

Toward a Model of Mobile User Engagement

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ABSTRACT

In this paper we propose User Engagement (UE) as a conceptual framework for studying mobile information interaction. We redefine the six attributes of UE: focused attention, felt involvement, perceived usability, novelty, aesthetic appeal, and endurability for the mobile environment. We argue that mobile information interaction is an emerging area and situating it in UE can further research in this area.

Keywords

User engagement, mobile information interaction, theoretical frameworks, behavioral modeling

INTRODUCTION

The widespread adoption and use of mobile devices present unique considerations for how we study, evaluate, and design for mobile information interaction. The affordances of smartphones – lightweight, portable – embed them in everyday life and provide constant connectivity. Yet, mobile information search and retrieval is inherently different from information interactions on computers. Further, mobile searchers experience lower levels of success and task completion (Church, Smyth, Bradley & Cotter, 2008; Kamvar, Kellar, Patel & Xu, 2009; Sohn Li, Griswold & Hollan, 2008). These poor outcomes, combined with the fact that 91% of American adults own cell phones (Brenner, 2012), presents a call to action. If increasing numbers of people are using mobiles to interact with information, then it behooves us to develop a richer understanding of mobile information interaction. At the user-level, we must examine the utilitarian and hedonic qualities of mobile information interactions for how they impact user experience; at a broader level, we need to determine if new methods and frameworks are needed to capture, measure, and make sense of mobile information interaction.

We argue that to move forward with a research agenda for mobile information interaction, a strong theoretical basis is needed. We propose user engagement (UE) (O'Brien & Toms, 2008; 2010) as a holistic framework for appreciating the unique system, user and contextual components of mobile interactions. Building upon existing work in user experience (UX), we extend an

existing model of UE, and are currently examining its fit in a mobile diary study. We propose how the facets of UE manifest in mobile information interaction, and augment the model by suggesting that specific temporal and contextual factors should be taken into consideration.

MOBILE INFORMATION INTERACTION

A recent Pew survey showed that Americans use mobile devices for complex information activities, including creating, downloading, and sharing multimedia content, and performing Internet-based searches and transactions (Brenner, 2012). Mobile devices are pervasive in society and their functional capabilities are expanding. However, the degree to which people are using mobile devices does not speak to the *quality* of those experiences.

UX research suggests that mobile search and retrieval is less than ideal. Kamvar et al. (2009) examined computer, smartphone, and phone logs and found that users were reluctant or unable to follow through/follow up on search results. Relatedly, Church et al. (2008) discovered that only 11% of recorded mobile search queries resulted in click-through behaviors, while a diary study conducted by Sohn et al. (2008) found that 55% of participants' information needs were not addressed immediately (or at all) by their mobile devices. Collectively, these findings indicate that mobile users may not be conducting successful searches. Further, there is evidence to suggest that mobile searchers construct less sophisticated search queries (Kamvar et al., 2009) and do not engage in exploratory search behaviors (Kamvar & Baluja, 2006).

Interest in the area of mobile information interaction is growing. Lassila, Pääkkönen, Arvola, Kekäläinen and Junkkari (2012), for example, proposed a tracking tool to capture mobile browsing behaviors, citing that such tools are necessary to realistically model, visualize, and account for the temporal aspects of mobile information interaction. There is a consensus that mobile "retrieval [is] different from standard, non-mobile text search" (Kelly, 2009, p. 196). Yet, this knowledge has not yet translated into conceptual frameworks, methods and studies in information interaction research.

Thus mobile information interaction is a burgeoning area and will require new ways of thinking about, modeling, and evaluating information interactions. We draw upon user engagement (UE) (O'Brien & Toms, 2008; 2010) as a conceptual framework for further research. UE is a quality of UX comprised of system (usability, novelty, aesthetic appeal) and user (felt involvement, focused

attention) variables; the outcome of an engaging experience is highly enduring, in that users perceive it was worthwhile, rewarding, successful, etc. UE is a suitable framework for understanding mobile information interaction. In addition to accounting for system and user characteristics, it considers both utilitarian and hedonic motivations and outcomes of system use. The model was developed in a non-mobile context and in the following sections we explore how the attributes of UE may manifest differently in the mobile environment based on prior literature.

ATTRIBUTES OF UE FOR MOBILE INFORMATION INTERACTION

Focused Attention

Focused attention describes a state in which users are focused exclusively on a computer-based task to the extent that they block out the external environment and experience temporal dissociation. Focused attention is a component of Flow, a condition “in which people are so involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it” (Csikszentmihalyi, 1990, p. 4). Research suggests that flow may be impossible to achieve in mobile environments. Users must “safely navigate through the environment,” perceiving, monitoring and interpreting information in order to make decisions or take action (Oulasvirta, Tamminen, Roto & Kuorelahti, 2005, p. 919). Oulasvirta et al. (2005) studied mobile users performing information tasks under different time constraints and concluded that people engaged with mobile devices in “short bursts” of activity of four to eight seconds. Thus attention was not focused but fragmented, and the context of the interaction often took precedence over researcher assigned tasks. In addition to the fragmentary nature of attention, mobile UX studies have shown that users select mobile devices for the express purpose of avoiding a flow-like state (Nylander, Lundquist, Brännström & Karlson, 2009). Thus, a model of UE, as characterized by an absorbing experience is less applicable to mobile devices.

Felt Involvement

Felt involvement captures the *feeling* of being engaged during an information interaction. The user is drawn into that interaction and experiences enjoyment (O’Brien & Toms, 2010). Fun and enjoyment are terms used to describe interactions with mobile devices (Nylander et al., 2009). However, the aforementioned discussion about focused attention suggests that complete involvement in a mobile information interaction task may be undesirable. Mobile users may wish to maintain a superficial level of involvement, “deep diving” when contextual and time constraints are not pressing. Indeed, killing time is an oft-cited reason for mobile usage (Tojib & Tsarenko, 2012, p. 927). For this reason, felt involvement in mobile UE may

involve fun, enjoyment, and relaxation, but be relegated to specific times and places.

Perceived Usability

Usability is typically defined according to efficiency, effectiveness and user satisfaction. In the development of a questionnaire to measure UE, O’Brien and Toms (2010) concluded that efficiency is less salient for UE than users’ affective response toward and perceived mental effort expended during an interaction.

Recent mobile studies highlight that, as with other interactive systems, usability is paramount. When users are asked why they prefer to use their mobile devices instead of computers, they cite convenience (Nylander et al., 2009), ease of use, and the integration of the mobile device into everyday life (Church & Oliver, 2011) or social interactions (Nylander et al., 2009). Furthermore, task influences people’s device preference. Nylander et al. (2009) found that participants were comfortable reading on their mobiles, but more complex activities such as writing were carried out on the computer. While comparisons between mobiles and computers provide insight into usability, we need to understand the distinct concerns of mobile UE. Specifically, we must address how convenience, ease of use, and everyday life situations relate to traditional definitions of usability, and the mediating role of task.

Novelty

In the context of UE, novelty pertains to users’ level of interest and curiosity. O’Brien (2011) suggested that novelty is fostered both through the system (e.g., design features of the interface, such as video embedded in a news story) and the content presented by the system (e.g., “show me something ‘new’ about this news story I have been following”). Cui and Wang (2012) did not find support for curiosity in participants’ motivations to use mobile devices for social networking purposes. However, “following notifications” emerged as a common theme in their diary study. This suggests that, at least for social networking, novelty may not manifest as browsing content for fun, but may be the result of alerts and notifications. This concurs with Oulasvirta, Rattenbury, Ma and Raita’s (2012) results from a longitudinal study comparing behaviors of smartphone and laptop users. They found evidence that mobiles were ‘habit-forming’ technologies, and that they have imparted a compulsive, automatic ‘checking’ behavior in users seeking rewards in the form of updates and new content. From both log files and diary studies, Oulasvirta et al. (2012) concluded that such habits were motivated by both contextual cues and user’s affect, and frequently triggered by “empty moments” such as during a commute.

Novelty with respect to mobile engagement requires further exploration. Based on the work of Cui and Wang (2012) and Oulasvirta et al. (2012) we might hypothesize that device notifications, e.g., new text messages or Facebook status updates, foster novelty. However, using

the mobile for other purposes, such as news browsing may be based on the need to seek novel content.

Aesthetic Appeal

Aesthetic appeal pertains to the visual interface of the system with which a user interacts. Research demonstrates the importance of aesthetics in interface design and its relationship to perceived usability (see, for example, Lavie & Tractinsky, 2004). To our knowledge, little research has been conducted with respect to how the aesthetics of mobile apps and interfaces impacts information search and retrieval. A recent study by Kim, Lin and Sung (2012) assessed over 100 branded apps for attributes of engagement, including “vividness,” which was commonly expressed as images and graphics. They found that over 75% of the apps contained aspects of vividness. Thus even if this attribute has not been subject to extensive research, the design of mobile apps suggests it is an important variable for mobile products.

Endurability

Endurability is derived from the concepts “likelihood to return” (Webster & Ahuja, 2006) and system success (DeLone & McLean, 1992). It includes users’ overall evaluation of the experience as successful, rewarding and worthwhile, and their likelihood to use the application in future or recommend it to others (O’Brien & Toms, 2010). Based on the discussion of previous attributes, we believe that these traits of endurability are present in mobile engagement, but that the outcome of the experience will rely heavily upon the fit between the mobile interaction and the physical and/or social context in which it occurs. Although context is important in all information interactions, the nature of mobile use makes this especially pronounced. Komaki et al. (2012), found that the location of mobile searches was more significant than people’s actual information needs. Participants in their study reported that search success was related to their context and corresponding ability to concentrate on the task and browse search results in a given location.

A MODEL OF UE FOR MOBILE IIR

We propose that the attributes of UE in non-mobile environments (focused attention, felt involvement, perceived usability, novelty, aesthetic appeal, and endurability) will be present in mobile UE. However, to summarize the previous section, these attributes we manifest differently in the mobile environment as follows:

Focused attention will be limited to brief periods of interaction, since users must concurrently attend to the physical environment. Thus the *immediate context* is a mediating variable. Unlike a flow state, mobile UE cannot be completely absorbing, yet some concentration is needed to complete an interaction.

Felt involvement may only be possible when the user is in a situation where “killing time” is possible, and if they are open to diversion and relaxation. As a result, *time* and *context* will influence felt involvement.

Perceived usability includes users’ affective reactions toward and cognitive appraisal of the mobile experience. However, it also depends upon the degree of convenience afforded by mobile use at a particular point in time and/or for a particular task. Paramount is the integration of the device into everyday life, including social interactions. Thus, usability is mediated by the *physical and social context* and the *information task*.

Novelty may be contingent upon the content with which the mobile user is interacting with, or the ability of the device to deliver new information, e.g., social networking notifications. As such, the novelty sought by users may depend upon the application. For instance, constant updates may be welcome from Twitter but not an online retailer.

The **aesthetic appeal** of mobile tools is important. However, it remains to be tested whether aesthetic conventions ascribed to computer interfaces will apply to mobiles. The advent of mobile versions of numerous websites does confirm that aesthetics in simpler and cleaner designs are important for small screens. In addition, aesthetic appeal may need to be extended to sensory appeal since mobile interactions are not only visual but also tactile and auditory, and the user is interacting with the device in an evolving context.

As in the original model of UE, **endurable** mobile interactions will be perceived as rewarding, successful, and worthwhile, and users’ will be willing to re-engage with the same app in future. An additional consideration will be the *task-context* fit.

In summary, we propose that the original attributes of UE (attention, involvement, usability, novelty, aesthetic appeal, and endurability) are present in mobile UE, but will be operationalized differently than non-mobile UE. Further, we extend the prior model of UE by including temporal and contextual factors in the proposed framework.

CONTRIBUTION TO THE WORKSHOP

In this paper, we proposed UE as a framework for mobile information interaction. During the HCIR workshop we will present data from a recent diary and interview study we collected with 19 mobile users. We asked participants to create text and photo diary entries of their mobile information interactions and interviewed them at the beginning and end of the diary collection period. The interviews focused on understanding mobile users’ general information behaviors and probing five randomly selected and one participant-selected information interaction in greater depth. These six information episodes form the basis of our analysis to test the fit of the existing UE model in the mobile environment. Specifically, we are asking: Do we see evidence of the original attributes of engagement in mobile UE? Are there attributes that are not accounted for in the original model that are part of mobile UE? Have we accurately

identified the contextual, temporal and task variables that impact mobile UE? What is the relationship of these variables to the attributes of UE?

CONCLUSION

In conclusion, we present UE as a framework for mobile information interaction. We articulate how the attributes of UE may be operationalized in mobile UE and that temporal, contextual and task variables may mediate the expression of these attributes. The value of using and building upon an existing model is twofold. Firstly, UE provides a structure for unifying the findings of previous work in mobile UX and thinking about these contributions in a holistic way. Further, UE provides a framework for understanding system/user and utilitarian/hedonic qualities of mobile information interactions. Framing mobile information interactions as experiences may enable us to think more broadly about information activities, and to define and measure the unique physical and social contexts and temporal aspects of information seeking and use. Secondly, examining the generalizability of the UE model in the mobile environment supports theory building in information interaction. A more robust model of UE will guide future work in both mobile and non-mobile settings.

REFERENCES

- Cui, Y., & Wang, L. (2012). Motivations for Accessing Social Networking Services on Mobile Devices. In *Proceedings of AVI* (pp. 636-639).
- Brenner, J. (2012). *Pew Internet: Mobile*. Pew Internet and American Life Project, Retrieved January 18, 2013 <http://pewinternet.org/Commentary/2012/February/Pew-Internet-Mobile.aspx>
- Church, K., & Oliver, N. (2011). Understanding mobile web and mobile search use in today's dynamic mobile landscape. In *Proceedings of MOBILE HCI* (pp. 67-76).
- Church, K., Smyth, B., Bradley, K., & Cotter, P. (2008). A large-scale study of European mobile search behaviour. In *Proceedings of Mobile HCI* (pp. 13-22).
- Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.
- DeLone, W.H. & McLean, E.R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(1), 60-95.
- Kamvar, M., & Baluja, S. (2006). A large scale study of wireless search behavior: Google mobile search. In *Proceedings of the SIGCHI* (pp. 701-709).
- Kamvar, M., Kellar, M., Patel, R. & Xu, Y. (2009). Computers and iPhones and mobile phones, oh my!: A logs-based comparison of search users on different devices. In *Proceedings of WWW* (pp. 801-810).
- Kelly, D. (2009). Methods for evaluating interactive information retrieval systems with users. *Foundations and Trends in Information Retrieval*, 3(1-2), 224 pp.
- Kim, E., Lin, J-S. & Sung, Y. (2013). To app or not to app: Engaging consumers via branded mobile apps. *Journal of Interactive Advertising*, 13(1), 53-65.
- Komaki, D., Hara, T., & Nishio, S. (2012). How does mobile context affect people's web search behavior? In *Proceedings of AINA* (pp. 245-252).
- Lassila, M., Pääkkönen, T., Arvola, P. Kekäläinen, J., & Junkkari, M. (2012). Unobtrusive mobile browsing behavior tracking tool. In *Proceedings of IIIX* (pp. 278-281).
- Lavie, T., & Tractinsky, N. (2004). Assessing dimensions of perceived visual aesthetics of Web sites. *International Journal of Human-Computer Studies*, 60(3), 269-298.
- Nylander, S., Lundquist, T., Brännström, A., & Karlson, B. (2009). "It's just easier with the phone"—A diary study of Internet access from cell phones. *Pervasive Computing*, 5538, 354-371.
- O'Brien, H.L. (2011). Exploring user engagement in online news interactions. In *Proceedings of ASIST*, 48..
- O'Brien, H.L. & Toms, E.G. (2010). The development and evaluation of a survey to measure user engagement in e-commerce environments. *JASIST*, 61(1), 50-69.
- O'Brien, H.L. & Toms, E.G. (2008). What is user engagement? A conceptual framework for defining user engagement with technology. *JASIST*, 59(6), 938-955.
- Oulasvirta, A., Rattenbury, T., Ma, L., & Raita, E. (2012). Habits make smartphone use more pervasive. *Personal and Ubiquitous Computing*, 16, 105-114.
- Oulasvirta, A., Tamminen, S., Roto, V., & Kuorelahti, J. (2005). Interaction in 4-second bursts: The fragmented nature of attentional resources in mobile HCI. In *Proceedings of SIGCHI* (pp. 919-928).
- Sohn, T., Li, K. A., Griswold, W. G., & Hollan, J. D. (2008). A diary study of mobile information needs. In *Proceedings of SIGCHI*. (pp. 433-442).
- Tojib, D., & Tsarenko, Y. (2012). Post-adoption modeling of advanced mobile service use. *Journal of Business Research*, 65, 922-928.
- Webster, J. & Ahuja, J.S. (2006). Enhancing the design of web navigation systems: The influence of user disorientation on engagement and performance, *MIS Quarterly*, 30, 661-678.