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**What Drives Individuals to Access the Internet
Mostly Using a cell Phone?**

By

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WHAT DRIVES INDIVIDUALS TO ACCESS THE INTERNET MOSTLY USING A CELL PHONE?

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ABSTRACT

Mobile Internet users can access content, applications, and services using their cell phones. Recent PEW Internet research shows that more than half of U.S. cell phone owners have smartphones. Among them, some people have adopted a mobile phone and use it as a major Internet access medium; they may use other devices such as a desktop computer, notebook, netbook, or tablet PC, but those are not included in their Internet access medium repertoire. This paper examines who accesses the Internet mostly using a cell phone among the Internet users who access the Internet at least occasionally and what makes them regard their cell phone as a major Internet access medium. The results of this paper show that users who use their cell phones as their major Internet access medium are more likely to have a smartphones on which apps can be installed and used, not to have other portable PCs, to be young, to have less education, and to be nonwhite. The limitation of this paper was discussed.

Keywords: cell-based Internet access, PC-based Internet access, wireless computing devices

INTRODUCTION

As mobile Internet technology advances enough to compete with fixed Internet, some people start to use mobile Internet as their major Internet access medium. Along with U.S. network operators' upgrades to 3G and 4G networks, a wide range of mobile devices run on those networks, such as smartphones. Recent PEW Internet research shows that around 85 percent of Americans have a cell phone and 45 percent of them have a smartphone (3) and especially mobile Internet users can access content, applications, and services using their cell phones. The early studies regarding mobile Internet adoption investigated the factors that affect users' adoption of mobile Internet and who the early adopters of mobile Internet are. However, due to the limitations of mobile networks and devices, such as high perceived costs with relatively slow data transmission speed and small screens, a majority of Internet users still access the Internet using their desktops, laptops, or tablet PCs. This paper examines who accesses the Internet mostly using a cell phone among the Internet users who access the Internet at least occasionally and what makes them regard their cell phone as a major Internet access medium. To examine this question, the available second data originally collected by PEW Internet will be used. This study is different from other adoption studies in that it focuses on the significance or importance of one's mobile Internet use relative to other Internet use.

LITERATURE REVIEW

DEVELOPMENT OF PERSONAL COMPUTERS

The history of the personal computer (PC) as we know it today goes back to the 1970s, when Apple introduced the Apple II in 1977. Soon, other companies, such as IBM, entered the market and PCs became popular in homes and businesses (15). Today, we can have a PC with us wherever we go owing to the development of portable PCs, such as laptops or netbooks, smartphones, and tablet PCs. Laptops were introduced in the 1980s, but they became useful and gained popularity in the 1990s along with the development of relevant technologies (e.g., battery technology) (14). The first smartphone was introduced by a Canadian company, Research in Motion (RIM), in 2004. The smartphone market started to be competitive in 2008 as Apple launched the iPhone 3G, and competition became fierce as other companies such as Samsung entered the market (18). "Tablet PC" refers to any tablet-sized personal computer; a key component of tablet PCs is touch input. These were introduced in the 1990s, but in 2010 Apple made consumers perceive tablet PCs as a new class of consumer device (26).

MOBILE PHONES IN THE U.S.

Mobile-service consumers connect to the network using handsets, including traditional feature phones, smartphones, and devices that provide data services such as modem cards; 46% of American adults are smartphone owners, while 40% of them have basic phones and the rest does not have a cell phone as of February 2012 (3). Using mobile web and apps run on the operating systems, consumers can enjoy a variety of Internet services such as mobile music, videos, games, mobile shopping, and financial transactions. The two most popular operating systems, Google Android and Apple iOS, are taking the lead in the U.S. markets, occupying 48.6% and 29.5% of the smartphone platform market as of January 2012 according to comScore (7). Some content categories are popular among mobile-phone owners. For example, about two-fifths of U.S. smartphone owners visit social networking sites using apps or the web on a daily basis (6). Mobile games are another popular content category (6).

A MEDIA REPERTOIRE PERSPECTIVE AND INDIVIDUAL PREFERENCE

A media repertoire perspective was developed to explain a user's selection of one or multiple channels, content genres, media forms, and/or media platforms from their collection of communication channels, genres, and/or media forms and media platforms (32). Heeter (12) first used the concept of repertoire to explain channel repertoire of cable TV users. She found that people usually tune to a set of channels among all the available channels rather than all the available channels. With the advent of numerous new media platforms, communication scholars have examined media platform repertoire more than channel repertoire to overcome the limitations of the previous studies, which have focused on the adoption and/or uses of a single-media platform. For example, a person may use the Internet on his or her cell phone when they are on the go but mostly watch TV at home; in this case, his or her media platform repertoire consists of cell Internet and TV.

Although there is not a consistent theoretical framework to explain individuals' media choices yet, there are some studies that have examined individuals' media repertoires empirically. Hasebrink and Popp (11) analyzed individuals' media platform repertoires used to get news on politics, economy, and social issues and found six different combinations: high use of all media, mostly TV, mostly papers, mostly radio and papers, mostly papers and TV, and low use of all media. Every group of information users has different social characteristics; for instance, users who use all media less than any other users to get news related to politics, the economy, and social issues were dominated by females. They found that the use of information in one medium is independent from the frequency of use in another medium.

FACTORS AFFECTING MEDIA PLATFORM REPERTOIRE

While a media repertoire perspective implies that a user's media platform repertoire reflects individual preferences in selecting media platforms to get information and/or entertainment, digital divide research suggests that a user's social status acts as a barrier in adopting a medium and including it in his or her media repertoire. If a person has enough income but does not adopt a computer and home broadband Internet, it may be an individual choice reflecting his or her preferences; however, if a person does not adopt a computer and home broadband Internet because they cannot afford it, the choice is not totally affected by individual preferences.

Since the broad diffusion of the Internet in the 1990s, researchers have studied who has access to information technology. Differential access to information technology across social groups has been observed and the term "digital divide" was coined to describe this phenomenon. Digital divide research found patterns of unequal access to information technology based on income, race, ethnicity, gender, age, and geography (16, 4, 13, 22, 21, 29, 25). According to a survey conducted in 2009 by the Princeton Survey Research Associates International for the FCC, gender gaps have almost closed, but there is still a significant gap across different groups based on education, income, race, age, and geography in terms of broadband adoption by American adults.

Several studies have also shown that online skills are not evenly distributed across different social groups to actually utilize a computer and network. According to Hargittai (9), young adults with parents who have higher levels of education, who are male, or who are white or Asian American are more likely to have higher levels of online skills. Hargittai (9) also showed that age is negatively related to online skills and gender does not explain much about variances in online skills. Van Deursen and

van Dijk (27) found that age and education are related to basic online skills. In summary, education and age are important factors, and other factors such as gender and ethnicity are important factors in some studies but not in all studies.

Akiyoshi & Ono (1) also found that mobile phone-based Internet access was still determined by socioeconomic status and skills in Japan. However, the degree to which mobile phone-based Internet access was determined by them was much less than the degree to which a PC-based Internet access was determined by them. It is because phone-based Internet access requires less expensive devices and less sophisticated skills than PC-based Internet access (1). Mobile phone-based Internet access might be affected less by socioeconomic factors and more by individual preferences compared to PC-based Internet access.

RESEARCH MODEL

There is a group of people who have adopted a mobile phone and use it as a major Internet access medium; they may use other devices such as a desktop computer, notebook, netbook, or tablet PC, but those are not included in his or her Internet access medium repertoire. Some among the people who use a cell phone as a major Internet access medium might substitute a cell phone for other devices. Media substitution is the displacement of an old technology by a new substitute due to new technology's ability to provide a superior method of delivering content (20). In the early periods of home Internet adoption, most people accessed the Internet on a desktop computer, so early digital-divide studies examined whether people had a desktop to access the Internet or not (see 28). But recently, mobile phones, especially smartphones, have emerged as another important Internet access medium. Although a user can access the Internet using a certain type of basic phone, it has limitations to using it as a substitute for a PC. However, smartphones allow users to install a lot of applications for their own purposes like a PC, as well as providing Internet access through mobile data networks and/or wireless LANs, such as WiFi. The displacement of a PC is more likely to happen if a user has a smartphone than a basic phone and utilizes its PC-like characteristics. Therefore, the following question was proposed.

RQ1. Application use on a smartphone is positively related to Internet access mostly using a cell phone.

A user's repertoire can be limited by the media devices they have. For example, the poor in developing countries cannot afford computers, so mobile devices have become the most accessible and ubiquitous communications medium (2). In developed countries such as the U.S., most people who own a phone may also have a desktop PC or equivalent computing devices, such as notebook or tablet PC. Still, not all of them have all kinds of devices; the cluster of owned devices may differ from person to person as some technology cluster studies have suggested (see 19). According to the explanation by LaRose & Atkin (19), a user may adopt both a cell phone and tablet PC to access the Internet because they perceive a cell phone and a tablet PC to be complementary. On the other hand, a user may adopt a cell phone instead of a tablet PC to access the Internet because he perceives a cell phone and a tablet PC to be substitutable. Based on this argument, the following hypothesis was proposed.

H1. Having other wireless computing devices is negatively related to Internet access mostly using a cell phone.

This fashion of mobile phone adoption is very unique compared to other technology adoptions. Mobile-phone adoption has been greatly influenced by factors other than

income, especially in developing countries (2). For example, the speed and magnitude of mobile-technology adoption in Uganda and the Philippines was phenomenal. Digital-divide scholars developed a leapfrogging hypothesis, which posits that countries who adopted ICT later achieve faster initial growth in penetration rate by bypassing older, less appropriate, and less affordable forms of ICT. This hypothesis was proposed at the country level, so it is not clear yet whether it might happen at the individual level. There are a few studies that support this; Wareham, Levy, & Shi (30) found that African Americans' adoption rate of mobile feature phones is higher than those of the general population. However, it seems that it might not be applied to 3G-based mobile Internet services.

Wareham et al. (30) hypothesized that income and education will be positively related to 3G-based mobile-service adoption due to the costs associated with such services, while age is negatively related to 3G-based mobile-service adoption due to differences in skills. Akiyoshi & Ono (1) had consistent results in a different national context. They found that Internet access using a cell phone is positively related to income and education and negatively related to age. However, they found that once the ownership of cell phones enabling Internet access is controlled, the impact of income on mobile Internet access was not significant any more. Generally speaking, it seems that demographic variables are still important in mobile-phone adoption as well as cell Internet access, but once cell phone adoption is controlled, the impact of these variables on the Internet medium repertoire is uncertain.

The question is whether these demographic factors will play any role in users' medium preferences. Some empirical studies related to media repertoires tested whether there is a major difference among the groups that have different media repertoires. For example, Hasebrink & Popp (11) found that six different information-use groups who use TV, radio, and/or newspapers have different social characteristics. There is not much research related to the social characteristics of users who use cell Internet mostly for any purposes. Therefore, the following question was proposed.

RQ2. What are the social characteristic of the people who use a cell phone to access the Internet have different social characteristics?

METHOD

The second dataset used in this study was publicly available on the PEW Internet & American Life Project website. The original data was collected by PEW Internet using a survey in May 2011. The final sample included 711 respondents. Table 1 shows the descriptive statistics of the sample. Three hundred forty one (48%) of the respondents were male, 478 (70.1%) of the respondents were white, and 136 (19.1%) were African American; 167 (23.5%) of the respondents had high school degrees, 188 (26.5%) had some college education, and 310 (43.4%) had degrees from college or higher education. This study was conducted to understand the difference between two groups: people who accessed the Internet mostly using their cell phones and people who accessed the Internet mostly with other mobile devices or a combination of cell Internet and other devices. The numbers of respondents in the two groups were 159 (22.4%) and 552 (77.6%) respectively. Table 1 shows detailed information about the respondents.

Total (N)	Group1 (N) (Using the Internet mostly using a cell	Group2 (N) (Using the Internet mostly using other
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	phone)		devices)	
	Yes N (%)	No N (%)	Yes N (%)	No N (%)
Cell Internet	711.0 159(22.4) 552(77.6)		159 552	
App on a smartphone	710.0 443(62.4) 37.6(37.6)		159 128(80.5) 31(19.5)	
Having other wireless devices	708 521(73.6) 187(26.4)		159 98(61.6) 61(38.4)	
Age	693 M (SD)=39.95 (15.070)		157 32.96(13.559)	
Education	710 M (SD)=4.98 (1.575)		159 4.34 (1.606)	
Race	682 White 478(70.1) Black 136(19.1) Others 68 (9.6)		153 White 87(56.9) Black 45(29.4) Others 21(13.7)	
	552 443(62.4) 37.6(37.6)		549 423(77.0) 126(23.0)	
	536 41.99(14.887)		551 5.17 (1.518)	
	529 White 391(73.9) Black 91(17.2) Others 47 (8.9)			

Table 1. Descriptive statistics.

MEASUREMENTS

The variables used in this study were drawn from the self-reported survey data. The outcome variable of this study, *Cell Internet*, was measured with a survey item that included five categories: “Overall, when you use the Internet, do you do that mostly using your cell phone or mostly using some other device like a desktop, laptop, or tablet computer?” (1) Mostly on cell phone; (2) Mostly on something else; (3) Both equally; (4) Depends; and (5) Don’t know. “Mostly on cell phone” was recorded into “1 = Yes” and “Mostly on something else” and “Both” were recorded into “0 = No” to create a binary measure. Other categories were recorded as missing values.

Having other wireless devices was created from two items: “Do you have a laptop computer or netbook?” and “Do you have a tablet computer like an iPad, Samsung Galaxy, or Motorola Xoom?” If respondents answered “Yes” for at least one of the two questions, the cases were scored as “1 = Yes”, otherwise “0 = No”. Although some respondents answered “Yes” to these questions, if the respondents never used the mobile device for accessing the Internet wirelessly, the response was recorded as “0”. This specific condition was assessed with the item: “You said you have (a laptop and a tablet computer). Do you ever use any of those devices to go online wirelessly, either at home or somewhere else? (1 = Yes; 2 = No; 3 = Don’t know).” We assumed that the key component of these devices is portability, and if a user never uses the wireless capabilities, there is no difference between these devices and a desktop PC.

App experience was measured with an item that asks, “Do you ever use your cell phone to download a software application or ‘app’?” There were three different responses: (1) Yes; (2) No; and (3) Don’t know. “Yes” and “No” were recorded into “1 = Yes” and “0 = No” respectively.

This study included three socioeconomic variables: *age*, *education*, and *race*. *Age* was a continuous variable and *education* was also treated as a continuous variable. Seven categories — (1) None or grades 1–8; (2) High school incomplete; (3) High school graduate; (4) Technical or trade school after high school; (5) Some college; (6) College graduate; and (7) Post-graduated training — were used to measure *education*. Ethnicity was originally measured with six categories: (1) White; (2) Black or African-American; (3) Asian or Pacific Islander; (4) Mixed race; (5) Native American/American Indian; and (6) Other. The categories were rerecorded into three different categories: white, black, and others. The variable, *income*, was supposed to be included but was not included because it was highly correlated with the other variable, *education*.

RESULT

A binomial logistic regression analysis was conducted to test the proposed hypothesis and the research questions. Table 2 contains the logistic regression coefficients, standard errors of the coefficients, and odds ratios for each predictor. A test of the model against a constant-only model was statistically significant ($\chi^2 = 114.715$ (6), $p = .00$). The Hosmer and Lemeshow test was significant ($\chi^2(8) = 12.851$, $p = .117$) and Nagelkerke's R^2 of .239 indicated the soundness of the proposed model.

The result shows that all the predictors, including *app on a smart phone*, *having other wireless devices*, *age*, *education*, and *race*, are related to the likelihood of a user accessing the Internet mostly using a cell phone. People who owned a smartphone and had tried an application were more likely to use the Internet mostly using their cell phone about 4.2 times more than the people who had never downloaded an application on their phone (OR = 4.195, $p = .000$, 95% confidence interval [CI] = 2.564, 6.865).

People who had other wireless devices were less likely to mostly use their cell phone to access the Internet than the people who did not have devices other than a cell phone to access the Internet (OR = .437, $p = .000$, 95% confidence interval [CI] = .279, .682). For every one-year increase in age, the log odds of using the Internet mostly using a cell phone compared to using the Internet mostly with other devices or both decreased by .031 (OR = .970, $p = .000$, 95% confidence interval [CI] = .955, .985).

Age was a significant, but not influential, predictor. For every one-unit increase in education degree, the log odds of using the Internet mostly with a cell phone versus using the Internet mostly with other devices or both decreased by .291 (OR = .750, $p = .000$, 95% confidence interval [CI] = .653, .856). *Ethnicity* was statistically significant as well ($p = .035$). Whites were two times less likely to use the Internet mostly using a cell phone compared to other ethnicities, such as black and others.

β	SE	Wald's χ^2	Odds ratio (OR)	C.I	
				Lower	Upper

App on a smart phone (1 = Yes; 0 = No)	1.434	.251	32.575	4.195***	2.564	6.865
Having other wireless devices (1 = Yes; 0 = No)	-.829	.228	13.234	.437***	.279	.682
Age	-.031	.008	15.043	.970***	.955	.985
Education	-.291	.069	17.804	.748***	.653	.856
Ethnicity			6.723	*		
White vs. Others	-.548	.317	2.993	.578	.311	1.076
Black vs. Others	-.001	.352	.000	.999	.501	1.991
Constant	1.226	.487	6.327	3.408*		
X^2 (6)	114.715***					
Nagelkerke's R^2	.239					

*** $p < 0.000$; ** $p < 0.01$; * $p < 0.05$

Table 2. Binomial logistic regression result for using cell phones to access the Internet (N = 669).

DISCUSSION AND IMPLICATIONS

The results of this paper show that users who have a smartphone, do not have other portable PCs, are young, have less education, and are nonwhite are more likely to get used to accessing Internet using a phone. Young people were more likely to use a cell phone than the older respondents, but the impact of age was negligible. Smart phones are not well suited to do more complex information- and communication-related work; rather, they may be suitable to search for any information for daily life, pass time, etc. Whites have more various media repertoire in terms of Internet access platforms, but this study does not make clear why blacks and others prefer to confine their Internet media repertoire mostly to mobile phones.

The limitation of this paper is that we could not include other potential variables, such as the amount of time that a user spends accessing the Internet. The second data set used in this paper did not have data related to this kind of variable. Some studies have shown that media repertoire is closely related to the amount of media use. The more time a user spends on consuming media content, the more diverse their media repertoire becomes. Future studies can develop the idea of this paper and overcome this limitation. This paper can help communication scholars to theorize a user's media repertoire in the future and network operators, cell-phone manufacturers, and content, application, and service providers to better understand their users. Furthermore, marketers and advertisers can use this information to choose the right media platform to market their products and services to their customers.

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