Evidence Based Library and Information Practice

Classics

Cummings, Merrill, and Borrelli's Inquiry into Small Screen Use by Academic Library Users: Timing is Everything

A Review of:
Cummings, J., Merrill, A., & Borrelli, S. (2010). The use of handheld mobile devices: Their impact and implications for library services. *Library Hi Tech, (28)*1, 22-40. https://doi.org/10.1108/07378831011026670

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Abstract

Objective – The authors undertook this study to understand the relatively new phenomenon of handheld computing and the use of small-screen devices among academic library users. They sought to determine if users would be inclined to search the online library catalogue on their devices and, by extension, if there would be a growing demand for small-screen compatible library services.

Design – Online and paper surveys were used with both closed and open questions. Respondents included students, faculty, and staff at Washington State University (WSU).

Setting – Washington State University Library, Pullman, Washington, United States of America.

Subjects – The survey was open to any user of the Washington State University (Pullman) Library. The 206 respondents included 126 (61.2%) undergraduates, 26 (12.6%) graduate or professional students, 32 (15.3%) WSU employees, and 15 (7.3%) faculty members.

Methods – A survey was distributed both online and on paper. The online version used Surveymonkey.com and participation was solicited through various social media. It was open for three months during the Spring semester, 2007. The paper version was distributed to all library users on two days in June 2007. Eighty-four online and 122 paper responses were received.

Main Results – Most of the respondents (58.4%) who owned a personal digital assistant (PDA) or Web-enabled cell phone (WECP) indicated that they would search the library catalogue on a small-screen device. Responses to the open question "How would you use the OPAC [online public access catalogue] if it was available on a PDA or WECP?" were mixed, both positive and negative. The positive responders noted the possible time savings associated with the availability of more information on their devices. The negative responders noted the cost of data, the annoyance of public phone use, and the complex format of the current catalogue that would not transfer to a small screen.

Conclusion – The authors cited the growing usage trends in handheld devices, along with the willingness of current owners to use their devices, to predict an increase in usage of small screen searching. They speculated that further research should investigate how small screens would be used and what would that experience look like, rather than if patrons would use them.

Commentary

At a time when 77% of the population owns an applications-based smartphone, (Pew Research Center, 2017) it is difficult to remember when such devices were not omnipresent. Even harder to recall may be the brief period of time from 2002 to 2007 when "Web-enabled" cell phones and personal digital assistants were used to access the Internet through general packet radio services (GPRS) or wireless application protocol (WAP) technology ("The Evolution of Cell Phone Design", 2009). Yet this was the state of technology when Cummings et al. conducted their research study. Data collection was conducted from February to May 2007, in the few months between announcement of the forthcoming production of the iPhone in January and its release in June of that year. Unsurprisingly, the amount of research on smartphone use and its impact on library services has grown exponentially in the years since, and many of the researchers base their studies on the suggestions of Cummings et al.

To be clear, the authors did not present their research as revolutionary, but as a part of a growing interest in the use of handheld devices driven by significant increases in ownership. Cummings et al. cited previous studies on the use of PDAs for information seeking (Carney, Koufogiannakis, & Ryan, 2004; Tenopir, King, Clarke, Na, & Zhou, 2007; Spires, 2008); the technical challenges for libraries to support the new technology (Deneen & Allert, 2003; Garrison, Anderson, MacDonald, Schardt, & Thibodeau, 2003; Peters, Dorsch, Bell, & Burnette, 2003; Good, 2007); and changes in physical environments (Cowart, 2006; Duncan, 2006; Evans, 2006; Whelan, 2007; Lever & Katz, 2007) as precursors to their study. Together, these studies form a nucleus of early research on the possibilities, problems, and promises of information use through hand-held devices. Cummings et al.'s paper stands out, not only because it coincided with the advent of the Apple iPhone and its counterparts, but also because the research questions were broad

enough to be applied to a variety of subsequent studies.

While this study was not couched in theory, and the approach was a customary mixed method survey, the findings provided a baseline for subsequent research articles and justification for further investigations. Cummings et al. stated that their intent was to both "measure whether or not people wanted to access the … OPAC with a small screen, but also … [to] gain a broader understanding of handheld mobile computing's impact on academic libraries" (pp. 25-26). To determine how the research was used, citing articles were examined to understand the impact. In June 2017, Google Scholar listed 102 citations for this paper. Of those, 35 were unique research articles in English. In addition to research in foreign languages, other factors for dismissal included lack of availability, descriptive book chapters, dissertations, and Master's level research. While Cummings et al.'s article is a broad study that does not limit its scope to a particular audience or type of device, subsequent articles reveal a breadth of research that can be organized into three dominant streams that reflect the findings and suggestions of the original research: device ownership and barriers to use, user behavior, and service surveys.

Device Ownership and Barriers to Use

Repeated topics addressed within this paper include: who owns small-screen devices, what type of devices are used, how they are used, and barriers to using them to their fullest extent. Cummings et al.'s first research question investigated the participants' desire to access academic information on a small screen. The survey also inquired about ownership, actual use, and the intent or desire to use handheld devices for accessing academic information. Further research studies have expanded on these questions to include new types of devices and what barriers users encounter that prevent usage. Song and Lee (2012) inquired into how international students in the United States used their devices. Among the participants, ownership of mobile technology, including smartphones, electronic readers (e-readers), and tablets, was high (82%), but they were mainly used for communication and social networking. There was a marked lack of interest in e-readers among this group as well (Song & Lee, 2012). The majority of students and faculty in Kisii, Kenya used mobile devices to access the OPAC (72.5%), electronic books (e-books) (77.5%), and the library website (74.75%); significantly fewer (52.5%) used the devices to access full-text journal articles (George, Maina, & Wanangeye, 2016).

The usability of small screens for research or academic work is frequently noted as a barrier. Halevi, Moed, and Bar-Ilan (2015) and Madhusudhan (2015) looked at information use on small screens by academics. While searching for information on mobile devices was common, most researchers preferred to download and print material in portable document format (.pdf) to interact with it (Halevi et al., 2015). Library and information science students in Hong Kong, Japan, and Taiwan restricted their smartphone use to search engines for school work, not library resources; they did not use the devices for academic reading (Ko, Chiu, Lo, & Ho, 2015). The lack of a mobile-ready website for the library was a barrier to use of resources by the students (Ko et al., 2015). Respondents in Croatia who owned a smartphone or tablet, also expressed the need for interfaces customized to those devices (Pažur, 2014).

Investigations into screen size as a barrier to use have led to questions about other barriers, such as connection speed and access to quality resources. While the devices make it easier and faster to find research material (Madhusudhan, 2015), art and design students considered connection speed for downloading information a primary barrier to academic use (Lo et al., 2016). While the students were all active users of their smartphones, use of the devices for academic work was limited because of slow connection time (Lo et al., 2016).

A lack of instruction can also be perceived as a barrier. For example, Bushhousen et al. (2013) asked health sciences library patrons about potential use and perceived barriers. The students felt that their ability to use the devices was restricted by a lack of instruction on the specific apps, however they were eager to use the devices because they were required by the medical programs that they were enrolled in. The team of researchers and technology specialists found that education on app use was high on the list of required services by their patrons (Bushhousen et al., 2013).

User Behavior

The questions proposed by Cummings et al. regarding users' experiences and their intent to "gain a broader understanding of … [the] impact on academic libraries" (p. 26), is reflected in studies on user behavior. Research into user behavior considers if respondents use mobile services, how they are used, and which applications, sites, or functions are most commonly accessed. An early study explored the strategies used for searching on smartphones; it found high use of new input tools such as voice, global positioning system (GPS), barcode, and quick response (QR) codes (Yarmey, 2011). Android and iPhone users considered themselves first adopters, ahead of their peers in information use, and considered themselves well aware of the need to evaluate the sources of information that they used (Yarmey, 2011). The majority of undergraduate users reported employing the devices for academic work, but the most common types of apps used were search engines, and apps for websites that the user was already familiar with from their full-sized devices (Bomhold, 2013).

Dresselhaus and Shrode (2012) examined smartphone use by different types of students; fifty-four percent of undergraduates and 50% of graduates reported using mobile devices for academic work. The highest use by students (63%) was in the College of Business followed by 59% of engineering students (Dresselhaus & Shrode, 2012). Art and design undergraduate students used their mobile devices no differently than their peers in other colleges, aside from image and audio-visual needs (Lo et al., 2016). While they were all active users of their smartphones, use of the devices for academic work was limited, and they were only interested in library services of an administrative nature, such as hours, requests, check-outs, and renewals (Lo et al., 2016). Library and information science students in Asia restricted their smartphone use to search engines for school work, not library resources, and did not use the devices for academic reading (Ko et al., 2015). Similarly, undergraduate library and information science students in Greece preferred laptops and personal computers over mobile devices for school work and library use, but this preference was inverted when the students were looking for entertainment (Vassilakaki, Moniarou-Papaconstantinou, & Garoufallou, 2016).

Inquiry into potential and current use by academic library patrons was also used to rationalize the implementation of mobile-based library services. Students in Bangladesh were "very interested" in mobile services, especially in administrative functions such as texts for overdue messages and reminders (Elahi & Islam, 2014). Furthermore, engineering library patrons indicated that they felt mobile access would increase the use of services outside the library. Interest in e-books and online journals was high (74.2% and 67.74% respectively), but interest in using the online catalogue (25.8%) and databases was low (38.7%) (Kumar, 2013).

Service Surveys

In trying to understand the broader impact of hand-held computing on academic libraries, Cummings et al. discuss the adaptations libraries were making to their online services, in order to make them more accessible to mobile users. In particular, they mention that most libraries had adopted a "tailored" approach to designing mobile services (p. 34). They also

stated that "the question for libraries will become not will users access library services through mobile devices, but what type of experience will the eventual user have and what library services will be available to them" (p. 34).

The impact of this statement has been extensive. Several surveys have been published that investigate what types of research services are available on mobile platforms. An early assessment by Canuel and Crichton of mobile library services available at Canadian university libraries revealed that only a very small fraction (14%) offered some kind of mobile web presence, most often mobile-ready websites. Functionality, design, and intuitive usability made native apps more appealing to users over mobile-ready websites. A dichotomy between the need for services as reported by the users and the actual availability of that service was found in a survey of the usability of mobile web interfaces of academic libraries (Canuel and Crichton, 2011). In the rush to provide mobile services, Han and Jeong (2012) concluded, libraries were neglecting the needs of those they were trying to serve by not asking the users.

To evaluate library responsiveness to researchers' needs for mobile information and their ability to provide adequate services for research on the fly, Bomhold (2015) surveyed libraries at Carnegie-rated research universities (RU) and very heavy research universities (VH) universities in the U.S. While there was a three-fold increase of available mobile services in just three years, the types of services offered demonstrated a lack of consensus among the libraries as to what those services should be or should look like. The OPAC was the most commonly offered, followed by article databases, and assistance from a librarian (Dresselhaus & Shrode, 2012), and libraries abroad provided mobile services similar to those in the United States, including unique mobile sites or applications, the OPAC, text messaging for both notifications and reference, and QR codes (Kubat, 2017).

Functionality as determined by the design of the application was the best predictor of student use. Du (2015) surveyed library websites and reference services, and included learning management systems (LMS) such as Blackboard. To determine if the app was effective for their use, students compared what was available on the app to the full version that they were familiar with (Du, 2015). In a study of mobile use of library services by university faculty, staff, and students, half of those surveyed accessed the library catalogue and databases through their mobile devices, but the usability of the apps was considered a barrier to using them effectively (Caniano & Catalano, 2014). In a survey used to determine the feasibility of using a specific mobile app for providing different types of information to their users, Miller, Vogh, and Jennings (2013) concluded that successful implementation depends on the simplicity of design of the app as well as careful curation of available resources.

Moving Forward

Increasingly, researchers are shifting their focus from potential use of mobile services and user behavior to applying information theories to improve technology for mobile devices. The Technology Acceptance Model (Davis, 1989) was applied to student use of apps. In addition to perceived usefulness and perceived ease of use, the quality of the service, that is, the actual execution of the technology, plays a significant role in students' adoption of mobile library services (Adil, Izhar, & Khajazi, 2016). Quality of service as a factor in adoption also appears when information systems theory is applied to student use of electronic bookshelves (Chiu, Chao, Kao, Pu, & Huang, 2016).

Without diminishing the quality of the research or the work of Cummings et al., the primary significance of this article can be credited to its timeliness. The authors were prescient in their investigation of the potential use of small screen, hand-held devices for finding information, and were able to collect data shortly before the

release of the first iPhone, which ushered in the era of the smartphone. The number of articles that cite this research continues to grow as the prevalence of smartphones in society rises. In 2011, the first-year data was collected, 35% of Americans owned smartphones; by November 2016, that number had skyrocketed to 77%, with 95% owning some kind of cellular phone (Pew Research Center, 2017). Likewise, the number of articles investigating the use of such devices continues to climb.

The broad questions asked about the potential use of any small-screen device by any patron of the academic library, have given way to a progression of more focused studies in subsequent research. A review of the literature demonstrates a pattern of increasingly specific questions. The original article asked very broad questions about "small screen" (p. 23) ownership and use with any device by any patron of an academic library. It was also predictive, looking at what the respondents "might" do (p. 29) if the technology was available. After the introduction of the iPhone in 2007 ("The Evolution of Cell Phone Design", 2009) and the Android operating system in 2008 (German, 2011) smartphones are now pervasive, and most research proceeds on the assumption that this is the device that will be used to access mobile information. The ideas put forth by Cummings et al. have been taken up and narrowed in focus, creating a profuse body of literature for practitioners. The question of potential use has developed into questions on current use behaviors, barriers to use, and explanations of how to make apps more efficient and effective in order to encourage adoption by patrons in situ, outside of the library, and on the go.

References

Adil, T., Izhar, T., & Khajazi, N. N. I. M. (2016). Framework based mobile library usage and success factor: Review and extention concept. *International Journal for Innovative Research in Multidisciplinary Field, 2*(8), 283-290. https://www.researchgate.net/profile/Tengku_Adil_Tengku_Izhar/publication/308117293_FRAMEWORK_BASED_MOBILE_LIBRARY_USAGE_AND_SUCCESS_FACTOR_REVIEW_AND_EXTENTION_CONCEPT/links/57db4b8908ae5292a376a49e.pdf

Anbu, K. J. P., & Kataria, S. (2015, Jan.). Access to library resources through portable devices: A pre-design prototype for creating library websites. In *4th International Symposium on Emerging Trends and Technologies in Libraries and Information Services (ETTLIS).* (1-5). https://doi.org/10.1109/ETTLIS.2015.7048162

Bomhold, C. (2013). Educational use of smartphone technology: A survey of mobile phone application use by undergraduate university students. *Program*, *47*(4), 424-436. https://doi.org/10.1108/PROG-01-2013-0003

Bomhold, C. (2015). Research and discovery functions in mobile academic libraries: Are university libraries serving mobile researchers? *Library Hi Tech*, *33*(1), 32-40. https://doi.org/10.1108/LHT-09-2014-0084

Bushhousen, E., Norton, H. F., Butson, L. C., Auten, B., Jesano, R., David, D., & Tennant, M. R. (2013). Smartphone use at a university health science center. *Medical Reference Services Quarterly*, *32*(1), 52-72. https://doi.org/10.1080/02763869.2013.749134

Caniano, W. T., & Catalano, A. (2014). Academic libraries and mobile devices: User and reader preferences. *The Reference Librarian*, *55*(4), 298-317. https://doi.org/10.1080/02763877.2014.929910

Canuel, R., & Crichton, C. (2011). Canadian academic libraries and the mobile web. *New Library World*, *112*(3/4), 107-120. https://doi.org/10.1108/03074801111117014

Carney, S., Koufogiannakis, D., & Ryan, P. (2004). Library services for users of personal digital assistants: A needs assessment and program evaluation. *Portal: Libraries and the Academy*, *4*(3), 393-406. https://doi.org/10.1353/pla.2004.0043

Chiu, P. S., Chao, I. C., Kao, C. C., Pu, Y. H., & Huang, Y. M. (2016). Implementation and evaluation of mobile e-books in a cloud bookcase using the information system success model. *Library Hi Tech*, *34*(2), 207-223. https://doi.org/10.1108/LHT-12-2015-0113

Cowart, E. (2006). Take it outside. *Library Journal*, *131*(14), 50. Available from: Academic Search Premier, Ipswich, MA. Accessed January 18, 2018.

Cummings, J., Merrill, A., & Borrelli, S. (2010). The use of handheld mobile devices: Their impact and implications for library services. *Library Hi Tech*, *28*(1), 22-40. https://doi.org/10.1108/07378831011026670

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319-340. Retrieved from: https://misq.org/perceived-usefulness-perceived-ease-of-use-and-user-acceptance-of-information-technology.html

Deneen, L., & Allert, J. (2003). Hand-held computers in the classroom and the library: Teaching and learning resource issues resulting from widespread deployment at the University of Minnesota Duluth. *Library Hi Tech*, *21*(4), 419-425. https://doi.org/10.1108/07378830310509727

Dresselhaus, A., & Shrode, F. (2012). Mobile technologies & academics: Do students use mobile technologies in their academic lives and are librarians ready to meet this challenge? *Information Technology and Libraries*, *31*(2), 82-101. https://doi.org/10.6017/ital.v31i2.2166

Du, Y. (2015). Information use and barriers on a mobile app in distance learning. *Journal of Library & Information Services in Distance Learning*, *9*(3), 204-220. https://doi.org/10.1080/1533290X.2015.1052608

Duncan, M. (2006). Courtesy is key. *Library Journal*, *131*(14), 50. Available from: Academic Search Premier, Ipswich, MA. Accessed January 18, 2018.

Elahi, H., & Islam, S. (2014). Go fast, go with mobile: Students perception on implementing mobile based library services at Dhaka University Library. *Library Philosophy and Practice*, 1197. Retrieved from: http://digitalcommons.unl.edu/libphilprac/1197

Evans, W. (2006). Phones are everywhere. *Library Journal*, *131*(12), 47. Available from: Library & Information Science Source, Ipswich, MA. Accessed January 18, 2018.

Garrison, J., Anderson, T., MacDonald, M., Schardt, C., & Thibodeau, P. (2003). Supporting PDAs: The experience of a health sciences library. *Library Hi Tech*, *21*(4), 412-418. https://doi.org/10.1108/07378830310509718

George, B. O., Maina, J., & Wanangeye, L. W. (2016). Analyzing the use of mobile phone technology in access and utilization of library resources in Mount Kenya University, Kisii Campus. *World Journal of Computer Application and Technology*, *4*(1), 15-21. https://doi.org/10.13189/wjcat.2016.040103

German, K. (2011). A brief history of Android phones. Retrieved from: https://www.cnet.com/news/a-brief-history-of-android-phones/

Good, S. (2007). PDA serials: Practical and policy issues for librarians. *The Acquisitions Librarian*, *19*(1-2), 145-160. https://doi.org/10.1300/J101v19n37_12

Halevi, G., Moed, H., & Bar-Ilan, J. (2015). Accessing, reading and interacting with scientific literature as a factor of academic role. *Publishing Research Quarterly*, *31*(2), 102-121. https://doi.org/10.1007/s12109-015-9404-9

Han, H., & Jeong, W. (2012). Mobile web interface of academic libraries. *Proceedings of the Association for Information Science and Technology*, *49*(1), 1-4. https://doi.org/10.1002/meet.14504901279

Ko, E. H., Chiu, D. K., Lo, P., & Ho, K. K. (2015). Comparative study on m-learning usage among LIS students from Hong Kong, Japan and Taiwan. *The Journal of Academic Librarianship*, *41*(5), 567-577. https://doi.org/10.1016/j.acalib.2015.07.005

Kubat, G. (2017). The mobile future of university libraries and an analysis of the Turkish case. *Information and Learning Science*, *118*(3/4), 120-140. https://doi.org/10.1108/ILS-09-2016-0063

Kumar, K. (2013). Application of mobile technology among engineering college library users: A study. *Community of Knowledge*. Retrieved from: http://www.community-of-knowledge.de/fileadmin/user_upload/attachments/Application_of_Mobile_Technology_among_Engineering_College_Library_Users_A_Study.pdf

Lever, K., & Katz, J. (2007). Cell phones in campus libraries: An analysis of policy responses to an invasive mobile technology. *Information Processing & Management*, *43*(4), 1133-1139. https://doi.org/10.1016/j.ipm.2006.07.002

Lo, P., Cho, A., Leung, M. H., Chiu, D. K., Ko, E. H., & Ho, K. K. (2016). Use of smartphones by art and design students for accessing library services and learning. *Library Hi Tech*, *34*(2), 224-238. https://doi.org/10.1108/LHT-02-2016-0015

Madhusudhan, M. (2015). Use of mobile devices for improving the research work by research scholars of the University of Delhi and University of Hyderabad: A study. *World Digital Libraries - An International Journal*, *8*(2), 127-144. https://doi.org/10.18329/09757597/2015/8204

Miller, R. E., Vogh, B. S., & Jennings, E. J. (2013). Library in an app: Testing the usability of Boopsie as a mobile library application. *Journal of Web Librarianship*, *7*(2), 142-153. https://doi.org/10.1080/19322909.2013.779526

Pažur, I. (2014). Attitude of the Rudjer Boškovic Institute's scientists to the small screen mobile devices library services: A user survey. *Library Hi Tech*, *32*(4), 628-644. https://doi.org/10.1108/LHT-03-2014-0025

Peters, T., Dorsch, J., Bell, L., & Burnette, P. (2003). PDAs and health sciences libraries. *Library Hi Tech*, *21*(4), 400-411. https://doi.org/10.1108/07378830310509709

Pew Research Center. (2017). Mobile fact sheet. Retrieved from: http://www.pewinternet.org/fact-sheet/mobile/

Song, Y. S., & Lee, J. M. (2012). Mobile device ownership among international business students: A road to the ubiquitous library. *Reference Services Review*, *40*(4), 574-588. https://doi.org/10.1108/00907321211277378

Spires, T. (2008). Handheld librarians: A survey of librarian and library patron use of wireless handheld devices. *Internet Reference Services Quarterly*, *13*(4), 287-309. https://doi.org/10.1080/10875300802326327

Tenopir, C., King, D., Clarke, M., Na, K., & Zhou, X. (2007). Journal reading patterns and preferences of pediatricians. *Journal of the Medical Library Association*, *95*(1), 56-63. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1773049/pdf/i0025-7338-095-01-0056.pdf

The Evolution of cell phone design between 1983-2009. (2009). *Web Designer Depot*. Retrieved from: https://www.webdesignerdepot.com/2009/05/the-evolution-of-cell-phone-design-between-1983-2009/

Vassilakaki, E., Moniarou-Papaconstantinou, V., & Garoufallou, E. (2016). Identifying the uses of mobile technology among library and information science undergraduate students. *Program*, *50*(4), 417-430. https://doi.org/10.1108/PROG-10-2015-0069

Whelan, D. (2007). School cell phones: lock em up. *School Library Journal*, *53*(2), 117. Available from: Library & Information Science Source, Ipswich, MA. Accessed January 18, 2018.

Yarmey, K. (2011). Student information literacy in the mobile environment. *EDUCAUSE Quarterly*, *34*(1). https://er.educause.edu/articles/2011/3/student-information-literacy-in-the-mobile-environment