# Paper: Searching for Information On-the-Go: Understanding User Engagement with Mobile Devices

**Abstract:** Information interaction with mobile devices is becoming increasingly common, and is often an everyday method of information search for many users. This research will investigate the system, user, and contextual variables that predict user engagement with mobile search and examine the general engagement model in the more specific mobile context.

**Résumé:**

Mobile technologies are ubiquitous in today's "plugged in" society. 85% of adults in the United States own a cell phone and 45% have a smartphone (Brenner, 2012). Mobile devices are changing the ways in which we interact with and exchange information. No longer merely conduits for verbal communication, smartphones allow users to communicate via text messaging and email, but also to create, store, and share content such as images and videos, download apps, access the Internet, and perform Web-based search tasks and transactions (e.g., online banking). In this research, we are investigating information interactions with mobile devices and the unique contextual, system, and user factors that influence user engagement in these interactions.

Despite the shortcomings of mobile devices for complex information tasks – for example, screen real estate compared to desktop or laptop computers (Kim et al., 2011; Ahmadi and Kong, 2008; Maekawa et al., 2006) – people are interacting with information using mobile devices. However, searching for information on a mobile device is a different experience from non-mobile search. Kamvar and Baluja (2007) found that over a period of 18 months, mobile searchers had improved their typing speed and were clicking on more results from their queries; yet a follow-up study concluded that mobile users' searches were still less sophisticated and more homogenous than those conducted on computers (Kamvar et al., 2009). Oulasvirta et al. (2005) emphasize the attention resources required to use a mobile device and navigate one's physical surroundings concurrently. Others have underscored the importance of time in mobile users' information interactions and in their evaluations of mobile technologies (Kamvar and Baluja, 2006). Specifically, Tojib and Tsarenko found mobile users "kill time" or operate "under time constraints" (2012, 927), and thus time motivates mobile use and is the strongest determinant of the user experience. Given the design constraints of mobile technologies, there is a time cost associated with exploratory search, and this deters some types of search behaviours on mobile devices (Kamvar and Baluja, 2006, 709). In summary, the physical environment, time parameters, and device affordances all influence mobile search behaviour.

An under-explored area is mobile users' engagement in the search process, specifically what sustains their attention and interest in terms of system (e.g., interactivity, aesthetic and sensory appeal, novelty) and user (e.g., motivation) variables (Laarni et al., 2004; O'Brien and Toms, 2008). Based on past findings about the contextually driven nature of mobile search, we might hypothesize that user engagement with mobile devices for the

purposes of search is contingent upon the design and presentation of content and aspects of the physical environment, including the presence of other people. For example, local information searches (e.g. restaurants or attractions) tend to be of a highly contextual nature, influenced by the searcher's geographic, temporal, and social contexts (Teevan et al., 2011). Specifically relating to the social context, Teevan et al. found that 63% of participants' mobile local searches took place in a social situation and were discussed with others. This may be an illustration of the importance and influence of social contextual variables on mobile search engagement.

In the context of system variables, the importance of system characteristics and design attributes are emphasized in models of technology acceptance and user satisfaction (Davis, 1989; Doll and Torkzadeh, 1988). Research suggests that mobile devices with constant connectivity are often 'habit-forming' due to an automatic 'checking' impulse for updates and new content (Oulasvirta et al., 2012). This behavioural trend could be further facilitated by specific applications, or apps, which often replace the tendency for users to consult search engines to satisfy particular information needs (Church and Oliver, 2011). System characteristics such as ease of use, content, format, flexibility and timeliness, are also likely to factor into mobile search engagement and are overlapping attributes of the User Engagement Scale, a 31-item survey developed to measure user engagement (O'Brien and Toms, 2010). In particular, mobile behaviour literature suggests that mobile devices are valued by users for the way they afford better integration with the activities of daily life (Church and Oliver, 2011), and allow for "discreet usage" that is not disruptive or damaging to social interactions (Rahmati and Zhong, 2012, 5). At home, emerging patterns of behavior suggest that users are motivated to access the Internet by phone, instead of computer, because they desire a less absorbing experience (Nylander et al., 2009); in the mobile context, users must be aware of their surroundings and thus devote more attention resources to the environment than their mobile device use (Oulasvirta et al., 2005). Given that preference and appreciation of mobile devices is to an extent dependent on their ease of use, at minimal cost to attention resources and interference to other behaviours and activities, a model of user engagement, as characterized by an absorbing, consuming experience may be less applicable to the domain of mobile devices.

Given that the role of device has not been explored in user engagement research, and the evidence that suggests mobile searching has unique contextual, system, and user affordances, we are investigating mobile search engagement. We anticipate that our work will encourage an understanding of and support for the dynamic nature of "on-the-go" information interactions to motivate future engagement with mobile devices, which themselves are changing the ways we conduct and conceptualize activities as diverse as socializing, learning, and working (Kim et al., 2012). With the advent of smartphones and a constant influx of new and improved devices with computer-like functionality, information searchers are turning more and more to their mobile devices.

We are conducting an exploratory study to understand the context, intent, and experiential factors that drive users' information interactions with mobile devices. This study will allow us to explore and determine how to measure system, user, and context variables that influence and predict engagement in mobile environments. For this

exploratory study, we will examine users' mobile search experience, not as isolated moments in time, but as an unfolding narrative, situated in the user's past influences, present context, and future expectations, as articulated in McCarthy and Wright's process-based model of user experience (2004). This narrative structure of the experience emphasizes the dynamic, situational and temporal nature of user engagement, and is reflected in O'Brien's process model for engagement, where she proposed that technology users move through a series of stages: point of engagement, period of sustained engagement, disengagement and re-engagement (O'Brien & Toms, 2008).

Hence, to capture this narrative, we will use a methodology that combines a diary and interview study with a participatory research method akin to Photovoice (Wang & Burris, 1997), used in information literacy studies and suggested as an appropriate tool to study individuals' use of, and engagement with technology (Given et al., 2011). An initial interview with participants will first establish the purpose of the study where they will be asked to keep track of their information seeking activities on their smartphones by making brief notes of the search activities and taking photos of their surroundings using the phone, immediately after or during the activity. Participants will return for a follow-up interview, where they will be shown the photos and notes they took to enable them to contextualize the data using their own perspectives. This will also allow the recounting of the narrative of their information needs and search experiences at the time. Previous studies have found that photos triggered more specific recall for participants during interviews, compared to other media objects (Carter and Mankoff, 2005) and prompted more detailed reporting (Brandt et al., 2007).  We will be seeking a convenience sample of adults who own a smartphone with an embedded camera and data plan, and who use their smartphones on a daily basis for activities beyond making phone calls or texting (e.g., for social media or web searching). Content analysis of the interviews and images will provide a rich picture of the social and situational contexts, and the train of thoughts and experiences that surrounds information interactions with mobile phones. Our CAIS presentation will focus on preliminary findings from the exploratory study, and how it will inform the design of future work.

The purpose of this research is to gain an understanding of how and why mobile searchers perform different types of search tasks and utilize different search applications, as well as develop a more robust engagement model in light of considerations of device affordances, user variables, and contextual factors. Findings will be analyzed according to the process-based model of user experience (McCarthy and Wright, 2004) and engagement (O'Brien & Toms, 2008). As more and more people turn to mobile devices to satisfy their information needs, it will be imperative to understand how to measure and design engaging experiences with information that consider the dynamic contexts and key factors of users and systems associated with these devices.

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