use of art-related language or recalling the names of the artists and the titles of the artworks (Christidou, 2020; Christidou & Reitstätter, 2020).

Both visitors' markings on the screen and their conversations are being recorded through the app and can be accessed as a video file through the *Visitracker* portal. The video allows the recreation of the mapping process in synchronization with the audio recorded conversations (see Figure 5b).

As each marking is associated with verbal content, and sometimes additional visual, what is being captured through SMM goes beyond simple representations of visitors' pathways or lists of artworks. With visitors creating their SMMs in collaboration with each other, everything marked on the map is part of a personal and often social, verbal and visual storyline, which at times can be very detailed. Both individual and social aspects of their experience are being recounted, shared and renegotiated. In this light, visitors' map making is seen as an "act of representation" --- that is, "the act of highlighting aspects of our experience and communicating them to others and ourselves" (Enyedy, 2005, p.427). These acts place artworks in a spatial, temporal, and categorical context (Christidou & Reitstätter, 2020), bringing together aspects of the physical context of the visit with the visitors' personal and socio-cultural context.

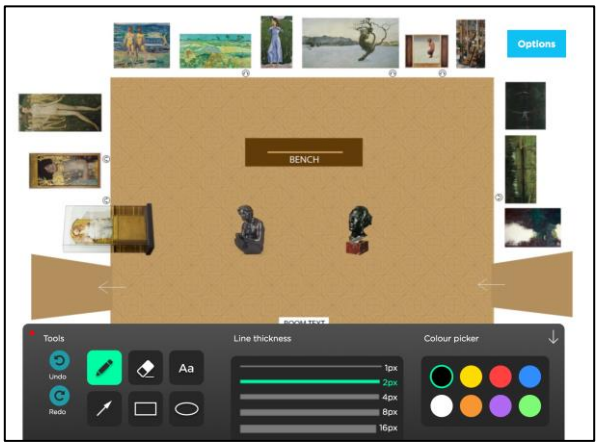


Figure 5a. The SMM interface.

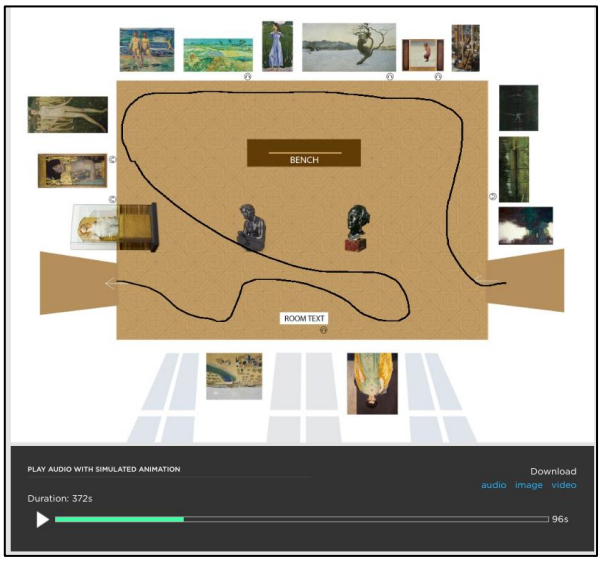


Figure 5b. Synchronized SMM at 01:36 minutes.

TWO STUDIES

This section presents data collected with the *Visitracker* app for two studies: Study A at the National Museum of Art, Architecture and Design in Oslo, Norway and Study B at the Upper Belvedere, in Vienna, Austria. In Study A, the sample consisted of nine groups (N= 21), while in Study B participated 76 dyads (N= 152). By combining data from two studies in different art museums in two countries, this chapter attempts to demonstrate the ways in which SMM allows researchers to capture and explore the ways in which visitors encounter art.

In both studies, the same procedure was followed when collecting the data: the researcher conducted timing and tracking in a gallery room and then, visitors responded to a short survey and filled in their SMM post-visit. The researcher handled the tablet for the timing and tracking and the survey whereas visitors were handed the tablet for SMM. The average time for the data collection was approximately 20 minutes for Study A and 25 minutes for Study B, excluding the time between visitors' recruitment and them arriving to the room where data collection took place.

FINDINGS

Timing and tracking. The movement maps aggregated based on the timing and tracking dataset for all visitors were analyzed first, followed by the heatmaps. For Study A (see Figure 4a and Figure 4b), the analysis attended to the direction of the arrows as suggestive of visitors' direction of movement, while taking into account those instances when the line splits into two or more lines towards different directions. The splitting of a line into two or more lines is a visual marker of those points in time when and positions in space where visitors split from each other and took individual paths. The heatmaps also visualize the locations in the room where interactions took place. Based on these, the areas that are being used, or not, by visitors were identified.

The movement direction maps for each group were also carefully analyzed revealing that seven groups entered from Room 17, with six of them turning to the right upon arrival to Room 18. Turning right upon entering a room is a common movement pattern when visiting museums (Bitgood, 2006; Tzortzi, 2014) while visitors' entrance from Room 17 implies that visitors in their majority followed the curatorial order of the exhibition.

Based on the splitting or merging of the arrows depicted in each map, instances during which visitors departed from their group to approach other artworks, approached each

other, and walked together were identified. Such instances indicated the location of potential "social" incidents in Room 18. These instances were explored further by looking at the type of interactions that each group performed at certain locations in the room (Christidou, 2020).

From the 180 interactions registered for the twenty-one visitors, the average number of observed "interactions" recorded for each group was 20, with 40 being the highest, and 10 the lowest (including interactions unfolding between visitors, between a visitor and a resource, and between visitors and a resource). These numbers allowed for a better understanding of (i) the type of interactions unfolding, (ii) the degree of interaction between the visitors, and (iii) the exhibits or locations around which these interactions unfolded. "Looking at" paintings was the most performed interaction as most of the artworks were paintings, followed by "talking to others", "reading the wall text" and "reading the label text" (see Figure 6).

Based on the summary of the duration of their interactions while in the room, the average dwell time in Room 18 was four minutes and twenty-four seconds.

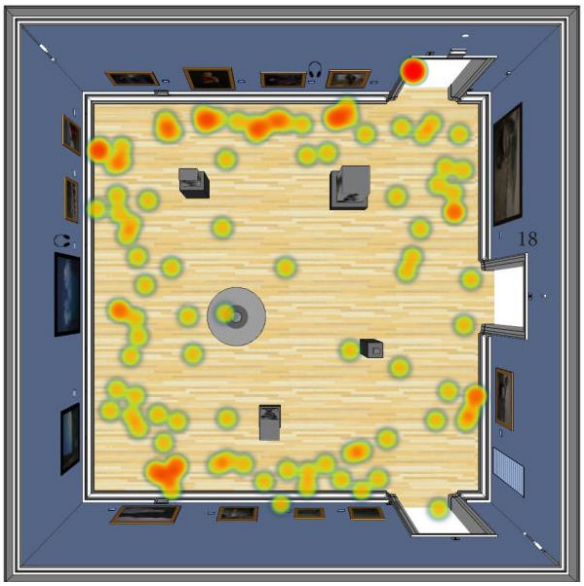


Figure 6. Heatmap of "Looking at paintings."

For Study B, the dataset was analysed in a similar manner to Study A. Based on the movement direction map for all 156 visitors (see Figure 7), visitors entered from the right door, following the curatorial order, and turned right. They also remained in the room for about four minutes and forty-seven seconds, a time very similar to the one calculated in Study A. This is perhaps due to fact that both rooms displayed approximately the same number of artworks including paintings and sculptures (Study A, 18; Study B, 16).

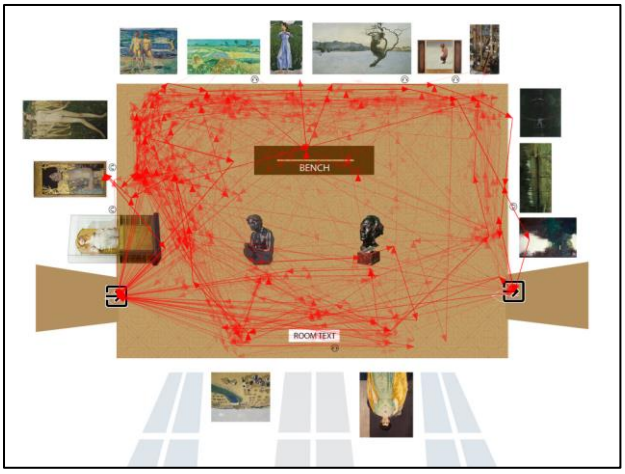


Figure 7. Movement Direction Map.

Similar to Study A, the 1646 interactions registered offered a better insight into (i) the degree of interaction between the visitors, (ii) the type of interactions unfolding, and (iii) the exhibits/locations around which these interactions unfolded. Based on the dwell time of all interactions, the top five included "looking at Judith", "talking to another visitor", "looking at Evil Mothers", "looking at Plain of Auvers" and "looking at Pond" (see Figures 8a-d). From these, one can conclude that four out of the five most performed interactions were still ocular-centric, and all were related to different paintings. Interestingly, "talking to another visitor" has been the second most performed interaction, pointing towards the social nature of these visitors' encounters.

The combined datasets from timing and tracking for Study A and B point towards the

ocular-centric nature of the art museum visit. There is of course movement from one painting to another but not many other embodied interactions were registered as often as looking. Following the criticism towards data collected through observation studies regarding their accuracy as the data are registered by the researcher and not visitors themselves, the researcher now turns to the SMM dataset to complement the researcher's observations with the visitors' representations of their visit.

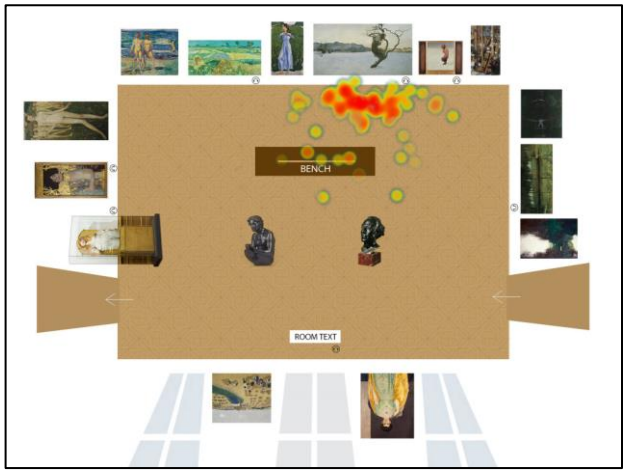


Figure 8a. All interactions related to Evil Mothers.

Figure 8b. All interactions related to Judith.

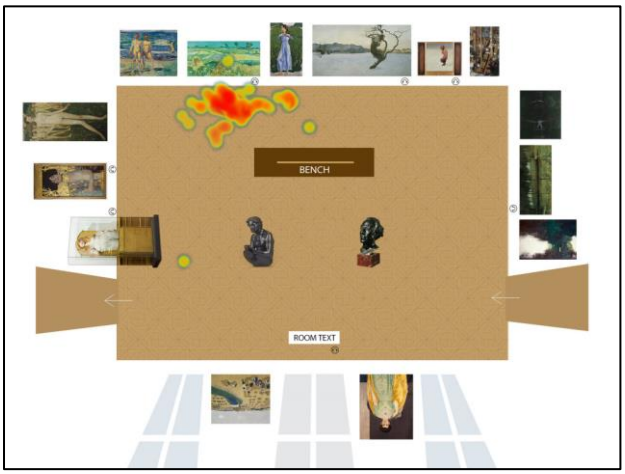


Figure 8c. All interactions related to Plain of Auvers.

Figure 8d. All interactions related to Pond.

SMM dataset. For each group of visitors, a video was created visualizing their SMM. A multimodal transcript was created based on the video, with visitors' talk transcribed on the left and any associated marking activity on the right side as a screenshot (see example Table 1 & Table 2). This way of transcribing was intentional in order to acknowledge the interconnection between the map drawn and the process of thinking aloud in uncovering visitors' experience (Cox, 2005; Wright, 2007). The transcripts were then analyzed qualitatively through inductive coding (Corbin & Strauss, 2008) --- that is, developing codes from the data itself using a bottom-up method. In this chapter,

the analysis of two examples focuses on how SMM provided opportunities to discover aspects of visitors' visual literacy.

Study A. The first example came from an American couple, Florence and Marcus, arriving to the gallery room twelve minutes after being recruited. Based on the timing and tracking data, they stayed in the room for approximately 10 minutes. When looking at their movement direction map (see Figure 9), there are split arrows close to the door where they entered from, which represent independent movement into the room. On the top left corner of the image, the arrows merge, representing them reuniting as a group. From this point and until they exited the room, as indicated by the merged arrows, the pair stayed together. Forty interactions were registered with more than the half emerging in between the two visitors, hinting at the social nature of their visit.

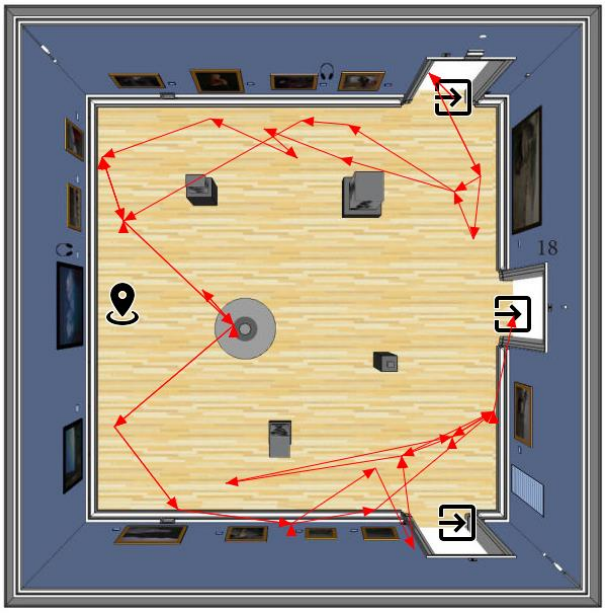


Figure 9. Movement Direction Map.

As revealed during the survey, the couple was visiting Norway for twenty days. They described themselves as regular visitors to cultural institutions --- visiting museums and galleries when they travel around the world or at home. When visiting cultural institutions, they mentioned that they visit them together as a group as they enjoy sharing opinions and experiences, debating with each other while exploring such places. For their visit to the National Museum of Art, Architecture and Design in Oslo, they mentioned that they followed the suggestions of a travel guide, which they held in their hands during the visit. They also mentioned that the travel guide highlighted the artworks in Room 19, the room next to the one where data collection took place.

After handing the tablet to this couple to fill in their SMM (Table 1), the researcher introduced the toolbox and indicated the door through which they came in. Florence held the tablet and was the first one who started annotating and talking. All in all, the couple took three minutes and thirty seconds to fill in their SMM.

During this time, Florence was the one leading the activity. She was the one marking their stops at certain artworks and often provided descriptive accounts such as *these were the lake ones*, or evaluations of their experience with these such as *we liked these*. Marcus often confirmed her markings and storying by saying yes and assuring her that she 'did a great job'.

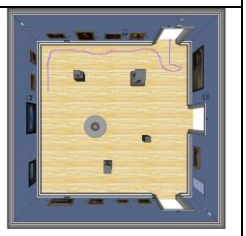
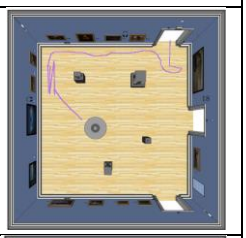
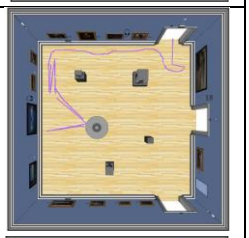
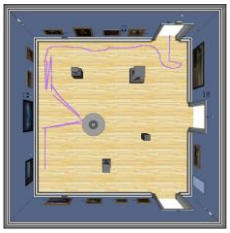
Only when Florence drew a circle on the floorplan and this annotation was shared on the screen, the researcher sought to find out more about the meaning of the specific annotation by asking the pair about it. Florence explained that this was an area of interest for both of them, but her account was not shared by Marcus. As a response, Marcus offered his account that he spent more time with the 'dance and the play one' painting but Florence, who was in charge of the SMM, challenged his reflections ('no, you didn't'). Marcus then responded that he indeed spent more time looking at this painting than Florence because he tried 'to convince here that the two paintings by the lake must be the same body of water'.

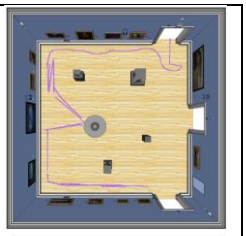
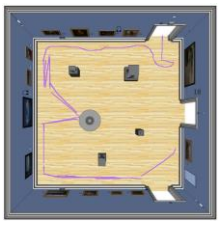
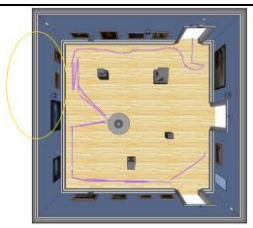
In one of their turns-in-talk, Florence referred to 'the Chinese', a group of visitors viewing the large blue painting on the left. At this point, the information collected through timing and tracking became relevant in the visitors' SMM that captured the couple's interaction with those attending the guided tour as an important part of their visit to Room 18. The couple

decided to sit down and wait until the tour was over. This instance also highlighted the fact that specific contextual information related to this pair's visit became visible and audible when the pair reached this location on the digital map --- their navigation through the map allowed them to write not only themselves on the map but also those sharing the same space.

What can be seen in this example is how visitors reimagined their visit as an embodied experience --- moving through the space in sequence, looking at artworks, and evaluating what they come across in space and time in this room. This pair's footprint of their experience is being drawn on the digital floor plan coupled with their own narrations and descriptions of what they encountered during their time in Room 18. Although we do not learn a lot about why they approached specific paintings and avoided others, this is a very typical example of how visitors used the SMM to share their experience with the researcher and each other.

Table 1. Transcript of the SMM made by Florence and Marcus.

Ways of talking	Trails of walking
Marcus (M): *OK, so, is this where you came in?* Florence (F): *No, that's from 18. We came here* (**draws line**) *and we stopped there* (**draws line**), *and we went to that painting* (**draws line**), *and that was the scary* M: *so this is the… dance in play, right?* F: *But then we really liked these ones* M: *I liked that one the folk dancing, right?* F: *yes! But we liked these, with the street.* M: *Oh yes yes yes* M: *And the summertime.*	
F: *so we went back and forth for a little* (**draws a zig zag line**). M: *yeah* F: *the Chinese! And then we sat down* (**Extends the line towards the couch**).	
M: *yeah, and this is the one with the, down here, is the same lake. Oh sorry!* (Giggles) (**extends line**) F: *and down to the right* (**draws line**), *and then the other way* (**draws line**). *These were the lake ones.* M: *OK, I stayed there for quite a bit, for some time and then.* F: *and then we went to this one* (drawing on the floorplan, closer to **the wall text**)	 

	 
M: *Yeah* F: *OK, that's the eraser, right? I will do a circle* (**over the main painting with the lake**) Researcher (R): *is it easy to use?* F: *it is! Yeah.* M: *Yes* F: *do you want to add anything?* M: *so, you got a circle down, OK …No, I think you did a great job!* R: *so, you highlighted this area here, as an area of conflict or an area of interest?* F: *An area of interest* M: *hmhm* F: *It's like the most time there I feel like we spent there. Intellectually, at least for me.* M: *I think I spent the most time – maybe I circle around the dance and play one. That's the one I looked at the most.* F: *No, you didn't!* M: *yes, I did! I spent more time there than you!* R: *Based on my observations, you were stuck at this painting for a little bit more, and then you were having an issue also here.* M: *yeah, cause I was, I was trying to convince her that the two photos by the lake must be the same body of water. I wasn't sure.*	

Study B. This example from the Belvedere involves a pair of two female visitors, Sofia (W) and Maria (Wb), arriving to the gallery room twenty-five minutes after being recruited. Based on the timing and tracking data, their dwell time in the room was approximately six minutes and thirty-three seconds. In reviewing their movement direction map (see Figure 10), there are no split arrows and all arrows are merged pointing to one direction, representing individuals moving together through the room and interacting as a group.

Twenty-one interactions were registered with sixteen involving both visitors performing in relation to an artwork, a resource and with each other. The most performed interaction was "looking" at the artworks followed by "talking to each other". Based on the merged arrows and the number of interactions involving both visitors, their visit appears to be a social one, with visitors moving together in the room, looking at paintings and talking to each other.

In their survey responses, this group reported that they were friends on holiday in Vienna, and that this was their first time at the Belvedere. Both reported that they saw the museum in each other's company and identified themselves as regular museum visitors, visiting cultural institutions four to six times a year. These responses hint at a degree of familiarity between the two visitors and the existence of a common ground between them which informs their visiting practices, looking at artworks together and talking to each other (Christidou, 2018; Tröndle et al., 2012).

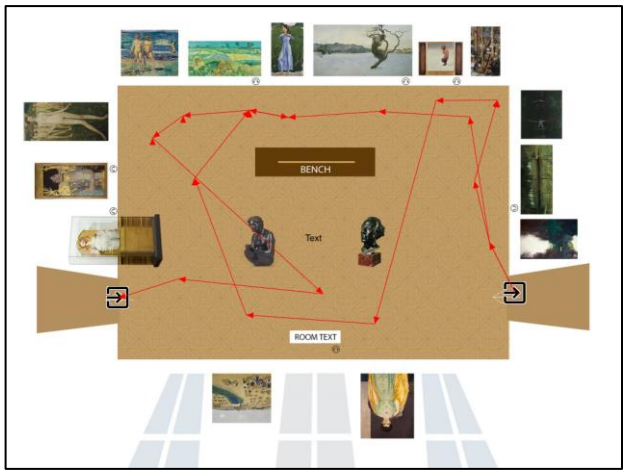


Figure 10. Movement direction map.

In the SMM (see Table 2), the experience became manifested and shared as an embodied and emplaced timeline of sequences of actions in the specific room, involving moving through the space, looking, reading, searching for more information online and talking to each other. Moving and looking comprised the majority of actions mentioned during their SMM. The visitors regularly referred to the artworks as *that*, coupled with a marking on the screen which facilitated their identification by marking out their location on the digital floor plan.

These indications were regularly coupled with evaluative descriptions of the artworks through adjectives such as *pretty*, *lonely*, *sad*, *beautiful*. These words provided hints of emotional responses that visitors had upon encountering the artworks. Visitors heavily related their reasoning for approaching and noticing certain artworks to the visual characteristics and the emotions that these artworks triggered (i.e., *Yeah that one we thought was really sad*; *We thought that this was beautiful; That was fun that one*). These two visitors also introduced their knowledge about the artist and their lives or techniques, such as Van Gogh *('we were talking about him* […] *about his life also... I was kind of, oh yeah, I always forget that he killed himself'*) and Munch (‘*That was fun that one*, *we were talking about yeah. We were trying to figure out where the actual Scream was, and there are four of them apparently'*). More lengthy reasoning and evaluative comments were offered in example 2 than in example 1, revealing aspects of visitors' visual literacy.

This pair appears to have an enhanced degree of visual literacy, knowing how to look at the paintings, how to read the interpretive resources and where to look at for more information. They introduced in their SMM aspects of their knowledge about the artists and their techniques which became possible to capture only through SMM. Their interactions during SMM are complementing each other, elaborating on each other's comments and interpretations, revealing the high social nature of this visit and how these two visitors enhanced their visual literacy by talking to each other, reading the resources, and searching information online.

Table 2. Transcript of the SMM made by Sofia and Maria.

Ways of talking	Trails of walking
Sofia (W): *So, we went around, and we were discussing* Maria (Wb): *That we liked, that one [Early Spring].*	
W: Yeah, we liked this one, I didn't know. I wasn't familiar with the artist. This one is kind of sad [Lost]. *Wb: Yeah that one we thought was really sad.* *W: I mean he is pretty lonely.* *Wb, W: (laughing)*	
Wb: We thought that this was beautiful [Emotion] (.) but it was really beautiful	
W: This one also, I liked the way, it wasn't familiar. *I: Familiar?* *W: No, I wasn't familiar with the artist either but it's nice, I like the style and then of course, Van Gogh [Plain of Auvers]. We were talking about* *Wb: We were talking about him. Never seen this one of course about his life also.* *Wb, W: (laughing)* *Wb: I was kind of, oh yeah, I always forget that he killed himself.* *Wb, W, I: (laughing)* *I: Were you able to tell from that painting? Probably not* *W: No, probably not. Although it is kind of little sad cause it is, I mean it's lonely.* *Wb: Yeah, it is compared to the other ones.* *W: It's lonely, because it is: it is pretty, but you are looking into the field and there is no one there, it is little bit.* *Wb: Yeah because it was one of the last ones, no? It was, yeah.* *W: I said, yeah, his last one. And then, we went here. We were discussing.*	
W: No, probably not. Although it is kind of little sad cause it is, I mean it's lonely. *Wb: Yeah, it is compared to the other ones.* *W: It's lonely, because it is, it is pretty, but you are looking into the field and there is no one there, it is little bit.* *Wb: Yeah because it was one of the last ones, no? It was, yeah.* *W: I said, yeah, his last one. And then, we went here. We were discussing.* *Wb: That was fun that one [Seashore?].* *I: About?* *W: No, we were talking about yeah. We were trying to figure out where the actual Scream was, and there are four of them apparently.* *Wb: Loads, yeah.* *W: I didn't remember that either.* *Wb: So, we opened Google for that.* *Wb, W: (laughing)*	

I: Oh yeah you opened.	
W: Yeah, we were Googling things on our phone, and we didn't really look at this one [Adolescentia]. *Wb: No* *W: Because we went straight to the Klimt [Judith].* *Wb: Yeah, we stopped there for a while.* *W: We were looking and reading and* *Wb: Yeah, we commented on how you can see the difference from the ones in the previous room and then this one.* *I: In the room you walked in before.* *Wb: Yes, they were* *W: The ones we saw earlier on, some early works yeah and I mean his style has changed.* *Wb: And then* *W: And then we went.*	
Wb: We passed this one, we didn't pay attention to it at all.	
W: And then we went: I kind of looked at this but not really so I moved back. I looked at this little but then we looked at that one. *Wb: That one, yeah*	

Limitations. A common limitation of both *Visitracker* and SMM is that they allow data collection in one gallery room per study and thus, capture a spatially and temporally limited snapshot of the whole museum visit. Nonetheless, data collection through *Visitracker* and SMM requires the physical presence of at least one researcher and thus, data collection even in just one room can be time-consuming. For instance, the data collection for each of the groups in Study A lasted an average of one hour. Another aspect that became evident during data collection with SMM is that the digital representation of the gallery room displayed on the small tablet screen seemed to shape visitors' spatial understanding and the representation of their experience in very specific ways. For example, visitors often referred to features of the map by pointing at them or describing them as "over here". In such instances, the researcher intervened and asked visitors to mark these features or areas out. Coupling SMM with video recording could facilitate those instances in which identification of features of the map was connotated verbally while also capturing the embodiment involved in visitors' map making, revealing important aspects of the ways in which visitors interacted with the tool.

DISCUSSION

This chapter introduced the *Visitracker* app and the Social Meaning Mapping (SMM) method and tool. It drew upon data from two studies at art museums in Norway and Austria. By combining data from studies in two different art museums, the analysis exemplified the multimodal ways in which visitors made sense

of their art encounters and challenged those long-lasting ocular-centric perspectives towards visual literacy.

Both *Visitracker* and SMM use a digital copy of the museum floor plan with the artworks on display to mediate the representation of the museum visit and the data collection. Specifically, the floor plan allows the researcher to collect the data through a simple tapping on the screen while enabling visitors to talk about their experience without needing to recall the names of the artists and the titles of the artworks or use art-related language (Christidou, 2020; Christidou & Reitstätter, 2020). Both the movement map created automatically based on the timing and tracking data and the one made during SMM visualize the museum experience as a collection of encounters a person has with the artworks displayed in these rooms. These encounters involved all artworks on display but also a selection of those as visitors wandered in the room, approaching only those artworks that they wished to look closely.

Upon looking closely to the two examples, both the maps created by the researcher and those created by visitors reveal aspects of visitors' visual literacy and their practices when encountering artworks in the museum. Their analysis revealed the museum experience as an embodied event, unfolding in specific time and space, during which vision is only one of the modes enacted. Visitors' movement lines and their markings were proxies for their embodied engagement with specific areas and artworks in both gallery rooms. What was marked out as a point or location in the map could be read as a "place" of interest or interaction and lines become paths, showing sequence of movement. Other markings had particular meanings which became articulated through visitors' storying.

As seen in both examples, movement was used by visitors as the main mode when attempting to represent their experience on the tablet. Every time visitors marked their positioning in the room, they elaborated their marking with phrases such as *I went there and saw this*; *I didn't see this*; *I saw that one*. Such verbal elaborations foreground the importance of movement and looking in visitors' encounters with the artworks, while highlighting the lack of art-related terminology in visitors' narrations.

When coupling the information revealed through SMMs with timing and tracking data, it became possible to identify other modes and resources that were used by visitors apart from movement and vision such as talking to their co-visitors, taking photos, reading the text, using their mobile phones to search for information online and so forth. The analysis showed that in understanding visitors' visual literacy and engagement in the museum, it is not only important to know *what* they look at but also *how* they look at that including the resources they used and the discussions they might had with others. What is happening during looking is important in (re)shaping the visual literacy one might have.

Both studies showed that SMM addresses successfully the methodological challenge of incorporating visitors' own narratives, movement, and meaning making into data collected by researchers through in-gallery observations. The focus of this chapter was on the ways in which SMM allows visitors and researchers to capture more than meets the eye in the museum, contributing to a multimodal understanding of visual literacy. The analysis of the SMM data showcased how visitors' experience became represented as a multi-modal timeline. By coupling their SMM with the data collected through timing and tracking, the analysis moved beyond the visual and captured aspects of visitors' visual literacy as an embodied event unfolding in interaction with the resources, other visitors sharing the same space, and the interaction between those two visitors.

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