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A new dimension of the digital divide: Exploring the relationship between broadband connection, smartphone use and communication competence

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ABSTRACT

The study explores group differences in demographic characteristics; Internet usage (device ownership, Internet availability, and frequency of weekly Internet use); and communication competence (instrumental, creative, and networking skills) between people who have and who do not have wired and/or wireless broadband connections and smartphones. The results of the one-way ANOVA and Scheffe's post-hoc comparisons demonstrate significant differences in groups with different network connection types across demographic lines, different levels of Internet usage, and different communication competences. The results of the multinomial regression show significant differences across the variables between wired-only users and wired and smartphone users as well as between wired-only users and wired, wireless, and smartphone users. However, group differences between wired and smartphone users and wired, wireless, and smartphone users are significant only in device ownership and creative skill. We concluded that smartphone use was likely to aggravate the gaps of demographics, access, and skills in the seamlessly connected media environment. Meanwhile, access gap made the most impact on information, communication, leisure/entertainment, and financial management activities online, followed by skill and demographic gaps. The findings imply that access and skill gaps could be higher barriers to the active engagement in diverse online activities and consequently create an overlapping effect on the established divide.

1. Introduction

An emerging communication technology has been at the center of an ongoing controversy over whether it contributes to bridging the digital divide or widening it. In the case of the Internet, the impact of Internet adoption and use on the digital divide has been debated since the late 1990s. Some communication scholars have argued that the Internet reinforces social inequality already established in the social structural division (DiMaggio et al., 2004; Norris, 2001; van Dijk, 2006). Some have argued that the advantageous characteristics of open networks and interactive communication modalities inherent in the Internet and the resultant users' enhanced empowerment can contribute to more participation in civic and political life (D'Alessandro and Dosa, 2001; Jenkins et al., 2009; Katz et al., 2001). Meanwhile, others have advocated that the notion

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of the digital divide should encompass multiple dimensions in a more refined way that comprehensively considers the scope of access to participation in diverse Internet uses (Hargittai, 2010; Pearce and Rice, 2013).

As such, whether the digital divide will increase or reduce social inequality still remains at the heart of the debate. Nevertheless, we need to bear in mind Selwyn's point that although the disputed arguments surrounding the discourse on technology evolution are inevitable in the evaluation of technology's effect on socio-economic growth, the positive prospects of the technology effect tend to provoke "techno enthusiasm" (Selwyn, 2004, p. 342). Being aware of making this problematic diagnosis, we need to evaluate aspects of the digital divide from a critical point of view.

While the adoption and access rates of broadband connections are leveling off, the gap in physical access to the Internet is steadily narrowing. For instance, Korea has high fixed and mobile broadband penetration rates, and about 84 percent of the population uses the Internet, ranking first in use and skills sub-indices (International Telecommunication Union, 2012). Korea's broadband Internet subscriptions per 100 people equal 36.9 percent, taking fourth place among 144 countries; its mobile broadband subscriptions per 100 people equal 105.1 percent, taking second place (Bilbao-Osorio et al., 2013).

In an over-saturated environment of Internet connections, academic focus on the digital divide has shifted away from physical access to Internet skills/usage and creative production/sharing. One reason for the shift in focus is that high-speed fixed and mobile broadband adoption, including smartphones and tablet computers, can redouble the number of seamlessly networked connections. The other reason is that the immersion of broadband connections nationwide and worldwide has made online activities that require skills more available. This increased Internet activity means communication competence has a greater influence on effective online activities; therefore, even with the increase in user experience of Internet use, instrumental and creative skills between stratified Internet users play a more important role in increasing the second level of the digital divide (Correa, 2010; Hargittai and Walejko, 2008; van Dijk, 2006), which means a discrepancy in Internet usage and skills (Hargittai, 2002).

In addition to different methods of accessing the Internet, more ways of networking through social media have emerged as another important factor that may deepen the digital divide. In particular, the rise of social network sites (SNSs) is intensifying the use of participatory online activities through interactive communication between users who in turn maintain existing social relations and make new social relations online (Boyd and Ellison, 2007).

The main purpose of the present study is to investigate the scope and magnitude of the digital divide between the haves and have-nots of wired and/or wireless broadband connections and smartphones. Subsequently, the study evaluates the importance of communication competence, including instrumental, creative, and networking skills, depending on different types of broadband access. As a result, the study will shed light on the question of whether wired and wireless broadband plus smartphones could create a new dimension in the digital divide.

The other purpose is to examine the effect of the new dimensions of digital divide on online activities. As broadband connections have reached saturation levels in various population segments, Internet users have had more opportunity to experience diverse online activities ranging from surfing, information seeking, and entertaining to real-time communicating, shopping and banking. Since the introduction of the Internet, the demographic, access, and skill gaps have been identified as the main causes of a wide range of on- and offline activities, which were expected to widen the discrepancy between haves and have-nots (Hargittai and Hinnant, 2008; Horrigan and Rainie, 2002). The smart media environment, however, could change the relationships between these gaps and online activities because it reinforces the accessibility to and availability of different network types. Hence, the study will reveal how demographic, access, and skill gaps influence diverse online activities by observing the relationships between the gaps and online activities.

2. Literature review

2.1. Demographics of the digital divide

The demographic characteristics of the digital divide refer to inequality in gender (males and female), race (Whites and non-Whites), age (older and younger), income (rich and poor), and education (more educated and less educated) in the adoption and use of new communication technologies. Previous studies show that the early stage of communication technology adoption is more likely than later stages to be closely associated with unequal demographic profiles even in advanced countries, albeit the effects of demographic disparities are not equal (Chaudhuri et al., 2005; Horrigan and Rainie, 2002; Leung and Wei, 1999; Yogesh and Banita, 2007).

Broadband adoption and use illustrates demographic inequality. In the United States, levels of household income and education were strongly associated with broadband subscriptions (Chaudhuri et al., 2005). Broadband users in the US were more likely than dial-up users to be male, wealthier, and better educated (Horrigan and Rainie, 2002). The UK presents similar correlations between broadband adoption and the socio-economic characteristics of age, income, education, and occupation, which were determinants of broadband adoption and non-adoption (Yogesh and Banita, 2007). In the case of mobile phone adoption in Hong Kong, non-adopters' profiles were more likely than adopters to be female, older, less affluent, and less educated (Leung and Wei, 1999).

However, prior research has revealed that the widespread penetration and dissemination of communication technology have the potential to reduce demographic disparities (Horrigan, 2007; Ono and Zavodny, 2003; van Dijk and Hacker, 2003). For instance, the gender gap in Internet use disappeared by 2000, although men were more likely than women to increase

the frequency and intensity of Internet use (Ono and Zavodny, 2003). Significant gaps in Internet use depending on socio-economic status were reported to diminish due to Internet availability at home, work, and public places (Horrigan, 2007). Van Dijk and Hacker (2003) argued that digital gaps in Internet adoption and access across demographic lines have either increased or decreased due to the effects of Internet saturation in the US and the Netherlands; however, they stressed that gaps in Internet skills and usage are far behind those in Internet access. The patterns of digital gaps even in other contexts and countries could be similar to these patterns.

Smartphone adoption and use are rapidly growing, with an adoption rate of over 50 percent in advanced countries (pocketapp.co.uk, 2013). While smartphone adoption and use in the US have increased across demographic lines, young adults tend to adopt and use smartphones regardless of their levels of income and education. On the other hand, older adults tend to get left behind in the use of smartphones, similar to trends in delayed adoption in other technologies. The ethnic divide shows a reverse pattern, indicating that African–Americans and Latinos are more likely than Whites to own a smartphone; their adoption rates are higher than the national average (Aaron, 2012). In Korea, smartphone adoption follows the demographic divide. Smartphone users are more likely to be male, older, wealthier, and more educated (Lee et al., 2011). Even though the ethnic divide is reversed, the findings on smartphone adoption and use show a trend reinforcing the established demographic divide.

2.2. Unequal physical access

In addition to demographic disparities in Internet use, another aspect of the digital divide is difference in physical access: (1) ownership of fixed and mobile communication technologies and (2) high-speed Internet connectivity. The notion of physical access is connected to the issue of universal access, that is, the full diffusion of new media cannot be reached until the point of critical mass (Mahler and Rogers, 1999; Markus, 1987). Because physical access to new media is inevitably unbalanced across adopters during the diffusion, it is very important that everyone in society should have an equal chance to access digital media and benefit from it. The underlying idea is that along with socio-economic disparities, the absence of physical access can cause and even make worse the unequal conditions of non-adopters socially, economically, and culturally. Despite increasing the potential and benefit of Internet access, the digitally disengaged have a greater propensity to be isolated. Put in a different way, those who cannot afford to use Internet-enabled communication technologies anywhere and anytime cannot benefit from online resources and consequently are marginalized in the society.

In an earlier wave of Internet use research, the ownership of the technologies and access to broadband were among the most important factors affecting the digital divide along with demographic disparities (Correa, 2010; DiMaggio et al., 2004; Hargittai and Walejko, 2008). More notably, while the availability of Internet access has provided basic use, online experience such as the length and amount of Internet use has become more meaningful following a period of skillful use of the Internet involving the utilization of a wide range of online activities (DiMaggio et al., 2004; Hargittai and Hinnant, 2008; Howard et al., 2002). In addition, Internet availability not for work but for personal purposes at home, work, and public facilities contributes to diversity in Internet use. Ultimately, increasing the number of locations of access embodies the always-on character of flexible Internet use. However, we live in an age when Internet-enabled handheld devices are still not diffused across a majority of the population. Hassani (2006) asserted that lack of Internet access locations could be a barrier to enjoying beneficial online activities, thereby widening the digital divide.

In the converged media environment, the patterns of the digital divide are taking on a more complex aspect. In Korea, mobile digitalization has grown at an enormous speed since the introduction of the iPhone in 2009. As of August 2012, the smartphone adoption rate reached 30 million and accounted for 57.5 percent of the total population, with Korea ranking the highest in the world (Korea Internet & Security Agency, 2012). Nevertheless, the smartphone access gap across demographic lines has remained, although the gaps in mobile skills and usage were significantly wider than the access gap (Hwang et al., 2013). The problem is that the discrepancy in smartphone adoption could further increase the established digital divide. As Norris (2001) pointed out, following the stratification rather than the S-curve model of diffusion, the unbalanced dissemination of smartphones could not bridge but amplify the established digital divide.

2.3. Differential communication competence enhancing digital inequality

As the high-speed Internet saturation rate has now reached over 80 percent among Internet users in advanced countries (Bilbao-Osorio et al., 2013), research on dimensions of digital inequality needs to move from users' socio-economic status and broadband adoption to competency in using the Internet at diverse levels of versatility (Hargittai, 2002; Howard et al., 2002; van Dijk, 2004). Linked to the quality of Internet use, the level of Internet users' experience and skills could lead to a more serious digital inequality than socio-economic status and physical access (van Dijk, 2006). Therefore, not surprisingly, dexterous skills on the computer and the Internet and comfort with the technology have a positive relationship with the quality of Internet use as users gain more benefits and expertise.

As shown, the digital divide of communication competence is closely tied to digital literacy rather than exogenous variables of demographics and broadband connections. Digital literacy originates from the concept of media literacy, defined as "the ability to access, analyze, evaluate and communicate messages in a wide variety of forms" (Aufderheide, 1993, p. 6; Hobbs, 1998, p. 16). Further, digital literacy is leading the next wave of communication use based on the development of

versatile skills to use information on the computer and the Internet effectively, including the ability not only to read, view, and write, but also to "communicate, create, manipulate, design and self-actualize" (Jones-Kavalier and Flannigan, 2006, p. 8). This means that beyond the skill-based definition of literacy (e.g., instrumental skill), literate engagement should include the application of the technological architecture such as creative and networking skills, which are based on experience accumulated through the use of an array of existing media technologies (Livingstone and Helsper, 2007).

The length and amount of Internet use and diverse online activities are related to a relatively simple level of digital literacy without the specifically skilled Internet expertise necessary to create textual, audio, or visual content. On the other hand, a rather complex level of digital literacy is associated with avatar and multimedia creation in that at least some degree of creative effort and technical skill are prerequisites for multimedia creation.

The different aspects of digital literacy range from strategic Internet use for various online activities to active engagement for interactive communication. Internet users, therefore, can develop their literacy by engaging in a variety of types of participatory content, for example, bulletin boards, blogs, or social network services. These types of participatory content have the characteristics of user-generated content (UGC) in common. The technological architecture of UGC is designed for contributing to both production sharing and the selection system of content for interactive communication via networked social relations (Lai, 2007). The functional similarity of the interface allows users to retrieve, share, and distribute customized content as well as recommend, rate, and post the content. In this regard, UGC develops networking skills for the "participative web," or realizing the Internet users' empowerment through the entitlement to download, upload, create, share, and collaborate on Internet content, thereby communicating via posting messages and comments between readers or viewers and creators (OECD, 2006). Since participatory production and consumption are for sharing and communicating content via networked bonding and bridging individuals, networking skills also need to be considered as a key element of communication competence.

2.4. The effect of the digital divide on online activities

Internet users report that they use the Internet as a tool to conduct everyday activities (Fallows, 2004). By allowing them access to and use of a wide variety of resources for informational, communicative, entertaining, and economic activities, the Internet offers benefits in unimaginable ways that preexisting individual mediums such as newspaper, radio, and TV never provided. Research has revealed that online activities not only offer users substantial resources that the disengaged may be unevenly excluded from, but that they also provide a way of enhancing human, social, and economic capital (Hargittai and Hinnant, 2008; Hassani, 2006; Shah et al., 2001).

What is more, in the always-on connected milieu fostered by Internet-enabled handheld media, users' particular online activities are becoming more and more similar to the way they live and work. In fact, the widespread diffusion of smartphones equipped with high-speed Internet connections is helping to realize the converged media environment for the exchange of valued information literally always available, anywhere, and anytime.

Nevertheless, the gaps in demographics, physical access, and communication competence could be barriers that restrict varying activities online. In relation to the demographic divide in online activities, lower socio-economic Internet users tended to pursue purposeless information seeking rather than goal-oriented information seeking (Selwyn et al., 2005). Regarding gender differences in Internet usage, males were more likely than females to engage in diverse Internet uses such as "banking/financial management, downloading software, music/films/music or images, and web authoring" (Selwyn et al., 2005, p. 12).

The literature on access gaps supports a positive relationship between the increased amount of Internet use and online activities. Those who use the Internet for a longer period of time have more skilled Internet expertise (Hargittai, 2002) and tend to more actively participate in web activities (e.g., Internet use for entertainment, information, and transactions) or online social contacts (Howard et al., 2002; Katz et al., 2001) than do those using the Internet for a shorter period of time. In addition, the greater the number of Internet access locations Internet users had, the more likely they were to search for health and product information to do their shopping and banking (Hassani, 2006).

Participatory culture, which requires online communication competence, is also related to active online activities (Jenkins et al., 2009). SNSs and social platforms that are representative for web 2.0 applications have allowed users to engage in participatory and collaborative content production and consumption. Despite the enhanced empowerment provided by web 2.0 applications, Internet users may have a big disadvantage in their differential ability to produce, share, edit, remix, and swap information and knowledge. More research on digital inequality focuses on the participatory divide in web 2.0 applications (Correa, 2010; Hargittai and Walejko, 2008; Schradie, 2011). Perceived competence, external (e.g., value and utility) and internal motivations (e.g., interest and enjoyment) facilitate content creation (Correa, 2010). In this way, the participatory divide in web 2.0 applications tends to become wider at the level of quantitative and qualitative skillful usage.

The participatory divide in smart media usage may also stimulate different ways of using diverse online activities. Particularly, considering over 50 percent of the distribution rates of smartphones in advanced countries, the gap in skillful usage rather than the gaps in demographics and physical access could have a greater impact on online activities. In this respect, we need to investigate how online activities have been influenced by demographics, physical access, and communication competence since the rise of smartphone use.

3. Methods

3.1. Research questions

The study attempts to investigate differences in three groups—the wired-only users, who have only wired Internet access without smartphones; the wired and smartphone users, who have both wired Internet and smartphone access; and the wired, wireless, and smartphone users, who have all types of network access, including wired, wireless, and smartphone connections. The variables used are classified into three components. One component includes demographics, which are gender, age, income, and education. Another component includes Internet usage, which is operationalized as device ownership, Internet availability, frequency of weekly Internet use, and types of network access with smartphone use or non-use. The other component includes communication competence, which signifies instrumental, creative, and networking skills. Research questions one through four examine if there are differences in the variables among the three groups. Research question five examines the extent to which the variables influence online activities. The research questions are as follows:

RQ1: Are there significant differences in gender, age, income, and education among the three groups?
RQ2: Are there significant differences in Internet usage (device ownership, Internet availability outside the home, and frequency of weekly Internet use) among the three groups?
RQ3: Are there significant differences in communication competence (instrumental, creative, and networking skills) among the three groups?
RQ4: What are the influential differences among demographic characteristics, Internet usage, and communication competence across the three groups?
RQ5: How are online activities (information, communication, leisure/entertainment, and financial management) predicted by demographic characteristics, Internet usage, and communication competence?

3.2. Data collection and analysis methods

The national online survey data was collected by administering a stratified quota sampling in Korea in May 2011. Focusing on dimensions of digital divide at the saturation level of broadband adoption rather than non-adoption, online survey alone was carried out without consideration of offline data collection to include non-Internet users. In order to scrutinize the effect of unequal physical access, the study allowed for the availability of wired and wireless access as well as smartphone adoption as the main indicators of group categories. The data was analyzed using one-way analysis of variance (ANOVA) and multinomial logistic regression to test for group differences in demographics, Internet usage, and communication competence. Then, regression analyses were performed to examine the relative influence of the variables on information, communication, leisure/entertainment, and financial management online activities.

3.3. Measurements

3.3.1. Group categories

Three groups were categorized by the possession of both network access types of wired and wireless broadband and smartphone use: the wired-only user group ($N = 357$), the wired and smartphone user group ($N = 372$), and the wired, wireless and smartphone user group ($N = 206$).

3.3.2. Demographics

Gender was relatively evenly distributed so that female participants accounted for 47 percent ($N = 439$), and their male counterparts for 53 percent ($N = 493$). The average age of the respondents was in the 40s ($M = 2.4$, SD = 1.03). The average income was between more than $3000 and less than $5000 ($M = 3.6$, SD = 1.56). The average education level was some college ($M = 2.93$, SD = .57).

3.3.3. Device ownership

The total number of fixed and portable devices that the participants owned was calculated. The devices included desktop and laptop computers at home and outside the home, regular cellular phones, personal digital assistants (PDAs) or Portable multimedia players (PMPs), Tablet computers, MP3 players, and game consoles. The device ownership ranged from nothing (.5%), 1 (10.6%), 2 (31.3%), 3 (28.6%), 4 (18.7%), 5 (7%), 6 (1.8%), 7 (.4%), 8 (.4%), to 9 (.6%). The average number of devices owned was approximately three devices ($M = 2.92$, SD = 1.35).

3.3.4. Internet availability

The concepts of "autonomy for Internet use" (Hargittai and Hinnant, 2008) and "location of access" (Hassani, 2006) were adapted to measure Internet availability. The respondents were asked to answer whether they were able to use the Internet autonomously for personal purposes (not work) when they wanted to use it anywhere outside the home. A five-point Likert scale (1, no use; 5, a great amount of use) ($M = 3.68$, SD = 1.02) was used to measure this item.

3.3.5. Frequency of Internet use

The frequency of Internet use was gauged with a five-point Likert scale: 1, no use in a week, 2, one day in a week, 3, two or three days in a week, 4, four or five days in a week, 5, six or seven days in a week ($M = 4.40$, SD = 1.03).

3.3.6. Instrumental skill

Communication competence was measured with three types of communication skills: instrumental, creative, and networking skills. The conceptualization and operationalization of the category "Instrumental Skill" was adopted and modified from van Dijk (2006) and Hargittai and Hinnant (2008). A four-point Likert scale of seven items measured the participants' ability to maneuver various Internet options (e.g., "I can identify text files from image and video files well," "I can upload files on the Internet well," "I can store or modify information that I search for on the Internet," "I can send MP3 files to others," "I can use the Internet to fit the job well," "I can choose information that I need on the Internet," "I can set the web browser configuration such as to Explorer or Chrome") ($M = 3.12$, SD = .69, Cronbach's $\alpha = .94$).

3.3.7. Creative skill

This was defined as the ability to make inventive content to express group or self-identity (OECD, 2006). Hargittai and Walejko (2008) measured on- and offline creative activities of music, poetry or fiction, artistic photography, and film or video. The construct of content creation in this study made reference to their measurements, but focused more on self-produced content or mash-ups and remixes produced in the media transformation process. Therefore, the construct consists of a four-point Likert scale of seven items identifying the ability to create, edit, and/or remix online content via software and hardware programs (e.g., "I can express my own idea on user-generated content," "I can use graphic editing programs such as Moviemaker and Adobe premiere," "I can make video, audio and image clips of stars, sportsmen, politicians, or CEOs whom I like as a fan," "I can create parodies and remix content such as drama video clips, music videos, popular songs, and movies," "I can use editing software such as Photoshop," "I can use digital cameras and camcorders," and "I can express what I want to talk about in the form of pictures and video clips") ($M = 2.58$, SD = .84, Cronbach's $\alpha = .90$).

3.3.8. Networking skill

This was conceptualized as "the ability to search for, synthesize, and disseminate information" for collective intelligence (Jenkins et al., 2009, p. xiv). By developing Jenkins et al's conceptualization, networking skill was operationalized as posting, sharing, distributing, and collaborating on content online. The variable was measured with eight yes–no questions to ask about the participants' ability to provide, share, and collaborate on information over a variety of website formats (e.g., replying to news articles, leaving comments on bulletin boards, uploading photos and video clips, managing blogs, sharing favorite links or news articles, searching Wikipedia, writing on collaborative websites such as Wikipedia, and sharing information and news via SNSs). The respondents' answers were additive for the variable ($M = 3.84$, SD = 2.42).

3.3.9. Online activities

Online activities were classified into four categories: information, communication, leisure/entertainment, and financial management. The online activities included 22 dichotomous yes–no questions. The items in each category were additive for the measurement of each online activity. "Information Activity" includes six items: searching for and acquiring news, life information (e.g., weather, health, or cuisine), entertainment and sports information, financial and investment information, educational information, and web surfing ($M = 4.63$, SD = 1.46). "Communication Activity" includes six items: emailing, messaging, SNS use, blogging, online community activity, and Voice Over Internet Protocol (VoIP) use ($M = 3.37$, SD = 1.53). "Leisure/Entertainment Activity" has five items: downloading music, downloading videos and movies, downloading games and playing real-time games, real-time TV watching or radio listening, and downloading and reading e-books ($M = 2.43$, SD = 1.50). "Financial Management" has five items: shopping, banking, stock trading, coupon use, and ticketing ($M = 3.22$, SD = 1.28).

4. Results

Research question one examined whether the three groups were different in demographic characteristics. Table 1 presents gender difference between the three groups. The three groups showed a large disparity between males and females (χ^2 (2,$N = 935$) = 12.7, $p < .01$). Male respondents were more likely than female respondents to belong to the wired and smartphone user group (the ratio of males to females was 57.3% ($f = 213$) to 42.7% ($f = 159$) and the wired, wireless, and smartphone user group (the ratio of males (58.3%, $f = 120$) to females (41.7%, $f = 86$). On the other hand, females were more likely than males to be classified as the wired-only user group (the ratio of females (54.3%, $f = 194$) to males (45.7%, $f = 163$). The results indicate that females tend to only access wired broadband, but do not to use smartphones, whereas males tend not only to access wired and/or wireless broadband, but also to use smartphones.

As seen in Table 2, Scheffe's post-hoc comparisons of the three groups were also significantly different in other demographic characteristics: age (F (2,932) = 40.6, $p = .000$), income (F (2,932) = 11.2, $p = .000$), and education (F (2,932) = 11.6, $p = .000$). The average age of the wired, wireless, and smartphone user group was the youngest ($M = 2.15$, SD = 0.94), followed by that of the wired and smartphone user group ($M = 2.22$, SD = 1.03), and finally the wired-only user group

Table 1
Gender difference between network access types with or without smartphone use.

Gender	Wired-only user group (N = 372)	Wired and smartphone user group (N = 357)	Wired, wireless and smartphone user group (N = 206)
Males			
Frequency (%)	163 (45.7)	213 (57.3)	120 (58.3)
Females			
Frequency (%)	194 (54.3)	159 (42.7)	86 (41.7)

Note: χ^2 (2, N = 935) = 12.7, p < .01.

Table 2
Group mean differences between network access types with or without smartphone use.

Variables	Wired-only user group (N = 357) M (SD)	Wired and smartphone user group (N = 372) M (SD)	Wired, wireless and smartphone user group (N = 206) M (SD)
Age	$2.79\ (0.98)_a$	$2.22\ (1.03)_b$	$2.15\ (0.94)_b$
Income	$3.34\ (1.53)_a$	$3.65\ (1.54)_b$	$3.96\ (1.55)_b$
Education	$2.83\ (0.61)_a$	$2.95\ (0.54)_b$	$3.06\ (0.50)_b$
Device ownership	$3.18\ (1.60)_a$	$4.36\ (1.61)_b$	$5.09\ (1.68)_c$
Internet availability	$4.28\ (1.18)_a$	$4.44\ (0.95)_{a,b}$	$4.55\ (0.84)_b$
Weekly Internet use frequency	$3.42\ (1.10)_a$	$3.76\ (0.99)_b$	$3.98\ (0.82)_c$
Instrumental skill	$2.81\ (0.72)_a$	$3.24\ (0.60)_b$	$3.42\ (0.58)_c$
Creative skill	$2.29\ (0.82)_a$	$2.67\ (0.79)_b$	$2.94\ (0.79)_c$
Networking skill	$2.90\ (2.13)_a$	$4.19\ (2.38)_b$	$4.84\ (2.40)_c$

Note: The ANOVA Table presents mean differences between the three groups. Scheffe's procedures were used to conduct these post hoc comparisons. Means with the same matching subscripts within the same row are not significantly different from one another. Significant differences are at p < .05.

(M = 2.79, SD = 0.98). Conversely, the mean scores in income (M = 3.96, SD = 1.55) and education (M = 3.06, SD = 0.50) of the wired, wireless, and smartphone user group were highest. Overall, the mean values of age, income, and education in the wired-only user group were statically different from those in the other two groups.

Research question two investigated whether there were differences in Internet usage among the three groups. The three groups were significantly different in terms of device ownership (F(2,932) = 100.4, p = .000) and frequency of Internet use (F(2,932) = 5.2, p < .01). Overall, the mean values of device ownership (M = 5.09, SD = 1.68) and frequency of Internet use (M = 3.98, SD = 0.82) were highest in the wired, wireless, and smartphone user group compared to those of the other two groups. The mean value of the wired, wireless, and smartphone user group in Internet availability (M = 4.55, SD = 0.84), however, was significantly different only from that of the wired-only user group (M = 4.28, SD = 1.18) (F(2,932) = 22.6, p = .000).

Research question three explored whether the three groups were different in terms of communication competence. The mean values of instrumental skill (F(2,932) = 69.1, p = .000), creative skill (F(2,932) = 46.8, p = .000), and networking skill (F(2,932) = 53.8, p = .000) were significantly different among the three groups. The means of all dimensions of communication competence were highest in the wired, wireless, and smartphone user group (instrumental skill: M = 3.42, SD = 0.58; creative skill: M = 2.94, SD = 0.79; networking skill: M = 4.84, SD = 2.40). The mean values of the wired and smartphone user group (instrumental skill: M = 3.24, SD = 0.60; creative skill: M = 2.67, SD = 0.79; networking skill: M = 4.19, SD = 2.38) were in the middle. The wired-only user group showed the lowest mean values (instrumental skill: M = 2.81, SD = 0.72; creative skill: M = 2.29, SD = 0.82; networking skill: M = 2.90, SD = 2.13).

To answer research question four, multinomial regression analyses were conducted to test for relatively influential differences in the three groups in terms of demographic characteristics, Internet usage, and communication competence (see Table 3). The chi-square value of the full model was 247.1 (p = .000) with 20 degrees of freedom, indicating that the model performed quite well. The model explained 26 percent of the variance (Nagelkerke R^2 = .263) in predicting the three group differences. In terms of demographics, age and income were significant indicators between the wired-only and the wired and smartphone user groups (age: W = 29.43, p = .000; income: W = 10.62, p = .000). This was also true between the wired-only and the wired, wireless, and smartphone user groups (age: W = 24.28, p = .000; income: W = 14.86, p = .000). The results indicate that the younger and the more affluent respondents are, the more they utilize the seamlessly connected networks that come with smartphones. Meanwhile, gender was only a significant indicator of group difference between the wired-only and the wired and smartphone user groups (W = 4.59, p < .05).

In relation to Internet usage, the wired-only user group was significantly but slightly different from the wired and smartphone user group in Internet availability (W = 3.50, p < .10). On the other hand, the wired-only user group was significantly different from the wired, wireless, and smartphone user group in terms of device ownership (W = 3.20, p < .10) and Internet

Table 3
Multinomial logistic regressions predicting categories of network access types with or without smartphone use.

Groups	*B*	SE	Wald	Sig.	Exp (*B*)
Wired-only user group (reference group) vs. wired and smartphone user group					
Gender (female = 1)	−0.37	0.17	4.59	0.03	0.69
Age	−0.49	0.09	29.43	0.00	0.61
Income	0.18	0.06	10.62	0.00	1.20
Education	0.00	0.15	0.00	0.98	1.00
Device ownership	−0.10	0.07	2.29	0.13	0.90
Internet availability	0.16	0.08	3.50	0.06	1.17
Weekly Internet use frequency	−0.06	0.08	0.48	0.49	0.95
Instrumental skill	0.40	0.16	6.43	0.01	1.50
Creative skill	0.17	0.12	2.21	0.14	1.19
Networking skill	0.12	0.04	8.37	0.00	1.13
Intercept	−1.30	0.75	3.06	0.08	
Wired-only user group (reference group) vs. wired, wireless and smartphone user group					
Gender (female = 1)	−0.12	0.21	0.35	0.56	0.88
Age	−0.54	0.11	24.28	0.00	0.58
Income	0.26	0.07	14.86	0.00	1.30
Education	0.21	0.19	1.22	0.27	1.23
Device ownership	0.14	0.08	3.20	0.07	1.15
Internet availability	0.30	0.11	7.73	0.01	1.35
Weekly Internet use frequency	−0.04	0.11	0.12	0.73	0.97
Instrumental skill	0.59	0.20	9.00	0.00	1.81
Creative skill	0.42	0.14	8.79	0.00	1.52
Networking skill	0.15	0.05	8.90	0.00	1.16
Intercept	−5.63	1.00	31.83	0.00	
Wired and smartphone user group vs. wired, wireless and smartphone user group (reference group)					
Gender (female = 1)	−0.25	0.19	1.60	0.21	0.78
Age	0.05	0.10	0.26	0.61	1.05
Income	−0.08	0.06	1.63	0.20	0.93
Education	−0.21	0.18	1.35	0.25	0.81
Device ownership	−0.24	0.07	11.30	0.00	0.79
Internet availability	−0.14	0.10	1.98	0.16	0.87
Weekly Internet use frequency	−0.02	0.10	0.04	0.84	0.98
Instrumental skill	−0.19	0.18	1.08	0.30	0.83
Creative skill	−0.24	0.13	3.71	0.05	0.78
Networking skill	−0.03	0.04	0.38	0.54	0.97
Intercept	4.32	0.94	21.18	0.00	
Nagelkerke R^2	.263				
N	935				

availability ($W = 7.73$, $p \leqslant .01$). Among the three dimensions of Internet usage, frequency of Internet use did not predict the network access types.

All dimensions of communication competence were significant predictors of group differences, revealing the relative importance of influential factors after age and income variables. The wired-only user group was significantly different from the wired and smartphone user group in instrumental skill ($W = 6.43$, $p \leqslant .01$) and networking skill ($W = 8.37$, $p = .000$). The wired-only user group was also significantly different from the wired, wireless, and smartphone user group in terms of instrumental skill ($W = 9.00$, $p = .000$), creative skill ($W = 8.79$, $p = .000$), and networking skill ($W = 8.90$, $p = .000$). Meanwhile, there were only group differences between the wired and smartphone users and the wired, wireless, and smartphone users in terms of device ownership ($W = 11.30$, $p = .000$) and creative skill ($W = 3.71$, $p \leqslant .05$).

With respect to research question five, we performed hierarchical regressions to identify the relative extent to which demographics, Internet usage, and communication competence were related to the four types of online activities (see Table 4). Informational activity was predicted by age ($\beta = .16$, $p = .000$), types of Internet access ($\beta = .06$, $p < .10$), Internet availability ($\beta = .06$, $p \leqslant .05$), frequency of Internet use ($\beta = .18$, $p = .000$), instrumental skill ($\beta = .22$, $p = .000$), creative skill ($\beta = -.09$, $p \leqslant .01$), and networking skill ($\beta = .13$, $p = .000$). Communicative activity was predicted by types of Internet access ($\beta = .17$, $p = .000$), Internet availability ($\beta = .07$, $p \leqslant .01$), frequency of Internet use ($\beta = .06$, $p \leqslant .05$), instrumental skill ($\beta = .11$, $p \leqslant .01$), creative skill ($\beta = .08$, $p < .05$), and networking skill ($\beta = .30$, $p = .000$).

Leisure/entertainment activity was predicted by gender ($\beta = -.15$, $p = .000$), education ($\beta = -.05$, $p < .10$), device ownership ($\beta = -.09$, $p \leqslant .01$), types of Internet access ($\beta = .18$, $p = .000$), frequency of Internet use ($\beta = .07$, $p < .05$), instrumental skill ($\beta = .17$, $p = .000$), creative skill ($\beta = .08$, $p < .05$), and networking skill ($\beta = .20$, $p = .000$). Financial management activity was predicted by gender ($\beta = .07$, $p < .05$), device ownership ($\beta = .06$, $p \leqslant .10$), types of Internet access ($\beta = .10$, $p = .000$), Internet availability ($\beta = .09$, $p \leqslant .01$), frequency of Internet use ($\beta = .08$, $p \leqslant .01$), instrumental skill ($\beta = .15$, $p = .000$), and networking skill ($\beta = .12$, $p = .000$).

Table 4
Hierarchical regression models indicating the effect of dimensions of digital divide on online activities.

Independent variables	Information β (t value)	Communication β (t value)	Leisure/Entertainment β (t value)	Financial management β (t value)
Block 1: Demographics				
Gender (female = 1)	0.00 (0.04)	0.04 (1.32)	–0.15 (–5.11)***	0.07 (2.07)*
Age	0.16 (4.48)***	−0.03 (−103)	−0.05 (−1.43)	0.06 (1.66)
Income	−0.04 (−1.12)	0.01 (0.34)	−0.04 (−1.41)	0.05 (1.59)
Education	0.03 (0.95)	−0.02 (−0.73)	−0.05 (−1.66)#	0.02 (0.64)
Change in R square	0.03	0.08	0.11	0.03
Block 2: Internet usage				
Device ownership	0.05 (1.51)	0.04 (1.22)	−0.09 (−2.78)**	0.06 (1.63)#
Network access types with smartphone use	0.06 (1.73)#	0.17 (5.46)***	0.18 (5.68)***	0.10 (2.95)***
Internet availability	0.06 (1.95)*	0.07 (2.49)**	−0.03 (−0.86)	0.09 (2.61)**
Weekly Internet use frequency	0.18 (5.54)***	0.06 (1.94)*	0.07 (2.37)*	0.08 (2.55)**
Change in R Square	0.09	0.12	0.08	0.07
Block 3: Communication competence				
Instrumental skill	0.22 (5.33)***	0.11 (2.84)**	0.17 (4.57)***	0.15 (3.65)***
Creative skill	−0.09 (−2.52)**	0.08 (2.37)*	0.08 (2.31)*	0.00 (0.04)
Networking skill	0.13 (3.61)***	0.30 (8.89)***	0.20 (5.74)***	0.12 (3.11)***
Change in R Square	0.05	0.12	0.09	0.04
Incremental adjusted R Square	0.17	0.32	0.28	0.14
N	935	935	935	935

Note: #$p < 0.10$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

5. Discussion and conclusion

The study observed and analyzed dimensions of the digital divide depending on different types of network access and the association of diverse online activities with the dimensions of the digital divide. Regarding differences of the three groups with different broadband access types in terms of socio-demographic status, the results revealed that smartphone use is a more influential factor affecting the digital divide than wired or wireless broadband access. The wired and smartphone user group and the wired, wireless, and smartphone user group had no difference in demographic variables. On the contrary, the wired-only user group signified typical attributes of have-nots, that is, female, older, less affluent, and less educated. Consistent with the pattern of demographic inequality in the adoption and use of an emerging communication technology (Chaudhuri et al., 2005; Horrigan and Rainie, 2002; Leung and Wei, 1999; Yogesh and Banita, 2007), the smartphone has become a new communication technology that widens the demographic gap between "haves" and "have-nots."

In research question two, the multiple dimensions of Internet usage further showed the disparities between the three groups. Device ownership and frequency of Internet use were significantly different across the three groups. The wired, wireless, and smartphone user group owned the most number of fixed and mobile devices and used the Internet the most frequently. On the other hand, the wired-only user group had the fewest number of devices and used the Internet the least frequently. Regarding Internet availability, however, the wired, wireless and smartphone users were more likely than the wired-only users to use the Internet autonomously but not more likely than the wired and smartphone users. The findings imply that group differences in Internet usage remain substantial, indicating a gap in Internet usage and different types of broadband access. This means that the disparities of physical access among the three groups could far overweigh demographic disparities in the era of smart media.

In our analysis of research question three, the wired, wireless, and smartphone user group had the highest mean values of communication competence among the three groups, followed by the wired and smartphone user group and finally the wired-only user group. These findings made clear that intergroup differences are apparent in instrumental, creative, and networking skills. Thus, it seems that the always-on network via fixed and mobile devices could accelerate the enhanced gaps in communication competence between haves and have-nots.

Regarding research question four, the wired-only user group was older and had lower incomes than the other two groups. Age and income are the main socio-economic factors affecting the wide gap in different types of broadband access. Gender was different only between the wired-only and the wired and smartphone user groups. Education, however, was not an important factor and did not make a significant difference among the three groups. In the Internet usage variables, Internet availability was a key factor in predicting group differences, whereas weekly Internet use was not. Device ownership was different between the wired-only and the wired, wireless, and smartphone user groups as well as between the wired and smartphone and the wired, wireless, and smartphone user groups. More importantly, the wired-only user group presented lower levels of communication competence than the other two groups. The group differences between the wired and smartphone users and the wired, wireless, and smartphone users were only significant in terms device ownership and creative skill.

The multinomial regression analyses clarified that despite widespread broadband connections at national and global levels, smartphone use has emerged as a new dimension of the digital divide. Smartphone use was likely to aggravate the demographic, access, and skill gaps in the networked media environment. Above all, the wired-only user group showed a notable disparity in communication competence from that of the other two groups. The findings imply that the seamless network access, including mobile broadband access via smartphone, could result in a wider gap in communication competence. The findings, therefore, suggest that it is necessary to stress digital literacy education to improve communication competence for the wired-only user group.

The hierarchical regression model for research question five showed that when considering changed *R*-squares, Internet usage in information and financial management activities is a more important factor than demographics and communication competence. Relatively, Internet usage and communication competence in communicative activities were equally important, and demographics in leisure/entertainment activity were more important than the other variables.

Age was one of the most significant indicators of informational online activity. The older respondents were, the more they sought information online. Males enjoyed leisure and entertainment online more than females did, whereas females engaged in financial management activity more than males did. Consistent with the results of prior research (Helsper, 2010; Selwyn et al., 2005; Weiser, 2000), the present study found that males are more likely than females to use the Internet for leisure/entertainment. The main reason for this pattern is that leisure/entertainment activity includes the use of high bandwidth applications such as downloading games and playing real-time games. On the other hand, the relationship between gender and financial management activities showed conflicting results with those found in previous studies (Selwyn et al., 2005; Wasserman and Richmond-Abbott, 2005).The current study measured financial management activity with items such as online shopping, coupon use and ticketing, and banking and stock trading, which are female-oriented online activities. Encompassing a wider range of online activities for financial management may explain the opposite findings of previous research.

When considering that the block of Internet usage explains 7–12 percent of the variance in the models, multiple dimensions of Internet usage play an important role in enabling Internet users to engage in diverse online activities. The always-on character of Internet connections through a smartphone amplifies diverse online activities. Specifically, different types of Internet connections had the greatest effect on communication, entertainment, and financial management activities, albeit marginally influencing informational activity. In addition, the frequency of Internet use was closely associated with all online activities, showing the decisive role of conducting them, whereas it was the most influential predictor of informational activity. Internet availability was another significant predictor for explaining the variance in information, communication, and financial management activities except for leisure/entertainment.

Based on the 4–12 percent of the variance in the models, the three dimensions of communication competence are all influential indicators predicting online activities. Instrumental skill was the most influential indicator of informational and financial management activity, followed by networking skill. On the other hand, networking skill was the most significant indicator for communicative and entertaining online activities, followed by instrumental and creative skills. It could be inferred from the findings that information and financial management activities online are more associated with skillful expertise pertaining to the Internet, whereas communication and leisure/entertainment activities are more related to disseminating and sharing information with others.

Interestingly, creative skill is positively associated with communicative and entertainment activities, whereas it is negatively related to informational activity. When considering that the items to measure creative skill include making, editing, and remixing user-generated content, it is reasonable that creative skill contributes mainly to enhancing communication and entertainment online behaviors. Creative skill, however, was likely to decline informational online activity. One possible reason is that information activity items contain just searching for and acquiring a wide range of information, which does not always require the capability to produce user-generated content. The inference is feasible in that informational online activity is related to engagement in text-based material rather than in moving images. Hence, the findings suggest that Internet users employ creative skill, which requires versatile dexterity to deal with information transformation and pursue entertainment and communication online. Another interesting finding is that device ownership was negatively related to leisure/entertainment activity. This means that owning multiple devices is not key to enjoying online entertainment activities. Rather, the ability to utilize technologies properly and create and share content with others online is a significant factor in predicting entertainment activity.

The overall findings revealed that dimensions of demographics, Internet usage, communication competence, and diverse online activities are influenced by different types of network access. As a result, the current study addresses the new scope and magnitude of the digital divide by discussing fixed and mobile broadband connections and smartphone use. With the rise of smartphone use, the issue of the digital divide will address more complex dimensions. While the gap resulting from socio-economic status declines, the gaps in Internet usage and communication competence are greatly increasing. Furthermore, online activities are mainly influenced by the levels of Internet usage. In this regard, the findings support those of previous studies (DiMaggio et al., 2004; Mossberger et al., 2006; Norris, 2001; van Dijk, 2006) by suggesting that disengagement from the use of new communication technologies, especially smartphone use, could lead to social, cultural, and economic exclusion. Therefore, we need to consider that it is timely to discuss ways of addressing social inclusion to bridge the new dimensions of the digital divide.

Despite the significance of the present study, its main limitation lies in categorizing the three groups depending on network access types, which makes it difficult to address the continuum of the digital divide. The dichotomous conceptualization and measurement of the digital divide as haves and have-nots is not enough to explain the variation in the multifaceted

aspects of the digital divide (Livingstone and Helsper, 2007; Qiu, 2009). For instance, Qiu (2009) argued that the binary mode of the digital divide does not reflect the emergence of *the information have-less* users who fall between the two extremes of haves and have-nots in China. He also asserted that the information have-less users are a wide range of socially stratified people who are less affluent or technologically behind such as migrant workers, laid-off workers, senior citizens, and micro entrepreneurs. His study focuses on class formation due to the unbalanced diffusion and appropriation of Information and Communication Technologies (ICTs). In contrast, our study draws attention to social differentiation in access, usage, and ICT competence. Accordingly, we suggest that future studies consider diverse methods of device use along with network access types. In addition to measuring access gaps, measuring communication competence in future studies needs to be extended to actual use and management of Internet applications rather than assessing users' perceptions of them. Thus, future studies need to embrace and explore the wider scope of the digital spectrum by developing and applying such refined measurements of the digital divide.

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References

Aaron, S., 2012. 46% of American adults are smartphone owners. Pew Research Center's Internet & American Life Project. Retrieved May, 2013 from <http://pewinternet.org/~/media/Files/Reports/2012/Smartphone%20ownership%202012.pdf>.

Aufderheide, P., 1993. Media Literacy. A Report of the National Leadership Conference on Media Literacy Conference Report., Aspen Institute, Washington, DC.

Bilbao-Osorio, B., Dutta, S., & Lanvin, B., 2013. The global information technology report 2013: growth and jobs in a hyperconnected world. World Economic Forum and INSEAD. Retrieved May, 2013 from <http://www3.weforum.org/docs/WEF_GITR_Report_2013.pdf>.

Boyd, D.M., Ellison, N.B., 2007. Social network sites: definition, history, and scholarship. J. Comput-Mediat. Commun. 13 (1), 210–230. http://dx.doi.org/10.1111/j.1083-6101.2007.00393.x.

Chaudhuri, A., Flamm, K.S., Horrigan, J., 2005. An analysis of the determinants of internet access. Telecommun. Policy 29 (9–10), 731–755.

Correa, T., 2010. The participation divide among "online experts": experience, skills and psychological factors as predictors of college students' web content creation. J. Comput-Mediat. Commun. 16 (1), 71–92. http://dx.doi.org/10.1111/j.1083-6101.2010.01532.x.

D'Alessandro, D.M., Dosa, N.P., 2001. Empowering children and families with information technology. Arch. Paediatr. Adolesc. Med. 155 (10), 1131–1136, doi:10.1001/archpedi.155.10.1131.

DiMaggio, P., Hargittai, E., Celeste, C., Shafer, S., 2004. Digital inequality: from unequal access to differentiated use. In: Neckerman, K.M. (Ed.), Social Inequality. Russell Sage Foundation, New York, pp. 355–400.

Fallows, D., 2004. The internet and daily life. Pew Research Center's Internet & American Life Project. Retrieved June, 203 from <http://www.pewinternet.org/~/media//Files/Reports/2004/PIP_Internet_and_Daily_Life.pdf.pdf>.

Hargittai, E., 2002. Second-level digital divide: differences in people's online skills. First Monday 7 (4).

Hargittai, E., Hinnant, A., 2008. Digital inequality: differences in young adults' use of the internet. Commun. Res. 35 (5), 602–621. http://dx.doi.org/10.1177/0093650208321782.

Hargittai, E., Walejko, G., 2008. The participation divide: content creation and sharing in the digital age 1. Info. Commun. Soc. 11 (2), 239–256. http://dx.doi.org/10.1080/13691180801946150.

Hassani, S.N., 2006. Locating digital divides at home, work, and everywhere else. Poetics 34 (4–5), 250–272, <http://dx.doi.org/10.1016/j.poetic.2006.05.007>.

Helsper, E.J., 2010. Gendered internet use across generations and life stages. Commun. Res. 37 (3), 352–374. http://dx.doi.org/10.1177/0093650209356439.

Hargittai, E., 2010. Digital na(t)ives? variation in internet skills and uses among members of the "Net Generation". Sociol. Inq. 80 (1), 92–113. http://dx.doi.org/10.1111/j.1475-682X.2009.00317.x.

Hobbs, R., 1998. The seven great debates in the media literacy movement. J. Commun. 48 (1), 16–32.

Horrigan, J., 2007. Home Broadband Adoption 2007. Retrieved April, 2008 from < http://www.pewinternet.org/pdfs/PIP_Broadband%202007.pdf>.

Horrigan, J., & Rainie, L., 2002. The broadband difference: how online Americans' behavior changes with high-speed internet connections at home. Pew Research Center's Internet & American Life Project. Retrieved May, 2013 from <http://pewinternet.org/Reports/2002/The-Broadband-Difference-How-online-behavior-changes-with-highspeed-Internet-connections.aspx>.

Howard, P.E.N., Rainie, L., Jones, S., 2002. Days and nights on the internet. In: Wellman, B., Haythornthwaite, C. (Eds.), The Internet in Everyday Life. Blackwell Publishing, Malden, MA.

International Telecommunication Union., 2012. Measuring the information society. Retrieved May, 2013 from <http://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2012/MIS2012_without_Annex_4.pdf>.

Hwang, Y.S., Shin, D.H., Lee, H.J., & Park, N.S., 2013. The 2012 new dimension of digital divide: analysis of current trends and prospects [in Korean]. National Information Society Agency. Retrieved May, 2013 from <http://www.nia.or.kr/bbs/board_view.asp?boardid=20111128132107445 8&Order=010200&id=10985>.

Jenkins, H., Purushotma, R., Clinton, K., Weigel, M., Robison, A.J., 2009. Confronting the challenges of participatory culture media education for the 21st century. MIT Press, Cambridge, Mass.

Jones-Kavalier, B.R., Flannigan, S.L., 2006. Connecting the digital dots: literacy of the 21st century. EDUCAUSE Quarterly 29 (2), 8–10.

Katz, J.E., Rice, R.E., Aspen, P., 2001. The internet, 1995–2000: access, civic involvement, and social interaction. Am. Behav. Sci. 45 (3), 405–419. http://dx.doi.org/10.1177/0002764201045003004.

Lai, R.F.L., 2007. Personal technology to "We" technology: a critique to neoliberalism discourses about contents and control behind web 2.0. Presented in the Annual International Communication Association. San Francisco, CA.

Lee, W.T., Hwang, Y.S., Lee, H.J., Park, N.S., Oh, J.Y., 2011. The study on bridging information divide and improving media literacy in the converged digital environment [in Korean]. Korea Information Society Development Institute, Seoul, Korea.

Leung, L., Wei, R., 1999. Who are the mobile phone have-nots?: influences and consequences. New Media & Soc. 1 (2), 209–226. http://dx.doi.org/10.1177/1461444899001002003.

Livingstone, S., Helsper, E., 2007. Gradations in digital inclusion: children, young people and the digital divide. New Media & Soc. 9 (4), 671–696. http://dx.doi.org/10.1177/1461444807080335.

Mahler, A., Rogers, E.M., 1999. The diffusion of interactive communication innovations and the critical mass: the adoption of telecommunications services by German banks. Telecommun. Policy 23 (10–11), 719–740, <http://dx.doi.org/10.1016/S0308-5961(99)00052-X>.

Markus, M.L., 1987. Toward a "critical mass" theory of interactive media: universal access, interdependence and diffusion. Commun. Res. 14 (5), 491–511. http://dx.doi.org/10.1177/009365087014005003.
Mossberger, K., Tolbert, C.J., Gilbert, M., 2006. Race, place, and information technology. Urban Aff. Rev. 41 (5), 583–620. http://dx.doi.org/10.1177/1078087405283511.
Norris, P., 2001. Digital divide: civic engagement, information poverty, and the internet worldwide. Cambridge University Press, New York.
OECD., 2006. Participative web: user-generated content. Working Party on the Information Economy. Retrieved June, 2013 from <http://www.oecd.org/sti/38393115.pdf>.
Ono, H., Zavodny, M., 2003. Gender and the internet. Soc. Sci. Quart. 84 (1), 111–121. http://dx.doi.org/10.1111/1540-6237.t01-1-8401007.
Pearce, Katy E., Rice, Ronald E., 2013. Digital divides from access to activities: comparing mobile and personal computer internet users. J. Commun. 63 (4), 721–744. http://dx.doi.org/10.1111/jcom.12045.
Pocketapp.co.uk., 2013. The world's smartphone population. Retrieved June, 2013 from <http://www.pocketapp.co.uk/blog/2013/05/02/the-worlds-smartphone-population/>.
Qiu, J.L., 2009. Introduction. In: Qiu, J.L. (Ed.), Working-Class Network Society: Communication Technology and the Information Have-Less in Urban China. The MIT Press, Cambridge, MA, pp. 1–20.
Schradie, J., 2011. The digital production gap: the digital divide and web 2.0 collide. Poetics 39 (2), 145–168 (<http://dx.doi.org/10.1016/j.poetic.2011.02.003>).
Selwyn, N., 2004. Reconsidering political and popular understandings of the digital divide. New Media & Soc. 6 (3), 341–362. http://dx.doi.org/10.1177/1461444804042519.
Selwyn, N., Gorard, S., Furlong, J., 2005. Whose internet is it anyway?: exploring adults' (non)use of the internet in everyday life. Eur. J. Commun. 20 (1), 5–26. http://dx.doi.org/10.1177/0267323105049631.
Shah, V., Kwak, N.J., Holbert, R.D., 2001. "Connecting" and "disconnecting" with civic life: patterns of internet use and the production of social capital. Polit. Commun. 18 (2), 141–162. http://dx.doi.org/10.1080/105846001750322952.
van Dijk, J., Hacker, K., 2003. The digital divide as a complex and dynamic phenomenon. Info. Soc. 19 (4), 315–326. http://dx.doi.org/10.1080/01972240309487.
van Dijk, J., 2004. Divides in succession: possession, skills, and use of new media for social participation. In: Bucy, E.P., Newhagen, J.E. (Eds.), Media Access: Social and Psychological Dimensions of New Technology Use. L. Erlbaum, Mahwah, NJ., pp. 233–254.
van Dijk, J., 2006. Digital divide research, achievements and shortcomings. Poetics 34 (4–5), 221–235.
Wasserman, I.M., Richmond-Abbott, M., 2005. Gender and the internet: causes of variation in access, level, and scope of use. Soc. Sci. Quart. 86 (1), 252–270. http://dx.doi.org/10.1111/j.0038-4941.2005.00301.x.
Weiser, E.B., 2000. Gender differences in internet use patterns and internet application preferences: a two-sample comparison. CyberPsychol. Behav. 3 (2), 167–178. http://dx.doi.org/10.1089/109493100316012.
Yogesh, K.D., Banita, L., 2007. Socio-economic determinants of broadband adoption. Ind. Manage. Data Syst. 107 (5), 654–671. http://dx.doi.org/10.1108/02635570710750417.