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Educational use of smart phone technology

A survey of mobile phone application use by undergraduate university students

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Abstract

Purpose – This paper aims to present the results of a survey of undergraduate student use of smart phone applications.

Design/methodology/approach – Undergraduate students currently enrolled in an information literacy course answered an online survey regarding their use of applications (apps) on their smart phones.

Findings – However, still a small percentage of most frequently used apps (10.4 percent), search engines, online encyclopedias, and libraries are used by undergraduate students. The apps used most often are familiar to them and allow mobile access to popular web sites available on personal computers. Furthermore, a significant number (76 percent) of undergraduate students also report that they use apps to find academic information. The type of app most frequently used to find academic information is search engines.

Originality/value – This research provides evidence on the actual use of mobile devices by students for library administrators and educators interested in developing integrated mobile academic library applications.

Keywords Academic libraries, Apps, Mobile technology, Smart phones

Paper type Research paper

Introduction

The student with his or her head buried in a smart phone screen is ubiquitous on college and university campuses. Walking down the street, in elevators, even during classes iPhones, Androids, and other similar devices are the constant companion of this generation of undergraduates. The question of what is being read or otherwise accomplished on these devices, however, has not been adequately addressed. Is this just a reflection of a need for constant companionship, or are these devices being utilized otherwise? The difference in the use of technology for this generation from those that came before it has been well-documented (Oblinger and Oblinger, 2005). Having grown up with the internet, computers, instant messaging, video games and cell phones, the "millenial" generation, as it has become known, has a very different view of information access than their parents and grandparents (Prensky, 2001). Rather than "going to get" needed information, the 18-25 year olds who make up the majority of undergraduate students are accustomed to instant information access. Their expectation is to have their information needs and wants answered immediately,

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and speed usurps the accuracy of the information retrieved (Oblinger and Oblinger, 2005).

Libraries would like to believe that their services and resources are more accurate and efficient than keyword searching on the internet. But do the searching habits of undergraduates reflect this? If academic libraries wish to remain relevant to their student body, then services must be available when and where students access information. Today that is hand-held, internet-enabled devices commonly referred to as "smart" phones. As opposed to other types of computers, including tablet computers which also use specialized apps, smart phones only require one hand to operate and therefore have an immediacy of use that other minicomputers have yet to attain. Because of this many academic libraries have, or plan to have, applications that will make some of their services available on these devices. But in order to create applications, or apps, that are useful to patrons, their use of the devices must be fully understood. This paper reports on a survey of undergraduate use of smart phone applications for both every day and academic use.

Literature review

There is much current research on the use of mobile devices and computing in the literature, although few look specifically at the use of applications by undergraduate college students. Relevant studies can be found in multiple disciplines; information seeking, mobile computing, and electronic library systems.

The literature of information seeking focusses on information needs within a mobile context. Heimonen (2009) explored experienced users, students, and IT professionals and concluded that mobile internet users are very likely to address information needs as they arise. Karen Church at Telefonica Research in Spain investigated information needs through diary studies to document how searching behavior is heavily influenced by location and time (Church and Smyth, 2008, 2009). In a study published in September 2012, Church *et al.*, 2012 examined mobile searching in users from 18 to 60 years old and found that social mobile searching occurred in close knit groups, was inspired by random conversations, and mostly consisted of searching for trivia and planning future activities of the group.

The literature of mobile computing is much broader in scope but precise in data retrieval. In this discipline, researchers often use internal tracking programs attached to smart phones to generate exacting data for quantitative analysis. Rahmati and Zhong (2012) interviewed teenagers 14-18 years old, providing them with special phones that tracked usage. The four month combined method field study found that different usage patterns applied to various locations, and that mobile smart phone use was significant even when PCs were within close range. Böhmer *et al.* (2011) evaluated data collected through the Appazaar app. For users, this application generated suggestions for other apps based on their current smart phone usage. The program also logged application usage, time, and generalized location that the researchers analyzed. The authors concluded that the use of news applications dominated in the morning, games were prevalent at night, and that communication apps were used throughout the day. While the application generated much rich data it did not capture demographic information, so the conclusions are only generally applicable.

In the profession of library and information science, the recent literature can be divided into three groups; the need for libraries to offer mobile service, how models of

library service will have to adapt to mobile technologies, and technical considerations in developing those mobile services. While generally useful to the profession, authors often proceed under the assumption that library patrons, especially students, will use the technology if the software is created. Few question the current use by patrons in order to inform the proposed actions. Additionally, with the rapid change in technology research articles are quickly outdated, so only the most current research is considered.

The literature that projects the need for library mobile services has been plentiful. Farkas (2010), Krishnan (2011) and Thomas (2012) recognize the potential of smart phones as a tool for libraries, both public and academic, but do not address current patron use. In academic libraries, Seeholzer and Salem (2011) collected data from undergraduate students at Kent State University in 2009. The focus group study inquired into the wants of the participants regarding possible mobile library services, but only cursorily questioned current use and ownership. Starkweather and Stowers (2009), Wilson and McCarthy (2010) and Little (2011) also discussed the potential for mobile services in the university setting but did not survey students regarding their actual use of the technology. Most recently, Dresselhaus and Shrode (2012) surveyed students about their use of mobile devices for academic purposes. They reported that 54 percent of undergraduate students at Utah State University use mobile devices for academic purposes. Of those, 70.8 percent of students reported that they owned a hand held device. To evaluate the use of hand held devices to access academic information, the authors provided results based on the students' respective colleges. Not surprisingly, more than half of the students in the colleges of engineering and business reported using smart phones for academic work. While related, the data for this study was collected in 2010 (Shrode, 2012), and may be outdated.

The effect of mobile computing on library services also has been addressed in the literature. Cummings *et al.* (2010) surveyed library patrons' interest in accessing library catalogs with handheld devices. They concluded that the manner in which patrons use library services through mobile devices differs from PC use, and that mobile OPAC interfaces will have to reflect these differences. Lippincott (2010) supports the availability of content through mobile devices in addition to reference services and notes the necessity to maintain flexibility when providing mobile services. Peters (2011) predicts the complete marginalization of library reference services unless it is redesigned to meet the needs of mobile users. Rapid response, 24/7 availability, and the abandonment of the traditional reference interview are included in his suggestions of a new model for reference services in a mobile environment.

Others discuss the potential use of mobile library services once they are developed. Since the mid-2000s, annual conferences such as The Handheld Librarian and M-Libraries have been exploring the development and promotion of mobile devices in libraries and education. Recent themes of the conferences have included developing services for libraries (HandHeld Librarian, 2012) and how mobile technologies can transform library services (M-Libraries, 2012). Keating (2011) focuses on the promotion of services, while Ryan (2011) offers a list of points to consider in the planning phase of developing mobile web sites. Connolly *et al.* (2011) surveyed 20 graduate and undergraduate students' use of mobile devices using focus groups specifically for planning mobile library and smart phone applications for the library, but focused their inquiry on what the users wanted to see or would like to use on-the-go rather than their current use of the device.

In the USA, the Educause Center for Applied Research produces a National Study of Undergraduates and Information Technology. This is an annual survey of college students' use and perception of information technology within higher education. Since 2004, the Educause report has charted student use and perceptions of technology in education. The most recent report was published in September 2012. Data for that report were collected from February 16 through April 10 of 2012. More than 100,000 students from 195 institutions took part in the survey (Dahlstrom *et al.*, 2012). This report provides a base line of ownership and post-secondary academic use of smart phones over the past nine years and provides useful comparisons for the results of this research.

Problem statement

The ownership of mobile internet devices has seen a dramatic increase by undergraduates in recent years (Dahlstrom *et al.*, 2012). But popular literature indicates that most use of these devices is mostly for entertainment and communication (Viticci, 2012). Both universities and academic libraries state that they have or plan to have a mobile internet presence (Thomas, 2012). Before useful, intuitive apps can be developed, the frequency of use of different types of apps by this population should be explored in order to inform the practices of those who wish to attract them to their web sites.

Research questions

For this research, the following question was identified:

RQ1. Do undergraduate students use smart phone applications (apps) for more than communication and entertainment?

From this, three sub-questions emerged:

RQ2. What apps do they use and how frequently?

RQ3. What apps do they use most frequently?

RQ4. Do they use apps to find academic or research information and if so, what apps do they use?

Methods

An online survey was developed to collect the data for this study. The instrument was a 14 question mixed response survey that inquired into student ownership and the frequency of use of different types of mobile computing apps. The survey included two six-point Likert scales that asked students to rate their frequency of use of different types of mobile applications from very frequently (defined as several times a day) to Do Not Own. 12 general groups were defined using Böhmer *et al.* (2011) as a guide to types of apps. Each Likert scale was then followed by short answer questions that asked the respondent to name specific applications that they used most often in each category. Finally, the participants were asked about their use of smart phone apps for academic work, including frequency of use and which specific apps were used. A copy of the survey instrument is provided in the Appendix.

The population for this study included students enrolled in an introductory class in information literacy at a university in the Southern USA. The school is a mid-sized Carnegie Doctoral Research Extensive institution with approximately 13,500 undergraduates. The class, which is an elective for undergraduates in the college of arts and letters at the university, had a total enrollment of 75 students in four individual sections. A total of 62 students took the survey. Of those, 84 percent were 18-24 years old, 67 percent were white (non-Hispanic), and 27 percent were Black or African American, which is a close replication of the University student body. The final demographic, 74 percent female, while not representative of the University, does reflect enrollment in the course. Students were asked to fill out the survey during the class, and a link was provided within their supplemental courseware for access.

There are several limitations for this study. Due to the small sample of students in one course at one university, the research described here does not purport to provide definitive answers but instead is only illustrative of this particular group of people. Although the instrument was approved by the university's Institutional Review Board and is believed to be accurate, the validity of the data is dependent on the participants' understanding of the survey nomenclature as well as the instructors' consistent administration of the survey. Finally, while the survey design is thought to be efficacious, it is dependent on the researcher's understanding and development of the application categories being in agreement with those of the student population surveyed.

Results and discussion

The first question determined the rate of ownership of internet ready mobile devices among those who answered the survey. Students were specifically told "include iTouch, iPhone, Android, Blackberry and other devices, regardless of phone capability. Do NOT include tablets, laptops, or other portable computers." Of 61 initial respondents, 47 (77 percent) answered affirmatively. The responses coincided with the most recent Educause reports by Dahlstrom, Dziuban, and Walker that found 55 percent of undergraduate students-owned smart phones. 12 months later, the number had increased by 7 percent (Dahlstrom *et al.*, 2012). Six months later that number had increased by 14 percent in this group of respondents, presumably reflecting the increased use of devices by incoming freshmen. Skip logic was used to exit respondents out of the survey who did not report owning such a device.

To inquire about the frequency of app usage, respondents were asked to rank how frequently they used each type. A total of 47 students responded to the question. The results are presented in Table I. The most frequently used types of apps were "social and communication", with 95.7 percent reporting that they used these apps 1-2 times daily or more (frequently very frequently). Other frequently used app categories include "search engines" (78.7 percent), "tools and productivity" (75 percent), "games or music" (65.9 percent), "sports or other entertainment" (44.7 percent), and "reference or libraries" (36.9 percent). Applications groups that had little use or no ownership include "hobbies" (44.6 percent), "casual reading" (41.3 percent), "finance and banking" (40.5 percent), and "shopping" (34.1 percent). In order to refine preferences, participants were also asked to name up to three specific apps within each category that they used most frequently. Communication apps such as Facebook, Twitter, or e-mail

Type of app	Very frequently used (%)	Frequently used (%)	Little use or not owned (%)
Social and communication	95.7		
Search engines		78.7	
Tools and productivity		75.0	
Games or music		65.9	
Sports or other entertainment		44.7	
Reference or libraries		36.9	
Hobbies			44.6
Casual reading			41.3
Finance and banking			40.5
Shopping			34.1

Table I. Percentage of students reporting frequency of use of apps, by app type

encompassed 54.8 percent of the list; 14.8 percent were for entertainment such as YouTube or Pandora; and 10.4 percent were search engines, most frequently Google.

Students were also asked if they used their mobile devices to find academic information and if so, what five applications they used most often. Of the 46 respondents, 35 (76.1 percent) answered it positively. This corroborates the dramatic rise of smart phone for academic use reported in Dahlstrom *et al.* (2011) and Dahlstrom *et al.* (2012) (31 percent increase over 12 months), and the data collected by Dresselhaus and Shrode (2012) in December, 2010. Of the 70 named applications used for academic work, 60 percent were search engines, 14.4 percent were online encyclopedias or homework sites; 11.3 percent were dictionaries or translators; 10 percent were tools such as calculators or flashcards, and 4.3 percent were libraries or databases (Figure 1).

Because of the ambiguity of defining the information sought when a person uses search engines to find information, the survey was also used to inquire about students' use of mobile search engines. Respondents were asked to recall the past three times that they used their smart phone search engine app and complete the statement "I needed information [. . .]". These responses were then compiled, coded, and analyzed for commonality. Of the 115 responses, 51.4 percent were academic or ready reference type inquiries. Representative responses were both specific "about Ronald Reagan economics," or "about Jane Austen" and broad ranging such as "to find a translation,"

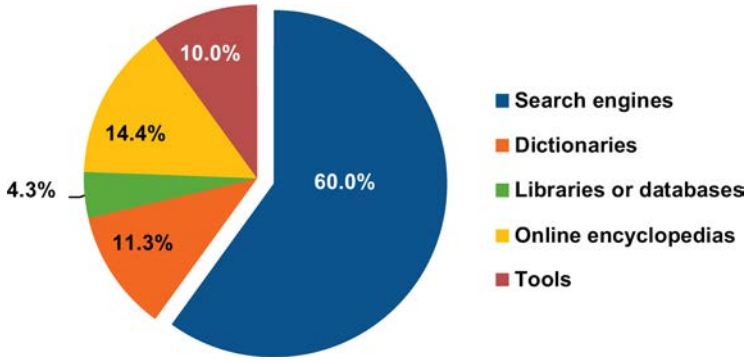

Figure 1. Applications used for academic purposes by app type

or "to do homework." Another 40 percent were lifestyle inquiries such as finding movie times, song lyrics, recipes, or online game help. Finally, 8.6 percent were health or wellness inquiries; "to find headache remedies" or "on protein supplements" (Figure 2).

Conclusion and recommendations

The results of this study demonstrate that undergraduate students do use smart phone applications for more than communication and entertainment. Hand-held, internet ready devices that employ specific applications are increasingly being utilized for information seeking. Although still a small percentage of the most frequently used apps (10.4 percent), search engines, online encyclopedias, and libraries are used by undergraduate students. Furthermore, a significant number (76 percent) disclose using apps to find academic information. The apps they use are familiar and allow mobile access to popular academic web sites they can find on their desktop computers. These sources are those which are online representatives of traditional sources of information such as encyclopedias, dictionaries, translators, or libraries, or they are open-ended resources such as search engines where the user looks for information that either does not have an app or the user does not know that it exists.

The implications for this research reiterate findings on the role of convenience in the search process for this demographic. Born between 1980 and 1994, the majority of the respondents in this study are part of the so-called millennial generation. Having grown up using computers and the internet, they are digital natives and have their own views and expectations of information. They want information fast, are comfortable with non-linear information seeking, and have little tolerance for delays or limited access (Prensky, 2001; Oblinger, 2003; Oblinger and Oblinger, 2005). The convenience of a resource, therefore, is the overriding consideration for choosing a source when gathering information.

Studies of the use of electronic sources corroborate the importance of convenience as a factor in searching for information. Students are not "lazy"; by continually choosing electronic full-text sources over print, they demonstrate a change in expectations that information must be accessible "anytime, anywhere" and that they are willing to sacrifice authoritative content for convenience and speed (Fast and Campbell, 2004). Time, ease of access, and sources that were "good enough" are qualities of convenience discussed in making choices in finding both academic and everyday life information (Connaway *et al.*, 2011). Specifically, search engines were rated higher than libraries in

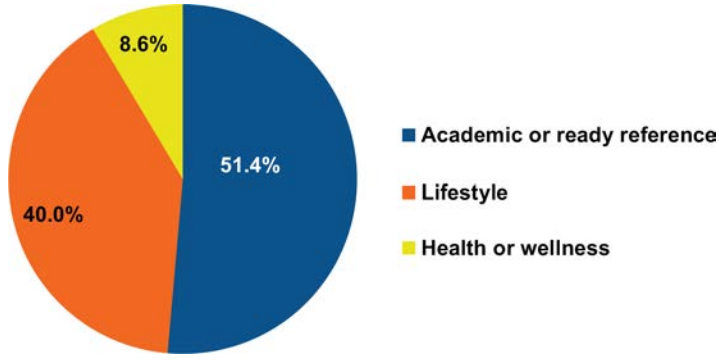

Figure 2.
Types of open-ended inquiries

ease of use, speed, and convenience and were the "favorite place to start a search, and Google the search engine most recently used" (De Rosa *et al.*, 2005). The search engine is perceived as an "easy" tool and requires little specialized knowledge or skills (Fast and Campbell, 2004). Google searching produces immediate results with instant access to documents whereas OPACs imply wait time, delays, and the need to have a specific skill set. In order to compete, libraries must offer more than authoritative sources. Like search engines, access to library resources must be seamless, instantaneous, and around the clock.

This idea of convenience can be used to explain our participants' choices of Wikipedia, Ask.com, and general search engine apps such as Google, Safari, and Yahoo! to find information. These apps are familiar to the user and so there is no learning curve, they are readily available at no cost, and the content or results are considered "good enough." Designing a useful, intuitive library app or mobile web site therefore must be more than just making static information available on a smart phone. Warwick *et al.* (2009) noted that undergraduate respondents were reluctant to move beyond keyword searches even when it was not effective, and new methods were only adopted "when immediately relevant to the task". The students in the current study who acknowledge using search engines for academic work will be disinclined to use library apps until it offers them something that the search engines cannot. A review of major studies from the USA and the UK that inquired into the information needs of users and how libraries can better support digital resources concluded that "library systems need to look and function more like search engines and popular web services" because they are familiar to users – they are comfortable and confident using them. In order for libraries to develop applications that successfully compete with information giants such as Google and *Wikipedia*, they cannot rely on users to go to lengths to find the best information. Instead, they must offer what the giants do; broad choices, convenience and ease of use – along with access to authoritative content, all in the palm of their patrons' hands.

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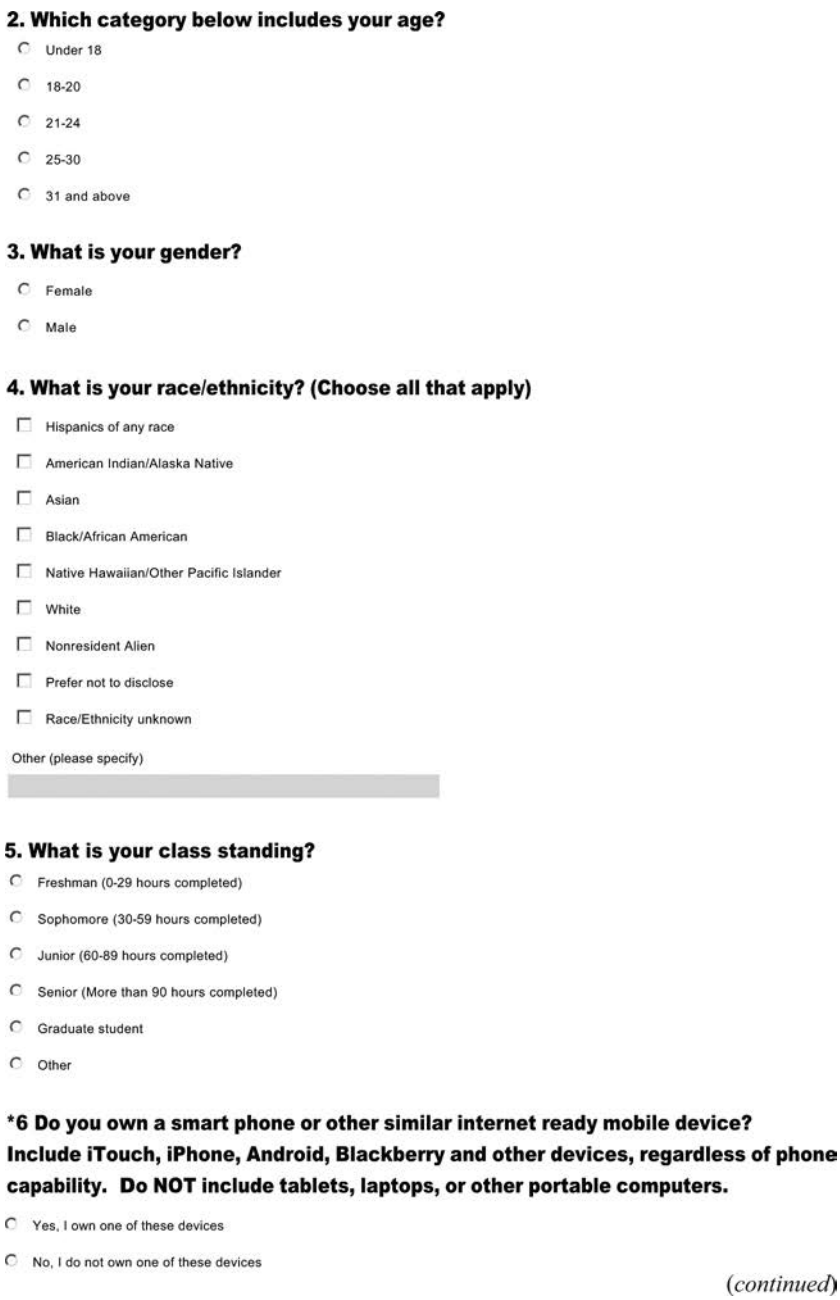
Appendix



2. Which category below includes your age?

- Under 18
- 18-20
- 21-24
- 25-30
- 31 and above

3. What is your gender?

- Female
- Male

4. What is your race/ethnicity? (Choose all that apply)

- Hispanics of any race
- American Indian/Alaska Native
- Asian
- Black/African American
- Native Hawaiian/Other Pacific Islander
- White
- Nonresident Alien
- Prefer not to disclose
- Race/Ethnicity unknown

Other (please specify)

5. What is your class standing?

- Freshman (0-29 hours completed)
- Sophomore (30-59 hours completed)
- Junior (60-89 hours completed)
- Senior (More than 90 hours completed)
- Graduate student
- Other

***6 Do you own a smart phone or other similar internet ready mobile device? Include iTouch, iPhone, Android, Blackberry and other devices, regardless of phone capability. Do NOT include tablets, laptops, or other portable computers.**

- Yes, I own one of these devices
- No, I do not own one of these devices

Figure A1.

(*continued*)

7. Below are list of types of applications (apps) for smartphones.
For each, please indicate how often you use them.
Examples of the types of apps are given for guidance only, and may include others.

	Very Frequently (more than 2 times a day)	Frequently (1-2 times a day)	Occasionally (1-2 times a week)	Rarely (2-3 times a month)	Very Rarely (once a month or less)	Do not use/Do not have
Finance, banking and insurance (bank accounts, stocks, insurance company)	○	○	○	○	○	○
Travel, life (Maps, Yelp, Urbanspoon, rental or area information)	○	○	○	○	○	○
Hobbies (cookbooks, gardening, geocaching)	○	○	○	○	○	○
Social and communication (email, Twitter, Facebook, texting, Reddit)	○	○	○	○	○	○
Tools and productivity (calendar, notes, flashlight, alarms)	○	○	○	○	○	○
Shopping (Amazon, Craigslist, barcode scanner)	○	○	○	○	○	○
Casual reading (non-academic books, comics, or magazines)	○	○	○	○	○	○
Entertainment, sports (IMDB, Netflix, Youtube, ESPN, NFL Mobile)	○	○	○	○	○	○
Games, Music (AngryBirds, Words With Friends, Pandora, IHeartRadio)	○	○	○	○	○	○
Health and Fitness (WebMD, MyFitnessPal, Weight Watchers)	○	○	○	○	○	○
Reference and libraries (Wikipedia, Ask.com, libraries, encyclopedias)	○	○	○	○	○	○
Search engines (Yahoo!, Google, Safari)	○	○	○	○	○	○

8. For each of the following types of apps, please name two that you use most frequently.
If you only use one app in that category, list that.
If you do not use any, please leave the box blank.

Finance, banking and insurance (bank accounts, stocks)	
Travel, life (Maps, Yelp, Urbanspoon, rental or area information)	
Hobbies (cookbooks, gardening, geocaching)	
Social and communication (email, Twitter, Facebook, texting, Reddit)	
Tools and productivity (calendar, notes, flashlight, alarms)	
Shopping (Amazon, Craigslist, barcode scanner)	

(*continued*)

Figure A1.

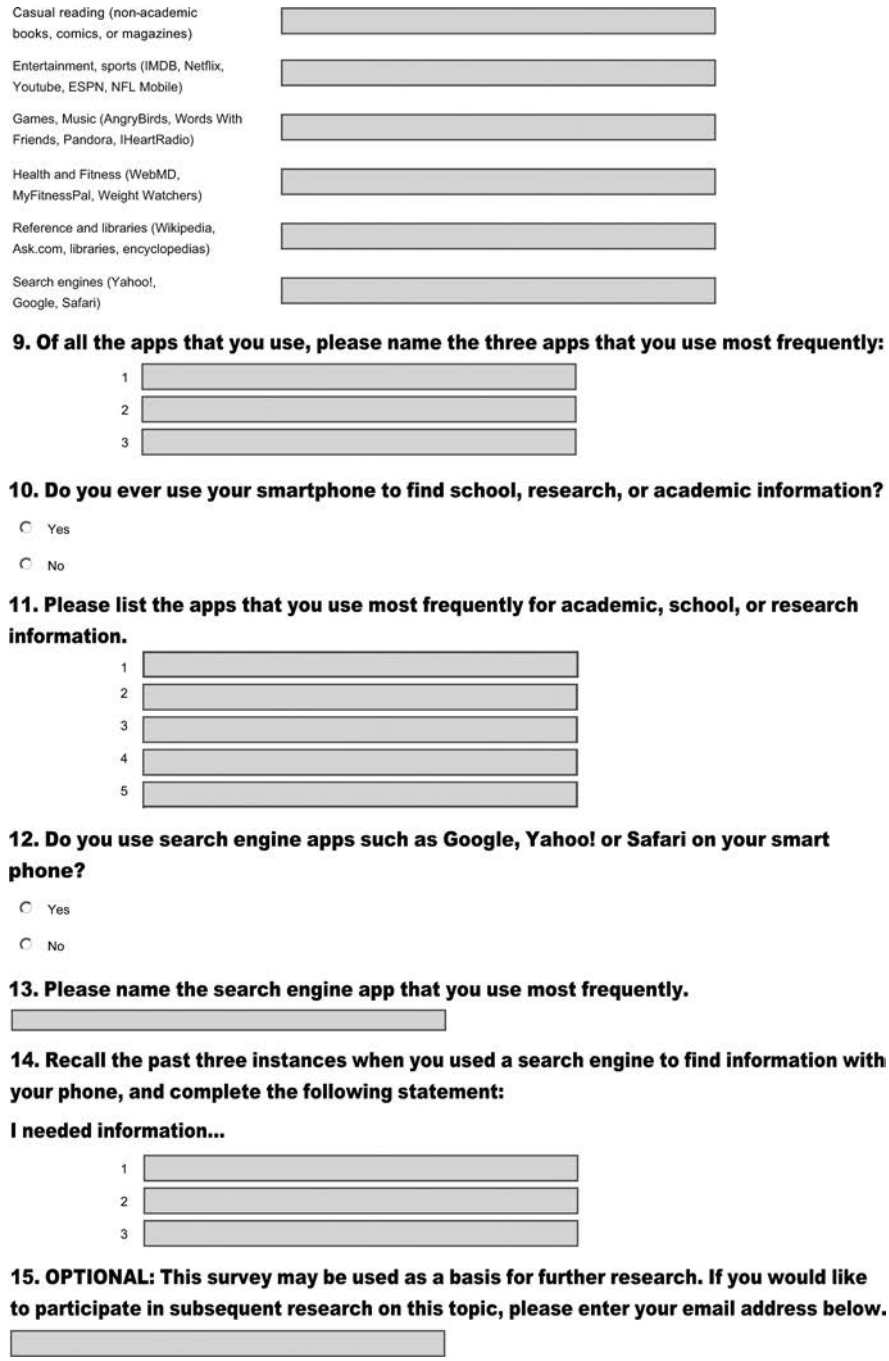

Casual reading (non-academic books, comics, or magazines)
Entertainment, sports (IMDB, Netflix, Youtube, ESPN, NFL Mobile)
Games, Music (AngryBirds, Words With Friends, Pandora, IHeartRadio)
Health and Fitness (WebMD, MyFitnessPal, Weight Watchers)
Reference and libraries (Wikipedia, Ask.com, libraries, encyclopedias)
Search engines (Yahoo!, Google, Safari)
9. Of all the apps that you use, please name the three apps that you use most frequently:
1
2
3
10. Do you ever use your smartphone to find school, research, or academic information?
Yes
No
11. Please list the apps that you use most frequently for academic, school, or research information.
1
2
3
4
5
12. Do you use search engine apps such as Google, Yahoo! or Safari on your smart phone?
Yes
No
13. Please name the search engine app that you use most frequently.
14. Recall the past three instances when you used a search engine to find information with your phone, and complete the following statement:
I needed information...
1
2
3
15. OPTIONAL: This survey may be used as a basis for further research. If you would like to participate in subsequent research on this topic, please enter your email address below.

Figure A1.