Understanding Taiwanese mobile information access behavior

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Abstract:

As the growing of smart phone ownership, the mobile information service is becoming popular. Thus, no one should underestimate the potential of mobile internet and mobile app. However, what do people in Taiwan do with their mobiles? How do they use smart phone, especially the mobile application, to satisfy their information needs? The study about mobile device information service or mobile application needs is seldom in Taiwan. This paper reports on a diary and in-depth interview study performed to better understand library user's mobile information behavior, and focused on their mobile device application needs. The author is seeking answers to help improve the development of mobile service and speed adoption of library mobile information services. First, many public, college, and even private libraries in Taiwan have established library-related apps. However, the interviewees in this study did not use these library apps. Second, what is seen, heard, and thought of present situations generates information needs. This need could be regarded as a tipping point that forms an idea or task and then produces information-seeking behavior for completing the task. Finally, the previous models of information behavior could not be used to explain the characteristics of information-seeking behavior on the move. It is important to investigate library user's mobile information behavior and mobile application needs before proposing the library mobile information service. Understanding the why requires a deeper picture of what drives people to incorporate mobile Internet access into their daily lives. The contributions of this study are twofold: First, we could utilize the experienced mobile device users have about good mobile services and applications to provide new adaptive service for library users. Secondly, we could provide suggestions about what kinds of mobile applications which library can provide for users to promote their service.

Keywords: Mobile internet, Mobile information needs, Information access, Mobile device application (App), Library service

1 INTRODUCTION

Mobile Web access is currently being hyped as the next big thing for both mobile devices and Web search (Jones & Marsden, 2006). For example, the 2013 study shows that of consumers searching for local products and services, 45% tap mobile devices first, while 49% use PC/Online as their primary media resource. Although 54% of all mobile users (including smartphone and tablet) indicated usage of additional media sources to aid in their purchase decision, 46% exclusively used mobile as their default/primary research tool. The study also demonstrated that 50% of all mobile users rely on their device at the beginning of the

research process with 1 out of 3 users indicating they used their device throughout their entire purchasing process (xAd, 2013) .

In Taiwan, 51% of Taiwanese adult owning one in March 2013, up from 32% one year previously. 69% of the owners use smartphone everyday, and 81% of the owners with smartphone when going out (Retrieved Aug. 15, 2013 from http://news.cnyes.com/Content/20130813/kh9nwe1yi2n3k.shtml). So increasingly it is the norm to access the internet from small, mobile, handheld devices and to do so regularly, as a normal part of daily life (Walsh, 2012).

Facing the trend of fast growth of technology innovation, are libraries starting to respond to the demand for mobile device application service? The mobile phone provides an essential "any time", "any place" portal into the entire world wide web of knowledge (Boulos, Wheeler, Tavares, & Jones, 2011, p.3). It is a good chance for libraries to establish mobile applications to provide innovative services. What and how the libraries can do?

Before libraries elicit mobile application services, we need to understand what types of information people need while on the go and how they address those needs. Observing people's behaviors in such situations could point to improved mobile interface and system designs (Sohn, Li, Griswold, & Hollan, 2008, p.1). This study, therefore, seeks to explore how information use and mobile application services needs can vary in an environment where mobile devices provide quick and easy access to information on the move. The research questions this study addressed were:
1. How people use information and create new knowledge on the move.
2. What are the characteristics of users' mobile information behavior that could inform library information service design?

2 LITERATURE REVIEW

Simply providing mobile users with access to the internet and desktop tools is insufficient. Mobile users need applications and services that are designed to the particular requirements of mobile context and use. As just one example, mobile users are often preoccupied with the things going on around them. As a consequence, they often need to decide if they have sufficient time and attentional resources to access potentially useful information services (Sohn, Li, Griswold, & Hollan, 2008, p.1). The features of mobile device application, easy use, functional orientation, and fast information access, make applications become the primary information channel on the move. As Sohn, Li, Griswold, & Hollan (2008, p.7) addressed, first, they found that Internet users appreciated being able to address their needs on their own without having to call someone for assistance. Second, their participants were quite savvy with their phones, for example employing shortcut techniques to obtain information quickly.

Some research has been performed on adapting applications to match the user's context (Marmasse & Schmandt, 2000; Mihalic & Tscheligi, 2007). A First step some libraries take is to determine the library functions users want to access using smartphones. For example, students might want to access databases and course reserves, download citations, view a map of the library building and its physical resources, and ask a librarian for help (Seeholzer & Salem, 2009). The users also hoped to access online public access catalogs (PEACs) in order to assist with locating items within library buildings (Broussard, Zhou, & Lease, 2010). Mills (2009) found users wanted to select flat information by library apps, for example, library

hours, library maps, and contact information. North Carolina State University Libraries built their own app called WolfWalk, which overlays historical images from the library archives a more than 50 point around campus, as well as provides the basic library flat information of other library apps (North Carolina State University Libraries, 2010).

Customized mobile applications (apps) utilized by colleges and universities aim to build relationships with prospective students and families, connect with their current students, strengthen alumni bonds, and to engage communities (Kaya, 2010). Harvard, Princeton and other universities have developed location-based apps that provide users with a combination of digital historical markers, fun facts, and present-day frequently-asked questions about points-of-interest on their campuses, including information on all student services and resources, navigation, and safety (Klamm, 2010).

Bishop (2012, p.265) concluded 8 kinds of questions transactions: find an item, printing, circulation, desk supplies, computer, staff, room access and hours. The location-based questions include two types: wayfinding questions (e.g., "Where is room 105?"), and attribute questions (e.g., "What are your hours?"). Many queries do not relate to a specific location, such as a user who needs help with citation software (e.g., EndNote). Bishop (2012, p.269) concluded that a simple platform with flat information appears to be a better long-term, cost-effective approach, because content management allows the same information to be drawn into the library app when library Websites are updated.

The navigability to retrieve that information should be different on a library app, however, and simply mobilizing an existing library website may not be sufficient (Bishop, 2012, p.269). Mobile devices allow users more flexibility in their information behavior, but also provides new opportunities for library-based services (Hinze, Chang, & Nichols, 2010). Briefly, library-specific mobile applications include digital reference services (Dempsey, 2009; Lippincott, 2010), navigation aids for physical library environments (Aittola, Parhi, Vieruaho, & Ojala, 2004) and portable knowledge collections (Bainbridge, Jones, Mcintosh, Witten, & Jones, 2008; Hahn, 2009).

Information needs can arise as the result of complex interactions between people, the context and activities (Heimonen, 2009 , p.50:7). However, sometimes the needs emerge without any appreciable effect of context. Heimonen (2009 , p.50:7) classified context into 4 categories: location, time, activities and social interactions. Sohn, Li, Griswold, & Hollan (2008) found that location and time are prominent, making up approximately 45% of all information needs. Church & Smyth (2009) also note the importance of geographical and temporal cues. Sohn, Li, Griswold, & Hollan (2008, p.8) found, 72% of their participants'information needs were prompted by some contextual factor.

Mobile information needs are dominated by the desire for quick, often context-specific information particularly regarding local services, travel and trivia (Church, & Smyth, 2009). The types of information that users seek on the move are often factual, small elements of information. People look for the time of the next train, the way to the station or perhaps the closest place to eat while they are waiting. According to the report, one out of every three smartphone users search for a business's contact information (Lee, May 1, 2013). Amin, Townsend, Ossenbruggen, & Hardman (2009) report that 2/3 of their participants' (location-based) queries were to satisfy a "spontaneous need". "Spontaneous need" means a context-specific information need.

Heimonen's (2009 , p.50:3) research classified the information need into 15 topical categories: trivia, work/studies/hobbies, public traffic, contact information, interest, shopping, entertainment, health, business hours, news/weather, website, timetable, travel, content download, recipe. The largest category was trivia (26.5%). While trivia information needs lack a unifying thematic element, they tend to occur in quite specific contexts. The primary contexts for trivia needs were social situations and the home. The next two major category were work/studies/hobbies and public transportation. Most information needs reflect casual browsing behavior, For example, when shopping, customers maybe hope to check the price information or just for killing time on the bus.

Heimonen (2009 , p.50:6) proposed recurring information needs that arise repeated over time, such as looking up the latest news updates online every morning or checking the timetables for the usual bus lines when you leave for or from work. He classed recurring information needs as habitual and functional. Habitual refers to recurring needs that emerge out of individual interests and personal information management habits, e.g. checking fan pages for new messages about specific subject. Functional needs are associated with recurring activities where the participant needs to access the same or similar information repeatedly, e.g. checking the weather information.

Taylor et al. (2008) focuses on why the mobile subscribes access information on the Mobile Internet. The most frequent motivation is awareness. The author defined awareness as the desire to stay current, to keep oneself informed in general, e.g.; scanning email and checking news sites. Church & Smyth's (2008, p.255) study indicated when we looked at the intent behind the information need, many were non-informational in nature (approx. 42%), with geographical needs being very popular within the mobile space (>31%). Church & Smyth (2008) identified three key intents among diary entries: informational, geographical and personal information management (PIM). They also found many of these information needs have high temporal and location dependencies. In their study, Taylor et al. (2008) and Heimonen (2009 , p.50:4) divided mobile Internet usage motivations in utilitarian and hedonic. The former consist of pragmatic needs such as awareness and time management. The later includes curiosity, diversion, social connection and avoidance.

Based on the Church & Smyth's (2008, p.255-6) study, mobile needs differ from Web needs. The key factor that attributes to this difference is that mobile users are on-the-move and as such are interested in locating different types of content. When searching and using information in a fixed, traditional location, users search for a broad range of information, but this isn't the case for mobile use. The searches users carry out on a mobile device are much more likely to be an additional activity rather than the sole focus of their attention (Walsh, 2012, p.59). Users are therefore influenced by the primary activity they are also engaged in, in other words, the context in which they find themselves (Hinze, Chang, & Hinze, 2010).

If needs were addressed at the time they arose, participants indicated the following methods they used to address the need: Asked someone, called a proxy, called source, web browser, online maps, want to location, print beforehand and other means (Sohn, Li, Griswold, & Hollan, 2008, p.5). Heimonen (2009 , p.50:5) characterized information access approaches into the following categories: asked someone (3%), web access (e.g., use the Web browser on the mobile phone to access an known website, 31%), web search (60%), mobile application (3%), sms services (2%), other (1%).

Mobile search has become an increasingly popular way to locate content on the Mobile internet. There have been a number of studies that examine mobile search behavior (Baeza-Yates, Dupret, & Velasco, 2007; Church, Bradley, Cotter, & Smyth, 2008; Kamvar & Baluja, 2007; Yi, Maghoul, & Pedersen, 2008). Today mobile search still only accounts for a samll fraction of mobile information access (Church & Smyth, 2008). Kellar, Watters, & Inkpen (2007) classified mobile Internet behavior as followings: information seeking (fact finding, information gathering, and browsing), action support (in-the-moment and planning), and information exchange (transaction and communication).

Walsh (2012, p.58) compared the difference between fixed information searching and mobile information searching, and found that when people search on the mobile, there are some features as following: they search everywhere, need quick information, often context- or location-specific, and search narrow apps and individual specialist sites rather than open web. Cui & Roto (2008, p.909) classified information seeking into 3 subcategories: fact finding (e.g. search for a name, an address a word, et al.), information gathering (e.g. when making a decision, to collect knowledge around a topic), and casual browsing (e.g. a person used the mobile Web to access information but did not have a specific goal). Fact finding was the most common information seeking task in mobile Web, followed by casual browsing and information gathering.

3 METHOD

This study applied diary and in-depth interview methods to better understand library user's mobile information behavior, and focused on their mobile device application needs. Before conducting interview, this study applied observation method to find the heavy users of the National Central Library to be our participants. The observation was conducted from January 3, 2013, to February 5, 2013. We stayed at the National Central Library for a half twice every week to observe and identify active library users, that is, the population that uses the library frequently for a long time. After detecting several target populations, we discussed with them the general situation of their library use and asked them whether they were willing to assist in writing the journal.

The observation process is as following. The researcher selected seats wherein we can observe library users and stayed on each floor for more than one hour. After staying at one floor for one hour, the researcher went to other floors to observe the screened candidate readers and focused on the objects of our study. The researcher tried to find users who prioritized reading library books (many people bring their own books to read at the library on holidays). After determining the individuals who read library books, we unobtrusively checked whether they used smartphones in the library by observing whether a smartphone is placed on their desks. We did not approach these readers directly but listed them as candidates.

After observing these readers for five times or six times, we discussed with them our research purpose and verified their willingness to participate in the study. After identifying the readers who are willing to participate in our study, we sent letters asking them to help us by writing their daily records. Participants can randomly select 10 days within three succeeding weeks to write their records. The record contents include the information they gathered from papers and other print media, computers, and smartphones as well as their reading behavior.

This study considered using a smartphone application (app) to document information regarding the readers' library use as well as that concerning their daily lives. However, file transmission to computer via an app (e.g., MomentDiary) is not possible. Therefore, the traditional method of writing daily records was adopted in this study. We provided the participants with a writing format for reference, which most of them followed. This study first included 21 participants; however, 4 of which were unable to finish their records. Thus, we analyzed data from 17 participants.

After the daily records were finished, the participants were invited to an interview regarding the contents of their daily records to facilitate discussion between both sides (i.e., the researchers' and the interviewees') and to ensure record clarity. However, after interviewing three participants, we found that the participants repeat what is written in their daily records and could not provide supplementary data. Therefore, we adopted the snowball method to gather a new set of interviewees. This study also adopted data saturation theory. That is, the interview is stopped immediately when an interviewee could not provide new information. At the end of May 2013, 18 respondents were interviewed.

4 RESULT

.Contexts of information need while on the move

What we see, hear, or think of while we are on the move (e.g., traveling or checking weather conditions) are the contexts needed for accessing information. Some interviewees believed that mobile phones enable them to do something to pass the time, such as when waiting for someone. Thus, using mobile phones does not necessarily imply that one searches for information; some mobile phone users might browse their Facebook page, send and receive emails, or play online games.

The finding of information accessing behavior resulting from what was seen, heard, or thought of during the study was different from the definition of context in studies on Information behavior. Context refers to a personal situation affects information seeking behavior. The term "situation" includes environment, activity, type of information, and culture (Case, 2007, p.13). The definition of context is limited to factors that influence the findings of information seeking behavior. This argument is also different from information encountering. Information encountering refers to the background, issue, or several topics of interest related to the information that seekers found accidentally as they actively sought information on purpose (Erdelez, 1997).

.The information needs of users on the move

The information needed by users on the move includes traffic or map updates and food information. The interviewees often mentioned that they need information that helps them search for the recipe of local cuisine. They also searched for information concerning traffic, especially when they are unfamiliar with the road conditions.

.Mobile information access behavior

The participants usually use apps or browse websites on the move to meet their information needs. The types of apps used by interviewees are those related to entertainment (e.g., TV series, games, audio download, audio editing, music, and jigsaw), currency exchange, photos,

unified invoice raffle, dictionary, traffic information (e.g., map, public transportation time, traffic flow volume, and tourist attractions), communication software, calendar, weather condition, coupon, health (e.g., diet, exercise, weight loss), and accounting.

Among these types, functional apps or apps that provide fact information are favored by users. The action needs that meet the interviewees' cognition indicate that information should be fast, simple, and intuitive. An app that meets the intuitive information needs of users is one that immediately meets the user's needs the moment he or she opens it. However, apps have limited capabilities. For example, dictionary-like apps cannot provide a detailed explanation of words. Several interviewees mentioned the limitations of apps for finding taxis.

Previous studies have found that mobile users often search information on websites by using their mobile phones because mobile phones with small screens can be easily used on the move. No comparative study has been performed on behavior regarding the use of apps and browsing websites. By comparing the users' behavior on using apps and browsing websites, we found that one type of behavior is never greater than the other. This reason might be attributed to the different functions of the two activities.

. The characteristics of the information accessing behavior

This research found that the interviewees' behavior was induced by what they saw, heard, or thought at a certain time, which could be regarded as a type of tipping point. The portable feature of mobile phones met this requirement. For example, an interviewee said, "I collected information anytime and anywhere when I wanted to. However, the purpose of collecting information was not special. Anytime, I would search for contents I wanted by using my smart phone" (Interview 15:3–5). This notion forms a certain thought or task and seeks information to complete a task. The information access behavior on the move was more obvious.

News and events are the common tipping points. Basing on the daily records of interviewees, we learned that they searched information by using a mobile phone or a computer whenever they suddenly thought of something. However, the interviewees did not mention the sources of such sudden thoughts on their records.

The mobile phone met information user needs at different time periods. For example, one interviewee pointed out, "I would use my mobile phone to search information for a short time, such as while waiting for a bus or during free time in between classes. I prefer using the computer for long periods" (Interview 1:93–95). Interestingly, several interviewees reflected that they were hooked to their mobile phones. For example, one interviewee expressed, "My life was already occupied, and I decided to spend very minimal time on these technical products. I felt slightly ambivalent and excluded. Nevertheless, I accepted to use them later due to convenience" (Interview 5:393–395). The aforementioned interviewees had two contrasting views for using mobile phones at different periods. Some of them believed that mobile phones save time, whereas the others believed that mobile phones waste time.

Moreover, mobile phones meet immediate information needs. For example, an interviewee mentioned, "[I] use mobile phones for a short time for convenience. Sometimes, I need to open a computer but none is available" (Interview 1:101–102). This immediate information need was mainly reflected in the needs for food, transportation and entertainment (online games). Several interviewees indicated that they searched for related information by using

their mobile phones when the information at hand is incomplete (e.g., when searching the map of a certain place but information on the mode of transport to that place is unavailable) (Interview 4:125). Several interviewees opt to search information temporarily once they thought of something. For example, an interviewee considered haircut while shopping; thus, the interviewee went online to search without any idea of which haircutter to search for (Diary 8, February 8, 2013).

The popularity of social media, such as Facebook, transformed individual knowledge construction into social knowledge construction. Users can know their friends' current activities on the move. When users encounter problems, they could ask for help from their friends through the chat room. This notion was well described by Interviewee 8 by stating, "I only take a look at the mobile phone during free time; afterward, I check on the recent activities of my friends" (Interview 8:47–48). "I take a look from time to time" (Interview 8:53).

The design of mobile phones and computers is based on different working situations. Computers are designed at a 15-degree depression angle to enhance the users' focus while using them. By comparison, televisions are designed at a 15-degree elevation angle to promote viewer relaxation while watching TV. In this study, several interviewees expressed similar statements, "We use mobile phones on holidays to relax. We may also browse the Internet and watch music videos on YouTube" (Interview 2:48–49).

Finally, this study found that most users utilize multiple channels to meet their information needs. Therefore, dichotomy could not be used to investigate whether a certain information channel was replaced by another channel. Instead, a combination of multiple channels was employed by users to select an information searching method on the basis of their own habits and preferences.

5 CONCLUSIONS

Owing to new technologies, information needs on the move can be met immediately by mobile phones. Specifically, mobile phones add greater possibilities to people's lives. This study arrives at the following conclusions. What is seen, heard, and thought of present situations generates information needs. This need could be regarded as a tipping point that forms an idea or task and then produces information-seeking behavior for completing the task. The definition of "situation" provided in the previous studies was limited in the framework of information seeking and is unsuitable for explaining the situation resulting from information-seeking behavior on the move. This definition reflected the mode of previous information seeking behavior. For example, Wilson's (1981) "Information Need and Seeking," Wilson's (1999) "A Revised General Model of Information-Seeking Behavior," Savolainen's (1995) "The ELIS Model," and Ellis's (1989) "Model of Information Behavior" could not be used to explain the characteristics of information-seeking behavior on the move. Information accessing behavior on the move has the following objectives: (i) to meet immediate searching needs at random time periods, (ii) to address information needs, and (iii) to cope with the popularity of social media. For example, Facebook transforms personal knowledge construction to social knowledge construction to meet its users' information needs via multiple channels.

This study has several limitations. The research data gathered were less comprehensive than expected. Beside, this study did not consider the urban–rural gap problem. The original

objects of this study were the extensive users of National Central Library. We presumed that these users have in-depth understanding of the functions of the library and that they could represent the population who has certain requirements for library apps. However, these extensive users of the National Central Library emphasized only on masteral and doctoral theses or special collections and had limited cognition of other functions of the library. Therefore, this study considered librarians and readers who frequently use the City Library as research objects by using the snowball method. The analysis also revealed that the empirical materials were less comprehensive than expected. Nevertheless, the data reflected that the users use apps because they are fast and functional. Given this behavior, the users were unable to immerge into in-depth experience and cognition. In general, the research materials were slightly insubstantial. An urban–rural gap also exists in terms of network speed and mobile phone popularity. All interviewees in this study resided in Taipei. The results of this study could be different if it will be extended to all counties and cities in Taiwan. Thus, this extension should be considered in future studies.

6 ACKNOWLEDGMENTS

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