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Reading on the move: A study of reading behavior of undergraduate smartphone users in China

Ziming Liu [a,*], Xiaobin Huang [b]

[a] School of Information, San Jose State University, One Washington Square, San Jose, CA 95192-0029, USA
[b] School of Information Management, Zhongshan (Sun Yatsen) University, Guangzhou, China

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ABSTRACT

The wearability of smartphones enables communication while physically in motion. This research examines some key areas in reading behavior in light of the wide spread adoption and use of Internet-capable mobile phones, or smartphones. A survey of 205 undergraduate students was conducted in China. Reading behavior on smartphones was found to differ significantly from reading on desktop or laptop computers. Compared to reading on desktop or laptop computers, an increased reliance on smartphones for reading has raised a new set of challenges, and has shaped new behavior such as more browsing and scanning, more selective reading, less in-depth reading, and less concentrated reading. People interact with mobile information in varied and unpredictable locations or while in transit. The mobility of information engagement is an important issue that human information theory should embrace.

1. Introduction

Mobile technology has emerged as one of the defining communication technologies of our time (Castells, Fernandez-Ardevol, Qiu, & Sey, 2007). The advancement of portable devices, together with wireless technology, allows fast and easy access to the Internet from handheld devices. A report by the International Telecommunication Union (2010) indicated that 90% of the world's population had access to mobile networks. It was estimated that by 2013 people who access the Internet on mobile devices will surpass those who use PCs. The latest projections by Gartner (2013) showed continued worldwide declines for PCs, while ultramobiles, tablets, and mobile phones continue their strong growth. *The ECAR study of undergraduate students and information technology, 2013* report (Dahlstrom, Walker, & Dziuban, 2013) revealed that 76% of undergraduate students in the United States own a smartphone, and smartphone ownership is even more common outside the U.S. (e.g., 81% in Canada). The report also indicated that students are ready to embrace their mobile devices more for academic purposes. An increasing number of people access the Internet from these small mobile handheld devices as a normal part of their daily life. In China, undergraduate and graduate students represent the highest ownership of Internet-capable mobile phones (or smartphones) among all age groups. Almost every undergraduate and graduate student in China today owns a smartphone.

2. Problem statement

Many previous studies have explored mobile information behavior by log analysis or diary studies. While these approaches are useful in discovering mobile information behavior, they are limited. For example, log analysis studies provide interesting data such as the length of access, but they cannot capture the actual intent behind the users' information needs, and leave many questions unanswered (e.g., factors and contexts that influence information needs). Such questions would require using other methods, such as questionnaire surveys or interviews (Nicholas, Clark, Rowlands, & Jamali, 2013). By contrast, diary studies give us detailed analysis and description of mobile information behavior, but they are constrained by very small time frames (e.g., one week). Timing may have a significant impact on information needs (e.g., end of the semester and holidays).

Numerous studies focus on reading behavior on e-readers (e.g., Kindles) and tablets (e.g., iPads), however, at present very little is understood about the nature of reading on smartphones. Studying changes in reading behavior would help us redesign information services and empower readers in the increasingly mobile landscape.

3. Literature review

With the increasing proliferation of smartphones, and people spending more time on mobile devices, these newly ubiquitous screens have begun to change how people (especially the young) read and write. Kelly (2010) found young people worldwide collectively write 12 billion quips each day from their cell phones. He further stated that:

* Corresponding author.
E-mail address: Ziming.Liu@sjsu.edu (Z. Liu).

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"Just as it seemed weird five centuries ago to see someone read silently, in the future it will seem weird to read without moving your body" (p. 124).

Mobility, context awareness, and specific needs become important stimuli for the adoption of mobile technologies. Kukulska-Hulme (2010) argued that: "Both educators and learners need to realize that mobile technology is substantially different from desktop computing in its essential connection to mobility and the contexts in which it is used" (p. 11). Castells et al. (2007) argued that there is a strong connection between the capacities of mobile technology and the characteristics of youth culture (e.g., chatting, blogging, and multi-tasking). For many young people, having a smartphone indicates one is socially connected (Campbell, 2005). A recent survey conducted at Cambridge University revealed that while the majority of respondents primarily use their smartphones to make calls, send text messages, and take pictures, iPhone users are already more inclined to read e-books on their phones than they used to be (Mills, 2009).

In their capacity theory of comprehension, Just and Carpenter (1992) indicated that working memory resources are critical during the reading process. In certain situations (e.g., distraction), a reader's available capacity for processing text may decline, making it difficult to fully understand the text (Margolin, Driscoll, Toland, & Kegler, 2013). Distraction is not a new problem, but the arrival of a mobile environment raises this issue to a new level of attention. Horrigan (2009) stressed that the "continual information exchange" in the mobile world could cause "'serial digital distraction' as people respond to a slew of bits cascading to them" (p. 98).

Smartphones have fundamentally changed how students use technology. In a study of student information literacy in the mobile environment, Yarmey (2011) found that 69% of survey respondents between 18 and 22 years old at the University of Scranton, Pennsylvania own a smartphone. Her study indicated that while students claimed reading on smartphones is not distracting, evidence strongly showed that disruptions did occur in homework sessions and during class time.

Most early research showed marked differences in reading speed or comprehension between paper and screen (Bevan, 1981; Dillon, 1992). While a slight majority of recent studies continue to confirm earlier conclusions, many recent studies demonstrate smaller or less consistent differences (Jabr, 2013; Margolin et al., 2013). A study by Siegenthaler, Schmid, Wyss, and Wurtz (2012) indicated that reading behavior on tablets and on e-ink readers is very similar. However, participants tended to read faster on a tablet than on an e-ink reader. Similar results were reported in an earlier study. Nielsen (2010) found that reading on an e-ink reader is 10.7% slower compared to reading a printed book. Meanwhile, reading on a tablet is 6.2% slower than reading a printed book. While unfamiliarity with the e-reader may distract reading and require additional working memory resources to operate the device, Margolin et al. (2013) showed that "the resources necessary for operating the device were minimal and did not significantly limit readers' comprehension during reading" (p. 517). Research is needed on the working memory resources for navigating smartphones and their resultant impacts on reading and comprehension.

"Today some of 4.5 billion digital screens illuminate our lives …. We are now people of the screen. And of course, these newly ubiquitous screens have changed how we read and write" (Kelly, 2010. p. 123). With the growing amount of digital information available and the increasing amount of time people spend on reading electronic media, the digital environment has begun to affect people's reading behavior. Liu (2005) and Liu and Huang (2008) investigated reading behavior in the digital environment in the United States and China, respectively. Their studies consistently showed that with an increasing amount of time spent on reading electronic documents, a screen-based reading behavior is emerging. This screen-based reading behavior is characterized by spending more time on browsing and scanning, keyword spotting, one-time reading, nonlinear reading, and reading more selectively, while less time is spent on in-depth reading, concentrated reading, and decreasing sustained attention. While people today spend more time reading than they did in the print-only past, the depth and concentration associated with reading has declined.

Mangen (2008) indicated that digital reading is dominated by shallow forms of reading (e.g., scanning and skimming), and digital text makes us read in a shallower, less focused way. In a study of how expert readers handle printed and digital documents, Hillesund (2010) attempted to explain differences in digital reading and paper-based reading. He found that online reading is characterized by browsing, skimming, and bouncing, that is, "discontinuous and often ends to encourage discontinuous reading. In a study of the online reading behavior of college students in India, Loan (2012) found an increase in interactive reading and superficial reading, and a decrease in concentrated reading and in-depth reading.

Church, Smyth, Cotter, and Bradley (2007) investigated the information behavior of European mobile Internet users. They found that 94% of sessions consist of just browsing. Dominated by the desire for quick, often context-specific information, the types of information people read while they are on the move are often factual and small. People tend to avoid reading detailed information on the small screens (Walsh, 2012). An analysis of the logs of a major cultural site, Europeana, revealed that mobile visits are typically shorter and less interactive with less content viewed per visit (Nicholas et al., 2013). Joon and Joan (2013) suggested the importance of understanding the differential effects of reading on a small screen (e.g., smartphones) and reading on a larger screen.

4. Methodology

4.1. Aims and scope

Mobile reading refers to reading on handheld devices (e.g., tablets, e-readers, and smartphones). Because of the relatively recent advent and popularity of smartphones, few studies to date examine their impact on reading behavior. This study focuses solely on reading behavior on smartphones. The following nine questions were used to elicit data on mobile reading activities:

- Compared to reading on desktop or laptop computers, what particular advantages do you find when you read on your smartphones?
- Compared to reading on desktop or laptop computers, what particular challenges do you face when you read on your smartphones?
- Compared to reading on desktop or laptop computers, which of the following reading activities have changed when you read on your smartphones (e.g., browsing/scanning, reading selectively, in-depth reading, and concentrated reading)?
- If you read research papers, on which of the following devices/media do you prefer to read (e.g., smartphones, e-readers or tablets, desktop or laptop computers, and printed media)?
- If you read course-related materials (e.g., textbooks), on which of the following devices/media do you prefer to read (e.g., smartphones, e-readers or tablets, desktop or laptop computers, and printed media)?
- In what circumstances do you use smartphones for reading?
- Which factors discourage your use of smartphones for reading?
- Which functions do you think are essential for reading on smartphones?
- What are your suggestions for improving reading on smartphones?

4.2. Sample population

Undergraduate students in China were selected as the subjects of this study for three reasons: (1) They are young and educated, and always open to new technologies. Almost every undergraduate student in China today owns a smartphone. (2) They spend a significant amount of time on reading, and they frequently use their smartphones for many