Exploring the adoption of mobile Internet services by socioeconomically disadvantaged people: a qualitative user study

ABSTRACT

Purpose: This study aims to identify enablers and inhibitors to the adoption of mobile Internet services by socioeconomically disadvantaged people. This is an understudied population adversely affected by digital inequality.

Design/methodology/approach: A qualitative study combining a questionnaire and semi-structured interviews. Thirty-two socioeconomically disadvantaged people explored mobile Lottery services and subsequently were asked a series of semi-structured questions about their perceptions of the technology.

Findings: Users' attitudes toward mobile Internet services were ambivalent. They experienced some advantages of smartphones (including escaping spatiotemporal constraints, fashionableness, privacy and cost-effectiveness) and conceived of mobile Internet services in terms of social advantages (including their ubiquitous nature, fitting in socially and fear of being 'left behind'). However, they also experienced barriers and concerns, such as limited mobile data packages, external barriers from mobile services (including security concerns, complex online help tutorials, irrelevant pop-ups and a lack of personalized services) and internal psychological barriers (including technophobia, self-concept and habitus).

Research limitations/implications: The findings are of limited generalizability due to the small size of the sample. However, the study has implications for understanding the acceptance of technology among socioeconomically disadvantaged people.

Social implications: The study has social implications for bridging digital inequality in terms of socioeconomic status.

Originality/value: While previous studies have primarily focused on enablers of adopting mobile Internet services by active users, this study reveals both the promise of and the barriers to the use of such services by inactive users who comprise an under-served population.

Paper type: Research paper.

Keywords: Mobile Internet services, Disadvantaged people, Technology acceptance, Digital inequality, Enablers, Inhibitors, Online lottery

1. Introduction

Individuals have increasingly used smartphones in recent years (Source Digit, 2012); worldwide, mobile phones have overtaken personal computers (PCs) as the most common device for accessing the Internet (Gartner, 2010). Resultantly, a variety of mobile applications have been launched in domains including social media; finance; education; entertainment; health and government (Mosa *et al.*, 2012; Zarmpou *et al.*, 2012; Hoehle *et al.*, 2015). The Android market featured over one million apps and 50 million downloads in 2013; in 2014, smartphone users accessed an average 26.7 mobile apps, on which they spent an average of 37 hours and 28 minutes per month (Nielsen, 2015). Mobile Internet applications – small programs that run on a mobile device (such as smartphones and tablets) and perform services ranging from banking to gaming and web browsing – have clearly become a common channel for individuals to access multiple self-services (Adipat *et al.*, 2011; Liu and Li, 2011; Zhou, 2012); indeed, they have become both pervasive and integral to modern life.

However, not all citizens fully experience the benefits of this economy. Digital inequality prevents the socioeconomically disadvantaged from exploring digital opportunities (Hsieh *et al.*, 2008). People with the means to access and use these digital technologies become the 'haves', while those without the means become the 'have-nots'. Although mobile technologies aim to assist people in every aspect, these often do not meet the specific needs and requirements of disadvantaged groups, leaving this potential virtually untapped (Mervyn and Allen, 2012; Venkatesh and Sykes, 2013). In an information-driven, Internet-enabled environment, access to digital resources is a critical component of social engagement (Hoffman *et al.*, 2000). Hsieh *et al.* (2008) have argued that, as such, the digital divide is one of the most critical issues in the knowledge economy.

Most governmental digital inequality initiatives have emphasized technology access (DiMaggio *et al.*, 2001). However, experience suggests that the key to reducing digital inequality is not only to provide access to basic technology, information and services but also to improve the skills necessary for using the technology (Gitau *et al.*, 2010; Wei *et al.*, 2011; Racherla and Mandviwalla, 2013). For example, in China, an online train tickets system was recently developed by government to reduce the crush of purchasing tickets during the Spring Festival. However, the major potential users – urban migrant workers – were unable to use the system due to a dearth of computer and Internet skills (Deng, 2014).

This reflects the imperative to overcome barriers to disadvantaged people using Internet technology-based services in China.

Studying the adoption of mobile Internet applications by disadvantaged people is particularly interesting for three key reasons. First, competition among mobile applications is increasingly fierce. The latest market research shows that many applications are not successfully adopted (Deloitte, 2012; Tiongson, 2015), with 80% being downloaded fewer than 1,000 times (Deloitte, 2012), only one in four downloaded apps being used daily, and one in four remaining unused (Tiongson, 2015). This evidences the need to explore what factors affect the adoption of such services and why. Second, disadvantaged people are more likely to need mobile Internet services but remain under-served. For instance, elderly people are significantly less likely to use the Internet than the average population, even though it could greatly benefit their daily lives (Niehaves and Plattfaut, 2014). With the development of mobile Internet and the proliferation of smartphones, the potential for disadvantaged populations to engage in mobile Internet is huge (Mallenius *et al.*, 2007). Third, the successful adoption and use of mobile Internet-based services by disadvantaged people has major implications for digital equality; such services are expected to be a cornerstone for improving quality of life through greater access to education, entertainment, healthcare and government for marginalized people (Hsieh *et al.*, 2008).

Despite these significant implications of expanding access to mobile Internet services for socioeconomically disadvantaged people, there is limited theoretical understanding of how this can be done and numerous questions remain unexplored. For instance, little is known about how disadvantaged people shift from traditional offline services to mobile online services; how they perceive the usefulness and quality of mobile Internet services; what interventions could benefit their adoption and use, or whether existing models are applicable to mobile applications and disadvantaged populations. It is impossible to embody all of these questions in one study; in response to the notable lack of efforts in this particular field, this study focuses on highlighting the enablers of, and barriers to, the adoption of mobile Internet-based services by disadvantaged people. Rather than the quantitative approach usually used by IT acceptance researchers, this study employs a qualitative methodology, taking mobile Lottery services as a case study and conducting in-depth interviews to explore enablers and inhibitors in detail.

Specifically, the following two research questions were addressed:

RQ1: What enablers prompt socioeconomically disadvantaged people to use mobile Internet services in daily life?

RQ2: What barriers exist for their adoption of mobile Internet services?

This research enhances our understanding of the factors associated with the usage of mobile Internet services by groups adversely affected by digital inequality. It also has practical implications for software application companies aiming to expand their user base and to provide services for disadvantaged people.

The remainder of the paper proceeds as follows. The next section reviews relevant studies on disadvantaged people's interaction with mobile Internet services and individual acceptance of information technology. The study's research design and methodology are then presented, followed by the study's findings. The contribution and implications of the study are subsequently discussed. The conclusion details the study's limitations and provides recommendations for future research.

2. Related studies

This section reviews the literature in two areas: disadvantaged people's interactions with smartphones in the information behavior community, and individual acceptance of information technology in the information system (IS) adoption community.

2.1 Disadvantaged people's interactions with smartphones

'Disadvantaged people' refers here to socioeconomically marginalized groups, who are under-served, disadvantaged or underrepresented in access to, and knowledge of how to use, information technology (Jaeger *et al.*, 2012). Such socioeconomic disadvantage is found in different populations; for example, elderly people (Niehaves and Plattfaut, 2014); the homeless (Hersberger, 2003); disconnected minorities (Barbatsis *et al.*, 2004); rural households (Zhang and Wolff, 2004) and urban migrant workers (Thomas and Lim, 2010). Previous studies have indicated that several factors – including physical conditions; education level; geography; age; language; literacy and ethnicity – may contribute to this disparity (Hoffman *et al.*, 2000; Jaeger *et al.*, 2012; Venkatesh *et al.*, 2014).

Over the last few years, the information behavior community has paid increasing attention to disadvantaged people's interactions with smartphones and mobile Internet. To name a few notable examples, Kim and Zhang (2015) interviewed 20 low socioeconomic status Hispanic adults to study their use of smartphones for health information. They found affordability was an important reason for the participants to use smartphones; users mostly used the mobile web rather than apps, for which they

lacked the knowledge and skills to effectively use. In their work on indigenous South Australians, Du et al. (2015) employed questionnaires, semi-structured interviews and field observation to investigate the indigenous people's information practices and Internet use. They observed that smartphones were one of the most frequently used devices to access the Internet in this region. Indigenous people preferred to use mobile Internet for information searching, online games and social media. The use of smartphones and mobile Internet is consistent with the strongly oral and visual culture of the indigenous community. Using the method of ethnographic interview, Thomas and Lim (2010) explored information and communication technology (ICT) use by female migrant workers employed as maids in Singapore. They found that mobile phones were the most crucial communication device for most of these women, who used them to foster emotional links with their friends and family, grow their social networks, seek better job opportunities and manage their personal matters. Martin and Abbott (2010) explored the use of mobile phones in agricultural development in Uganda with the semi-structure interview method; they found that farmers used their phones for purposes including obtaining market information, monitoring financial transactions and consulting with experts.

Recent studies on the digital divide have found that the popularity of mobile Internet in public life can be seen as a way of bridging the divide due to its ubiquity, low cost and convenience (Mervyn and Allen, 2012). For example, Martin and Abbott (2010) argued that the diffusion of mobile phones into rural areas in Uganda brought great changes for the local people, and Horrigan (2009) reported that the digital divide in the US was halved when mobile devices were included. Mobile phones are much more affordable than personal computers to socioeconomically disadvantaged populations (Docksai, 2011). Low-income adults and elderly people are increasingly using mobile devices to conduct online banking, find jobs, access medical help and obtain entertainment information (Docksai, 2011). Fishermen in remote areas were found to search market prices across the country using smartphones (Chhachhar and Omar, 2012). Residents of rural areas in which doctors are sparse can use their phone to find city-based doctors (Docksai, 2011). As such, Internet-connected mobile phones and other handheld devices present great potential for empowering disadvantaged people and ultimately enhancing their social engagement (Chigona *et al.,* 2009).

2.2 Individual acceptance of information technologies

A significant body of information systems (IS) literature aims to understand individual acceptance and use of information technologies. Davis (1989) was the first to introduce the concept of individual technology acceptance into the IS area with his technology acceptance model (TAM). TAM was derived from the theory of reasoned action in psychology and tailored for IS. It examined the mediating role of perceived usefulness and ease of use in relation to systems characteristics and the probability of

system use. Thompson *et al.* (1991) adapted the theory of interpersonal behavior to predict personal computer (PC) utilization and individuals' acceptance of a range of information technologies. Moore and Benbasat (1991) adapted the characteristics of Rogers's (1995) innovation diffusion theory (IDT). The prediction validation of innovation characteristics was supported by a variety of information technologies. Venkatesh *et al.* (2003) proposed a unified theory of acceptance and use technology (UTAUT), which integrated the elements of eight prominent models; this had excellent explanatory power and had been widely employed in studies of various IT innovations.

Acceptance behavior is influenced by a variety of antecedents, which previous studies have condensed into three key categories: utilitarian, social influence and perceived behavior control (Table 1). Collectively, these models and antecedents provide a reasonable understanding of why and how people use technologies, and have contributed greatly to IS research. However, it is notable that these studies focus on potential users who actively adopt new technologies, such as college students (Davis, 1989; Choi and Stvilia, 2014; Kim et al., 2014) and professionals (Moore and Benbasat, 1991, Thompson et al., 1991; Venkatesh et al., 2003; Wu et.al, 2011). Conversely, only a handful of studies have focused on socioeconomically disadvantaged people, who are far less likely to be active adopters of such technologies. For example, McKenzie et al. (2014) explored socioeconomic differences in university students' access to and use of technologies with a wide range of questionnaire survey. They found that students from low, medium and high socio-economic status backgrounds had similar access to equipment and there were no difference in their common use of technologies. Niehaves and Plattfaut (2014) employed two technology acceptance models, namely, Unified Theory of Acceptance and Use of Technology (UTAUT) and Model of Adoption of Technology in Households (MATH), to investigate Internet adoption among elderly people. Their results showed that UTAUT and MATH were able to explain more than 70% of the variance in Internet adoption intention and the additional inclusion of four socio-demographic variables of gender, income, age and education led to a significant increase of the coefficients of determination. Sipior et al. (2011) applied TAM to e-government services usage among members of a socioeconomically disadvantaged community. They found perceived ease of use, level of education, employment status and household income of community members were significant determinants of e-government services usage. Drawing on capital theory, Hsieh et al. (2011) conducted a field survey to study socioeconomically disadvantaged people's intentions to use ICT. They found that intention to use was affected by intrinsic motivation for habitus, self-efficacy for culture capital, and important referents' expectations and support from acquaintances for social capital.

Further, the aforementioned studies – as well as a significant body of literature in this area – focus on factors that foster adoption and usage. They studied antecedents of system satisfaction and

perceptions that create positive attitudes and encourage usage. For example, TAM, UTAUT, and MPCU focus purely on adoption enablers such as perceived usefulness, effort expectancy and job–fit. However, limited research has investigated what factors inhibit usage. Socioeconomically disadvantaged people may face numerous barriers to adopting technological innovations. Against this backdrop, and based on the theoretical lens provided by individual acceptance of information technology, this study focuses on socioeconomically disadvantaged people's adoption of smartphone-based self-services to identify factors that both enable and inhibit their use.

[[insert Table 1 here]]

3. Research method

Quantitative modeling approaches have dominated research in IS acceptance. In contrast, a qualitative methodology commonly used by information behavior community is employed here, utilizing semi-structured interviews to generate detailed data on disadvantaged people's perceptions of mobile Internet services (Table 2). This approach is particularly valuable for research with socioeconomically disadvantaged and "vulnerable" groups because it gives a "voice" to participants, allowing them to define what is relevant and important to understanding their experiences (Dickson-Swift *et al.*, 2007).

[[insert Table 2 here]]

3.1 Data collection

3.1.1 Study participants

Age, income and education are generally considered to be the most significant factors predicting use or non-use of IT; other factors contributing to digital inequality tend to correlate with these (Hsieh *et al.*, 2008; Niehaves and Plattfaut, 2014). As such, this study used age, income and education as screening conditions for recruiting socioeconomically disadvantaged people. To maximize chances of recruiting eligible participants, we contacted an elderly activity center and a migrant workers' construction site. A screening survey was administered to collect information concerning potential participants' age,

education level, income, and experience of Lottery purchasing. A snowballing technique was adopted, asking participants to recommend eligible others to participate in the interview.

As a result, 32 low-socioeconomic status people were selected to participate in the study. The participants were migrant workers, house cleaners, small traders, unemployed and retired people living in Nanjing, China, who either had not obtained bachelor degrees, had a low annual income or were over 50 years old. In addition, all participants had purchased Lottery tickets from traditional (offline) sites and had been playing the Lottery for an average of 4.3 years.

3.1.2 Services experience platform

To delve deeper into participants' perceptions and experiences, this study focused on online mobile Lottery services. This was one of many trends taking place in the mobile commerce markets. It was expected that disadvantaged people could anchor their perceptions more concretely after direct interactions with a specific mobile Internet service. We chose the mobile Lottery application as a case service because it did not require a high level of education or income and because socioeconomically disadvantaged people accounted for a large proportion of Lottery players in China (Shen, 2000). As a fact, traditional Lottery selling sites are distributed almost in every community of China cities for ordinary people to buy even with changes from shopping. People including those disadvantaged ones frequent Lottery services through traditional channels with hopes of bonuses. As such, disadvantaged people were greatly interested in participating in our survey and this provided us with convenience in sampling.

The mobile Lottery application used in the study – Suning Lottery – can be freely downloaded from the Android and app stores. It provides one-stop purchasing services – including information queries, number selection, payment, and checking the winning results – for different categories of lotteries (Suning Lottery, 2014). It is a popular mobile Lottery application, widely used in China.

3.1.3 Data collection techniques and procedures

Data collection techniques included a background questionnaire, services experience and post-experience interview. Data was collected individually and each participant followed identical procedures. First, participants completed the background questionnaire, including gender; education level; personal annual income; employment status; home location; smartphone ownership; Internet access; smartphone use; and experience of Lottery purchasing. Then participants read and signed the consent forms, which stated that all monetary rewards from the Lottery services experience would be attributed

to the participants and all monetary costs derived would be attributed to the researchers. Participants were then required to purchase three different categories of lotteries on the application platform, which lasted around 10 minutes; researchers provided guidance when participants met difficulties. Participants were also required to complete the payment procedure and check the winning results, thus covering all major functions of the application platform.

Following the service experience, a semi-structured interview was conducted with each participant. Participants were asked to briefly talk about their experiences of accessing and using mobile technologies; their experiences of purchasing Lottery tickets using the smartphones; barriers and difficulties encountered during purchasing; and their intentions regarding using smartphone-based services. If participants provided insufficient information for the researchers to make sense of the enablers or barriers influence their perception, probing questions such as: “can you talk more about…?” and “are there any other reasons for you to…?” were asked. To capture participants’ meanings and elicit more detailed information, the interviewers also reaffirmed each factor mentioned by participants and asked follow-up questions, such as: “you said you are afraid of using the mobile Internet service; why?” and “You said you like to purchase Lottery in the traditional Lottery site even though the mobile lottery is more convenient; what’s the reason for that?” On average, each interview lasted about 30 to 40 minutes. At the end, the researcher collected all the documents and gave 20 RMB (equivalent to approximately US$3), to each participant to thank them for their participation.

Data was collected for 12 days (23 December 2013 to 3 January 2014). The service experiences and interviews were scheduled at the participants’ convenience in places chosen by them. As a result, data was collected in various places, including traditional lottery sites; an urban migrant workers’ dormitory; a canteen; a grocery store; a fruit store; and an elderly activity center. All interviews were audio-recorded and later transcribed for analysis.

3.2 Data analysis

Questionnaires were imported to Microsoft Excel for descriptive analysis and transcribed interviews were analyzed using qualitative content analysis (Schamber, 2000). The researchers were especially interested in investigating the adoption behaviors of disadvantaged people, studying what factors enable their use of mobile Internet services and what barriers exist. Initial high-level categories were established based on our research objective and the human–system interaction nature of IT, including enablers and inhibitors relating to mobile Internet services, users, and social surroundings (see Figure 1). Two researchers first independently analyzed five transcribed interviews, applying an open coding approach to identify subcategories of enablers and inhibitors for each related factor. New high-level

categories emerged. The mobile Internet services-related factors were eventually divided into two categories: smartphone characteristic-related and services system-related. Comparison and discussion then took place regarding discrepancies and uncertainties in the coding results of subcategories. The authors used constant comparison to ensure that the subcategories analysis represented all perspectives of the meanings and interpretations expressed by participants. Discussions were held until the authors arrived at an agreement on the high-level categories and subcategories. A complete coding scheme was thus developed, which the two researchers used to independently analyze all transcriptions. The percentage of agreement of the two researchers reached at 91.4%.

[[insert Figure 1 here]]

4. Results

4.1 Demographic and socioeconomic profiles of participants

Participants' demographic and socioeconomic profiles (shown in Table 3) confirm that participants were socially and economically disadvantaged as a whole. Participants had relatively low educational attainment: 2 participants got the elementary school education, 16 of them obtained junior high school education, 9 of them had achieved senior high school or vocational and technical school education, and only 5 participants had got the chance to study in universities or colleges. In terms of their personal income, 11 of the participants earned over 20,000 RMB (US$3,048) annually, 12 participants earned 10,000-20,000 RMB (US$1,524-3,048), and 9 participants earned less than 10,000 RMB (US$1,524) annually. Totally, 21 of 32 participants reported incomes lower than the annual minimum wage standard prescribed by the Nanjing Municipal Government **[1]**. Employment status demonstrated 12 participants were employed full time as migrant workers, followed by 11 self-employed as small traders and 5 participants worked part time as house cleaners. The number of participants who were unemployed and in retirement was 1 and 3 respectively. The participants' home locations were also reported. Among the 32 participants, 17 came from rural villages. Even though they got chances to work in city, they had to leave their family and live in construction sites or rental rooms. There are 9 participants who were from towns or third-tier small cities. Only 6 participants had their own houses in the modern city Nanjing.

[[insert Table 3 here]]

4.2 Mobile technology access and use

This section explores whether or not mobile technologies were available to participants, and then reports their actual use of such technologies. Access to two forms of mobile technology was investigated: smartphones and mobile Internet. All participants except for five (84%) owned a smartphone, the price of which ranged from 100 RMB (US$15.24) to 2,500 RMB (US$381). Brands included Samsung; Oppo; Nokia; China Mobile; and China Telecom. In terms of Internet access, 18 of 32 participants (56%) accessed the Internet through a paid mobile data package; five participants (16%) reported sometimes accessing Wi-Fi in public areas, such as train stations, restaurants, and public libraries; and 9 participants (28%) said they neither accessed, nor knew how to access, mobile Internet. Smartphone-owning participants had an average of three years' experience of smartphone use, varying from two months to six years. The commonly used features of smartphones were calling, text message, clock, calculator and calendar. It is worth noting that participants' use of smartphone-based Internet services was meager: only 15 participants had used social networking sites (such as QQ and WeChat **[2]**); only two had used online shopping (once and four times respectively), and only one person had played games online. So while most participants owned smartphones, they rarely used most of the functions beyond those mentioned.

4.3 Factors enabling use of mobile Internet services

Analysis of the interview transcripts revealed motivating factors that enabled the use of mobile Lottery services. Four categories of motivating factor were identified, relating to smartphone characteristics, service systems, user, and social surroundings (Table 4). Due to the small sample, these findings are not statistically generalizable; however, they remain indicative for identifying motivating factors and their popularity.

4.3.1 Enablers related to smartphone characteristics

Four enablers related to smartphone characteristics were identified: escaping spatiotemporal constraints, affordability, fashionableness, and privacy of smartphones.

The most common motivating factor relating to smartphone characteristics related to spatiotemporal constraints, cited by 50% of participants. Escaping spatiotemporal constraints refers to the ability to

carry smartphones and use smartphone-based services from anywhere and at any time. Because of the ubiquity of smartphones, participants felt that it was convenient to use one anywhere; it was easy and could save time:

Participant 2: "I always bring my phone in my pocket, it is small, very convenient."

Participant 4: "I don't need to go to the traditional Lottery site. With this mobile Lottery, I could buy lotteries on my phone."

Participant 5: "I usually use QQ to chat with my family. I don't go home often, I live in the construction site in the whole year. QQ is very nice. With it I could see my family and talk with them."

Participant 14: "I don't have to go home and do all these things on my computer. I can do it on my phone."

Compared to a computer, smartphones were also much more affordable to participants; 12 of 32 (38%) reported that they had never owned home computers and that their smartphones were thus their only devices for accessing the Internet. Affordability was an important factor enabling the use of smartphones for self-services:

Participant 5: "I can't afford a computer, neither a place to put it. I live in the construction dormitory with other migrant workers. We have no space to put a computer."

Participant 14: "I bought my phone from China Mobile [a telecommunication company in China]. It only cost me 20 RMB per month for one year, and then I could own it."

Three participants also mentioned fashionableness, even though it was rarely seen as an enabler. Using a smartphone is regarded as fashionable and enables keeping up with others. As one young migrant worker reported:

Participant 7: "Purchasing Lottery on a smartphone is cool … I think it's a tendency that people use a smartphone to do many transactions."

Another valued characteristic of smartphones was privacy. One participant reported that buying Lottery is a private thing and that he did not want others to know. Compared to offline sites, in which he always meets friends, acquaintances and peers, buying Lottery on a smartphone is more private.

4.3.2 Enablers related to service systems

Perceived usefulness (PU) has been extensively accepted and empirically validated as an important factor contributing to IS adoption. In this study, PU refers to the Lottery service providing the basic features that service users need. For example, users could choose from various categories of lotteries; pay for them; check the winning results; and communicate with other players on the mobile Lottery platform. Twenty-five participants (78%) mentioned the usefulness of mobile Lottery system. For instance:

> Participant 10: "It's fantastic. The application offers all the lotteries I used to buy…"
> Participant 17: "Whenever I want to buy Lottery, I could complete it with the application. It can totally satisfy my need, buying and checking [lotteries]."

Relative advantage refers to the degree to which the mobile Lottery service is perceived as being better than the traditional Lottery site service. Nineteen participants (59%) compared the traditional and mobile lotteries when reporting their reasons for accepting the mobile service. They viewed the mobile Lottery service as more convenient, efficient, and advantageous than the traditional service:

> Participant 7: "There is no Lottery site near my home. Usually I go to a site about three kilometers away. But if I could use this application, I don't need to go there."
> Participant 8: "I think [purchasing lotteries on] this application is similar to [purchasing lotteries at] the Lottery site. But with this application, I could buy lotteries at any time."
> Participant 11: "It saves time. No worry for queuing [in the Lottery site]."

4.3.3 Enablers related to users

Prior experience with similar technologies played an important role in the participants' adoption of new technologies: those with experience of using information technologies – such as computers, Internet, and online shopping – were more likely to hold positive beliefs about the mobile Internet services. Eight participants (25%) mentioned technical experience as a factor motivating their intention to adopt new technologies. For example, a participant who had shopped online on one occasion said:

> Participant 8: "Buying lotteries on a smartphone is just similar to buying something on a computer. They are actually same. I have even bought a sweater online; it is not that hard."

The experience experiment provides a chance for participants to first try the mobile Lottery service. Participants reported feeling resistant or skeptical before having contact with the new service, but subsequently feeling much more positive, or at least comfortable, with the service. Five participants

(16%) mentioned that this initial use was a positive experience for them, and was thus an important factor for motivating their acceptance and use. For example:

> Participant 4: "Before the experience experiment I thought I was OK. I didn't think I needed to use the mobile Lottery. I didn't see how it fit into my life. But after the first try, I think it's very convenient to conduct services on the smartphone. I love this application."
>
> Participant 17: "It is an enjoyable experience. Thanks for your patient guidance. I become more confident to use the smartphone."

4.3.4 Enablers related to social surroundings

An important factor related to social surroundings is the perceived ubiquity of mobile Internet services. The participants held a common sense that such services were pervasive and widespread in everyday life. As one participant, who had never used mobile Internet services, said: "I think everyone is using smartphone for daily transactions except for me".

Family members, co-workers, and friends were reported as sources of social influence in adopting new forms of technologies and services. Participants tended to follow others' adoption decisions, motivated by the desire to be consistent with others:

> Participant 5: "I use QQ for video chatting with my son. He taught me how to use it."
>
> Participant 8: "I remembered that all of my friends were talking about online shopping on Boxing Day last year, but I have no idea at all. I feel excluded from them. So I install an app on my smartphone … But until now, I still don't know how to use it."

In addition, two participants – both of whom were elderly – expressed their feelings of being "left behind" from new technologies and services and concern about the fast pace of technological change and ubiquity of mobile Internet services:

> Participant 2: "I feel I'm excluded from all of the new technologies. Everyone is using mobile Internet, but it is a bit difficult for me to learn how to use it."
>
> Participant 29: "It is changing too fast. I can't catch up with technologies. Yeah, just because I don't know what to do with it."

[[insert Table 4 here]]

4.4 Factors inhibiting use of mobile Internet services

Three categories of factors inhibiting the use of mobile Internet services were identified, relating to smartphone characteristics, service systems, and users (Table 5). Again, due to the small sample size these findings are not statistically generalizable; however, they remain indicative for identifying inhibiting factors and their popularity.

4.4.1 Barriers related to smartphone characteristics

Nine participants (28%) reported that they paid for a limited mobile data package per month. To ensure that they did not surpass the limit, they used the data carefully. Some only used data for social networking, and some relied on Wi-Fi at public places such as restaurants and train stations. Only two mentioned that they could access Wi-Fi at home. Paid mobile data packages impose a cap on how much data one can access using smartphones, and thus limit the use of Internet-based services:

> Participant 30: "I subscribe a prepay plan. It contains 200MB data and 500 minutes calling. Only 20 RMB per month. But if I surpass the limit, I have to pay for 1 RMB for 1 MB."

4.4.2 Barriers related to service system

Participants experienced varying levels of difficulty in using the platform. The barriers related to the service system can be summarized as security and privacy; complex online help tutorial; relative disadvantage; irrelevant pop-up requests; and lack of personalized services.

Security and privacy were significant concerns to participants when using the mobile Lottery service, with 15 of 32 participants (47%) mentioning this. Participants' reluctance to use the service was partly due to uncertainty about its characteristics. One participant commented that he was not able to touch, feel or see the actual goods. Compared to the electronic Lottery, the paper Lottery purchased in traditional sites made people feel more at ease. The Lottery platform required users' smartphone numbers to log in and their bank account details to pay and to receive winnings; most participants were concerned about the security of disclosing this private information.

Another barrier to using the system was the complex online tutorial; such online instructions are often said to have been written from one engineer to another. As one participant suggested, even though he was an experienced Lottery player, having partaken in purchasing lotteries in traditional offline sites for

more than ten years, he still could not figure out the rules of the system. The instructions were too long and the language was full of jargon, making it very difficult for him to understand.

Relative disadvantage refers to the degree to which the mobile Lottery service is perceived as being worse than the traditional Lottery site service. Six participants (19%) compared the traditional and mobile Lottery sites when reporting barriers to adopting the mobile service. They suggested that the mobile platform did not offer the features of winning records figures, purchasing recommendations, or communication between Lottery players offered by traditional lottery sites:

> Participant 9: "I usually go to one Lottery site. I am familiar with the conductor, he always gives me some useful recommendations."
>
> Participant 27: "At the Lottery site, I could communicate with other Lottery players. We discuss which number should pick up. I have lots of fun from the communicating."

Four participants (13%) mentioned irrelevant pop-up requests (for example, game advertisements) as an inhibitor. They reported that the advertisements interrupted their transaction and wasted unnecessary attention and time:

> Participant 11: "I clicked a pop-up window, and soon found it was an advertisement. I managed to quit the advertisement page and continue to proceed the transaction. It wastes time."
>
> Participant 19: "I see, pop-up advertisements are very normal. But sometimes annoying."

Most people's eyesight declines with age, and poor vision was a barrier to elderly people using smartphones for self-services. However, this issue could be overcome through offering personalized features for older people, as one elderly participant suggested:

> Participant 29: "My son bought me a smartphone on my birthday. I am happy with that. But I don't know how to use [it]. I just use it for calling … Yeah, the font size is too small. My eyesight is poor. I think I won't use the smartphone for any service … If the system could provide a voice-based interface or a font magnifier. That will be better."

4.4.3 Barriers related to users

Technophobia – a characteristic apparent in 18 of the 32 participants (56%) – was a primary user-related factor inhibiting the adoption of mobile Internet services. Unsurprisingly, fear of technology was more prevalent in older people, who did not grow up with computers: nine of the 18 technophobic participants were elderly (50 years old or older), accounting for 100% of the elderly people in our

sample. These participants were anxious about (or fearful of) current and future interactions with smartphone-based services, and held negative global attitudes about new technologies (Rosen and Maguire, 1990). They gave several reasons for their technophobia and resultant reluctance to use smartphone-based services. First, they lacked confidence; people are generally afraid of new technologies because they are scared by this technology, lack of understanding and confidence, and fear the unknown. They thought that the mobile Internet services would be too complicated, and that they were not competent enough to learn to use new technology. As one participant said:

> Participant 16: "There is so much to learn. They seem really complicated. I didn't know if I could do it. It seemed overwhelming."

Second, the participants did not welcome technical change. They felt that new technologies threatened their personal values of simplicity and living a traditional lifestyle. As one participant said:

> Participant 1: "The technology is changing fast, I can't catch up with it. The new technology always make my life more complicated, I don't need it. I just want to keep my way of life."

Third, they were afraid of making mistakes; they did not want to look foolish if they accidentally made a mistake on the service platform. Regardless of gender, age, and education background, these fears were strong enough to deter participants from using – or wanting to use – a smartphone-based service. As one participant said:

> Participant 18: "I was always afraid that I would push the wrong button or make some mistake. If it happens, I don't know what to do, just like a fool. Plus, without your help, I can't finish the Lottery purchasing tasks."

Self-concept was another user-related barrier. Nine participants said that they did not initially believe themselves to be the "type" of person who uses smartphones to do shopping. They thought that such a person would be young, wealthy, and well-educated, and thus believed that smartphone-based services were "not for people like me". For example, one elderly people (aged 54) perceived himself to be "too old" to learn to use these services, even though he thought that they were very useful. Surprisingly, one construction worker (aged 36) with a junior high school education also said that he was too old to learn to use mobile Internet services. The data strongly suggests that seeing oneself as the "type" of person who uses mobile Internet services is correlated with perceptions of such services. As one construction worker said:

Participant 14: "I thought I had no need for it. I couldn't see myself as someone who uses mobile lotteries. I haven't much idea of online shopping and I am too old to learn it. I didn't want to be a part of that world. I thought it was for smart people and college students."

The interviewees also revealed that their decision to adopt (or not adopt) mobile Internet services was affected by their habitus (Bourdieu, 1990). Users' perceptions of traditional services were an important factor affecting their decision whether to switch from the status quo to a new situation; those who were accustomed to services from traditional Lottery sites were not willing to accept the mobile Internet services. As one participant said:

Participant 30: "I've been doing this [buying Lottery in a traditional site] for more than ten years. I'm used to it. I don't need the mobile services."

[[insert Table 5 here]]

5. Discussion

This qualitative study used interviews to explore socioeconomically disadvantaged people's decisions whether (or not) to adopt mobile Internet services. It added to the existing knowledge base on mobile Internet adoption by focusing on disadvantaged potential users and non-users. This topic is worthy of study because the majority of socioeconomically disadvantaged people are non-users of such services, and because the motivations and inhibitors of the "late majority" and "laggards" may differ from those of the "early adopters" and "early majority", which currently dominate the field of information technology adoption. We identified enabling and inhibiting factors in four key categories: smartphone-related characteristics; service system-related factors; user-related factors; and factors relating to social surroundings (Table 6).

One contribution of our study is that it provides a better understanding of the characteristics of smartphones. Mobile Internet services are applications that run on a mobile device; as such, the characteristics of mobile devices have a significant impact on users' adoption and use. Our study revealed that escaping spatiotemporal constraints was a primary smartphone-related characteristic that enabled disadvantaged people to adopt mobile technologies. Such technologies (including PDAs, tablets, and smartphones) allow information and services to be accessed in places and times in which

they were previously inaccessible; they also change the nature of interaction and accessing information. Second, cost was revealed to significantly impact upon disadvantaged people's technology use. Socioeconomically disadvantaged groups are highly sensitive to cost, and they consider their spending carefully (Mallenius et al., 2007). Affordability was less important to earlier technology models, which were primarily designed for organizations (Venkatesh et al., 2012), but it is a vital consideration for socioeconomically disadvantaged people. Third, additional factors such as fashionableness and privacy were important factors affecting users' adoption. Our study also revealed barriers posed by smartphone-related characteristics: mobile Internet services obviously rely on mobile data, which users access either through public Wi-Fi or through their mobile data package. However, the limited amount of data available in participants' mobile packages and participants' limited access to Wi-Fi inhibited their use of mobile Internet services.

In terms of motivating factors relating to the service system, perceived usefulness and relative advantage were key. According to Davis (1989), perceived usefulness serves as an important contributor for IS adoption. This is also confirmed by our findings that the system could provide the basic features users need, for example, purchasing different categories of lotteries, payment, checking the result, and communicating with other lottery players. While the perceived usefulness of a service system does not fully explain motivating factors for using it, relative advantage allows us to incorporate the influence of other service systems that would be otherwise ignored (Wang *et al.*, 2008). When shifting from traditional offline services to mobile online services, users make comparisons between the two. Participants reported that mobile Lottery services featured the advantages of saving time and ease of daily transaction. They were perceived to be better than the traditional Lottery site services. This comparison process has significant impacts on participants' adoption and perception of the service system. Five inhibitors related to service systems were revealed to affect use: security and privacy; complex online help tutorials; relative disadvantage; irrelevant pop-up requests; and lack of personalized services. It was worth noting that participants were very sensitive to security and privacy, and showed no patience for irrelevant pop-up requests. They also had personalized requirements for the system. For example, features like font magnifying and voice assisting could be provided for elderly people due to their visual impairment. Even though these factors specifically related to the Lottery service, they may also extend to other mobile Internet services.

In terms of user-related factors, participants with prior experience of similar technologies were more likely to hold a positive attitude toward mobile Internet services. Previous psychological studies have found that experience is a significant determinant of behavior (Fishbein and Ajzen, 1975). It has been suggested that experience makes knowledge more accessible in memory and that knowledge gained

from prior experience helps to shape intention (Fishbein and Ajzen, 1975). IS researchers have also found plenty of evidence to suggest that experience is an important antecedent in IS adoption (Taylor and Todd, 1995; Venkatesh *et al.*, 2003). This study also revealed that positive initial use led to more favorable attitudes toward future use. This is not surprising. Initial exposure in a new environment is considered to be an important factor for individuals' attitude formation (Hoeffler *et al.*, 2012). The disadvantaged people interviewed in our study were all novice users of mobile Lottery services; a positive attitude towards initial use could motivate their later use. Regarding barriers related to users, technophobia, self-concept, and habitus were identified. These are all psychological barriers that inhibit users' adoption, and could be overcome if users' fears and preconceived biases about mobile Internet services were preemptively addressed. For instance, it has been shown that the majority of novice users quickly overcame their fears once they had an actual hands-on experience encounter in a supportive learning environment (Stanley, 2003). In fact, most participants expressed relief and surprise at finding the technology much less difficult to learn than they had presumed, and retrospectively admitted that their fears had been largely unfounded.

In terms of factors relating to social surroundings, participants held a common view that mobile Internet services were widespread in society. Individual circumstances and perceptions of the speed of change and ubiquity of mobile Internet services had an impact on users' adoption of such services. Moreover, participants desired to be consistent with socially proximate others, and would change their attitudes when they became aware of the attitudes and behaviors of others. Previous studies have shown that social influence is an important factor affecting individual behavior (Kelman, 1961; Asch, 1952) and has been included in previous IS adoption models such as subjective norm in UTAUT (Venkatesh *et al.*, 2003), image in IDT (Rogers, 1995), and social factor in Model of PC Utilization (Thompson *et al.*, 1991). This study confirmed that being consistent with others is a significant social motivation enabling people to accept mobile Internet services. Finally, the perceived pressure of being afraid of being "left behind" motivates potential users to adopt and use mobile Internet services. It is interesting that the term of "being left behind" was not used negatively by users, but rather was used to describe their own situations and to go against what they perceived to be the norm: that is, the perceived ubiquity of mobile Internet services.

[[insert Table 6 here]]

The goal of this research was to understand the factors that contribute to the adoption of mobile Internet services by disadvantaged people in a developing country. There are several areas of research to which this work contributes. First, it advances knowledge regarding the specific enablers and inhibitors of mobile Internet adoption by disadvantaged people. Rather than only examining the enablers of adoption – an approach that has dominated previous IS research – it is the authors' belief that users' adoption of new technologies is based on simultaneous consideration of both enabling *and* inhibiting factors. Many objects or behaviors can be simultaneously evaluated both favorably and unfavorably (Zemborain *et al*., 2007). Here, users hold both positive attitudes and doubts and concerns towards mobile Internet services. Enablers and inhibitors are thus presented here as two correlated, but potentially separable, dimensions. Second, this research contributes to the study of digital inequality. Much of the research in this area focuses on first-order effects regarding who has access to technology; this study addresses the second-order effects of inequality in ability to use technology among those who do have access (Wei *et al*., 2011). It concludes that efforts to increase the adoption of mobile Internet services among disadvantaged people must go beyond physical access and connectivity to consider the roles of psychological factors and social surroundings. Third, from a practical perspective, the findings of this research reveal the most important factors influencing the adoption and use of mobile apps among socioeconomically disadvantaged people. In the competitive world of mobile apps, in which developers find their product surrounded by thousands of other apps in virtual stores, promotion and differentiation is vital – but challenging. These findings should therefore be of interest to companies developing and distributing mobile apps for various populations.

6. Conclusion

Given the increasingly important role of the mobile Internet in education, healthcare, entertainment, and other essential services, it is important that we develop an understanding of disadvantaged people's interactions with mobile Internet services. The results highlight that, because of the characteristics of escaping spatiotemporal constraints and lower cost, smartphones have great potential for bridging the digital divide for this under-served demographic. Most of the study's participants held a positive attitude toward mobile Internet services, with high levels of perceived usefulness and relative advantage. However, they also expressed some concerns about mobile Internet connection, service system quality, and psychological barriers. Mobile data providers could consider reducing the cost of mobile data packages, providing cheaper home Wi-Fi for socioeconomically disadvantaged people, or offering free Wi-Fi Internet access at more public institutions and places. Mobile app designers could improve their services by simplifying online help tutorials; providing winning records and communication features; reducing irrelevant advertisements; and offering font magnifiers and voice services for elderly

people. The results also revealed some enablers that could be leveraged. A positive initial experience is very important for combating technophobia. As such, service providers should offer a supportive and comfortable learning environment and give new users essential guidance. Family members, friends, and colleagues play a significant role in users' acceptance intention. These social influence mechanisms could be leveraged to motivate socioeconomically disadvantaged people's use of mobile Internet services.

Several limitations of this study are noteworthy. First, a qualitative methodology was employed, using interviews as a method. This was assumed to be appropriate for our study, but it must be acknowledged that using this method means that the enablers and barriers identified were derived from users' subjective perceptions. It may be useful to collect objective data about participants' actual participation, using methods such as photovoice and user observation. Second, for the convenience of conducting the experience experiment, we used mobile Lottery as a representative service platform. As such, the findings may not be directly applicable to other mobile services.

Several research directions are necessary to pursue in order to further our understanding of socioeconomically disadvantaged people's adoption of mobile Internet services. First, further research could analyze how each factor identified here impacts upon users' decisions to use a mobile Internet product, whether certain factors are more important than others, and whether there are striking differences in this sense between different groups of disadvantaged people (such as elderly people and young people). Second, the social influence mechanism identified in our study could be further investigated. More recent models – such as the model of acceptance with peer influence (Godinho *et al.*, 2014; Venkatesh and Sykes, 2013), which emphasizes interpersonal interactions using a social network lens – could yield insights in contexts in which literacy is low, such as in the case of socioeconomically disadvantaged people (Venkatesh *et al.*, 2014). Enhancing understanding of the role of social influence has great potential for facilitating disadvantaged people's adoption of mobile Internet products.

Notes

[1] This study was conducted in Nanjing, Jiangsu province of China. The annual minimum wage standard prescribed by the Nanjing Municipal Government was 19,660 RMB (US$2,996) in 2014.

[2] QQ and WeChat are very popular mobile communication and social networking apps in China. They enable users to send text and voice messages and to call people for free when connected to the mobile Internet.

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Exploring the adoption of mobile Internet services by socioeconomically disadvantaged people: a qualitative user study

FIGURE

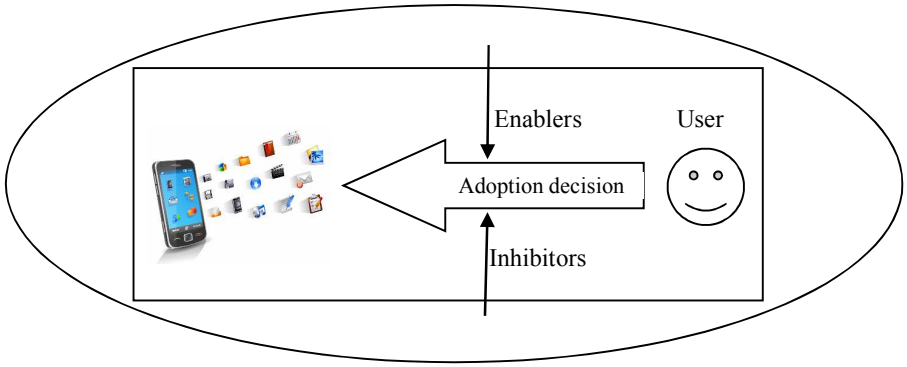

Figure 1. Initial coding framework for adoption of mobile Internet services

Exploring the adoption of mobile Internet services by socioeconomically disadvantaged people: a qualitative user study

TABLES

Table 1. A taxonomy of antecedents to user adoption

Categories of antecedents	Variables of antecedents	Definition	Source theory
Utilitarian	Perceived usefulness	"The degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p.320).	TAM
	Performance expectancy	"The degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh *et al.*, 2003, p.447).	UTAUT
	Relative advantages	"The degree to which an innovation is perceived as being better than its precursor" (Moore and Benbasat, 1991, p.195).	IDT
	Job-fit	"The extent to which an individual believes that using can enhance the performance of his or her job" (Thompson *et al.*, 1991, p.129).	Model of PC Utilization
Social influence	Subjective norm	"The degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh *et al.*, 2003, p.451).	UTAUT
	Image	"The degree to which use of an innovation is perceived to enhance one's status in one's social system" (Moore and Benbasat, 1991, p.195).	IDT
	Social factors	"The individual's internalization of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations" (Thompson *et al.*, 1991, p.126).	Model of PC Utilization
Perceived behavior control	Perceived ease of use	"The degree to which the prospective user expects the target system to be free of effort" (Davis, 1989, p.320).	TAM
	Effort expectancy	"The degree of ease associated with the use of the system" (Venkatesh *et al.*, 2003, p.450).	UTAUT
	Facilitation condition	**"**The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh *et al.*, 2003, p.453).	UTAUT

Table 2. Research method

Study elements	Description
Objective	To identify specific enablers and inhibitors related to technology, user and environment.
Approaches	Participants experienced one mobile Internet service on a lottery platform and were asked a series of semi-structured questions about their perceptions and adoption of the technology.
Data collection	Background questionnaire, and in-depth interviews with 32 socioeconomically disadvantaged people.
Data analysis technique	Qualitative content analysis; Identification of enablers and inhibitors.

Table 3. Demographic and socioeconomic profiles of participants

Variables	Item	No. of participants	Percentage (%)
Gender	Male	21	65.6
	Female	11	34.4
Age	Under 20	5	15.6
	21-30	5	15.6
	31-40	10	31.3
	41-50	3	9.4
	51-60	6	18.8
	Over 60	3	9.4
Education background	Elementary school or less	2	6.3
	Junior high school	16	50.0
	Senior high school or vocational and technical school	9	28.1
	University and college	5	15.6
Personal annual income	Less than RMB￥10,000 (US$1,524)	9	28.1
	RMB￥10,000 (US$1,524)–￥20,000 (US$3,048)	12	37.5
	More than ￥20,000 (US$3,048)	11	34.4
Employment status	Employed full time	12	37.5
	Employed part time	5	15.6
	Self-employed	11	34.4
	Unemployed	1	3.1
	Retired	3	9.4
Home location	Nanjing city	6	18.8
	Small cities (i.e. third-tier cities; county towns)	9	28.1
	Rural villages	17	28.1

Table 4. Enablers of the use of mobile Internet services

Categories of enablers	Motivating factors	Description	No. of participants	%
Smartphone-related characteristics	Escaping spatiotemporal constrains	The ability to carry and use smartphones from anywhere and at any time.	16	50
	Affordability	Compared to a computer, smartphone was much more affordable.	12	38
	Fashionableness of smartphones	Using smartphone is regarded as being in fashion and keeping up with the pace of others.	3	9
	Privacy characteristic of smartphones	One's personal information is free from others' intrusion or interference.	1	3
Service system-related factors	Usefulness	The service system could provide the basic features that user need, such as purchasing different categories of lotteries; payment; checking results; and communicating with other Lottery players.	25	78
	Relative advantage	The degree to which the mobile Lottery service is perceived to be better than the traditional Lottery site service. For example, saving time and ease of daily transaction.	19	59
User-related factors	Similar prior experience	Users with experience of using similar technical service – such as computers, Internet, and online shopping – are more willing to try the mobile Internet product.	8	25
	Positive initial use	Initial use is a positive experience for users, and thus an important factor for motivating their acceptance and use.	5	16
Social surroundings-related factors	Perceived ubiquity of mobile Internet services	Users hold a common perception that mobile Internet services were pervasive and widespread in everyday life.	13	41
	Consistent with others	Users prefer to use the new service to be reachable and consistent with others. For example, users adopt the mobile Lottery service because their family members, co-workers, and friends use it.	6	19
	Being afraid of being "left behind"	Due to their perception of the fast pace of technological change and ubiquity of mobile Internet services, users are afraid of being "left behind" from the information society.	2	6

Table 5. Barriers to the use of mobile Internet services

Categories of barriers	Inhibiting factors	Description	No. of participants	%
Smartphone-related characteristics	Mobile Internet connection	Users have a limited mobile data plan per month and limited access to Wi-Fi.	9	28
Service system-related factors	Security and privacy	Users are concerned about their financial security and private information when paying on the mobile Internet.	15	47
	Complex online help tutorial	The online help tutorial provided by the system is very complex and hard to understand.	7	22
	Relative disadvantage	Compared to traditional Lottery sites, the mobile lottery platform did not offer the features of winning records, purchasing recommendation, and communication among Lottery players.	6	19
	Irrelevant pop-up requests	System pop-up requests that are irrelevant or not needed for a system transaction (such as pop-up game advertisements).	4	13
	Lack of personalized services	System did not provide personalized services for elderly people. For example, font magnifier and voice service could be provided for elderly people due to their visual impairment.	1	3
User-related factors	Technophobia	Users are anxious about or fearful of current and future interactions with new technologies.	18	56
	Self-concept	Refers to the vision that one holds about the “type” of person one may belong to or become.	9	28
	Habitus	Users were less willing to accept mobile Internet services if they were accustomed to traditional Lottery site services.	2	6

Table 6. Factors affecting current adoption decision

	Smartphone-related characteristics	**Service system-related factors**	**User-related factors**	**Social surroundings-related factors**
Enablers	(1) Escaping spatiotemporal constrains (2) Affordability (3) Fashionableness of smartphones (4) Privacy characteristic of smartphones	(1) Usefulness (2) Relative advantage	(1) Similar prior experience (2) Positive initial use	(1) Perceived ubiquity of mobile Internet services (2) Consistent with others (3) Being afraid of being "left behind"
Barriers	(1) Mobile Internet connection	(1) Security and privacy (2) Complex online help tutorial (3) Relative disadvantage (4) Irrelevant pop-up requests (5) Lack of personalized services	(1)Technophobia, (2) Self-concept (3) Habitus	