Multidimensionality: redefining the digital divide in the smartphone era

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Abstract

Purpose – *In a converged and smart media environment, it no longer makes sense to talk only of a digital divide based on access to a platform – instead, a new "smartphone divide" is created based on a user's ability to access and use an array of different services. Although there is an extensive literature on the digital divide in broadband access and use, zero research efforts have addressed the digital divide in mobile phone usage. Therefore, this research study aims to fill the gap in the literature by looking into new dimensions of the smartphone divide.*

Design/methodology/approach – *Data were collected from a college student sample through an online survey and some hypotheses were framed and tested for intergroup (smartphone users vs non-users) and intragroup (active smartphone users vs inactive users) differences based on access, experience and persistence of usage.*

Findings – *Findings are: first, smartphone users were more active online as expected. Although no significant difference was detected in the amount of time spent on social networking sites (SNSs) between smartphone users and non-users, smartphone users had more friends online and more "online-only" friends than non-users. Second, smartphone users seem to participate more actively in social and political issues than non-users do. Third, active users were adopting digital technologies faster than less active users, and active users were inclined to spend longer time on SNSs than less active users. Also, active users used more free and paid applications on their smartphones compared to less active users.*

Originality/value – *This research study aims to fill the gap in the literature by looking into new dimensions of the smartphone divide and exploring the differential usage of smartphone users in terms of usage level, awareness and usability levels, usage scope and consequential uses controlling for demographics and socioeconomic status. The ensuing pilot study validates some of speculations suggested in the previous literature.*

Keywords *User studies, Digital divide, Telecommunications, Smartphone divide, Smartphone use, Wireless*

Paper type *Research paper*

1. Introduction: smartphone revolution

It is clear by now that the smartphone is fundamentally altering how users access information and interact with their social networks. The advent of smartphones and their increasing usage even among low-income communities and minorities has also changed the dynamics of the digital divide debates, opening up the possibility that some of the inequalities of access that existed prior to the advent of smartphones might be bridged (King, 2011). The Pew Internet Project reports that nearly half (46 per cent) of American adults are smartphone owners, as of February 2012, an increase of 11 percentage points over the 35 per cent of Americans who owned a smartphone the previous year. Only two in five adults owned a cell phone that was not a smartphone, indicating that smartphones are now the prevalent means by which users connect to mobile networks (Pew, 2012).

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The sudden emergence and the increasing popularity of smartphones have generated much interest on their implications for the digital divide. With the more advanced features

available on smartphones, a new digital divide might be emerging: non-smartphone users can be further marginalized in terms of their ability to access information and applications (Hargittai and Kim, 2012; Fortney *et al.*, 2011; Horrigan, 2011; Rice and Katz, 2003). This gap involves "unequal access to the opportunities, experiences, skills, and knowledge that will prepare youth for full participation in the world of tomorrow" (Jenkins, 2009, p. 3).

Such mobile gaps can lead to a "dual digital divide" (Kim *et al.*, 2011; Selwyn, 2004; van Dijk and Hacker, 2003a, 2003b; Molnár, 2002; Hargittai, 2002): an intergroup divide between smartphone users and non-users, and an intragroup divide among smartphone users caused by differences in skill levels permitting some to enjoy more sophisticated and advanced usage. The differential usage even among smartphone users arises because a smartphone is a versatile multimedia platform serving diverse purposes and functions (Verkasalo, 2010; King, 2011). While smartphones and feature phones share some functionalities, smartphones have more capabilities such as cameras, touchscreens, global positioning system navigation, Wi-Fi, and mobile broadband access (Table I). Above all, the open environment of smartphone applications enables the creation of functions that were never intended. The more skilled a user is in operating the smartphone, the greater is the possibility that he or she would be able to fully exploit the technical capabilities of the device. Therefore, an intragroup smartphone divide arises between users who are confined to a limited set of functions on the smartphone, and users who are able to use a diverse set of applications. Accordingly, in a converged and smart media environment, it no longer makes sense to talk only of a digital divide based on access to a platform – instead, a new "smartphone divide" is created based on a user's ability to access and use an array of different services.

Although there is an extensive literature on the digital divide in broadband access and use, only a few researchers have addressed the digital divide in mobile phone usage (Hargittai and Kim, 2012; Wu *et al.*, 2006; Wareham *et al.*, 2004; Rice and Katz, 2003). Therefore, this research study aims to fill the gap in the literature by looking into the new dimensions of the smartphone divide and exploring the differences among smartphone users in terms of usage level, awareness and usability levels, usage scope and consequential uses, controlling for demographics and socioeconomic status.

In the following sections, we first review the literature on the digital divide with particular attention to identifying different dimensions of the divide. Among other objectives, this paper intends to suggest a theoretical framework and lay the ground for further empirical research and conceptual explication. After this theoretical framework is presented, we describe a pilot study targeting smartphone users and non-users. The study intends to empirically investigate the multiple dimensions of the digital divide. As described below,

Table I Comparison between basic mobile phone (feature phone) and smartphone

Device	*Capabilities*	*Device*	*Capabilities*
Basic mobile phone	Network services, including Voice telephony and voice mail SMS (short message service) USSD (unstructured supplementary service data) SMS-based services such as mobile money USSD services such as instant messaging	Smartphone	All basic mobile phone features plus Video camera Web browser GPS (global positioning system) 3G+ Internet access Mobile operating "platform" (such as iOS, Android, Blackberry) Ability to download and manage applications VoIP (Voice over Internet Protocol) Mobile TV (if available) Removable memory card

Source: InfoDev (2012)

some of our theoretical expectations were supported, while others were not. The conclusions follow, with some theoretical and policy implications.

2. Multidimensionality of the mobile divide

2.1 Divide between smartphone users and non-users

In general, a smartphone can be understood as a mobile phone built on a mobile operating system with advanced computing ability and Internet access (*Definition of Smartphone*, 2011). Differentiating features of smartphones are their mobility, immediacy, instrumentality and ability to transcend time and place (Verna, 2012). In addition, smartphones are operated easily for personalization and self-expression. All media can be integrated on one single device with the possibility of creative extensions. These advanced features, thus, would make the digital divide a more complicated, multifaceted phenomenon. Recognizable divides might emerge in terms of access to smartphone and to specific smartphone features, leading to different levels of utilization, which in turn results in different real-world outcomes, and ultimately, different levels of social, economic and political participation (van Dijk, 2012; Selwyn, 2004; Bucy and Newhagen, 2004; van Dijk and Hacker, 2003, 2003b). Thus, smartphone users may be subject to an access gap, a utilization gap, a gap caused by use consequences and even a cultural and psychological gap. From this perspective, Song (2004) posited several distinct dimensions of the mobile divide, as shown in Table II. First, whether a person possesses a smartphone or not creates an access gap. Second, differences in the duration, extensiveness and variety of use creates quantitative discrepancies. Third, users' awareness and capability to use varied functions and services and their ability to benefit from applications would add another dimension to the digital divide. Finally, the consequences of effective use, or the ways in which smartphones enable users to achieve greater efficacy and efficiency in their daily lives, can provide the last, but not the least, critical dimension to the smartphone divide.

Several broad themes emerge in the literature regarding the smartphone divide. In the paragraphs below, we identify and discuss these broad themes: the relationship between socioeconomic factors and mobile access and usage, the potential of smartphones to reduce digital inequality, and the cultural and psychological divide that is created consequent to the differential use of smartphones in society. We discuss each of these themes in detail below.

2.1.1 Socioeconomic divide. In the socioeconomic divide, smartphone users are differentiated from non-users by age, gender, income and education, as frequently identified in previous digital divide studies (Fox and Madden, 2005; van Dijk, 2005). That is, male, younger, higher-income and better educated users are more likely to adopt and use smartphones (KCC, 2011). In a society with a more advanced infrastructure, for example, South Korea, the divide in broadband access was found to be negligible but the discrepancy in smartphone use was prominent (Lee *et al.*, 2012). In particular, Rice and Katz (2003)

Table II Multidimensionality of mobile divide

Dimensions	*Contents*
Access Gap	Own a feature phone or a smartphone, cost
Gap of usage amount	Usage time
	Usage extensity
	Usage variety
Gap of use capability	Understanding functions (cognitively)
	Utilizing functions (behaviorally)
Gap of use consequences	Effectively managing everyday lives
	Expanding social capitals
	Ability to mobilize resources
	Self-expression

Source: Song (2004)

analyzed three kinds of digital divides for the Internet and mobile phones: between users and non-users, experienced and new users and continuing users and those who have dropped out/discontinued usage. The study distinguishes the varied dimensions of the digital divide, and suggests that there are several digital divides, each predicted by somewhat different variables. They found that early cell phone adopters had higher levels of income and education compared to non-users. Wareham *et al.* (2004) also discovered that income and education were positively related to 2G-based mobile phone ownership, but did not find any association with age. The authors projected that for 3G-based systems, age might be negatively correlated with ownership due to the technological skills needed for the advanced applications of 3G devices. This was verified in a cell phone adoption study in Japan (Akiyoshi and Ono, 2008) that found a positive relationship between income and education, and device ownership and mobile Internet access. However, age was negatively associated with adoption and mobile Internet usage. This finding conforms with the speculation of that older adults may not have the technological proficiency required for using the more advanced smartphones (Hargittai and Kim, 2012; Zickuhr and Smith, 2012).

2.2.2 Leapfrogging effect of smartphones. The recognition that advanced mobile technologies offer great potential to underprivileged groups has led scholars to hypothesize that mobile phones can help reduce digital inequality across population groups (Wareham *et al.*, 2004). That is, they speculate that mobile devices can have a leapfrogging effect by providing cheaper and more accessible resources to those who are not able to access more costly computers with broadband access. In stark contrast to the documented trends in Internet use on computers where African Americans lag behind Whites and Asian Americans [e.g. National Telecommunications and Information Administration (NTIA), 2010], Hargittai and Kim (2012) discovered that African Americans engage with more diverse types of mobile phone functionalities and have higher odds of using their phones for accessing e-mail or the Web, playing games, listening to music and using picture and video features than any other group. These results are consistent with findings from previous research regarding the widespread adoption of mobile phones by African Americans (Wareham *et al.*, 2004; Watkins, 2009).

Horrigan (2012) investigated the substitution effect of smartphones for home broadband access by surveying 3,506 residents of Illinois. Considering the impact of minority groups' greater adoption rate of smartphones on closing the digital divide, Horrigan examined whether there were demographic differences between broadband access types (all broadband users, broadband, smartphone and tablet users, broadband and smartphone users, broadband at-home-only users and smartphone-only users for Internet access). Relative to home broadband users, "smartphone-only" users were younger, had lower levels of educational attainment, lower incomes and were more likely to be African American or Hispanic, a result also confirmed by Yelton (2012). Blacks and Hispanics are more likely than whites to own cellphones and use a wider range of data features, but they are more likely to have a mobile phone as their only means of accessing the Internet.

Horrigan (2012) also discovered that smartphones certainly played a complementary role for online access, but "broadband plus smartphone" users carried out the widest range of the online activities compared to "smartphone-only" users. "Smartphone-only" users were more cost conscious compared to those with other types of broadband access, and had less confidence in their ability to find information online. Crawford (2011) suggested that there might be a big chasm between home broadband access and wireless-only access in terms of closing the digital divide. Hargittai and Kim (2012) examined what functionalities younger users utilize on smartphones and whether there are differences in mobile phone usage based on the user's socioeconomic background. Their conclusion also concurs with Crawford (2011) and Horrigan (2012): mobile devices seem to *supplement* traditional access to the Internet rather than replacing it.

2.2.3 Cultural and psychological divide. As indicated previously, the digital divide can be driven not only by external factors (socioeconomics) but also by endogenous

psychological factors. That is, some people do not feel any need for obtaining new technologies and learning them, or in some instances, they may resist digital media (Facer and Furlong, 2001). According to the NTIA (2002), not only economic reasons but also lack of need and risk aversion were reasons for not adopting technologies.

Kim (2005) identified two groups of people, digital laggards and "out-digitals", who lack access to digital technologies, but for quite different reasons. Digital laggards refer to people who want to adopt digital media but may have difficulty doing so, such as the elderly, the poor, the disabled and other underprivileged groups. On the other hand, "out-digitals" may appear to be misfits, mentally resisting digital technologies and trying to keep to an analog lifestyle. In Kim (2005) study, some respondents without access were identified as either digital laggards or "out-digitals". Individual attitude toward smartphones can be also a factor for the smartphone divide. The so-called "smartphone phobia" is associated with affective attitudes, fear and frustration, and usage-related stress. In particular, those people who fear new technologies such as computers would have difficulty using a smartphone. Because phobias are primarily motivated by internal psychological factors, it is a reasonable assumption that within the same demographic groups, big gaps in attitudes toward digital media may be found. To date, however, research about the digital divide has presumed that users within the same demographic group will share similar attitudes or characteristics and show the same patterns in adopting and using technologies. However, even in the same demographic and socioeconomic groups, so much variation is found depending on a person's environment, capability and psychological attributes. For instance, all younger users may not be digital natives or cyber kids (Facer and Furlong, 2001).

In this case, lack of self-efficacy or self-confidence will possibly explain the differences (Park and Chen, 2007). Self-efficacy in the smartphone environment indicates a form of self-evaluation that influences people's decisions on what they can do with a given skill to produce a certain goal (Bandura, 1986). People lacking self-efficacy feel less motivation for using smartphones. The level of self-efficacy can be detected by observing use time, persistence of use and the frustration level when confronted with failure. Usually, low self-efficacy leads to lack of adoption and use (Park and Chen, 2007; Stanley, 2003).

Park and Chen (2007) investigated factors affecting the smartphone adoption decision among medical doctors and nurses and found that the individual intention to use smartphones is mostly determined by attitude toward using smartphone, perceived usefulness and self-efficacy. People with low self-efficacy also showed low expectations from smartphone use. In addition, self-confidence in using technologies was found to be an important factor for smartphone adoption and use. Stanley (2003) did an ethnographic study with 100 low-income adults and found that three non-cost-related psychosocial obstacles significantly undermined motivation for acquiring computer skills:"relevance", "fear" and "self-concept". In particular, lack of self-confidence significantly explained why interviewees were not using the Internet (Stanley, 2003). Mostly, the frustration people experience in the process of learning new technologies appeared to lead to discontinuance of use. In addition, studies show that people's personality played a role in their adoption and use of technologies (Hamburger and Ben-Artzi, 2000; Hills and Argyle, 2003). Low innovative personality can be a barrier to adoption, especially for such a versatile mobile device as a smartphone. The technological versatility of a smartphone, juxtaposed with their own perceived lack of technical skills, may cause fear and embarrassment among low innovative persons rather than pleasure and convenience.

So far, we have discussed factors affecting the intergroup smartphone divide, namely, differences between smartphone users and non-users. At the same time, there is an intragroup smartphone divide too, among smartphone users based on their motivation level, capabilities and skills and application use. We next review the literature on this intragroup smartphone divide.

2.3 Smartphone divide within smartphone users

2.3.1 Motivational divide. Smartphone users can be categorized based on several criteria, the first of which may be motivation for use (van Dijk, 2004; Song, 2004). The functions of smartphone are diverse and how users perceive and use these functionalities for what purpose would produce different results. Some users who primarily utilize smartphones for instrumental purposes, such as information retrieval and communication, may be motivated by efficiency or productivity. These users also seem to focus on real-time information or more practical information such as news. On the other hand, other users, drawn to smartphones for self-expression and self-image display, may engage in more affective uses through social networking sites (hereinafter SNSs) (Kelan, 2007; Song, 2004). These users focus more on the recreational, entertainment and self-expressive functions of smartphones, such as decorating a phone and otherwise personalizing user interfaces. Likewise, Song (2004) classified user groups based on functional and expressive motivations, and identified four distinct groups (Table III). In line with this classification, Kelan (2007) also argued that different media use styles exist with some users adopting an "instrumental style" (seemingly more common among males) and others having more of an "expressive style" (more common among females).

2.3.2 Capability and skill divide. Second, smartphone users can be classified by their capability levels, as experienced users and inexperienced users. The capability will be more evident in the younger generation, who would be more active and easily use smartphones. Digital literacy will play a role in shaping this divide. Basic education and cultural capital would be required for capable smartphone uses. Interestingly, relationships with others and social support seem to make a big difference in users' capability (de Haan, 2004).

2.3.3 Applications use divide. Mobile applications, serving for entertainment, information, education and financial functions, are available to users in almost unlimited numbers, with the users' motivation being the only determinant of individualized experience. Active users will creatively exploit the functions of smartphones by downloading and utilizing various mobile apps, while less active users may be limited to using the basic apps. Knowing how to use social networking sites determines whether the users are active or not (Kim *et al.*, 2011). The mobility and immediacy characteristic of smartphones would make SNSs more effective and efficient. A South Korean survey found that the main reasons for using SNSs over smartphones were information and networking (86 per cent), communication (84 per cent) and building and managing relationship (83 per cent) (KISA and KCC, 2010). According to Verkasalo's (2010) study, examining the ways people spend time with smartphones, messaging (21 per cent of all direct face time spent with smartphones) and voice (34 per cent) together represent only a little over half of all smartphone usage, with Internet browsing (14 per cent) and multimedia (15 per cent) competing with voice and messaging. Within the messaging category, SMS and e-mail represent a total of 96 per cent of usage. Music, camera and gallery (viewing of photos) are the key multimedia functions.

2.3.4 Smartphone consequences divide. In this section, the literature on the consequences to users and society of different levels of utilization and engagement with smartphones is examined. In general, it has been argued that this "consequential divide" includes

Table III Assorted user groups by motivations

	Motivation for functions	
	Low	*High*
Motivation for expressions		
Low	Limited users	Functional users
High	Expressive users	Complex users

Source: Song (2004)

information gaps, divides in social relationships, divides in lifestyle and divides in civic and political participation. We discuss each of these separately below.

2.3.5 Information gaps. Kim *et al.* (2011) found differences among smartphone users in the usage of information retrieval, SNS use, and access of information apps. Some users actively utilized the functions of smartphones for professional activities or information search, while others reported that their usage was driven more by fun, hobbies or life convenience, though these users too searched for information and used basic information applications. Active users were more likely to use SNS extensively, and search and share information. In particular, as social media is a real-time information network, more intense engagement with SNS would be a marker of a more active user, even for other types of applications.

Twitter is a prominent SNS for real-time news delivery and information sharing by combining the functions of blogging, short message service, messenger and communities. Thus, the information we are getting out of Twitter will be common interests or issues. Twitter can spread information at unprecedented speed, and users without real-time information would be disadvantaged.

It is possible that age and years of Internet experience are closely related with advanced usage, as found by Hargittai and Kim (2012). People who have been Internet users for a longer period are more likely to use SNSs, games, the Internet, photos and video functionalities regularly. Users' level of online skills are also strongly associated with playing games, going online, taking and sharing pictures and videos and listening to music on their cell phone (Hargittai and Kim, 2012). A study conducted by Rubicon Consulting (2008) on iPhone users indicated that 50 per cent of the surveyed users were aged 30 years or younger. Most of the users described themselves as being technologically sophisticated.

2.3.6 Divide in social relationships. As building and managing social relationship is a primary function of SNSs on smartphones, a "social relationship divide" too may be expected as a consequence of differences in smartphone access and usage. In 2012, more than 425 million active users accessed Facebook through mobile devices like smartphones and tablets (Facebook, 2012). Feature phone users were more likely to use basic phone functions for making a phone call or texting with friends or family members. Accessing SNS's on smartphones would increase the opportunity of amplifying the range and depth of social networking.

2.3.7 Divide in lifestyle. Smartphones can make a difference in lifestyle as well, depending on whether users perceive the phone either as a functional tool or an aid to daily living. Differences in the intensity of use (limited vs extensive use) or usage style (active vs less active use) seem to affect the outcomes and lifestyle consequences of use. An older user is more likely to perceive new media as a tool for resolving problems and try to accommodate with the technology, while the younger generation is more likely to assimilate themselves into the technology (Song, 2004). Thus, the older generation would think of the smartphone as another advanced cell phone, while the young generation would think of it as a daily necessity. They would use it for managing everyday lives and social networking. Younger users are likely to be more active and to seek out and create new functions.

2.3.8 Divide in civic and political participation. By using multiple functions and SNSs, smartphone users gain more advantages in social and political participation. Smartphone users with high level of interest in political issues and high use of SNSs were more actively involved with political communication. Those with high levels of political opinion and knowledge are more likely to participate in public discussions, search for political information and engage in offline political activities (Lee *et al.*, 2012). On the other hand, smartphone users using only basic functions were not very active in political communication (Kum and Cho, 2010). Twitter is ideally suited for immediate communication because 80 per cent of conversation topics on Twitter were real-time

current affairs. Whereas the capitalist class will possess social power in industrial society, informed citizens are better positioned to exercise power in the information society. In the social networking society, celebrities with reputational capital gain influence as opinion leaders. These people would play a dominant role in disseminating information and leading public opinion by actively utilizing the mobility and immediacy of new technologies (Lee *et al.*, 2012). Wu *et al.* (2010) found that 0.05 per cent of elite users were producing half of the popular tweets, and Sysomos (2010), a company for social media analysis, discovered that the top 2.2 per cent of users produced 58.5 per cent of total tweets in December 2010. The majority of users like to follow the most productive and influential tweeters and their dependence on the influential may mislead or bias the public issues. Overrepresentation of a certain group or interest in political discourse is possible and that can be an unexpected negative consequence of differential use. Furthermore, the older generation that relies more on traditional mass media and the younger generation that actively adopts and uses new media may be getting information for the same issue from non-overlapping sets of sources, resulting in a divergence in their interests or agendas. Campbell and Kwak (2010) explored how the pattern of mobile communication affects civic and political engagement, and found a positive relationship between mobile phone use for information exchange and civic and political involvement. Furthermore, the findings indicated that an individual's technological competence determined their level of engagement. Individuals who feel more comfortable using mobile telephony and use it for exchanging information about public affairs tend to be more civically and politically engaged than those who are less comfortable with technology. Thus, Campbell and Kwak's findings identified an emergent dimension of the digital divide, namely, technological fluency.

3. A pilot study: smartphone divide

3.1 Sampling and data collection procedure

In the context of the above literature review, a pilot study was conducted utilizing an online survey to examine the proposed theoretical dimensions of the smartphone divide. Because college students have been identified as the most active adopters of smartphones (Pew, 2012), it was decided to collect data from a college student sample in the USA. Following Rice and Katz (2003), hypotheses are framed to test for intragroup differences based on access, experience and persistence of usage. Accordingly, two separate online survey instruments were developed to collect data for two different groups, smartphone adopters/users and smartphone non-adopters/non-users. Prior to data collection, ethics approval was obtained from the University's Institutional Review Board for human subjects' research.

A total of 395 undergraduate students (38.7 per cent male, 58.2 per cent female) attending two different four-year universities in the eastern USA participated in this study (M_{age} = 22.34, SD_{age} = 7.99). A total of 296 smartphone users completed the survey, and 99 non-users. Participants were recruited by an invitation circulated through class e-mailing lists, which contained the URL of the survey questionnaire. Participants received extra credits for completing the online questionnaire. The data collection were administered in August/September 2013 with a response rate of 68 per cent.

3.2 Variable measurement

The variables measured in this study are mostly adopted from Kim *et al.*'s (2011) interview questionnaires. Because the online survey was conducted separately for smartphone adopters/users and smartphone non-adopters/non-users, the variables measured were adjusted to each category. For example, the survey questions for smartphone users comprise general media usage behavior, general social activities, the level of participation in political issues, mobile application usage, usage scope, perceptions of cell phones, demographics and socioeconomic status, while the questions on application usage and usage scope were not included in the questionnaire for non-users (Table IV). Also, active

Table IV Variable measurements

Variables	*Questions*
Smartphone	Smartphone users/Non-users
Active users/Less active users	Extent of mobile application use, i.e., the number of mobile applications a person uses
Media usage and social activities	
Adopt_Fast	In general, how quickly do you adopt new digital technologies (e.g. digital cameras, MP3 players, cell phones, etc.)?
EasytoUse	Do you find digital technologies easy or difficult to use (e.g. digital cameras, MP3 players, cell phones, etc.)?
Internet_EasytoUse	How do you find the usage of the Internet? Very difficult to use–Very easy to use
TV_Hour/Newspaper_Hour/ PC_Hour/SNS_Hour	Approximately how many hours in a typical day do you use the following media? (television, newspaper, personal computer and SNSs)
Offline_SocialCom/ Online_SocialCom	How many social communities do you participate in? (offline/online)
FriendsOnline	How many friends do you have on SNSs including friends and followers?
Friends_OnlyOnline	Among your friends online, how many of them have you met online from the start?
Level of participation in social and political issues	
News	I am very much interested in news and current affairs
SocialCampaign	I participate in social campaigns such as charity and volunteering activities
PoliticalGroups	I participate in political groups or public interest organizations
Protest	I participate in any type of protest activities (e.g. Occupy Wall Street)
OnlineDiscussion	I participate in online discussions related to social and political issues
Boycotts	I participate in boycotts and/or signature-seeking campaigns online
Smartphone usage	
MobileYears	How many years have you used a mobile phone (years of mobile phone experience)?
SmartphoneYears	How many years have you used a smartphone (years of smartphone use experience)?
Voice_Use/Text_Use/Data_Use SNS_Time	How much time do you use for each service? (voice/text/data, minutes)
Application use	
FreeApps/PaidApps	How many mobile applications do you currently have on your smartphone? (free applications/paid applications, numbers)
No_Apps_Download	On average in a month, how many new applications do you download from iTunes or mobile app stores?
Perception about Smartphones (or Mobile Phones for non-users)	
Perceived_Awareness	I am well aware of the functions of smartphones
Perceived_Usability	I make the most out of the functions of smartphones
Changes after smartphone adoption (Only for smartphone users)	
LifeChange_1	I use my time more efficiently
LifeChange_2	I am more often alone
LifeChange_3	I tend to glance at my smartphone while interacting with others
LifeChange_4	I feel uncomfortable without my smartphone
LifeChange_5	I feel closer with my family, friends and colleagues after smartphone use
LifeChange_6	I participate in more activities (parties, meetings, get-togethers, etc.)
LifeChange_7	I am more sociable and make more new friends
LifeChange_8	I get new and updated information faster
LifeChange_9	I get timely information when making a decision
LifeChange_10	I share information with others more often
LifeChange_11	I obtain helpful information for my leisure/hobby related activities
LifeChange_12	My smartphone helps me to do my job (either business or school works)
LifeChange_13	My social and/or community participations have increased
LifeChange_14	I feel I am advanced for my time by using smartphone
LifeChange_15	Smartphone is an outlet for me to express myself

smartphone users and less active users were divided based on the number of mobile applications the person frequently uses. Although there may be other criteria for making the active/less active distinction such as the amount of time an individual spends with social media or how many apps the individual has purchased or how long the individual uses the smartphone per day, the use of smartphone applications is a distinctive aspect of the platform (Kim *et al.*, 2011). Accordingly, it was chosen as the best indicator of active usage, but it may seem an arbitrary decision and alternative criteria may be developed for future

research. All the survey items were measured on 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

3.2.1 Sociodemographics. In addition to the age and gender variables, participants' household income and racial/ethnic background were measured. The five categories used for measurement of household income were "under $20,000", "$20,000-$34,999", "$35,000-$49,999", "$50,000-$74,999" and "$75,000 or more". The categories for race/ethnicity were "Caucasian/White", "Black or African American", "Hispanic, Latino or Spanish origin", "Asian/Pacific Islander" and "Multi-racial or Mixed Race[1]".

On the basis of the variables above, we measured if there were statistically significant differences between smartphone users and non-users, and between smartphone active users and less active users in terms of media usage and social activities, level of political participation, perceptions about smartphone (or mobile phone). For smartphone users, differences in smartphone usage, application usage and consequential change after adoption were measured. Independent samples *t*-tests were conducted and reported in the following section.

3.3 Results

The *t*-tests in Table V indicate that there were mixed results in terms of differences between smartphone users and non-users. In terms of media usage, not much difference was found except on the speed with which users adopted new digital technologies. Naturally, smartphone users were more likely to be early adopters of all digital technologies, a finding previously observed by Yelton (2012). Smartphone users were found to have a significantly higher number of online friends and "online-only" friends. That might be ascribed to the smartphone's technological benefits, that is, users can easily connect with their friends online with no limits of time and place unlike feature phone users. In addition, it is interesting that the level of participation in social and political issues showed significant differences on most participation questions. Although the two groups did not display much difference in

Table V Independent samples *t*-tests of divides between smartphone users and non-users

	Smartphone users (n = 296)		*Smartphone non-users (n = 99)*		
	M	*SD*	*M*	*SD*	t-*test*
Media usage and social activities					
Adopt_Fast	3.90	1.08	3.49	1.21	$t(154) = 3.11^{**,a}$
EasytoUse	4.38	0.97	4.19	0.91	$t(391) = 1.74$
Internet_EasytoUse	4.70	0.97	4.68	0.91	$t(391) = 0.80^{*}$
TV_Hour	1.71	1.48	2.23	6.15	$t(100) = -0.82^{a}$
Newspaper_Hour	0.32	1.88	0.25	0.49	$t(386) = 0.35$
PC_Hour	4.45	2.79	4.86	2.96	$t(390) = -1.26$
SNS_Hour	3.28	3.71	3.21	6.55	$t(388) = 0.13$
Offline_SocialCom	1.63	2.07	2.27	2.32	$t(268) = 0.77$
Online_SocialCom	2.99	3.74	2.30	1.78	$t(275) = 0.70$
FriendsOnline	778.11	839.86	530.88	626.03	$t(228) = 3.08^{**,a}$
Friends_OnlyOnline	943.89	742.49	102.05	197.26	$t(255) = 2.34^{*,a}$
Level of participation in social and political issues					
News	3.70	0.98	3.72	0.96	$t(382) = -0.17$
SocialCampaign	3.07	1.14	3.30	0.95	$t(382) = -1.82^{****}$
PoliticalGroups	2.28	1.03	2.69	0.85	$t(381) = -3.48^{***}$
Protest	1.83	0.96	2.43	0.77	$t(210) = -5.68^{***,a}$
OnlineDiscussion	2.47	1.23	2.75	0.99	$t(235) = -2.21^{*,a}$
Boycotts	2.12	1.11	2.58	0.81	$t(235) = -4.33^{***,a}$
Perception about smartphones (or mobile phones)					
Perceived_Awareness	4.39	0.95	4.35	0.93	$t(380) = 0.43$
Perceived_Usability	3.93	1.13	3.65	1.16	$t(375) = 2.08^{*}$

Notes: $^{****}p < 0.10$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$; [a]equal variances not assumed

their interest in news and current affairs, other items all showed significant differences, for example in "I participate in social campaigns such as charity and volunteering activities", "I participate in political groups or public interest organizations", "I participate in any type of protest activities", "I participate in online discussion related to social and political issues" and "I participate in boycotts and/or signature-seeking campaigns online". Smartphone users are more likely to participate in social and political issues than non-users. In effect, smartphone users are privileged in social and political interactions due to the instant information sharing and feedback opportunities enabled by smartphones, as suggested by Lee *et al.* (2012) and Kim *et al.* (2011).

Then, differences between active smartphone users and less active users were compared. As indicated previously, active smartphone users and less active users were categorized based on the number of mobile applications the person frequently uses. In this study, the number of applications a subject frequently used was eight on average, and active users were defined as users who used more than eight applications every day, and less active users as those used less than eight applications. The two groups were compared on the same variables as above but additionally including some variables relevant to smartphone usage and application usage, and changes after adoption. The grey area in Table VI indicates significant differences between the two groups.

Active smartphone users are more likely to adopt new technologies fast compared to inactive users at the moderate level [Adopt_Fast: $t(274) = 1.80$, $p = 0.07$]. Also, active users tend to spend longer time on SNSs than inactive users [SNS_Hour: $t(273) = 2.44$, $p = 0.007$], which coincides with the expectation from previous research (Kim *et al.*, 2011). The longer you have owned a smartphone, the more likely you are to be an active user [SmartphoneYears: $t(154) = 2.31$, $p = 0.02$]. This may be ascribed to a learning effect over time. In addition, active users are more confident, at a moderately significant level, in the perception of their ability to use smartphones, indicated by their response to the statement "I make the most out of the functions of smartphones" [$t(270) = 1.74$, $p = 0.08$]. In terms of application use, active users exhibited a tendency to have more free applications, more paid applications and more applications altogether than inactive users. Finally, active users were more likely than inactive users to agree with statements such as "I use my time more efficiently", "I get timely information when making a decision", "I obtain helpful information for my leisure/hobby related activities" and "My smartphone helps me to do my job (either business or school works)" (Table VI).

3.4 Discussion

This study examined the differences between smartphone users and non-users and between active smartphone users and less active users. The results suggest a few interesting findings. First, smartphone users in this study were more active online as expected. Although no significant difference was detected in the amount of time spent on SNSs between smartphone users and non-users, smartphone users had more friends online and more "online-only" friends than non-users. This may indicate their vigorous online activities and in particular, the number of "online-only" friends often signifies the more assertive social activities of Internet users (Watkins, 2009).

Second, smartphone users seem to participate more actively in social and political issues than non-users do. This finding is relevant to the finding by Campbell and Kwak (2010), which suggests that individuals who report higher levels of competence in mobile telephony and use it for information exchange tend to be more civically and politically engaged than those who report less competence in the technology. Smartphone users are also more likely to exhibit greater comfort with digital technologies – in this study, they are likely to adopt digital technologies faster than non-users – and showed greater tendency to participate in social and political issues. This finding suggests that the smartphone divide can lead to real differences in social engagement and political empowerment, eventually impacting the quality of our democracy.

Table VI Independent samples *t*-tests of divides between active and less active smartphone users

	Smartphone active users (n = 99)		*Smartphone less active users (n = 177)*		
	M	*SD*	*M*	*SD*	t-*test*
Media Usage and Social Activities					
Adopt_Fast	4.07	1.04	3.83	1.07	$t(274) = 1.80^{****}$
EasytoUse	4.51	0.89	4.34	0.98	$t(274) = 1.38$
Internet_EasytoUse	4.75	0.66	4.66	0.75	$t(274) = 1.02$
TV_Hour	1.81	1.43	1.68	1.55	$t(272) = 0.70$
Newspaper_Hour	0.17	0.33	0.42	2.4	$t(269) = -0.99$
PC_Hour	4.63	2.41	4.50	2.97	$t(273) = 0.36$
SNS_Hour	3.73	2.82	2.57	2.84	$t(273) = 2.44^{**}$
Offline_SocialCom	2.70	3.26	2.11	2.15	$t(82) = 1.24^{a}$
Online_SocialCom	2.22	1.94	2.09	1.52	$t(171) = 0.45$
FriendsOnline	846.80	959.47	723.89	677.54	$t(149) = 1.11^{a}$
Friends_OnlyOnline	128.03	345.47	133.11	230.75	$t(244) = -0.14$
Level of Participation in Social and Political Issues					
News	3.74	0.97	3.71	0.99	$t(274) = 0.21$
SocialCampaign	3.07	1.16	3.08	1.13	$t(272) = -0.06$
PoliticalGroups	2.22	1.08	2.32	1.01	$t(272) = -0.80$
Protest	1.82	0.93	1.85	0.98	$t(271) = -0.24$
OnlineDiscussion	2.48	1.22	2.47	1.24	$t(270) = 0.07$
Boycotts	2.15	1.09	2.10	1.13	$t(270) = 0.37$
Smartphone Usage					
MobileYears	7.91	2.95	7.89	2.32	$t(244) = 0.06$
SmartphoneYears	3.8	1.84	3.26	1.56	$t(154) = 2.31^{*,a}$
SNS_Time	3.71	4.31	3.63	3.92	$t(177) = 0.13$
Perception about Smartphones					
Perceived_Awareness	4.41	0.88	4.34	1.08	$t(274) = 0.57$
Perceived_Usability	4.10	1.12	3.86	1.11	$t(270) = 1.74^{****}$
Application use					
FreeApps	43.40	40.68	17.09	18.70	$t(121) = 6.08^{***,a}$
PaidApps	3.93	4.90	2.09	3.55	$t(155) = 3.25^{***,a}$
No_Apps_Use	14.27	5.72	4.68	1.80	$t(108) = 16.24^{***,a}$
Changes after smartphone adoption (Only for Smartphone Users)					
I use my time more efficiently	3.31	1.01	3.07	0.97	$t(273) = 1.87^{****}$
I am more often alone	2.32	1.00	2.45	1.06	$t(273) = -0.99$
I tend to glance at my smartphone while interacting with others	3.68	1.12	3.77	1.00	$t(273) = -0.68$
I feel uncomfortable without my smartphone	3.35	1.11	3.44	1.18	$t(273) = -0.61$
I feel closer with my family, friends and colleagues after smartphone use	3.44	1.11	3.31	1.02	$t(273) = 0.96$
I participate in more activities (parties, meetings, get-togethers, etc.)	3.47	1.03	3.28	1.05	$t(272) = 1.41$
I am more sociable and make more new friends	3.36	1.08	3.29	0.98	$t(272) = 0.15$
I get new and updated information faster	4.18	0.91	4.14	0.76	$t(272) = 0.46$
I get timely information when making a decision	4.00	0.88	3.81	0.83	$t(273) = 1.73^{****}$
I share information with others more often	4.07	0.80	3.96	0.85	$t(272) = 1.06$
I obtain helpful information for my leisure/hobby related activities	4.04	0.94	3.77	0.84	$t(273) = 2.46^{*}$
My smartphone helps me to do my job (either business or school works)	3.93	0.96	3.69	0.99	$t(272) = 0.49^{****}$
My social and/or community participations have increased	3.42	1.04	3.37	0.94	$t(270) = 0.15$
I feel I am advanced for my time by using smartphone	3.46	1.12	3.25	1.04	$t(270) = 0.17$
Smartphone is an outlet for me to express myself	3.10	1.16	3.18	1.16	$t(269) = 0.97$

Notes: $^{****}p < 0.10$; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$; [a]equal variances not assumed

Third, likewise, the differences between active smartphone users and less active users were discovered in many dimensions. First of all, active users were adopting digital technologies faster than less active users, and active users were inclined to spend longer time on SNSs than less active users. Also, active users used more free and paid applications on their smartphones compared to less active users. Those results correspond well with previous research (Kim *et al.*, 2011; Hargittai and Kim, 2012; Lee *et al.*, 2012). Also, by showing more confidence that they can make the best use of a smartphone, active users showed the higher level of use capability, which has been suggested by Song's (2004) mobile divide study. In addition, active users tended to think of their smartphones as more efficient, timely, informative and helpful for doing business or school work compared to the less active users. When seen in the context of active users' tendency toward faster adoption, these findings may indicate the personal innovative tendency of early adopters and innovative adopters (Rogers, 1995). Rogers (1995) has suggested that the early phase of innovation adoption was closely linked to the personal innovative tendencies of early users. As discussed previously, studies show that people's personality played a role in their adoption and use of technologies (Hamburger and Ben-Artzi, 2000; Hills and Argyle, 2003). Low innovative personality can be a barrier to adoption, especially for such a versatile mobile device as a smartphone.

Other variables indicating social interaction and self-expression (Table VI) did not show much difference between active users and less active users. This indicates that subjects participated in this study were more likely to focus on smartphone's functions rather than its sociocultural aspects. As Kelan (2007) and Song (2004) have argued, users adopt different media use styles based on functional and expressive motivations. That is, some users adopting an "instrumental style" may focus more on the utilitarian aspects of a technology, while others having more of an "expressive style" may pursue self-expression and pleasure. Interestingly, the active users participated in the study reported more instrumental and function-oriented viewpoints about smartphones even though a smartphone has much potential to be a self-expressive gadget (Song, 2004). As the smartphone becomes more prevalent and more ingrained in the sociocultural milieu, however, more sociocultural and affective aspects may emerge among users.

4. Conclusion

The discourses surrounding the digital divide have been evolving from a concern with simple accessibility to technology, to the consideration of users' capability to utilize digital technologies and engage with it. However, the emergence of smartphone is changing the dimensions of digital divide further to include not only how to use but also how much to use. That is, the chasm between more active users and less active users of smartphone should be considered for a better understanding of the current digital divide in society, and the direction it is likely to take in the future.

The rapid diffusion of smartphone and its higher use have been quickly changing the characteristics of the digital divide. Digital divide created by smartphones started to gain attention among scholars only recently (Verdegem and Verhoest, 2009; Verkasalo, 2010; Hargittai and Kim, 2010). Indeed, with an increasing array of traditional and new media and technologies embraced by smartphones, research efforts have identified new dimensions of the digital divide. This paper intended to examine those research efforts and identify the multifaceted dimensions of the digital divide with smartphones. The smartphone divide is not a simple access problem that can resolve by enabling ownership. Such divides in physical access are more noticeable and easily settled over time, but divides in users' capability; utilization and engagement can hardly be managed in a short time.

Beyond those multiple aspects, the digital divide occurs not only between users and non-users but also within user groups. Differences in the quality of utilization and awareness of smartphone functions have been observed among smartphone users. Thus,

there was recognition that while the conventional digital divide based on ownership of smartphones has been decreasing; the discrepancy in utilization and engagement, and its consequential divides has been increasing (Lee *et al.*, 2012). Divides in information, social relationships, lifestyles and civic and political participation between active users and inactive users were detected. As van Dijk (2012) argued, the digital divide with mobile technologies has been widening rather than closing thanks to the more advanced features of smartphones. For example, the integration of social media and smartphones has accelerated the dominance of technologically savvy users in political discourse compared to less media-aware users. This seems inevitable because previous computer-based online political forums quickly transitioned to social media, and again to social media on smartphones. Jenkins (2009) once posited that concerns over the "digital divide" were being replaced by concerns over what he calls the "participation gap". This gap involves "unequal access to the opportunities, experiences, skills, and knowledge that will prepare youth for full participation in the world of tomorrow" (p. 3). He suggests that those who are not participating in opportunities such as online learning are going to be left further behind, compared to those who are currently participating. Jenkins's participatory divide might be a reality in the near future. Thus, the digital divide in mobile technologies should be considered with its multifaceted dimensions. Just like people who are not connected to the Internet or lack the capabilities to use it may be completely isolated from a society, those people who cannot save unnecessary transaction costs through mobile technologies or actively engage in extracting the most benefits out of them may be left behind.

The findings shed new light on the discourses of digital divide in a smart media environment, while highlighting user skill and competencies as an emergent dimension of the so-called dual digital divide, which has traditionally focused only on non-users. This research suggests practical implications for policy and regulation because it expands the notion of the digital divide to encompass not just access but also usage, skill and competencies.

Note

1. The distribution of the racial/ethnic categories was as follows: "Caucasian/White" (67.6 per cent); "Black or African American", (9.6 per cent); "Hispanic, Latino or Spanish origin" (6.8 per cent); "Asian/Pacific Islander" (6.1 per cent); and "Multi-racial or Mixed Race" (1.1 per cent).

References

Akiyoshi, M. and Ono, H. (2008), "The diffusion of mobile internet in Japan", *The Information Society*, Vol. 24 No. 5, pp. 292-303.

Bandura, A. (1986), *Social Foundations of Thought and Action: A Social Cognitive Theory*, Prentice-Hall, Englewood Cliffs, NJ.

Bucy, E.P. and Newhagen, J.E. (Eds), (2004), *Media Access: Social and Psychological Dimensions of a New Technology Use*, Lawrence Erlbaum Associates, Mahwah.

Campbell, S.W. and Kwak, N. (2010), "Mobile communication and civic life: linking patterns of use to civic and political engagement", *Journal of Communication*, Vol. 60 No. 3, pp. 536-555.

Crawford, S.P. (2011), "The new digital divide", *The New York Times*, SR1, available at: www.nytimes.com/2011/12/04/opinion/sunday/internet-access-and-the-new-divide.html?pagewanted=all&_r=0 (accessed 3 January 2012).

de Haan, J. (2004), "A multifaceted dynamic model of the digital divide", *IT & Society*, Vol. 1 No. 7, pp. 66-88.

Facebook (2012), "Facebook developers", available at: http://developers.facebook.com/docs/guides/mobile

Facer, K. and Furlong, R. (2001), "Beyond the myth of the 'cyberkid' young people at the margins of the information revolution", *Journal of Youth Studies*, Vol. 4 No. 4, pp. 451-469.

Fortney, J.C., Burgess, J.F. Jr, Bosworth, H.B., Booth, B.M. and Kaboli, P.J. (2011), "A re-conceptualization of access for 21st century healthcare", *Journal of General Internal Medicine*, Vol. 26, pp. 639-647.

Fox, S. and Madden, M. (2005), "Generations online", Pew Internet & American Life Project.

Hamburger, Y.A. and Ben-Artzi, E. (2000), "The relationship between extraversion and neuroticism and the different uses of the internet", *Computers in Human Behavior*, Vol. 16 No. 4, pp. 441-449.

Hargittai, E. (2002), "The second-level digital divide: differences in people's online skills", *First Monday: Peer-Reviewed Journal on the Internet*, Vol. 7 No. 4.

Hargittai, E. and Kim, S.J. (2012), "The prevalence of smartphone use among a wired group of young adults", Institute for Policy Research Northwestern University Working Paper Series, available at: www.ipr.northwestern.edu/publications/papers/2011/ipr-wp-11-01.html

Hills, P. and Argyle, M. (2003), "Uses of the internet and their relationships with individual differences in personality", *Computers in Human Behavior*, Vol. 19 No. 1, pp. 59-70.

Horrigan, J.B. (2011), "What are the consequences of being disconnected in a broadband connected world?", *Dædalus*, Vol. 140 No. 4, pp. 17-31.

Horrigan, J. (2012), "Recent tech adoption trends and implications for the digital divide", available at: www.jointcenter.org/research/recent-tech-adoption-trends-and-implications-for-the-digital-divide (accessed 1 March 2013).

InfoDev (2012), "Maximizing mobile", 2012 Information and Communications for Development, available at: www.infodev.org/infodev-files/resource/InfodevDocuments_1179.pdf (accessed March).

Jenkins, H. (2009), *Confronting the Challenges of Participatory Culture: Media Education for the 21st Century*, MIT Press, Cambridge.

Kelan, E.K. (2007), "Tools and toys: communicating gendered positions towards technology", *Information, Communication & Society*, Vol. 10 No. 3, pp. 358-383.

Kim, H., Shin, K., Kho, D. and Lee, S. (2011), "Mobile divide in the age of smartphone", KT Business & Economics Research Center, available at: www.digieco.co.kr/KTFront/index.action (accessed 26 March 2012).

Kim, Y. (2005), *Digital New Generation*, Yongrim Cardinal, Seoul.

King, J. (2011), "How big telecom used smartphones to create a new digital divide ", available at: Colorlines.com, http://colorlines.com/archives/2011/12/the_new_digital_divide_two_separate_but_unequal_internets.html (accessed 11 March 2012).

Korea Communications Commission (KCC) (2011), "2011 Broadcasting media use survey", available at: http://old.kcc.go.kr/user.do?mode=view&page=P02020400&dc=K02020400&boardId=1006&boardSeq=33337 (Korean).

Korea Internet Security Agency (KISA) and Korea Communication Commission (KCC) (2010), "Smartphone use survey (II)", available at: www.kcc.go.kr/

Kum, H. and Cho, J. (2010), "Smartphone, communication gap and political participation", *Korean Journal of Journalism & Communication Studies*, Vol. 54 No. 5.

Lee, W., Kim, C., Kho, S. and Shin, H. (2012), "Participation discrepancy in the smartphone environment and public policy responsive strategies", *KISDI Research*, 12-04, available at: www.kisdi.re.kr (Korean).

Molnár, S. (2002), "The explanation frame of the digital divide", BME-UNESCO Information Society Research Institute, Technical University of Budapest, available at: http://tatk.academia.edu/Szil%C3%A1rdMoln%C3%A1r/Papers/1347373/The_explanation_frame_of_the_digital_divide (accessed 2 March 2012).

Park, Y. and Chen, J.V. (2007), "Acceptance and adoption of the innovative use of smartphone", *Information Management and Data Systems*, Vol. 107 No. 9, pp. 1349-1365.

Pew (2012), "46% of American adults are smartphone owners", Pew Research Center's Internet & American Life Project, available at: http://pewinternet.org/Reports/2012/Smartphone-Update-2012.aspx (accessed 1 March 2012).

Rice, R.E. and Katz, J.E. (2003), "Comparing internet and mobile phone usage: digital divides of usage, adoption, and dropouts", *Telecommunications Policy*, Vol. 27 Nos 8/9, pp. 597-623.

Rogers, E.M. (1995), *The Diffusion of Innovations*, 4th ed., Free Press, New York, NY.

Rubicon Consulting (2008), "The Apple iPhone: successes and challenges for the mobile industry. A Study of iPhone Users", available at: http://rubiconconsulting.com/downloads/whitepapers/Rubiconphone_User_Survey.pdf

Selwyn, N. (2004), "Reconsidering political and popular understanding of the digital divide", *New Media & Society*, Vol. 6 No. 3, pp. 341-362.

Song, J.H. (2004), "Conceptualizing the mobile divide and suggestions for its resolution", Digital Divide Issue Report, The National Information Society Agency.

Stanley, L.D. (2003), "Beyond access: psychosocial barriers to computer literacy", *The Information Society*, Vol. 19 No. 5, pp. 407-416.

Sysomos (2010), "Twitter statistics for 2010", available at: www.sysomos.com/insidetwitter/twitter-stats-2010/ (accessed March 2012).

van Dijk, J. (2004), "Digital new media", *The Sage Handbook of Media Studies*, Sage, Thousand Oaks, pp. 145-163.

van Dijk, J. (2005), *The Deepening Divide: Inequality in the Information Society*, Sage, Thousand Oaks, CA.

van Dijk, J. and Hacker, K. (2003a), "The digital divide as a complex and dynamic phenomenon", *The Information Society*, Vol. 19 No. 4, pp. 315-326.

van Dijk, J. and Hacker, K. (2003b), "The digital divide as a complex and dynamic phenomenon", *The Information Society: International Journal*, Vol. 19 No. 4, pp. 315-326.

van Dijk, J. (2012), "The evolution of the digital divide: the digital divide turns to inequality of skills and usage", in Bus, J., Crompton, M., Hildebrandt, M. and Metakides, G. (Eds), *Digital Enlightenment Yearbook 2012*, IOS Press, Amsterdam, Berlin, Tokyo, Washington, DC, available at: www.utwente.nl/gw/vandijk/news/The%20Evolution%20of%20the%20Digital%20Divide/Evolution%20of%20the%20Digital%20Divide%20Digital%20Enlightment%20Yearbook%202012.pdf

Verdegem, P. and Verhoest, P. (2009), "Profiling the non-user: rethinking policy initiatives stimulating ICT acceptance", *Telecommunications Policy*, Vol. 33 Nos 10/11, pp. 642-652.

Verkasalo, H. (2010), "Analysis of smartphone user behavior", *Ninth International Conference on Mobile Business/2010 Ninth Global Mobility Roundtable, Athens*, pp. 258-263.

Verna, P. (2012), "Smart devices: evolution and convergence", eMarketer, available at: http://cntelligence.condenast.com/uploads/document_attachment/attachment/155/emarketer_smart_devices-evolution_and_convergence.pdf (accessed 8 March 2012) .

Wareham, J., Levy, A. and Shi, W. (2004), "Wireless diffusion and mobile computing: implications for the digital divide", *Telecommunications Policy*, Vol. 28 No. 6, pp. 439-457.

Watkins, S.C. (2009), *The Young and the Digital: What the Migration to Social-network Sites, Games, and Anytime, Anywhere Media Means for Our Future*, Beacon Press, Boston, MA.

Wu, C.-I., Chan, C.-W., Chen, Y.-C. and Ishii, K. (2006), "Digital opportunity: the digital gap between openness and closeness of relational divide upon the mobile phone usage", *International Journal of Internet and Enterprise Management*, Vol. 4 No. 3, pp. 269-292.

Wu, S., Hofman, J.M., Mason, W.A. and Watts, D.J. (2011), "Who says what to whom on Twitter", Copyright is held by the International World Wide Web Conference Committee (IW3C2). WWW, Hyderabad, 28 March-1 April 2011, available at: www.cs.cornell.edu/~sw475/ (accessed March 2013).

Wu, S. (2011), "Who says what to whom on Twitter", Presented at International World Wide Web Conference Committee.

Yelton, A. (2012), "Who are smartphone users? From bridging the digital divide with mobile services", Chapter 1, Library Technology Reports.

Zickuhr, K. and Smith, A. (2012), "Digital difference", Pew Research Center's Internet & American Life Project, available at: http://pewinternet.org/Reports/2012/Digital-differences.aspx

Further reading

Barzilai-Nahon, K., Gomez, R. and Rucha, A. (2009), "Conceptualizing contextual measurements for digital divide/s: using an integrative narrative", in Ferro, E., Dwivedi, Y.K., Ramon, G. and

Williams, M.D. (Eds), *Handbook of Research on Overcoming Digital Divides: Constructing an Equitable and Competitive Information Society*, IGI Global Hershey, New York.

Gartner (2012), "Gartner says worldwide Smartphone sales soared in fourth quarter of 2011 with 47 per cent growth", available at: www.gartner.com/it/page.jsp?id=1924314

Leung, L. and Wei, R. (2000), "More than just talk on the move: uses and gratification of cellular phone", *Journalism and Mass Communication Quarterly*, Vol. 77 No. 2, pp. 308-320.

PC Magazine (2011), "Definition of Smartphone", available at: www.pcmag.com

PCWorld. (2012), "Apple reaches 25 billion downloads from its app store", available at: www.pcworld.com/article/251216/apple_reaches_25_billion_downloads_from_its_app_store.html

Turkle, S. (2012), "The flight from conversation", *New York Times*, SR1, available at: www.nytimes.com/2012/04/22/opinion/sunday/the-flight-from-conversation.html?pagewanted=all&_r=0

van Dijk, J.A.G.M. (2006), "Digital divide research, achievements and shortcomings", *Poetics*, Vol. 34 Nos 4/5, pp. 221-235.

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