How useful are smartphones for learning? Perceptions and practices of Library and Information Science students from Hong Kong and Japan

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Abstract

Purpose – The purpose of this paper is to provide an overview of higher education students' experiences in using smartphones for learning purposes, and their perceptions of the suitability of smartphones for learning.

Design/methodology/approach – A qualitative research method is applied to data collection and analysis by following the grounded theory approach. Data were gathered by an online focus group involving Library and Information Science (LIS) students from University of Hong Kong and University of Tsukuba (Japan).

Findings – LIS students at both universities regularly use smartphones for communication, socializing, entertainment and other daily information needs. The findings show that LIS students commonly use smartphones for learning and consider smartphones to be very useful for their academic work. They use smartphones to access course materials, search library catalog, discuss course assignments with peers, take notes, etc. Although both academic libraries involved offer a variety of services for mobile devices, these services are still not used frequently. A major barrier to using smartphone for academic learning is the smartphone's small screen.

Research limitations/implications – The study relies on a convenience sample, restricted to students from two universities, one from Hong Kong and the other from Japan. Further research on a larger sample is recommended.

Originality/value – The study adds to the knowledge of smartphone actual use for learning purposes and provides study participants' insights on the usefulness of smartphones for learning.

Keywords Smartphones, Higher education, Mobile learning, Mobile libraries

Paper type Research paper

1. Introduction

The well-known and widely used metaphorical reference "If you build it, they will come" most often does not work in real life. If applied in the context of mobile technologies, learning and libraries, the metaphor should be stated as a question asking whether they will really come if we build it (Keating, 2011). Librarians as well as other educators should not just build mobile learning systems under the assumption that library patrons and students will use them automatically and that mobile technologies on their own will be beneficial and effective in learning and study. Therefore studies looking at people's actual experiences in using mobile phones or smartphones for learning and study purposes will be of great importance for building any mobile learning support system.

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The main goal of this study is to provide an insight into Library and Information Science (LIS) students' actual use of cell phones or smartphones for learning and their perceptions regarding the usefulness and effectiveness of mobile phones for this purpose. The inquiry into students' smartphones use for other purposes like communication, entertainment and many other daily needs would provide valuable background information on the study participants' general smartphone use.

The working definition of mobile learning in this study is based on the concept of mobile learning established by Gikas and Grant (2013). According to their definition, there are four major characteristics of mobile devices that are necessary for mobile learning. These characteristics are constant access to the internet, a variety of downloadable applications, communication capability and a small size to allow for carrying it in a pocket or handbag. Therefore, the study focusses exclusively on students' mobile learning with cell phones and smartphones.

2. Recent studies on actual use of mobile phones for learning purposes

Cell phones and smartphones with web access are becoming popular among students in higher education. Mobile technologies allow students to access the relevant information and easily communicate with others.

There are a number of studies published in the past few years on cell phone or smartphone use for learning in higher education environment. The study by Dahlstrom *et al.* (2013) surveyed 112,000 college and university students from USA and 13 other countries about their use of mobile devices for academic purposes. The study identified a substantial growth in the use of smartphones for academic purposes over the period from 2011 to 2013. The academic activities mainly included accessing a course management system for reading course materials, viewing academic performance information like grades, accessing library resources and doing course registration. Similarly, Dresselhaus and Shrode (2012) looked at undergraduate and graduate students of the Utah State University and found that more than half of the students reported use of handheld devices for academic purposes. In this study various academic purposes are not specified as the study aimed at getting only general information about students' use of mobile devices for academic work.

The study by Bradley and Holley (2011) provides more details about ways of using mobile phones for academic learning. They conducted a survey with undergraduate students at London Metropolitan University to explore the ways in which the study participants use mobile phones for academic work. The study findings show that students use mobile phones for various learning-related activities such as searching for information, communicating with others, accessing learning materials, generating contents, recording presentations and taking notes. Bomhold (2013) conducted empirical research on undergraduate students at one university in the southern USA. The findings show that more than two-thirds of respondents use smartphones for academic purposes, such as retrieving information through search engines, accessing online encyclopedias and dictionaries and also for using tools like calculators or flashcards. The study also shows that very few among respondents use smartphones for searching library catalogs or subscription databases. On the other hand Paterson and Low (2011) in their study of Edinburgh University students' attitudes toward mobile library services found that searching the library catalog and online databases are considered to be very useful library services. Becker *et al.* (2013) explored the use of mobile devices for research purposes by students in one college belonging to the City University of New York and their findings support Paterson and Low's (2011) results.

Becker *et al.* (2013) found that among a variety of library mobile services there was a high demand for easy navigation of library databases, searching the catalog, accessing e-books and reserving books. As authors point out, this knowledge will greatly help librarians in constructing the library mobile website. Park and Jung (2013) studied Korean smartphone users' perception of usefulness of smartphones for learning. The majority of survey participants think that smartphones are very useful for learning anytime and anywhere. Mobile phone is perceived as an effective mean for informal self-directed learning because of its portability, accessibility and ease of use. Kim *et al.* (2013) investigated the use of smartphones for learning among education and engineering university students at one Korean university. The study findings reveal that all students extensively use various smartphones apps for learning purposes. The most commonly used apps are dictionary and translation, document viewer, e-mail and text, media, notes, scheduling, social networks and web searching.

Among recent studies about smartphone use for learning, there are a few studies that involve students in higher education in Hong Kong and Japan (Kukulska-Hulme *et al.*, 2011; Bibby, 2011; Ang *et al.*, 2012; Cheung, 2014). Kukulska-Hulme *et al.* (2011) explored the use of mobile devices for learning purposes from the learners' perspective. Their study was conducted on students in master and doctoral programs in Australia, Hong Kong, Portugal, Sweden and the UK. The study shows that students in all countries involved in this research use mobile phones for learning-related activities, such as accessing information, contacting others, reading e-books, listening to podcasts and scheduling. Participants from Hong Kong reported the highest frequency of reading e-books and academic papers on their smartphones.

Cheung (2014) researched the use of smartphones for learning by undergraduate students in marketing and public relations at the Hong Kong Polytechnic University, and his findings go along with findings by Kukulska-Hulme *et al.* (2011). Cheung's (2014) study shows that students use smartphones to perform various learning activities, such as sending e-mails to classmates, reading notes, searching Google Scholar, posting comments on the course website and occasionally for uploading contents. Ang *et al.* (2012) explored the potential use of mobile library services by undergraduate and graduate students from three universities in Hong Kong and one university in Singapore. The study shows that over three quarters of respondents from both cities, Hong Kong and Singapore, would very likely or likely use mobile devices to search library catalog, retrieve electronic resources, access course reserve, check for new books and resources, view their borrower record and book a group study room if such services are available. Bibby (2011) conducted research on students at one private women's university in Japan and examined students' actual use of PC and mobile phones for learning and homework purposes. The study shows that students regularly use smartphones for learning activities, such as communication and interaction with others, use of dictionaries, keeping diaries and scheduling. The findings also demonstrate that students definitely prefer cell phone to the PC and are ready to accept mobile learning in the future.

Besides smartphone use for learning purposes, some of the studies mentioned above (Kukulska-Hulme *et al.*, 2011; Bomhold, 2013; Cheung, 2014) also explore research participants' general smartphone use for their daily communication, information and entertainment, which serves as a background for the mobile learning study. Besides talking, texting smartphones are daily used for social networking, blogging, recreational reading, finding locations, watching movies, listening to the music, playing games, finding locations, etc.

In the light of the literature review it can be concluded that students in higher education widely use mobile phones to support their academic learning. Only a few studies provide detailed description of particular learning activities performed with smartphones while the specific context of these activities is rarely discussed. Since there are no studies explicitly focussed on LIS students it is expected that this research could provide a useful insight in mobile learning of students in LIS area.

3. Research objectives

This study aimed to explore how LIS students at both University of Hong Kong (HKU) and University of Tsukuba (UT) use their smartphones in everyday life and whether they use smartphones for learning purposes. Based on the major findings of recent studies on mobile learning the following research questions were identified:

RQ1. How do LIS students use smartphones for their everyday communication, entertainment and information needs?

RQ2. Do LIS students use smartphones for learning purposes and how do they perceive the suitability and usefulness of smartphones for learning?

RQ3. Do LIS students use smartphones to access library resources and services for learning and study purposes?

RQ4. Are there any differences between HKU and UT LIS students in terms of using smartphones for their daily needs and for learning?

4. Research methods

The study applied a qualitative research methodology, following the principles of the grounded theory approach (Glaser and Strauss, 1967; Glaser, 2002). This methodological approach seemed to be suitable for this research since we aimed to observe and analyze participants' multiple perspectives on using smartphones for learning and their actual smartphone use practices. By discovering the underlying patterns of these perspectives and practices we were able to construct the core categories of using smartphones for learning and also develop a basic theoretical framework for our further research in mobile learning.

4.1 Data collection and analysis

Empirical data were collected from an asynchronous online focus group. The major advantage of this research technique is that network technologies remove the time pressure from both researchers and participants (Williams *et al.*, 2012). Participants are given total freedom to provide detailed responses and researchers can reflect on previous responses before asking new questions. Online focus groups enable researchers to use slightly larger sample sizes, involve larger and geographically dispersed samples and run discussions over a longer time periods. For this reason, respondents can choose to respond to the researchers' questions at any time-without any geographical constraints.

A Facebook page was used as a platform for this online focus group. The major advantage of using a Facebook page for this research was that all participants were familiar with this technological tool and felt comfortable using it. The advantage for the researcher was that the discussion threads were available immediately online and could be easily downloaded to a computer in PDF format.

The Facebook page *LISEXCHANGE* was established to encourage LIS students from the two universities to freely share their ideas, knowledge and experiences in the LIS area. Students voluntarily joined this social network and took part in discussions on various topics. The discussion about students' use of smartphones for their everyday needs and for learning purposes was initiated and moderated by researchers from HKU and UT. All discussions were conducted in English.

The research population encompassed students enrolled into LIS bachelor and master programs at HKU and UT in the 2013/2014 school year. A convenience sampling technique was used to collect data. At the time of this research, the *LISEXCHANGE* group comprised of 65 members, bachelor and master LIS students from HKU and UT of various nationalities and ethnic backgrounds and a small number of academic staff, including three researchers of this study. Altogether 20 students actively took part in smartphone use online discussions, 12 students from HKU and eight students from UT. The age of study participants ranged from 22 to 34. In total, 16 participants were females and four were males. The empirical materials gathered from online discussions included 70 postings but only 43 postings were selected for the analysis because they were estimated as directly related to the research topic. It should be highlighted that all the HKU students were part-time students (meaning they all had full-time jobs and were undertaking the bachelor or master LIS program at HKU on part-time basis), while students from UT were undergraduate and graduate students mostly studying full-time. The online focus group was conducted over a period of several months and the process of data collection terminated in March 2014.

Researchers created the following focus group questions in order to guide respondents through the research topic:

(1) What kinds of mobile devices do you own and use (i.e. iPhone, iPad, etc.)?

(2) For what purposes do you use your smartphones (i.e. socializing, entertainment, etc.)?

(3) Do you use a smartphone for learning? How? What kinds of activities do you perform with your smartphones for learning purposes?

(4) Do you use a smartphone to access your university library for learning purposes? What mobile library services do you use?

During the focus group discussion a number of more specific follow-up questions were asked to facilitate a conversation and to expand answers.

Although the number of students participating in the study is relatively low the data collected from the online postings show that participants share similar views and experiences in using smartphones for their everyday needs and for learning purposes. Therefore, the objection about small sample size is of limited value in this context since researchers concluded that additional data collection would not bring any new perspective on smartphone use for learning and that the data collected satisfy methodological criteria required for a qualitative study.

Data collected from the *LISEXCHANGE* Facebook page were analyzed by applying qualitative content analysis. All discussions related to smartphone use were extracted from the *LISEXCHANGE* Facebook page and interesting features of the data were systematically coded across the entire data set. Coded data were further arranged into themes so that all data relevant to each theme were gathered together. Initial thematic categories were based on research findings of similar studies and new themes and categories were gradually developed through the process of analysis. Finally, all the

themes were identified and the main categories and subcategories were clearly named and defined.

The main categories and subcategories thus created included:

(1) type of mobile device that students own and use;

(2) smartphone use for communication, entertainment and daily information needs:
   - communication and social media;
   - entertainment: movies, music, gaming;
   - finding information for everyday needs; and
   - reading for recreation and news.

(3) smartphone use for learning and study:
   - academic learning;
   - personal learning;
   - use of library services; and
   - obstacles to using smartphones for learning.

In addition to *LISEXCHANGE* Facebook page discussions, semi-structured interviews were conducted with two reference librarians, one from the Hong Kong University Library (HKUL) and the other from the University of Tsukuba Library (UTL), to find out about their perceptions regarding feasibility and usage of library mobile services. Transcript of both interviews were analyzed and labeled to uncover the key ideas. The two libraries' mobile websites were only briefly analyzed in order to collect evidence of types of mobile services offered by both libraries.

4.2 Limitations of the study

The study relies on a convenience sample that is restricted to LIS undergraduate and graduate students currently enrolled at the two universities, one in Hong Kong and the other in Japan, and for that reason the findings may not be generalized to the wider population of MLIS students in Hong Kong and Japan. Further examinations of using smartphones for learning are therefore recommended.

5. Findings and discussion

5.1 Type of mobile device that students own and use

A discussion on the *LISEXCHANGE* Facebook page about use of smartphones for various purposes also included collecting data on types of smartphones that students own and use. According to StatCounter (2014) statistics two operating systems, Android and iOS, are used by over 95 percent of smartphone owners, both in Hong Kong and Japan. While over 67 percent of Hong Kong smartphone users use an Android operating system, over 60 percent of Japanese smartphone owners use the iOS operating system. The data obtained in our study are consistent with the StatCounter statistics, showing that HKU LIS students use smartphones with Android operating system more often than iOS one, while with UT LIS students it is the other way around.

Study findings indicate a number of ways how students use smartphones. Students mention that they use smartphones for communication, socializing, entertainment, reading and for finding information for their daily information needs. Some of them use

smartphones for study and learning purposes, including access to library resources. A detailed analysis of these various uses of smartphones is provided under the specified topics obtained from the qualitative content analysis of discussion threads from the *LISEXCHANGE* Facebook page.

5.2 Smartphone use for communication, entertainment, reading and daily information needs

Using smartphones for communication and for social media is quite popular among HKU and UT students. Most of them use their smartphones for talking, chatting, sending e-mails, text messaging, sharing personal photos, etc. The most popular apps for communication are WhatsApp and Line, while some also use WebChat. Both HKU and UT students very often use smartphones to connect with friends through Facebook as well. The following comments by students clearly illustrate the activities mentioned above:

> Most of the time, I check with my mobile my Facebook, email, WhatsApp, and Line (HKU 01).

> The mobile phone is like a mini computer that I always use to play games, read books, watch movies and listen to music (HKU 02).

> I use my iPhone for social purposes, like connecting with other people through Facebook, phone, e-mail, LINE, etc. and for entertainment purposes, like reading news and viewing web sites (UT 01).

The popularity of communication and social interaction apps is not surprising. The study about undergraduate students in the USA by Bomhold (2013) shows that applications for social and communication purposes are the most frequently used by most respondents. Entertainment related activities that are often used by our study participants include playing games, watching movies, often from YouTube and listening to music. All activities with smartphones mentioned above apply equally to HKU students and UT students.

Study participants regularly use their smartphones to fulfill their daily information needs. Both HKU students and UT students use their smartphones to get weather forecasts, find a nearby restaurant, look up directions on an electronic map, find information about public transport, etc. A HKU student states:

> I use it (a smartphone) for information purposes: weather forecast, restaurant nearby, map, online shop (taobao.com), and for bus and other transportation information (HKU 03).

One student even mentioned using her smartphone for job searching. Data from Google's (2013) statistics corroborate our findings about extensive use of smartphones by Hong Kong and Japanese smartphones owners for finding information for daily needs.

Quite a number of Hong Kong students use their smartphones for recreational reading. Most often they read comics, in many cases Japanese manga type comics. Respondents agree that manga is particularly suitable for reading on a smartphone because there is little text there, and it is simple so it does not require a lot of concentration. Comments by HKU students illustrate these opinions:

> For entertainment, I don't need to be too concentrated, so I use a mobile device to access and read manga and make updates in social media while I am queuing up outside a sushi restaurant, or on bus (HKU 04).

> For reading manga with my smartphone the main reason is, I think, that the text is simple and short (HKU 03).

> Almost everyday I read manga by using my iPad at home, and my smartphone when I am out! (HKU 05).

It can be seen that only Hong Kong students mention reading manga on their smartphones. Although manga is a Japanese type of comic, not a single Japanese student has mentioned reading it on a smartphone. A HKU student explains that people in Hong Kong read manga that is translated into Chinese and distributed illegally throughout China. Since it is easy to access manga for free from the internet, people in Hong Kong read it quite often. Japanese have to buy it and in that case they prefer to buy a print version.

Besides manga, students from HKU mention that they also consider novels to be suitable for reading on a smartphone. A HKU student provides an interesting explanation of why novels are suitable for reading on a smartphone:

> For reading fiction the smartphone browser can re-adjust the font size for you. Also, you don't have to really concentrate on it as it is just for leisure. You don't really need to pay a lot of attention of what you read so the reading environment (e.g. on the bus, in the restaurant) does not matter much (HKU 03).

This comment is based on two assumptions: one is that the small screen size is an obstacle to reading on a smartphone, and the other is that people usually read on their smartphones when they are outside their homes, offices, namely, in a noisy and distracting environment. The obstacle of the small screen might be bypassed by using the smartphone feature of text enlargement. Choosing to read materials that do not require high concentration solves the problem with the noisy environment. Other readings for recreation and leisure mentioned by students include magazines, the news and forum posts.

There are two major points that stand out regarding reading with smartphones for leisure purposes. One is that they read on their smartphones while they are outside their offices or homes, or while they are on-the-go or waiting and the other is that in that case they choose to read texts that are simple and do not require much concentration.

The findings about Hong Kong students frequently using their smartphones for recreational reading differ from findings in Bomhold's (2013) study which showed a very little usage of apps for casual reading. One possible explanation for this difference might be that the Hong Kong sample consists of part-time bachelor and master students who all work full-time and thus have to economize their time to fulfill study obligations. Participants in the Bomhold's (2013) study are full-time students who might not face time constraints as much as fully employed students do.

5.3 Smartphone use for learning and study

Most students participating in discussions agree that smartphones are not suitable for serious academic reading and even less so for academic work like writing assignment papers. They rarely download journal articles or access e-books to read on their smartphones and avoid typing or editing papers because the mobile phone is too small for it. The following comments by students illustrate this concept:

> I seldom download articles to my mobile, as others mentioned above. The screen is too small for reading and also, it is not very comfortable to read under the sharp light. So I would just search for articles and add them to my favorite or send them to my email so that I can easily read them later at home (HKU 06).

> Occasionally, I would read articles on my tablet or phone, but I prefer to read them on my laptop (UT 02).

> I seldom use the mobile phone for academic work because the screen of my mobile phone is not big enough. It is difficult to type the words and read the whole passage on the website (HKU 07).

Participants in our study mostly agree that the small screen size discourages them from reading academic and professional literature on their smartphones. They prefer to read it on their computers at home. Only a few mention that they would sometimes read journal articles or e-books on their smartphones for learning purposes. A study by Bibby (2011) came to the similar conclusion. Although students participating in his study use mobile phones extensively in their everyday activities, they prefer to use a computer for academic work.

Some study participants made another interesting point in explaining why they do not use their smartphones often for study purposes. They define studying primarily as formal learning, which requires high concentration and a quiet learning environment, such as an office, library or desk at home. A comment by a HKU student below illustrates this assumption:

> For formal learning, a higher level of concentration is required. Usually I would do it in a quieter environment, let's say, at home. There is no point for me to use my mobile device for formal learning and leave my computer being idle when I am at home (HKU 04).

The same participant elaborates his statement further:

> An entertainment need could be triggered at any time, e.g. suddenly I need to wait for something, so instead of just standing and waiting, I would play with my phone to better use my time. But formal learning usually happens according to a planned schedule (HKU 04).

From both statements we can infer that smartphones are used most often outside the office or home, namely, on the way to somewhere or while waiting for something, in surroundings mostly not suitable for serious learning. The portability of smartphones obviously plays an important role in how and when people will use them.

Although participants in the Facebook page discussion state that they mainly do not use smartphones for academic work such as reading academic papers or writing a course assignment, there are some exceptional situations when they would do so. The portability of a smartphone enables its owner to use it for learning purpose under some exceptional circumstances. A HKU student described how he used his smartphone for study purposes in an emergency situation:

> I have downloaded and read a journal article on my smartphone once, during a dinner on a Mother's day. I had to leave my desk to have a dinner with my wife's mum and the deadline of my assignment was very close […] (HKU 04).

This coincides with the finding of Kukulska-Hulme *et al.* (2011) that the pressure of studying and assignment deadlines might persuade students to use their mobile phones for study purposes.

Although smartphones are rarely used for reading academic resources, they are still quite often used to perform activities that are closely related to academic learning. Students state that they often use their smartphones to discuss the course assignment with classmates through social media or chat apps:

> Basically, I don't use my smartphone for research since the screen is too small. But sometimes I would use my smartphone to have some quick discussions with my group-mates on projects through the social media apps (HKU 03).

The following statement by another student explains why smartphones are suitable for discussions about course assignments:

> I prefer to use mobile phone to discuss assignments with my classmates everyday as I can get a reply anytime (HKU 08).

Smartphone functionalities also enable LIS students to communicate quickly and efficiently with their colleagues. As mentioned earlier, most participants in our study use mobile messaging apps such as WhatsApp or Line for their daily communication with others so it is much easier to reach them through these apps than by e-mail. A students from HKU supports this statement:

> Before we would use e-mail to contact the colleagues, but colleagues would not always check their emails. With WhatsApp we can contact colleagues immediately because they use it all the time (HKU 07).

Students also use smartphones to access the class website to see if the new lecture notes are available, read the latest news from course management and learning platforms, such as Moodle, access the university official e-mail and even to record a face-to-face interview for a research project. The following comments from students illustrate these specific smartphone uses:

> Sometimes I would use it to check the class website to see if any new lecture notes are available but I don't read the documents by this device (HKU 03).

> Because the mobile phone has online function, sometimes I use it for study purposes. I use it to download files, check the latest news from HKU Moodle and read emails from HKU (HKU 02).

> My smartphone is beneficial for studying, entertainment and leisure. I always use it to drop notes, read the notes online, and do the simple homework (HKU 09).

> From recently, I often use iPhone for recording face-to-face interview and collecting information related to finding an employment (UT 01).

Some students mention using apps for a calendar and to-do list for study-related time management:

> A few things are very important from the very beginning I started to use my PDA: Dictionary, Calendar, and to-do list (HKU 10).

These findings coincide with the findings from the studies by Dahlstrom *et al.* (2013) and by Cheon *et al.* (2012) which show that students in higher education use their smartphones for academic purposes, such as finding course information (schedulers, exam results), accessing course learning materials or for discussing assignment and collaborating with classmates on course assignment projects. Similarly, Kukulska-Hulme *et al.* (2011) mention that along with reading e-books and academic papers, academic study may also involve activities such as recording a seminar or presentations, taking notes, doing interviews as a part of research, etc.

Study participants also use smartphones for learning related to their personal interests. A statement by a student illustrates this learning need:

> I also use my smartphone for my personal learning purposes. Except heavily using Google translate for reading articles in English, I also downloaded apps for learning Putonghua, XML, etc. (HKU 04).

It may be concluded that smartphones are very convenient for all kinds of learning related to people's personal interests and needs. The study findings show that LIS students are using mobile applications, such as Google translate, dictionaries, foreign language and IT learning tutorials for their own learning interests. A study by Bibby (2011) also finds for Japanese students that they often use cellphones for accessing dictionaries or other reference tools and for keeping diaries and schedules as well. There is not much difference between HKU and UT students in using smartphones for study and learning.

5.4 Use of library mobile services

Using library services with smartphones is closely linked to the topic of using smartphones for learning and study. We consider this category separately so that we can easily link our findings to other studies focussed primarily on the use of mobile library services. Uses of library mobile services were examined from the two perspectives: librarians' and students'.

5.4.1 Librarians' perspective. Before starting a discussion about the use of mobile library services by students participating in this research there is a need to look closer at mobile services currently provided by both academic libraries. According to our brief analysis of both libraries' mobile websites it can be concluded that both academic libraries provide extensive mobile services to their patrons. Both university libraries provide mobile services enabling their patrons to search the library catalogues and electronic databases, manage their circulation accounts, book computers and study spaces, find various information about the library and also to use some other services depending on each library.

Interviews with reference librarians from both academic libraries provide some additional information about the technological features of library mobile websites, actual use of libraries' mobile services and their plans for future developments in mobile technologies.

The reference librarian from HKUL explained that the library has already developed a number of mobile services that users could access from the HKU official app or from the library mobile website:

> We sent a staff member to work with HKU IT department on the library part of the HKU official app. This was under the HKUL 2011 opening theme of mobile service (HKUL librarian).

According to HKU library usage statistics (by the time of the interview), only about 2 percent of current services are used through mobile devices. Such a low rate of library mobile services use is surprising, having in mind a high-smartphone penetration in Hong Kong. The librarian explained that HKUL has been constantly monitoring users' behavior regarding mobile technology use in order to be able to plan for further developments:

> We do not conduct a separate survey on mobile services but we regularly watch users' behavior and technology change. Library mobile services usage is covered by HKUL yearly users' survey and by HKU intake student survey (HKUL librarian).

Although HKU librarians do not conduct surveys focussing specifically on users' wants and needs regarding library mobile services they obtain such data from surveys conducted by HKU for some other purposes and also form HKUL yearly users' surveys. Asked about HKUL library future developments in mobile technologies the HKU librarian explains that for the time being they do not plan any bigger changes to their

mobile services for the reason that the library already provides a solid infrastructure for mobile access.

The UTL reference librarian emphasized that they developed the library website by applying responsive web design. This technology enables library users to access library resources and services from any device, from a smartphone to a desktop computer:

> We used to have a mobile website for some services such as access to library catalog, managing library account, opening hours, new arrivals, contact information etc. Recently we developed a new website by applying a responsive design technology so that users can access UTL from any device (UTL librarian).

UTL, however, could not provide statistics on the mobile web access at the time of conducting this research. They possess data showing users' access to library website but from available data they are unable to identify users accessing the library website with mobile devices:

> We only have data about users' access to library website but we can't see from these data how many users access library from mobile devices (UTL librarian).

For their future development regarding mobile library services UTL librarian mentions mobile access to UTL discovery platform and extending services through social networking platforms such as Facebook, Twitter, Google+ etc.

Findings from the interviews with both academic librarians also show that both HKUL and UTL pay close attention to new developments in mobile technologies and widely apply mobile technologies to enhance library services. However, they do not have enough information on users' opinions regarding mobile library services.

5.4.2 Students' perspective. In spite of the well-developed library mobile services the study findings show that only a few LIS students mention that they use smartphones to search for and access resources from their university library. When they do, they often save or e-mail resources to themselves to read them at home later on their computers. Most students generally agree with the following statements:

> When both, computer and mobile device, are available for searching OPAC or downloading a journal article, I would, certainly, use my computer instead of my mobile device (HKU 04).

> I might use mobile to search OPAC. However, I never use mobile when I am at home, except for receiving calls (HKU 08).

These findings for HKU LIS students differ from the findings in Ang *et al.* (2012) study, where a very high percentage of Hong Kong respondents expressed their readiness to access library electronic resources. Since in Ang *et al.* (2012) study most of the research participants are students from Science and Engineering departments their different attitude toward using smartphones for searching library resources might be influenced by their disciplinary background. This is in line with the finding by Dresselahus and Shrode (2012) that a disciplinary study area has an impact on frequency of using mobile devices for learning and that, for example, engineering students use their mobile devices for learning more often than students in social science and education. Reasons for this different behavior in information seeking with smartphones might be affected by different types of resources students use, differences in proficiency with technology, etc.

Students from UT are slightly more likely to use smartphones for searching library resources, some of them quite often searching the academic library catalog with a smartphone. Comment from UT students demonstrate this:

> I often use my mobile phone for searching OPAC, but I have never used it to download learning materials. The screen is too small for reading (UT 03).

> I often use iPhone for learning purpose such as accessing resources from university library (UT 01).

Comparing our findings with those reported in Bomhold's (2013) study, we may conclude that participants in our study more often use their smartphones to access library services. This difference in findings might be explained by the fact that students in our sample work full-time, have less free time for studying, thus they often use smartphones for study purposes while on-the-go.

Although the book renewal might look as a very convenient library service for smartphone users it turns out that most of study participants from both universities do not use their smartphones to obtain due date notices for borrowed items or to renew them. The similar attitude applies to the booking of study rooms. Here are some typical comments from students:

> I never use a mobile for reserving books or for booking study rooms unless my computer is out of order (HKU 08).

> I haven't tried those functions yet, but I wouldn't mind to use those functions if necessary (HKU 03).

> I never used my smartphone to reserve a book (UT 04).

Some students explain that they have not used renewal and booking services so far but that they would not mind using them in future. They also think that the library overdue notice service is very useful. One student from HKU uses a smartphone to take care of his overdue books in his own way:

> I used to set a schedule on my phone for renewing my borrowed books. So, when my reminder rings, I renew the books via my phone (HKU 04).

The study findings about using smartphones for library services like overdue notices, book renewal and study room booking differ from findings by Ang *et al.* (2012) where students stated that they would very likely use these services if they were provided by their libraries. This difference might be explained again by the different disciplinary study profiles of students involved in these two studies.

5.5 Obstacles to using smartphones for learning and study

The major obstacle to using smartphones for learning for both HKU and UT students is that the smartphone screen is too small for reading academic papers. Some also mention that typing and document editing is slow and sometimes it is difficult to save the document. Comments from students illustrate this:

> The smartphone's screen is too small, so I use my iPhone only for social networking purposes (UT 05).

> The screens of smartphones are too small and I feel that using smartphones to research might not be easy. Typing is slower and it is more difficult to save documents (HKU 11).

Another reason for not using smartphones for study purposes is that smartphones are mostly used on-the-go and in these situations the surrounding is mostly not suitable for serious reading and learning. A HKU student explains it all:

> On the other hand, when I read the literature for my study, I would like to read it in a stable and quiet environment where I can concentrate on reading. This environment usually equals to my office, a library or my desk at home (HKU 03).

LIS students from HKU and UT do not differ much regarding the major barriers to using smartphones for learning. They mostly agree that the small size of the smartphone keypad and screen is an obstacle to using it for engagement with academic texts and that the quieter environment is more suitable for serious studies.

Bibby (2011) comes to a similar conclusion and discusses possibilities of developing more smartphone-friendly learning materials for students.

6. Conclusions and recommendations

This study demonstrates that LIS students widely use smartphones in everyday life and that the ways of using smartphones are highly determined by smartphone versatility, multi-functionalities, size and portability. The study participants use smartphones for communication, socializing, finding quick information for everyday needs and for entertainment purposes, such as reading comics, novels or news, playing games, listening to music and watching movies. The findings about smartphone use for everyday needs align with findings from studies by Kukulska-Hulme and Pettit (2009) and Kukulska-Hulme *et al.* (2011). Due to their features and capabilities smartphones are very convenient for performing the above mentioned activities when the users are on-the-go, e.g. waiting for buses, waiting at restaurants, etc. The smartphone is perceived as a single tool that serves a multitude of purposes with only a few keystrokes.

When it comes to using smartphones for learning the study findings are in accordance with the findings by Dahlstrom *et al.* (2013), Cheon *et al.* (2012), Cheung (2014) and Kukulska-Hulme *et al.* (2011). The behaviors and opinions of study participants do not vary significantly. Those who use smartphones for learning and study explain that smartphones can be effective if they are used for simpler tasks related to academic learning like accessing course materials, searching library catalogs, discussing course assignments with peers, recording academic contents, taking notes, etc. Therefore, it may be concluded that LIS students commonly use smartphones for learning and that they consider smartphones to be very convenient and useful for their academic work.

However, most respondents agree that the smartphone is not ideal for learning if it is being used for "formal learning" such as reading academic papers or editing documents. Major factors contributing to infrequent use of smartphones for "formal learning" are the small screen and difficult information input. Another reason that study participants may not use a smartphone for "formal learning" is that smartphones are mainly used while on-the-go, thus away from study-friendly environments like offices, libraries or one's home. Hence, smartphones are most often used in an environment that is noisy and distractive, which is not ideal for serious academic learning.

Although most of study participants agree that smartphones are not very convenient for academic reading and writing and explain that they prefer to do their academic work on computers in a quiet environment, some of them point out that smartphones can be vary handy in emergency situations where assignment deadline

clashes with some other professional or social obligations. Under time pressure they would use smartphone to retrieve and download academic materials, and also to read and edit an academic assignment. Kukulska-Hulme *et al.* (2011) came to the similar conclusion.

In addition, a number of study participants indicate that smartphones are also very useful for more personal learning such as learning a foreign language, consulting a dictionary, learning a programming language etc.

Although both academic libraries involved in this study provide a variety of library services for mobile devices, these services are still not used frequently. Study participants vary in their use of library mobile services. Some of them search library catalog, electronic databases or access a library account to reserve or renew books. Others, however, state that they do not use these services at all. Data available for HKUL on mobile access also indicate that library users very rarely use library services with their mobile devices. It may be concluded that both libraries might benefit from learning more about mobile services from users' perspectives by collecting data on mobile services. The study does not indicate any significant differences between HKU and UT LIS students in using smartphones for their daily needs or for learning purposes.

Based on these conclusions some recommendation could be made regarding teaching and learning with smartphones in higher education, and also for planning and developing library mobile services to support students' academic learning.

The findings of this research are aligned with a statement by Park and Jung (2013) that mobile technologies could be effectively used by educators not only for teaching and sharing of specific knowledge but also for helping in promotion of collaborative learning through social networking. Therefore, an important task for researchers in the area of mobile learning would be to identify different types of learning that are done through a smartphone, and then to explore how major features of a smartphone can be exploited to deliver the best learning experience.

Since this study provides an overview of LIS students' personal insights on the usefulness of smartphones for learning and their actual use of smartphone for learning purposes it prepares the ground for further, more extensive research on mobile learning of LIS students.

The challenge for academic libraries is to provide mobile access to their services in a way that their users will find suitable for their needs. To ensure this, they need to keep an eye on new developments in mobile technologies, investigate users' needs and wants regarding library mobile services and observe closely how these services are being used. Effective marketing of library mobile services would be important as well. Furthermore, libraries should not build their mobile services by following the rule "one size fits all" (Bomhold, 2014). Rather, each library needs to plan its mobile services by exploring the actual needs of users in their local environment.

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