
Rhythms of Everyday Life in Mobile Information Seeking: Reflections on a Photo-Diary Study

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ABSTRACT

This work explores embodied mobile information practices through a photo-diary and interview study with nineteen smartphone users. We qualitatively analyze 234 diary entries and one hundred descriptions of diary entries to explore how mobile devices, specifically smartphones, facilitate embodied information seeking and production, drawing insights about the use of mobile devices as nonverbal communication tools. In addition, we probe the notion of smartphones as an extension of the human body, and ways in which the affordances of these devices (e.g., portability, convenience) support and interrupt information practices. In particular, we observe that mobile devices are not only perceived as extensions of the mind and body, but are embedded in bodily rhythms and routines. This research extends empirical work in Library and Information Science (LIS), which has not focused extensively on mobile information practices in connection with the body, and suggests that the theoretical lens of embodiment may inform future work on mobile information practices.

With the arrival of electric technology, man extended, or set outside himself, a live model of the central nervous system itself.

—Marshall McLuhan, *Understanding Media: The Extensions of Man*

Although the old dichotomy between function and form could be vaguely maintained for a hammer, a locomotive or a chair, it is ridiculous when applied to a mobile phone. Where would you draw the line between form and function?

—Bruno Latour, “A Cautious Prometheus?”

INTRODUCTION

Within Library and Information Studies (LIS), there has been longstanding recognition that information can be communicated through objects and the material environment, and substantial efforts have been made to abstract, manage, and store information in many forms (e.g., books, images, databases) for perpetual access and retrieval (Buckland 1991). Yet, dominant conceptualizations of how people and information interact have been limited in scope: a typical human-information interaction might be depicted as a hand that clicks a mouse, scrolls, or types a query; a pair of eyes that reads lists of retrieved records or text-based documents; and an information processor (i.e., the brain) that inputs and outputs messages via the perceptual channels. This cognitive, information-processing model of information seeking has largely underpinned information retrieval system design and information-behavior models. Today, voice, audio, and haptic technologies have become mainstream¹ (e.g., Apple's Siri or Amazon's Alexa), and there is increased recognition that digital interactions are not confined to text-based resources (e.g., Absar and Guastavino 2015) or one physical space. People move across physical and virtual spaces in their work and leisure activities aided by ubiquitous digital technologies, including smartphones.

The pervasiveness of digital devices² has affected the nature of humans' relationships with information and technology, as predicted over a decade ago by Benyon (2001):

As computing devices become increasingly pervasive, adaptive, embedded in other systems and able to communicate autonomously, the human moves from outside to inside an information space. . . . Information artefacts will be both embedded in the physical environment and carried or worn by people as they move through that environment. (p. 426)

Information artifacts have been enmeshed with the environment since humans first began to leave traces of their existence behind; artwork, landmarks, and signage come to mind as examples. However, the prominence of smartphones and other portable devices has affected the ways in which we deal with information—we can access information with increased frequency and agility from wherever we are geographically situated (Burford and Park 2014), and consequently, mobile information seeking and use are enacted in, and shaped by, diverse physical and social contexts. Thus, our information interactions are not influenced solely by our tools but are also affected by the myriad complex relationships between people, places, and things that come together in our practices of using our tools.

We understand that we, as human beings, interact with digital devices as extensions and reflections of ourselves and our bodies. The design of our digital tools can affect our interactions with these tools and our interactions with each other. Designers are increasingly involved in the creation

of objects that blend nature and culture and have an impact on how we use our physical bodies, as in critical making work using 3D printing to create prostheses (e.g., Ratto 2016). In this study, we take an interest in exploring embodiment, a concept that refers to the role of the human body in shaping our practices, social relations, and material worlds. Our understanding of embodiment is informed by scholarship on posthumanism (Hayles 2008) and LIS research that focuses on how people use their own and others' bodies as sources of information (e.g., Bonner and Lloyd 2011; Lloyd 2009; Olsson and Lloyd 2017) and to produce information (Pridgoda and McKenzie 2007). Haraway (1991) and Hayles (2008) describe our fascination with the cultural icon of the cyborg, a figure invested with the dreams and nightmares of futures in which digital technologies are increasingly embedded within our physical bodies. Conceptualizations of embodiment in these works blur binaries between body and mind, self and environment, human and technology, and between material and immaterial information that can travel through space and time as facilitated by our digital tools. With an interest in bringing scholarship on embodiment into conversation with LIS, we sought to question the degree to which digital devices enable, constrain, and become intertwined with human abilities, and how this impacts information practices that are performed with the body.

In this work, we explore embodied mobile information practices through a photo-diary and interview study. We were intrigued by the idea of the mobile device as a "third hand" that was used in the everyday routines of a migrant wayfinder (e.g., Lingel 2013), and sought to explore the human–mobile device relationship more fully. In order to investigate the use of mobile phones as an embodied information practice in the everyday lives of participants, we sought to involve participants in documenting information seeking and use *in situ* through photographs, text, and verbal descriptions.

LITERATURE REVIEW

Navigation is central to human information interaction (Bates 1989; Benyon 2001; Dörk, Carpendale, and Williamson 2011; Pirolli and Card 1999; Teevan, Alvarado, Ackerman and Karger 2004). Metaphors of information seeking tend to describe the individual striving to overcome obstacles; this effortful act of seeking information is often conceptualized as navigation through space (Kopak, Freund and O'Brien 2010). Individuals follow relevant "scents" to "forage" for information, moving within and between "patches" of resources to gather information (Pirolli and Card 1999), and engage in "berry picking" through querying and document selection, refining their goals as they search (Bates 1989). In Dervin's (1983) sense-making metaphor, individuals stride through space and time to bridge a "gap" in their understanding. Yet these metaphors featuring the human

body and the landscape are more typically used to depict mental or virtual rather than physical space (Cox, Griffin, and Hartel 2017). In these metaphors, queries and documents are illustrated visually along an information seeker's path (Bates 1989), so that the materiality of recorded information, the physical effort, and sociotechnical structures used to access and understand it are not the focus in these accounts of information seeking.

Although movement of the physical body has been recognized as important to information seeking by scholars such as Bates (1989), there is still limited understanding of how individuals use their bodies when looking for information. Kuhlthau (2004) incorporated physical components of information seeking, for example, "exploring" and "documenting," in the Information Search Process (ISP) model, and many information practices require seekers to physically move, transform, or manipulate information. Yet the physicality of information practices is less commonly depicted, with notable exceptions in studies of reading (e.g., Hillesund 2010), browsing library stacks (e.g., Buchanan and McKay 2017), and wayfinding (e.g., Lingel 2013). There has also been less emphasis on mobile information interactions in LIS (Greifeneder, 2014) compared to the related field of human-computer interaction (HCI). In this paper, we seek to frame mobile information interactions as information practices in order to understand, first, how they might represent and support embodied ways of knowing through their physical and social affordances, and, second, the ways we have come to relate to them and incorporate them in our daily lives.

Mobile Information Interactions as Information Practices

Mobile information interactions have been classified in various ways (Absar and O'Brien 2013), including by topic (e.g., games, shopping, communication (Böhmer et al. 2011)); domain (e.g., news, weather, and travel (Komaki, Hara and Nishio 2012; Nylander et al. 2009; Sohn, Li, Griswold and Hollan 2008)); motivation or intention (e.g., current awareness, time management, social connection, social avoidance (Taylor et al. 2008)); and activity (status checking, browsing, fact checking, performing transactions (Taylor et al. 2008)).

Overall, domain-based approaches tend to be inconsistent across studies, and motivation- and activity-based approaches were developed and modified from general web information interactions that may not take into account unique affordance of mobile interactions. The aforementioned typologies are also static, and yet we know that the mobile environment is not. The same studies that have categorized mobile interactions have also acknowledged the host of contextual factors that influence them. Much emphasis has been placed on the size of smartphone screens—especially in early days of mobile technology—and how this limited the performance

of more complicated computer tasks. Komaki, Hara, and Nishio (2012) found that mobile searches “were affected not only by information needs but also the place the search was conducted,” for example, on the bus, at home, in a restaurant, at the office. Search success has also been related to individuals’ contexts and corresponding ability to concentrate on mobile tasks depending on the time or place (Komaki, Hara, and Nishio 2012), causing some mobile users to defer or fail to satisfy their information needs (Sohn et al. 2008). Other work has noted the fragmented nature of mobile searching, where people must balance the demands of their tasks with their external environment (Oulasvirta et al. 2005).

Information practices are meaningful ways of dealing with information—and with information tools, such as smartphones—in specific material and social contexts. Given that mobile information interactions “are not static arrays of routinised action, but are fluid and ongoing arrays of activities” (Lloyd, Keenan, et al. 2013, 127), we find that it is helpful to understand these activities as information practices. Walsh (2012), who interviewed five information/computing professionals about their mobile information interactions, took a more practice-oriented approach, though not explicitly. Walsh derived three modes of engagement: locating and evaluating information on the move; using information and creating new knowledge on the move; and coping with being “always on” with the mobile device. Walsh’s modes move beyond seeking to incorporate information use, production, and coping strategies. With regard to using and creating new knowledge, Walsh noted that mobile devices acted as extensions of people’s memories, where facts could be stored on the phone for later retrieval, “freeing up space” to think about other things (64). In addition to the role that mobiles may play in reducing cognitive burdens, it has also been acknowledged that mobile information seeking is a multisensory experience:

Waiting for a metro to arrive is not simply about sitting idly with all cognitive resources free for time killing activities, but calls for action: estimating when the metro arrives, moving to a position where it can be perceived, continuously interpreting auditory sense data, monitoring how personal space is perhaps intruded by bypassers, occasionally glancing [at] the environment to see if the metro is coming. (Oulasvirta et al. 2005, 920)

Thus, the nature of mobile devices and the contexts in which they are used impact attention resources (Oulasvirta et al. 2005), the success of task completion, and the timing and feasibility of needs satisfaction (Sohn et al. 2008).

Conceptualizing mobile interactions as information practices takes into account the dynamic nature of individuals’ environments, materials, motivations, and contextual constraints, and the range of routines (e.g., seeking, evaluating, using, creating, coping) that may be undertaken (Walsh

2012). As opposed to understanding mobile information interactions using static taxonomies of activities, approaching mobile information interactions as practices encourages our inquiry into the combination of elements (Shove, Pantzar, and Watson 2012), including the materials of the mobile device and the human body, that are joined and remixed in these practices.

Embodiment in Information Practices

The ways in which individuals engage in reading and writing the physical and social environment by, for example, observing other people, reading signs, or inscribing places through graffiti or public art are a fresh interest in LIS, though they have been studied in disciplines such as anthropology for some time (e.g., Irving 2007; Mejía and Pink 2017). Recently, studies in LIS have focused on the ways in which individuals read information embodied in the environment, or write—or embody—information in the environment. This discursive activity has been explored in different contexts, including serious leisure (Cox, Griffin, and Hartel 2017) and workplace and everyday life information practices (Olsson and Lloyd 2017). Embodiment is the tangible manifestation of information through some means that is legible to others. Embodiment is often described in terms of the readability of corporeal elements to others, and has been central to constructivist approaches that examine how people use their bodies to produce and communicate information, or to glean information from the physical and social environment (Olsson and Lloyd 2017).

In the last decade, several studies have taken note of the ways people use their own and others' bodies as sources of information. A number of investigations have considered how novices learn to use their bodies according to the demands of their work, and the role of information within this embodiment: researchers have spent time with firefighters (Lloyd 2007), ambulance workers (Lloyd 2009), nurses (Bonner and Lloyd 2011), archaeologists (Olsson 2016), and a vault inspector (Veinot 2007). These studies have shown that learning is multisensorial, since many senses are used in seeking information to understand what mastery over a practice looks and feels like. For instance, Lloyd (2007) found that firefighters tend to construct "fire sense" using corporeal experiences by seeking information using their bodies and observing how colleagues make use of their senses to perform their work. Olsson's (2016) work highlighted archaeologists' haptic analysis of artifacts at field sites, finding that embodied information practices were not limited to individuals working in crafts or trades fields.

Prigoda and McKenzie (2007) called attention to the body as producer of information in their ethnographic study of a public library knitting group. Participants' hands, dress, and crafts were visible and tactile sources of information that enabled them to learn about one another's aesthetics, socioeconomic background, and skills. More recently, Lingel

(2013) investigated how migrants learned about the urban environment in the first months of moving to New York City; the act of wandering—a physical movement analogous to browsing—in strange and familiar neighborhoods was used as an information-gathering activity. Lingel presented one participant's account of the mobile device as a “third hand,” which he used as an extension of his body to navigate the city using digital maps, to entertain himself by listening to the radio, and to keep track of the rhythms of the day by using it as a watch.

Lingel is among few scholars to focus on mobile devices and the intersection of physical and virtual navigation through space. Within LIS, there has been some research on mobile interactions in specific domains, such as tourist information seeking (Tan and Goh 2015) or health (Mi et al. 2016), the use of mobile apps as tools to collect data or trigger information seeking (Pontis et al. 2016), and general information-seeking behavior (Burford and Park 2014; Walsh 2012). However, to date, there has been little exploration of the human-mobile relationship and the implications of this for mobile information practices; this is surprising given the ubiquity of mobile devices in society and how their unique affordances (e.g., portability, convenience, traceability, etc.) have embedded them in daily life.

The Current Study

Individuals use their bodies to access, produce, disseminate, and understand information. These embodied interactions with information have been investigated to a greater extent in workplace settings (Bonner and Lloyd 2011; Lloyd 2007, 2009; Olsson 2016; Olsson and Lloyd 2017; Veinot 2007), but increasingly are being examined in everyday life (Cox, Griffin, and Hartel 2017; Prigoda and McKenzie 2007). At the same time, mobile devices have had a profound impact on the ways in which we seek information, yet there has been less emphasis than one would expect in LIS (Greifeneder 2014).

Mobile devices are ubiquitous and represent one channel through which information may be sought, shared, and managed in everyday life. The physical affordances of mobile devices (e.g., size, communication capabilities, internet connectivity) have made them portable and pervasive. As a result, they may act as a “third hand,” or an extension of the user's body, assisting with specific tasks (Lingel 2013), or an extension of the mind, a place to store information for later retrieval (Walsh 2012). Yet research has also demonstrated the competing demands of the device and the physical environment on users' attention, and the way in which mobile interactions are more fragmented as a result (Oulasvirta et al. 2005). Thus, it would seem that at times mobile devices work to enable information practices, while at other times impede or interrupt them, and, therefore, the role of smartphones as a help or hindrance to individuals may be contextually dependent.

In this work, we look at mobile interactions as embodied information practices to explore the relationship between people and their smartphones. Specifically, we investigate how this relationship shapes and is shaped by the context of use. Our overarching line of inquiry for this study asked, to what degree are mobile information practices embodied information practices? We operationalized this through two exploratory research questions: How do mobile devices, in this case smartphones, facilitate embodied information seeking and production (RQ1), and what does the notion of the smartphone as a “third hand” encompass (RQ2)?

METHODS

A number of methods have been used to study information practices in different situations from an emic perspective that involves participants throughout the process of data collection and analysis (Julien, Given, and Opryshko 2013). Ethnographically informed participant observation has proven useful in understanding how people use their bodies to “read” and “write” information specific to the environments in which they live or work (Gorichanaz 2015; Olsson 2016; Prigoda and McKenzie 2007). Interviews and diary studies are also common in information practices research. McKenzie (2003), for example, conducted an interview and diary study by telephone with women pregnant with twins. More recently, Karlson et al. (2010) drew upon diary methods to understand how delaying work tasks or switching between mobile and computer devices affected information practices. Interviews and diary studies have also been used extensively in HCI to investigate mobile interactions (Church, Cousin, and Oliver 2012; Komaki, Hara, and Nishio 2012; Nylander et al. 2009; Sohn et al. 2008).

A number of studies of information practices have augmented interview and diary studies with arts-based elicitation techniques. In these works, participants produced drawings, writing, or photographs during or prior to being interviewed (Gabridge, Gaskell, and Stout 2008; Greyson 2015; Julien, Given, and Opryshko 2013; Lingel 2013; Lloyd and Wilkinson 2016). For instance, Gabridge, Gaskell, and Stout (2008) conducted a photo-diary study to understand how students sought information within and beyond the university library, while Lloyd and Wilkinson (2016) used Photovoice (Wang and Burris 1997) to map information spaces used by youth who had experienced forced migration. Lloyd and Wilkinson found that photographs illuminated the everyday spaces in which participants searched for and made sense of information. Gomez (2016) employed participatory photography to explore the information practices among migrants along the US-Mexico border, in Seattle, and in Southern Colombia, finding that the method empowered participants to disrupt preconceived notions about the research topics and promoted deeper understandings of participants’ lived realities.

We drew upon the methodological approaches utilized in both LIS and

mobile research to investigate mobile information practices. In particular, we conducted a diary study with pre- and postdiary interviews. Inspired by Photovoice, we asked participants to construct brief text and photo-diary entries using their mobile devices over a five-day period. Photovoice was a noninvasive approach to gain access to participants' everyday information practices, specifically the contexts in which mobile interactions took place. Diaries allowed us to capture information seeking as it happened, and by asking seekers to complement their text entries with photographs, we sought to increase their recall of information-seeking events during the postdiary interview (Carter and Mankoff 2005). We specifically constrained mobile devices in this study to smartphones, excluding tablets, GPS devices, smart watches, and so on, as these all offer different affordances. The duration of the recording period was selected to maximize participant retention over the course of the study (Taylor et al. 2008).

Participants

Participants were recruited through print advertisements posted around a university campus and through an online classified site, Craigslist, for the geographic area; the aim was to solicit students and nonstudents through virtual and nonvirtual avenues. The participants in this study consisted of eleven females and eight males who ranged in age from 19–37 years old ($M=24.16$, $SD=3.54$). In this study, we analyzed nineteen full cases, excluding data from one additional participant who did not complete the study. Fourteen diarists were students working on degrees at the bachelor ($N=10$), masters ($N=2$), and doctoral ($N=2$) levels in arts, education, commerce, science, and engineering. The remaining participants included a bank teller, lab technician, IT professional, executive administrative assistant, and field sales manager.

On average, participants had owned their current device for twelve months ($M=12.05$; $SD=8.4$). Ten people had phones with an Android operating system (e.g., Samsung, Galaxy), seven owned an Apple iPhone, and two used a Blackberry. Table 1 shows the variety and frequency of self-reported tasks completed by participants on their mobile devices. Communicating via social media was the most popular behavior, with twelve (63.16%) participants reporting that they did this several times each day, while online shopping was reported with much less frequency. Other behaviors, such as browsing online news, looking up directions, verifying information, and consulting product reviews saw the majority of responses falling into the daily to weekly categories. These specific categories of behaviors were derived from previous literature, but there may be some types of mobile interactions that we failed to touch upon. However, table 1 provides an overview of mobile device use in our participants' daily lives, and the kind of interactions we expected to see represented in the diary entries.

Table 1. Type and frequency of mobile behaviors

Mobile behavior	Several times/ day	Daily	Several times/ week	Weekly	Rarely/never
Communicating via social media, e.g., status updates	12 (63.16%)	2 (10.52%)	5 (26.31%)	0	0
Browsing online news	4 (21.05%)	5 (26.31%)	5 (26.31%)	3 (15.79%)	2 (10.52%)
Shopping online	0	0	3 (15.79%)	1 (5.26%)	15 (78.94%)
Consulting product or service reviews, e.g., restaurants	0	2 (10.52%)	10 (52.63%)	5 (26.31%)	2 (10.52%)
Looking up directions	4 (21.05%)	6 (31.57%)	7 (36.84%)	2 (10.52%)	0
Verifying information, e.g., hours of operation	2 (10.52%)	6 (31.57%)	7 (36.84%)	3 (15.79%)	1 (5.26%)

Procedure

The study consisted of three parts: i) an initial interview to orient participants to the study (“prediary interview”), ii) a five-day photo-diary composition period, and iii) a final interview to discuss a selection of the diary entries (“postdiary interview”). Figure 1 is an overview of the study design.

The Behavioral Research Ethics Board (certificate number H13-00670) at the University of British Columbia approved this study. Informed consent was obtained at the beginning of the prediary interview and reconfirmed at the beginning of the postdiary interview. Diary entries were completed in naturalistic settings, while interviews took place in a quiet room within an academic unit on a university campus. The interviews were audio recorded and later transcribed. Participants received an honorarium of 5 Canadian Dollars for the first interview and \$20 for the second interview. Prediary interviews lasted approximately 45 minutes, while postdiary interviews were about 90 minutes in length.

In the prediary interview, we collected information from participants about their demographics and the nature and frequency of their mobile interactions. In addition, participants learned about the type of information-seeking activities of interest in the study (e.g., news browsing, status-checking on social media sites, fact-checking, looking up directions, and so on). We felt it was important to discuss this with participants, who may have been otherwise confused by instructions to record their “information interactions,” or who may have otherwise limited their diary entries to interactions involving only search tools (e.g., Google) or activities (e.g., typing in keywords as opposed to linking to or sharing information). We stressed that participants were free to choose the activities they reported on depending on their privacy needs and comfort levels.

For the brief diary entries, we asked participants to indicate: i) the nature of the search (app used, information sought, and queries typed or

steps taken); ii) day, time, and location; and iii) whether the information need was satisfied completely, partially, or not at all. Participants were also asked to take a picture of the setting in which the interaction took place as part of the diary entry, and to send the diary entries to the researchers' secure university email account. To ensure participants felt comfortable with and retained these instructions, they practiced the steps for creating and sending a diary entry and were given a paper copy of the instructions.

During the diary data collection period, participants were sent daily email reminders to note, record, and submit diary entries. The number of diary entries sent by each participant ranged from 3 to 45, with a median of 12.3 entries per participant ($SD=10.7$), resulting in a total of 234 diary entries. Prior to the second scheduled interview, a random-number generator was used to select five search events to be discussed with each participant. In cases where an individual had submitted five or fewer entries, all of the events were discussed. Two slide decks were constructed for each participant: one deck with the five randomly selected events, and one with all search events. In both slide decks, the text and photo of each diary entry were arranged side by side on a slide. This allowed the researchers to collate and organize participants' data and maintain the authenticity of the digital diary entries.

Postdiary interviews focused on the five random search events and one "notable" event selected by the participant, resulting in a total of approximately 100 event descriptions. (In some cases, a participant selected a previously discussed event as the notable event.) Using a protocol adapted from Komaki, Hara, and Nishio (2012) and Sohn et al. (2008), for each event participants were asked to describe the following:

- The motivation for recording the search event
- The information event itself, i.e., how it arose and steps taken during the interaction
- The photo they took to represent the search event
- Whether the search activity was finite or continued at a later time
- Whether they continued the search activity on a device other than their mobile
- Whether they were searching for information for themselves or for others
- The estimated time parameter for the information activity
- The perceived complexity of the information activity

After the researcher and participant discussed the five preselected search events, the participant was asked to identify a "notable" event from the entire set by previewing all events in the comprehensive slide deck. After choosing an event, they were asked to elaborate on the context in which this diary entry was recorded and articulate why it was noteworthy. If participants sought clarification of what the researchers meant by "notable," we used phrases such as "stood out," "memorable," "significant,"

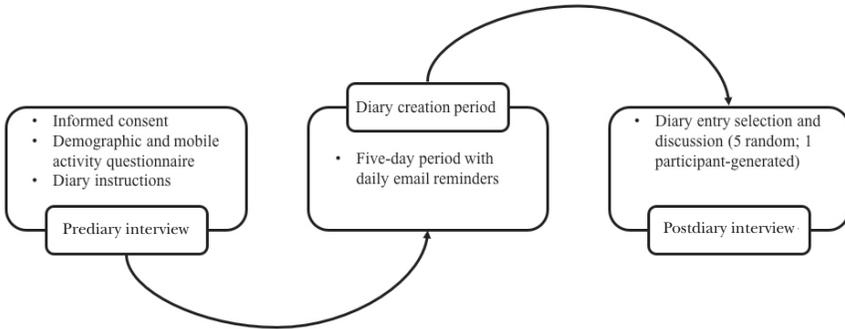


Figure 1: Diary study procedure

etc., but, in order to avoid influencing the valence of responses, we did not include affective language (e.g., “positive,” “negative”).

Approach to Data Analysis

The 234 photo-diary entries and one hundred event descriptions derived from the nineteen postdiary interviews from each participant formed the basis of our analysis. We were interested in the affordances of different photographic methods and analytic techniques (Banks 2008; Hartel and Thomson 2011; Hartel, Matusiak, and Thomson 2016; Rose 2016), as well as qualitative methods such as qualitative content analysis (QCA) (Schreier 2012) and thematic analysis (Braun and Clarke 2006) that could be used to understand information practices in the mobile context.

We first conducted a *compositional analysis* of the diary-entry photographs’ “colour, spatial organization, mise-en-scene, montage, light, and expressive content” (Rose 2016, 83). We assessed whether the visible activities and contextual features in the images related to information practices. The compositional analysis, which was inspired by the concept of the *information flâneur* (Dörk, Carpendale, and Williamson 2011), showed that individuals participated in space through creative exploration. Some participants’ photos revealed attention to aesthetics: scenes of nature framed through windows; activities of personal interest, such as swimmers at a pool; features of the urban landscape, including signs and decorative lights strung across buildings; and, more pragmatic, yet aesthetically pleasing scenes, such as an outfit being put together or a meal being prepared. The compositional analysis drew from the perspectivist approach to spatial context (Savolainen 2006), which emphasizes subjective interpretation of space and the whole confluence of people, space, and practices working together. We also analyzed how body position/arrangement (i.e., standing, sitting, reclining) may have contributed to the composition of photographs.

Table 2. Kappa statistical analysis for QCA of photographic data

Code	No. Cases	Interrater reliability (Kappa)
Arrangement of the body (e.g., sitting, lying down, standing)	218	0.581, $p < .001$
Visibility of the body (whole body, arms/hands, legs/feet)	217	0.849, $p < .001$
Place (e.g., vehicle, indoors)	219	1.000, $p < .001$
Time of day (daytime, nighttime)	218	0.188, $p < .001$
Features of the material environment (e.g. desktop computer, television, bed, etc.)		
<i>First code</i>	218	0.735, $p < .001$
<i>Second code</i>	169	0.492, $p < .001$
<i>Third code</i>	99	0.303, $p < .001$
<i>Fourth code</i>	54	0.253, $p < .001$
<i>Fifth code</i>	23	0.103, $p < .001$

Next, we identified contextual features of the photos using *qualitative content analysis*. QCA is a systematic means of data reduction, yet was interpretive and responsive to the study's research questions (Drisko and Maschi 2015; Schreier 2012). QCA of the photographs allowed us to survey contextual elements of interest, namely, places, information tools, and participants' bodies. Understanding the visual data in terms of time of day (e.g., daytime), place (e.g., indoors), and features of the material environment (e.g., bed) focused our attention on mobile device usage, such as waking and preparing for the day. One author adapted the findings of the compositional analysis to more systematically survey the contextual elements and references to seekers' bodies. Two authors applied this coding scheme to all photographs and achieved moderate to excellent reliability for the arrangement and visibility of the body and place, but unacceptable reliability for time of day (which was not always possible to infer due to conditions indoors or outdoors) and features of the material environment because each coder applied different numbers of codes (table 2). With respect to features of the material environment, agreement and the number of cases for analysis decreased with the assignment of multiple codes, but there was acceptable agreement for the first code. Some examples of the codes and representative images are featured in table 3.

Finally, we conducted a *thematic analysis* (Braun and Clarke 2006; Ryan and Bernard 2003) of the interviews and photo-diary entries to link the visual and textual data. A separate coding manual was developed for this stage of analysis, which included codes related to the compositional and qualitative content analyses. During this stage, we focused more deeply on the interview data, but referred to corresponding photo-diary entries for corroboration. We introduced *a priori* codes drawn from theoretical contributions in the literature, such as "mobile device entangled with the 'natural rhythms' of the person's body" (Lefebvre 2004), and developed

Table 3: Coding frame for photographs derived from photo-diary entries

Code	Code Level	Definition	Example Image
Body Arrangement	Sitting/Lying down	From the angle of the photo, it can be inferred that the participant took the photo while sitting or lying down.	
Place	Public transit	The interior of a bus, train, or other form of public transit is visible.	
Visibility of the body	Arms and/or hands	The participant's arms and/or hands can be seen in the photo.	

in vivo codes for recurring expressions (e.g., “killing time”). Two of the authors worked collaboratively on the development of codes. Each of us read five unique interview transcripts and used Post-it notes to jot down emerging interpretations and examples. We came together to visually display and group our Post-it notes and connected these with insights from previous research. This exercise allowed us to more clearly specify the coding frame.

After the coding manual was developed, the two authors assessed intercoder reliability and intercoder agreement. One author identified units of the text to be coded from two transcripts. Unitization facilitated agreement about the length of meaningful text spans, following one of the few detailed guides on intercoder reliability and agreement checks for qualitative studies (Campbell et al. 2013). Intercoder reliability refers to the degree to which a set of shared codes are independently applied by multiple coders to the same spans of text, while intercoder agreement is the degree to which coders can come together to agree on codes that apply to the same spans of text. In this study, intercoder agreement was negotiated through discussion between the two coders following an intercoder reliability check that illuminated divergent interpretations of codes and/or data. We conducted two rounds of intercoder reliability and agreement checks to test and revise the coding scheme. In the first round, coders had 45 percent intercoder reliability. Coders then explained their application of codes and were allowed to readjust their coding. This yielded 82 percent intercoder agreement in the first stage. The second round yielded a higher level of intercoder reliability (62 percent) and an intercoder agreement of 79 percent. This process supported a more cohesive understanding of codes and their applications, and enabled us to refine codes and code definitions before continuing to analyze the whole data set. We found that we were interested in concrete and abstract concepts, the latter of which were more difficult to identify, for example, “feelings of disembodiment.” Checking intercoder agreement and reliability in stages allowed us to work through misunderstandings, remove irrelevant or imprecise codes, and refine the semantic value and application of codes. Through these two stages we improved our confidence in independently applying codes to the whole data set. Appendix A contains the thematic analysis coding framework.

FINDINGS

This study offered us a partial view of nineteen individuals' mobile information practices. Methodologically, experimenting with visual analysis of photographs allowed us to see how, when, and where information practices were enacted. Photovoice (Wang and Burris 1997) was an effective method for focusing our attention on the ways in which people used their bodies when seeking information and gave us a window into individuals'

movements, routines, and rhythms of life and work. Surveying the visual data first revealed how closely mobile devices were kept on or near the body for much of the day and night. We found the physical relationship between participants and their mobile devices more explicit in the analysis of the visual data, as we could see the places, times of day, and features of the material environment where information seeking took place. However, the analysis of the visual data alone was insufficient, as the material and social context was not often evident from the photographs but more implicit in the interviews. However, it was the initial analysis of the visual data alone that first sparked our interest in embodiment, as participants' photographs captured their own and others' bodies, provided evidence of physical navigation through space, and documented their travel on public transit. Location was not always evident in the interviews but was captured in the text of photo-diary entries. Although we were limited in our ability to meaningfully analyze any one data stream on its own, we were able to move across the photos, text-diary entries, and interviews to make sense of mobile interactions as information practices and to understand the role of context in how people used their devices.

Our discussion of the findings focuses on the embodied nature of mobile information practices. Drawing upon previous work that has emphasized the importance of the body in information seeking and production (Olsson and Lloyd 2017; Prigoda and McKenzie 2007), we examined how mobile devices facilitated embodied information seeking and production. As anticipated, the convenience and portability of smartphones made them well suited for gathering information.

Our findings also made visible some of the social conventions and meanings associated with mobile use. For example, we found that smartphones played a role in nonverbal communication, such as the use of phones to create a physical barrier and to signal one's availability and unavailability for interactions with others. In addition, we investigated Lingel's (2013) notion of the "third hand" in our data. Our participants' reliance on their mobile devices for wayfinding and travelling confirmed Lingel's observations, which supported further inquiry into the place of smartphones in the mind-body connection and how this "third hand" can be both a support and an encumbrance in people's lives.

Mobile Interactions as Embodied Information Practices

Two key aspects of embodiment are people's abilities to seek information from their own or other people's bodies (Lloyd 2007; Olsson 2016) and to produce information for others (Prigoda and McKenzie 2007). As in other studies of mobile information interactions, we observed that people used their devices while "on the move" (Walsh 2012) as they looked up business hours of operation, found proximal services such as gas stations or restaurants, and searched for directions or transit schedules (Church

and Smyth 2008; Komaki, Hara, and Nishio 2012; Nylander et al. 2009; Sohn et al. 2008; Taylor et al. 2008). In this way, environmental (e.g., the fuel indicator on the car's dashboard) and bodily (e.g., hunger) cues triggered information needs and prompted information seeking. However, the most fascinating way in which embodiment was manifest in this study was in the social arena. Observing other people and acting in social spaces sent messages to other people about distractibility. We found that participants were self-aware about different norms of mobile device use and their intentional adherence to, or subversion of, these norms based on their situation.

Seeking information on the mobile device was a means of maintaining personal space in public environments, such as a city bus: "You're trying to block out what people are doing around you and it's the bus, you want to go somewhere and you can't get there any faster so you either bring a book or you space out or . . . you just need something to get you through it" (P03). Without a sense of control over the wider environment, individuals turned to the mobile device as a way to distract themselves (i.e., remove themselves mentally from the physical space) or practice social avoidance (Taylor et al. 2008) (i.e., send a signal to others not to interact with them). Several people reported escaping from their physical environment in this way.

We also noticed socially shared ways of engaging with information through the mobile device, as participants demonstrated their awareness of social conventions, that is, "right" and "wrong" places and times to use their phones, and recognized that the use of their devices communicated their awareness of and willingness to engage in their surroundings and with other people around them. The phone might be stowed away or surreptitiously hidden to avoid other people knowing it was in use. Rahmati and Zong (2013) also observed "discreet usage," but their participants associated this discretion with being less "anti-social" rather than skirting social conventions.

In more intimate social settings, participants resisted using their phones because they considered it "rude" to do so (P12), and the decision to seek information in interpersonal settings was often based on the degree to which seeking information was agreed to be important by members of the group in the situation. For instance, several participants reported seeking information on behalf of a friend who called or texted to request advice or directions (P07); one participant reported cobrowsing simultaneously for movie theatre locations and directions and searching for a restaurant with a group of co-located friends (P09). Social conventions also meant that some participants delayed their information seeking until they were alone, a finding concurrent with Sohn et al. (2008).

These social aspects of mobile information interactions complement the work of Tan and Goh (2015), who explored the collaborative nature

of mobile travel information seeking, specifically whom (e.g., friends and strangers), and why people draw upon others to support information acquisition and use. However, these authors focused more on triggers for collaborative information seeking, whereas we documented the social values that deterred information seeking, ways in which people used their bodies to shield their mobile activities from others, or how people used their smartphones as nonverbal cues to others that they did not wish to interact with. Furthermore, the act of participating in the study made some participants more reflective of their own practices and more curious about the practices of others whom they observed in their environments. One participant described her own practices as “boring” and routine, but observed the practices of others on a crowded bus: “. . . like everyone in this bus is just [doing] stuff in their own world, no communication, far away from everything. . . . And I was thinking, ‘You know it would be real interesting to be able to hear what they are listening [to], what they are reading and all that stuff because they rely on their cell phones’” (P17).

Mobile Devices as a “Third Hand”

Lingel (2013) discussed the notion of the “third hand” to describe how migrants in New York City relied upon mobile devices for wayfinding. In this sense, the mobile as a third hand assists people to do more in a given situation than they could without the device. As in Lingel’s study, our participants’ accounts of travelling and wayfinding spoke to the utility of having the device at a particular point in time for a particular purpose. Participants relied on their phones to look up transit schedules or driving directions, both before embarking on a journey and during a trip, as well as to orient themselves in physical space, or find nearby services to satisfy information and bodily (e.g., hunger) needs.

We also interpreted participants’ smartphones as a kind of “third hand” based on their physical proximity to people’s bodies and their pervasiveness in all aspects of people’s lives. Participants recounted using their devices upon waking. For example, one participant described using his mobile first thing in the morning from the comfort of his bed (see fig. 2):

I have to actually get out of my bed to my computer and my phone is, like, right beside me, so it’s the fastest access. If I check the information and I’m still sleepy I can go right back to sleep, blankets all wrapped up . . . I can survive without it, but I really like it there. (P15)

Use continued through the day as individuals commuted, organized meals, dressed, shared time with family and friends, and so on. Routines were organized around times of the day when participants anticipated opportunities to use their mobile devices to relax, take a break at work, travel, or wait for other people. When asked about the repeated activity of reading the news throughout the data collection period, one participant said,



Figure 2: Seeking information from the comfort of one's bed



Figure 3: Riding the bus

“Yeah, exactly, in the morning . . . that’s what I do on the bus” (P17) (see fig. 3). Thus, the devices were not necessarily reserved for being “on the go” but fully incorporated into the rhythms of the day.

We also noted how the use of this “third hand” affected the mind-body connection, where people “off-loaded” cognitive tasks to their mobile devices. One participant noted that her relationship with her smartphone had evolved along with the affordances of the device, and that being able to search for information in the moment affected her strategies for recording and storing information. Speaking specifically about directions, she said,

In the past without the data plan I didn’t rely on it very much because it can do a lot, but now I think I’ve gotten a lot more lazier because of my [device]—I don’t memorize anything. Anything I can find using Google or that [I can search] on my phone it’s something I don’t have to remember. . . . I just have to remember to look for it. So, for example, in the past if I were to go with someone downtown I would have to write down the street, how to get from the Skytrain station to that street, but I don’t do that anymore. (P21)

In this way, the smartphone is not just a physical extension of the body but also an external storage device for memories or information to ease or manage cognitive tasks (Walsh 2012).

While the smartphones extended the physical and mental capacities of participants, they were not always “helping hands.” As our analysis showed, mobile devices facilitated (e.g., wayfinding, travelling) and constrained participants’ activities in many ways. The technological affordances of mobiles were chief among its hindrances. Battery power, in particular, was frequently mentioned as limiting participants’ activities, with one participant reporting that her geocaching had been cut short when her battery died at the park (P03) (see fig. 4).

A commonly cited practice was to delay information activities or move to other devices, such as a laptop or desktop, if for example, it was difficult to view the screen due to its size or lighting conditions, or the participant needed to engage in more complex reading or typing tasks.

In addition, engaging with the mobile device required cognitive resources that could place users in danger. One of our participants recounted being so absorbed in their mobile interactions that they “walked into [a] bramble bush” (P01), while another described trying to remain conscious of their surroundings for safety reasons: “There are times when I am just focused on my phone and I forget everything else and I’m in the middle of the street, but I try to avoid it as much as possible” (P19) (see fig. 5). These examples reiterate previous research on the attentional demands of mobile devices (Oulasvirta et al. 2005), but, from an embodiment perspective, they show that moving between virtual and physical



Figure 4: One participant's smartphone battery ran down at the park, cutting short her geocaching activity



Figure 5: A participant makes his way through traffic

worlds simultaneously can leave one feeling embodied in one world and feeling disembodied in the other.

DISCUSSION

Individuals discursively construct, adapt, and change their information practices in relation to others' practices, material tools, and the environment (Bonner and Lloyd 2011; McKenzie 2003; Nathan 2012). As such, methods for studying information practices must be flexible enough to document the elements of these practices, such as the physical environment and material context, social relationships, and know how, in diverse settings. In this study, we used diaries, complemented with in-person interviews to investigate mobile information practices. Our study was limited in that we relied upon participants' self-reports in the form of their diary entries and interview responses. Participants may have failed to report or accurately recall relevant events. In addition, we did not have the opportunity to observe people interacting in their natural environments, and thus our study of embodied mobile information practices is less rich than if we had conducted an ethnographic study to examine the same phenomenon (e.g., Gorichanaz 2015; Nathan 2012; Olsson 2016; Prigoda and McKenzie 2007).

The inclusion of photographs with the diary entries mitigated some issues associated with self-reporting by assisting with recall, and provided us with a window into the material contexts in which participants' mobile information practices were situated. By examining the images using compositional and qualitative content analysis, we first became aware of themes of embodiment in the data. The activities and contextual features depicted in the photographs were used to derive codes related to location, time of day, arrangement and visibility of people's bodies, and aspects of the material environment. This analysis was combined with insights from the literature to conduct thematic analysis, which integrated the various data sources (text-based diary entries, photos, interview transcripts).

We observed commonalities with previous literature in terms of the types of mobile information practices in which people engaged (e.g., fact checking, browsing, communicating), the locations where these activities took place (e.g., buses, trains, at home), and social aspects of the interactions (e.g., collaboration, avoidance) (Church and Smyth 2008; Komaki, Hara, and Nishio 2012; Taylor et al. 2008). However, in using an embodied practice lens, we asked different questions than did previous mobile studies. For example, we acknowledged that mobile devices helped people "escape" uncomfortable or tedious situations (i.e., social avoidance [Taylor et al. 2008]), but extended this to suggest that people used the devices to inscribe their environments with nonverbal information about the focus of their attention and desire or lack of desire for engagement. Further, we saw evidence of socially constructed "rights" and "wrongs" related to



Figure 6: A participant searches for the time of his final exam during class instruction

public mobile use that participants learned by observing and interacting with others; these norms were internalized and influenced mobile use, where the device was either kept hidden or used surreptitiously (see fig. 6).

The notion of the “third hand,” coined by one of Lingel’s (2013) participants, was explored in the data. Our participants also kept their phones close at hand, and described how their smartphones were part of their everyday routines. Previous literature has emphasized the convenience of mobile devices, and how people will prefer to use them even when at home or in range of another computer that may be better suited for the task at hand (Nylander et al. 2009). In our study, participants opted for other devices when the affordances of the mobile limited what they needed to do; therefore, we conclude that it is more than the convenience

of smartphones that makes them a “third hand.” Rather, we contend that mobiles have become entangled with people’s “rational and natural rhythms” (Lefebvre 2004). For example, hunger prompted searches for recipes to make or places to eat, and one person even admitted using it “on the toilet . . . I play games or go onto the Internet, check mail, check Facebook” (P15). Natural rhythms of the body, such as sleeping, waking, sustaining one’s energy, and so on, are generally missing in examinations of information seeking, but they constitute information that is encountered, managed, and acted upon in everyday life.

Savolainen (1995) recognized rhythms in the information practices of Finnish teachers and factory workers (for instance, the routines of reading the news or checking the weather every morning). However, there has been less emphasis on how rhythms of movement and the body interact with rhythms of information seeking. This notion of rhythms is an emerging finding in this work, and one that is worthy of further analysis. Rhythms are cycles of activity that give structure to the passage of time, including conceptions of time, temporal sequences and cycles of work, and the coordination of tasks (e.g., Nilsson and Hertzum 2005; Mazmanian, Erickson, and Harmon 2015). Reddy and Dourish (2002) investigated rhythms in a surgical intensive care unit of a hospital, finding that nurses, pharmacists, and physicians participated in macro- and microrhythms. Reddy and Dourish identified macrorhythms as the larger scale operations of hospital work, such as physicians’ morning rounds and the arrival of patients from the operating room. They found that microrhythms were more fine-grained processes, such as receiving lab results, administering medication, and monitoring drug responses. Hospital work—including information activities—was organized around the collaborative rhythms of other people; for example, when lab results would be made available through an information system. Information needs and seeking were anticipated and coordinated with others in the workplace environment. Such investigations might be extended to public spaces where smartphones are part of the rhythms of coordination and coexistence. This corresponds to the ways in which our participants used their devices to engage or disengage socially and their observation and enactment of social norms around mobile use.

In addition, culturally constructed “temporal logics” (Mazmanian, Erickson, and Harmon 2015) played a role in our participants’ mobile information practices. Multitasking, productivity, and time management were important to participants who talked about “killing time.” Others took advantage of windows of time to search for nonleisure information, such as preparing for a job interview: “I had half an hour to kill at the mall just to, you know, prepare” (P03), or used wait times between work tasks for leisure-related information seeking. A participant who worked in a lab

said, "I have a lot of waiting times between experiments so that's when I use my phone the most" (P11).

Information-seeking activities also helped some individuals track their movement through space between point a and point b, though other participants reported feelings of disembodiment while moving through space when their attention was not on their immediate surroundings but on their devices. In particular we noted a spatial or temporal sense of information-seeking duration. This was manifest in discussions of traveling, when individuals described their information-seeking activities taking "the length of the boulevard" (P06) or riding the bus as "45 minutes of time I have to fill" (P04). In this way, we see mobile information practices influencing the ways in which individuals imagine and recall their movement through space in time.

CONCLUSION

Our photo-diary and interview study allowed us to work with multiple sources of data: images, text diary entries, and interview transcripts. Although reliant on self-reports, we were able to capture mobile interactions and the contexts in which they occurred. We explored two emergent themes in our data to better understand mobile information interactions as embodied information practices. More specifically, we examined how people use their bodies to communicate information and observe others to acquire information, and found this was especially related to social interactions and norms. We also looked at mobile devices as a "third hand," exploring how mobiles aid, interrupt, and otherwise influence information practices. We extended the notion of the third hand reported by Lingel (2013) by discussing the role of mobile devices in the natural and rational rhythms of daily life (waking, eating, socializing, etc.).

Cox, Griffin, and Hartel (2017) call for fuller theorizations of the ways in which the body is a medium for knowing and a channel to disseminate information, noting several works in LIS and longstanding efforts in other disciplines to study the coproduction of information through the body and mind. Olsson and Lloyd (2017) argue for greater empirical and theoretical emphasis on embodiment in LIS for the field to live up to its own ideals of understanding humans' relationships with information in all forms. One contribution of this work is its emphasis on rhythms and routines, which are noted in previous workplace information studies but are less common in everyday life information-seeking studies. Our findings illustrated that individuals are conscious of and actively cultivate mobile information practices that fit into their daily and weekly "natural rhythms" and "rational rhythms" (Lefebvre 2004).

Current information-behavior models of mobile information practices are inadequate because they "give amorphous attention to technology

and present it as remote from the user” (Burford and Park 2014, 636); at the same time, information-behavior models have not fully accounted for embodied interactions with information (Cox, Griffin, and Hartel 2017). Therefore, one means of advancing information practices and mobile research is to further investigate and incorporate the routines and rhythms of information seeking and use—and the entanglement of the body with tools such as smartphones—to more thoroughly account for ways in which these affect how, why, and when people engage with information. We must also move beyond labeling mobile interactions as activities alone, but acknowledge them as social, situated, and continually (re)constructed practices.

Mobile devices are indeed a “third hand,” but, as an extension of the body, they are felt to both enable and constrain individuals’ activities. Smartphones are a go-to resource for timely information, an escape or diversion from one’s physical and social environment, and a memory storage device to free the mind and body for other concerns. Yet, smartphones also place additional attention demands on the user and are ineffective for some tasks, thereby limiting the body’s capabilities in some scenarios. Pontis et al. (2016), for example, found that people did not always act on information triggers meant to encourage serendipitous information seeking depending on their level of interrupt-ability and other context-based factors. In this way, mobile devices evoke a different relationship with the body than less portable or less visible technologies that are not as noticeably woven into the texture of social practices.

Future work may examine how movement through space and time is experienced when individuals are seeking information on the move. We see an opportunity for future investigations to probe how the specific ways in which people use their bodies have an effect on their information-seeking strategies. We advocate for further exploration of innovative methods, such as mapping methods, participatory walking methods, and photo-based methods, which can allow access to participants’ everyday lives to better understand how they use their bodies to navigate online and real-world information spaces. Finally, we have found that conceptualizations of embodiment, practice, rhythms, and routines are important in theoretically grounding future studies of mobile information practices.

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NOTES

1. We acknowledge the range of assistive technologies, such as screen readers and audiobooks, that have existed for some time.

2. We recognize that digital device ownership and use (e.g., data plans) may be out of reach for many people, including individuals living in relatively urban environments such as our participants. In addition, we take the view that digital devices such as smartphones are practical tools rather than luxuries.

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Appendix A: Coding Frame for Thematic Analysis of Photo-Diary and Interview

Code name	Definition	Example(s)
Killing time	Participant has a window of time in which he or she decides to use the mobile device while waiting or passing time.	"I had half an hour to kill at the mall just to, you know, prepare" (P03); "I was bored and I, uh, just checked my phone out of my pockets and started searching . . . killing time" (P13).
Mobile device entangled with the "natural rhythms" of the person's body (Lefebvre 2004)	Participants discuss the mobile device, which is a part of the "rational rhythms" of living and working, interacting with the "natural rhythms" of the body (e.g., breathing, eating, going to the bathroom, sleeping, and waking).	"It was breakfast. I was tired of everything else I was eating" (P05 on searching for recipes through an app).
Mobile device on or near the body	Participant explicitly talks about keeping the mobile device on the body or within reach when they are sitting, sleeping, moving, walking, etc. This includes storage and usage of the device on or near the body.	"I usually have my phone beside me wherever I go, so that morning when I got up . . . I wanted to find out what the weather forecast is like for the day and that's when I took out my phone and searched for the information that I need" (P13).
Helping "third hand" (Lingel 2013)	The mobile device enables the participant's activities, goals, or physical abilities. The nature of the mobile device temporarily extends the scope of the abilities of the person and their body.	"What I usually do before I buy books, I go online and check Amazon or somewhere else to see if the book's like, rated good or rated well . . . Like it was 15 dollars as opposed to the original book price was, like, 40 something. So, that convinced me to buy it" (P15).
Hindering "third hand" (Lingel 2013)	The mobile device constrains the participant's activities, goals, or physical abilities. The nature of the mobile device temporarily disrupts or interrupts the participant's activities.	"My phone died before I could finish . . . so, and then I had to go home" (P03 when geocaching).
Feelings of disembodiment	Participant reports feeling highly involved in using the mobile device to the extent that he or she is less aware of immediate surroundings.	"I walked into [a] bramble bush. . . It was hanging over the sidewalk and I walked into one" (P01).
Emergency prompting information seeking	An emergency (including more trivial and more threatening crises) prompts the participant to seek information.	"Yeah, I was on Lionsgate Bridge, and, uh, suddenly we're stopped . . . No, yeah, I saw his body . . . I was trying to search to see if he was alive or not and he was not. So that was . . . the not nice. So that was really disturbing" (P06).
Affordances of the mobile device	Participant discusses the battery power, size, weight, and other physical features of the device's design that make it suitable for use in a particular situation. Features of design may also prohibit use in certain situations. This code covers the negative and positive design features of the device.	"It is more convenient, smaller, I usually have it in hand anyway" (P14 on using a mobile phone rather than a laptop).

(continued)

Appendix A (continued)

Code name	Definition	Example(s)
Mobile device as a social signal	Participant discusses social conventions, such as etiquette and norms, for using the mobile device. Participants may also describe a right or wrong way to use the device according to the social situation, which implies that using the mobile device can signal interest or disinterest in participating in a social interaction.	"I don't use my phone when I'm with someone. . . . Like if I'm with you having a conversation, I don't use my phone. I think it's not polite" (P17).
Wayfinding using the mobile device	Participant describes the activity of physically navigating toward a physical/geographical place using their mobile device (e.g., looking at a map, loading directions, etc.).	"Me and my friend—she's the one driving—uh, we're going to Cypress Mountain, and, uh, I used my phone to look up the location to get there.
Leisure-related information seeking and/or information seeking or browsing as a leisure activity	Participant reports looking for leisure-related information (e.g., related to arts and culture, personal hobbies and nonwork interests). Participants may also report information seeking as a leisure activity.	"I was just at a bar and they were playing that song and I wanted to know the lyrics on the Seabus by myself on the way home . . . at 1:30 in the morning" (P06).
Travelling while seeking information using the mobile device	Participant reports travelling by any means while concurrently seeking information on the mobile device. Participants may be walking, taking public transit, driving, biking, etc. This code includes the act of travelling as well as reflections about travelling while seeking information.	"As I was walking I was kind of just checking the score of the basketball game" (P16).
Surreptitious information seeking	Participant reports hiding their use of the mobile device to search for information, as using the device would not be accepted in a given environment/social situation. The use of the device in such a situation might signal a person's divided attention, "disembodiment," or lack of interest.	"Yeah, I'm actually not supposed to use my phone, so I was kind of doing it, like, inside a drawer, ah, so I could have taken a picture of the inside of the drawer, but that would have been pretty pointless and, uh, yeah" (P06).
Materiality of digital objects	Participant discusses digital objects on their mobile devices that they like to carry around with them physically.	"I also have, like the Bible on my phone, so I find it really handy so whenever I go I can, if I want to read something then I can just open it and read it. Instead of, like, carry a real book or a Bible, yeah, I find that really handy" (P13).
Routine	Participant identifies a routine involving the mobile device (i.e., an information practice).	"That's what I do in the bus. (laughs)" (P17 on looking up the news while taking the bus in the morning).
Stress	Participant talks about anxiety, stress, or similar feelings. Participant may search in order to manage feelings of uncertainty that contribute to stress.	"I'm already in the bus, so I think I would have been monitoring, trying to figure out when I would get there. . . . I think from a need to, um, I don't know if avert is the right word, but avert some anxiety toward when I might get to the university" (P01).

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