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Digital Divides From Access to Activities: Comparing Mobile and Personal Computer Internet Users

Katy E. Pearce[1] & Ronald E. Rice[2]

1 Department of Communication, University of Washington, Seattle, WA 98195-3740, USA
2 Department of Communication, University of California, Santa Barbara, Santa Barbara, CA 93106-4020, USA

Digital inequality can take many forms. Four forms studied here are access to Internet, use of different devices, extent of usage, and engagement in different Internet activities. However, it is not clear whether sociodemographic factors, or devices, are more influential in usage and activities. Results from an unfamiliar context show that there are significant sociodemographic influences on access, device, usage, and activities, and differences in activities by device type and usage. While sociodemographic differences are more influential, device type can increase likelihood of use for some "capital enhancing" activities, but only for a computer. Thus, although mobile Internet is available for those on the wrong side of the digital divide, these users do not engage in many activities, decreasing potential benefits.

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The Internet can have notable implications for the social and economic lives of those fortunate enough to have access to it. However, as the digital divide literature shows, there are separate and sequential divides beyond access, including the *usage gaps* of technologies, use, and outcomes. This study extends digital divide research through three main questions.

First, does the general usage gap model apply in unique contexts, such as a less-developed country with high literacy but low economic well-being, and which is still low in Internet but high in mobile phone diffusion (e.g., Armenia)? Second, are the two access devices differentially influenced by digital divide sociodemographic variables, and do they in turn differentially influence usage? We know little about how people differentially use personal computers (PCs) or mobile phones for Internet activities (Donner, Gitau, & Marsden, 2011). Third, are different Internet activities differentially influenced by the sociodemographic variables, the access device, and usage? As social connections and their resources are essential to survival

Corresponding author: Katy E. Pearce; e-mail: kepearce@uw.edu

in less-developed countries (Pearce, 2013), a better understanding of access, device, usage, and activity issues in such a context is a major contribution of this study.

Digital divide

Foundations

The *digital divide* or *digital inequality* originally described the gap between advantaged and disadvantaged computer users and nonusers in the United States and often focuses on socioeconomic differences. The digital divide is amongst the central foci of Internet studies (Bonfadelli, 2002; Katz & Rice, 2002; Mossberger, Tolbert, & Stansbury, 2003; van Dijk, 2005; Warschauer, 2004; World Internet Project, 2012). Several theoretical arguments explain the potential divides, from more general claims and more macro theories to more specific models.

The most general argument is the *Matthew effect*, whereby the "rich get richer" (Helsper, 2012; van Dijk, 2005, Chapter 6, pp. 96–130). We might expect that the Internet, with its seemingly endless supply of free information, would reduce some kinds of inequalities. However, demographic differences, access, skills, interests, and infrastructure all represent kinds of costs and barriers; so more usage, activities, and benefits flow to those with greater resources, abilities, and information needs (DiMaggio, Hargittai, Celeste, & Shafer, 2004). Some differences may decrease over time (such as basic access), some differences may expand (social capital), and some may be replaced (from dial-up to broadband) (van Dijk, 2005, Chapter 6).

Similar to the *Matthew* effect is the *knowledge gap* hypothesis (Rogers, 2003; Selwyn, 2004; Tichenor, Donohue, & Olien, 1970). Even though eventually almost everyone might benefit from a resource such as the Internet, those with the most resources (status, cognition, education, income, access) adopt first, have and gain more skills, and use more and different activities more effectively. They thus obtain earlier and more benefits, thereby *increasing*, rather than *reducing*, knowledge gaps in society (van Dijk, 2005, Chapter 6).

At the macrolevel of explanation, Witte and Mannon (2010, p. 148) combine three different *sociological perspectives* on sociodemographic disparities affecting online activity. The first is conflict/economic, in which Internet usage and benefits are (scarce) assets. The second is cultural, where status inequalities are represented in resources, power, lifestyle, and social networks; so Internet usage and benefits are a lifestyle. The third is functionalist, where Internet usage and benefits are incentives. Another perspective is that Internet usage in general, and different activities in particular, foster a more *inclusive* society and increased economic and political life through access to *capital* (DiMaggio et al., 2004; Helsper, 2012). Forms of capital are considered by some to be the overall mediating influence on access, use, and engagement (Selwyn, 2004). This includes economic and material capital, cultural capital (norms, values, knowledge, learning, institutions, skills, socialization about technology), and interaction capital (online experts and user groups, social networks).

Multiple divides

Selwyn (2004) notes varying meanings of access, ICT (information and communication technology), uses, activities, and consequences. Most important of these distinctions is the expansion of the general digital divide concept to a continuum of divides (Livingstone & Helsper, 2007). The broader concept encompasses any divide between people or groups in their awareness, adoption, skill, devices, use, and outcomes of communication technology (Dolničar, 2011; Hilbert, 2011).

The focus on multiple divides can be summarized under the *usage gap*, which argues that factors affecting the access gap also affect the usage gap, but in varying levels and for varying usage types. van Dijk (2005, Chapter 6) and van Deursen and van Dijk (2013) argue that the usage gap is broader than the knowledge gap because it includes practices, technologies, and applications as well; for example, certain activities favor particular social and cultural interests, languages, and skills. Motivational, material, and skills access are necessary for usage, but other factors also influence usage: access to temporal, cognitive, and material resources; the nature of the technology; connection speed; educational attainment; the presence of children in the household and socioeconomic differences.

These *multiple divides occur as a sequence or hierarchy* in various typologies (Bonfadelli, 2002; Chen & Wellman, 2004; DiMaggio et al., 2004; van Dijk, 2005, Chapter 6; van Dijk, 2012; Witte & Mannon, 2010). For example, Selwyn (2004) proposes the divide series of technical or theoretical access, perceived or effective access, basic use, and meaningful engagement in activities. These multiple differences in access, duration, content, relevance, meaning, and application are in turn associated with short- and long-term actual and perceived outcomes and consequences. Differential outcomes from each of these gaps create feedback loops that may increase and institutionalize such differences (van Dijk, 2012). Existing social inequalities thus both affect and reinforce various digital divides (Bonfadelli, 2002).

van Dijk (2005, Chapter 6) explicates multiple Internet characteristics affecting usage, within two main categories: *technology* and *content*. The first is *technology*, specifically *hardware and software*. New access technologies, such as mobile phones that support data and web browsing, are changing the contexts for accessing and using the Internet. The percentage of respondents accessing the Internet by wireless devices ranged from 34% in Japan and 32% in the United States to 8% in Poland (World Internet Project, 2012). In the United States, most of those who do not use PC-based Internet (largely those with no college and with lower household incomes) are now accessing the Internet primarily through their cell phones, but also by laptop, e-book, or tablet (Zickuhr & Smith, 2012).

Although initially Internet-enabled phones in less developed countries were largely available only to elites, now they have become available to a wider array of people due to a second-hand market, as well as inexpensive handsets and prepaid options and sharing (Chigona, Beukes, Vally, & Tanner, 2009; Donner et al., 2011). Furthermore, growing telecommunications competition has reduced prices. As such, in less-developed countries many Internet users have their first experience via a mobile phone (Zainudeen & Ratnadiwakara, 2011). Thus mobile Internet may overcome many of the infrastructural differences between urban and rural, and developed and less-developed regions, as wireless connectivity requires far less infrastructure (Chigona et al., 2009).

There is a small but growing set of research comparing technology access aspects of the digital divide, or the *device divide* (e.g., Chigona et al., 2009; Donner et al., 2011). For comparing Internet users by device type, we apply Donner et al.'s (2011) four categories of device-based access: neither PC-based nor mobile-based Internet (nonusers); PC-based only; mobile-based only; and both PC- and mobile-based Internet (also see Rice & Katz, 2003, for combinations of Internet and mobile use). Those with access to both PC and mobile-based Internet may view their mobile devices as augmenting or supplementing their PC use (Nielsen & Fjuk, 2010; Reuver, Ongena, & Bouwman, 2012). Some smartphone users, though, are using them as a primary Internet access point.

The second set of van Dijk's (2005) Internet characteristics is *content*. There is likely less practical Internet information relevant to, and at the accessible reading level of, lower-status and ethnic and cultural minorities, and in nonmajor languages. Thus, some familiarity with a language used pervasively on the Internet (especially English) represents another potential usage divide. More specific content is represented by different Internet *activities*. Use of different activities may vary by sociodemographics and device, posing additional divides (Witte & Mannon, 2010). Internet activities may be conceptualized as one form of *engagement*, which goes beyond access and use (Helsper, 2011). Prior studies have identified a wide range of Internet activities (Bonfadelli, 2002; Helsper & Eynon, 2010; Witte & Mannon, 2010; World Internet Project, 2012; Zillien & Hargittai, 2009). Several typologies of this range of activities have emerged (Bonfadelli, 2002; Witte & Mannon, 2010; van Dijk, 2005, Chapter 6). Finally, *activity breadth*, or diversity or total number of activities, indicates wider engagement in Internet use and thus possibly broader benefits (Helsper & Eynon, 2010, p. 507; Wei, 2012). So divides in activity breadth, influenced by prior divides, can foster ongoing social inequalities through differential access to benefits.

Research context

Armenia

This study's research site is Armenia, a former Soviet republic, categorized as a developing country (International Monetary Fund, 2012). We distinguish this context from the history of Internet access in the "developed" world where many users first encountered the Internet via a computer at least a decade ago. Here, PC-based Internet and mobile phone-based Internet have become affordable over the same, recent time period, and with actually greater wireless than wired connectivity, allowing for more equivalent comparisons of the influences on and by these devices. Armenia faces challenges of external conflict, internal instability, and political strife (Heritage Foundation, 2008), as well as has great economic inequality (GDP per capita purchasing power parity of 5,900 USD, 138th of 227 countries; CIA WorldFactbook, 2011). A third of Armenians (33.5%), based on the current study, do not have enough money for food, and another quarter (25.6%) can buy food but do not have enough for clothing. The less privileged in Armenia already have poor access to social and economic opportunities, and the lack of awareness, adoption and use of the Internet, and of some kinds of online activities in particular, can exacerbate inequality and lack of access to social and civic resources and participation.

Yet, unusually for a state facing such poverty, Armenia also has relatively high education (86.5% of the population has at least a secondary school education and over half have completed some type of postgraduate study) and very high literacy (the official adult literacy rate is 99.4%—Central Intelligence Agency, 2011; World Bank, 2009). As "literacy is universally linked with poverty reduction, economic growth, and wealth creation" (United Nations Educational Scientific and Cultural Organization, 2011), there are few opportunities to study an environment where economic wellbeing and literacy are not well correlated. Armenia is an exception.

Additionally, countries with more recent and/or lower levels of access provide an important setting for analyzing the usage gap because demographic differences play a more important role at early stages of diffusion (Rogers, 2003). Thus, Armenia provides a unique context for analyzing relationships among sociodemographics, access, usage, and Internet activities. Furthermore, it also provides an interesting mix of Internet access devices, as many Armenian Internet users only access via a mobile device. We not only suspect that this is unusual, but note that there are as yet few sources of nationally representative microdata that ask about Internet access device.

Thus because of Armenia's high poverty, high educational attainment, recent adoption of the Internet, and high proportion of mobile-online users, it provides an unmatched venue for testing digital divide hypotheses across devices.

PC-based vs. mobile phone-based Internet in Armenia

On the basis of data from the International Telecommunication Union (2011), the Caucasus Barometer (Caucasus Research Resource Center, n.d.), and the Gallup World Poll (Gallup Organization, 2011), use of a *PC* by adult Armenians has grown slowly, from 5.5 or 12.3% in 2005 to as high as 39.5% in 2011. *Internet* growth mirrors that, from 2.9 or 5.4% in 2005 to as high as 34.5% in 2011. As opposed to a workplace setting, most PC-based Internet use in Armenia is at an Internet cafe or in one's home. In this study, 17% of computer users use dial-up (such access is in rural areas and varies in regional cities), and 28% use DSL (available only in the largest regional cities), as their Internet service. Nighttime dial-up services cost about one-third the daytime charge of 0.24 USD/hour, while an unlimited ADSL 1 Mbps connection costs between 0.34 and 0.94 USD/hour ("Web.am Internet costs," 2011; Beeline Coverage Map, 2011).

Mobile communication grew very quickly in Armenia in the last decade, with ownership of a mobile phone going from 10.5% in 2005 to as high as 91.6% in 2011. Mobile connectivity is available across much of the country. Since 2008, mobile Internet has been available in Armenia and as of 2011 is available in most of the country (Beeline Coverage Map, 2011; Orange Coverage Map, 2011; Vivacell Coverage Map, 2011). Mobile Internet connectivity exists in three forms. The first is using a *data plan from an Internet-enabled phone*, costing 0.00004 USD/Mb ("Orange Internet Now cost," 2011), with 16% of Internet users in this study. The second is *tethering*—sharing the Internet connection of an Internet-capable mobile phone through a computer (Pearce, 2011) (30% of Internet users in this study). The third and most popular type is a *USB stick* with a built-in cellular connection (40% in this study), costing 44 USD, with an initial 3 USD and a monthly fee of 23 USD ("Vivacell GPRS costs," 2011). A competing service gives their USB sticks away for free with a one year subscription which, with unlimited Internet use, costs between 15 and 52 USD monthly, depending on the speed ("Orange Internet Now cost," 2011).

Influence Hypotheses

Influences on access and usage

Because influences on the Internet access digital divide by gender, age, education, and income have been extensively described (see citations above), we briefly summarize only the influences of living in a more *urban* environment and of *English language skills*. In Former Soviet countries the sociodemographic and resource access differences between rural areas, regional cities, and capital cities are stark (Buckley, 1998). For example, rural areas generally have less telecommunications infrastructure, thus lower levels of technology adoption and use. There is a material divide due to lack of infrastructure certainly, but there also may be a motivational divide due to the state of rural life in Armenia. In rural areas, most people work in agriculture as compared to more urban areas in which more people work in office environments, thus have greater exposure to technology at work. Rural people may also have less communication needs than urbanites due to greater frequency of contact with family and friends; lower quantity of relationships to maintain; less distance to travel for face-to-face communication with friends and relatives; and less competing activities for which coordination aided by technology is useful. *English language skills* open doors to the digital world (Hargittai, 1999), but also represent an access and use barrier for those who lack proficiency (Guillén & Suárez, 2005; Ono & Zavodny, 2007). This is particularly a salient issue in non-English speaking countries, especially for languages that do not use Roman characters (Danet & Herring, 2007), such as Armenian, which is more difficult to use on mobile devices (iPhones and the most recent version of the Android operating system allow for Armenian to be read and inputted using Unicode, but no other devices allow for this). Language becomes especially salient after access, as Web site browsing is likely more comfortable in one's first language (Chen & Wellman, 2004). Based on this literature we propose two hypotheses concerning access and usage.

H1a: The traditional Internet digital divide of *access* will be positively related to being male, younger, more educated, and more urban, and having greater economic well-being, and better English language skills.

After the access divide, there will still be a usage divide (that is, variation in frequency or duration of use), based on many of the same social inequalities, but less so, because adoption requires the most resources, and variation in usage may be due more to differences in tasks and individual preferences (van Dijk, 2005, Chapter 6).

H1b: Higher *usage* will be less influenced by sociodemographics overall, but still positively associated with being male, younger, more educated, and more urban, and having greater economic well-being and better English language skills.

Influences on device access and usage

In Armenia, as PCs have only recently diffused but not nearly as much as mobile phones, and because PC-based Internet requires more existing technical skills and local infrastructure than mobile phones, there should be greater influence of sociodemographic divide influences on PC users than for mobile phone users. Also, as mobiles require less text input in general than PCs, English language skills should be less important. It is not clear, however, given access, whether Internet usage in general would be greater for either device.

H2a: PC-based Internet access will be positively related to being male, older, more educated, having greater economic well-being, being more urban, and having better English language skills.

H2b: Mobile-based Internet access will be positively related to being female, younger, less educated, having lower economic well-being, and being less urban.

H2c: Internet usage will not differ significantly between PC-based Internet and mobile-based Internet.

Influences on type and breadth of Internet activities

Witte and Mannon (2010, p. 45), analyzing Pew data (2000 and 2007), report substantial variations in sociodemographics across the example Internet activities within each of their four categories (communication vs. information-seeking, crossed with production vs. consumption). Other studies show a broad range of influences on activities (van Deursen & van Dijk, 2013; Zillien & Hargittai, 2009).

Gender typically has a direct influence on Internet activities, with women using it more to communicate and for social reasons, and men using it more for information, instrumental, or individual recreational purposes (Kennedy, Wellman, & Amoroso, 2011). Women are more likely to use social networking sites (SNSs) (Madden & Zickuhr, 2011). And, until recently, in the United States, women were more likely to use e-mail (Purcell, 2011). Men are more likely to use the Internet for work, reading news, playing games, and downloading music (van Dijk & van Deursen, 2013).

Higher *education* has been positively associated with e-mail, information, education, work, business and shopping activities, but negatively with entertainment ones (Bonfadelli, 2002; van Dijk, 2005, p. 129). Better-educated individuals are more likely to use the Internet for work, e-mail, search engines, to play games, read blogs, watch videos, and read news, and less likely to use instant messaging (IM) (Moore, 2011; Pew Internet and American Life Project, 2008; Purcell, 2011; van Dijk & van Deursen, 2013).

Older users are less likely to use e-mail, search engines, IM, SNSs, play games, download music, read blogs, watch videos, or read online news (Madden & Zickuhr, 2011; Moore, 2011; Pew Internet and American Life Project, 2008; Purcell, 2011; van Dijk & van Deursen, 2013). Bonfadelli (2002) found that chatting, games, and music were less frequent for older than younger users.

Those with higher *economic well-being* are more likely to use the Internet for work, communication, business, or education (e.g., "capital-enhancing activities"; Zillien & Hargittai, 2009). They are also more likely to use it for e-mail, search engines, play games, watch videos, and read news, but less likely to use IM, while some studies show that those of lower socioeconomic status do so more for social and entertainment purposes (Moore, 2011; Purcell, 2011).

More *urban* residents are slightly more likely than rural residents to play games, use SNSs, and watch videos, and much more likely to read news (Madden & Zickuhr, 2011; Moore, 2011). As some English is required to engage in some Internet activities, especially text-intensive ones (Armenian language operating systems, software, script support, and content are uncommon), greater *English language skills* should be a positive influence on some activities.

We note that this prior research is primarily from the United States and Western Europe. The Armenian context, as noted earlier, differs from these regions by high literacy and education but very poor economic conditions, and low Internet but high mobile phone access. Thus Armenia provides a fairly unique context for testing traditional and extended digital divide hypotheses.

H3a: More frequent engagement in text-based and work-related activities will be positively associated with being male, older, better educated, having greater economic well-being, being more urban, and having greater English skills.

H3b: More frequent engagement in entertainment- and social communication-based activities will be positively associated with being younger, less educated, having less economic well-being, being more urban, and having lower English skills. More social communication-based activities will also be associated with being female.

With more usage in general comes the potential exposure to, and familiarity with, more activities, representing an aspect of the usage gap. Further, as discussed above, different Internet access devices have different requirements and characteristics, thus possibly differentially influencing engagement in different activities.

H3c: PC-based Internet users will engage in more text-based and work-related activities.

H3d: Mobile-based Internet users will engage in more entertainment- and social communication-based activities.

H3e: Greater usage will be positively associated with more frequent engagement in Internet activities.

In general, people typically engaged in greater *activity breadth* when using a computer versus a mobile for access (Jung, 2009). Examples include search for information, use e-mail, participate in online discussion forums, watch videos, and shop (Cui & Roto, 2008). Attributes of the device itself may be one influence on this differential use, as mobile users are challenged by the small screen size, difficult-to-navigate menus, challenging input abilities, non-mobile formatted pages, bandwidth speed, and cost (Marsden, 2007).

Activity breadth increases with more hours online and years online (U.S. data; DiMaggio et al., 2004) and with being male, younger, more education and greater income (Dutch data; Bonfadelli, 2002). While overall, users in the United States are engaging in more Internet activities over time, there are still significant differences by age, income, and education; interestingly, both African Americans and English-speaking Latinos engage in more activities via their mobiles (Zickuhr & Smith, 2012). A national UK survey demonstrated that the most popular activities for those with little activity breadth were shopping, entertainment, and travel, while social networking, finance, and diary functions were the most popular for those with greater breadth (Helsper & Eynon, 2010). Typically, only the most advanced Internet users, those with greater *usage* and who are already doing *other Internet activities*, engage in online civic activities (Helsper, 2011; Wei, 2012). Other factors associated with greater use of some Internet activities include offline civic engagement, social connectedness, varying ethnic dimensions, and some kinds of disabilities (Helsper, 2011).

H3f: Activity breadth will be positively associated with being male, younger, more educated, having greater economic well-being, being more urban, and having greater English skills, more PC-Internet use, and higher usage levels.

Method

Respondents and sampling

Respondents were adults from households in Armenia ($N = 1{,}420$) answering a face-to-face survey administered by the Caucasus Research Resource Center (n.d.). Participation in the survey was voluntary and anonymous. The sampling universe was all adult (age 16+) residents in January and February 2011. The design used multistage area probability sampling. Primary sampling units were electoral precincts. The sampling frame was divided into three "macrostrata" by settlement type: capital, urban region, and rural. The secondary sampling unit was electoral districts, the third was households (via a random route method), and the final was individual respondents (the next birthday method).

The response rate was 75.4%, which seems high but is normal for Armenia and the region for several reasons. First, data collection in the winter means more people were at home rather than being out socially or, in the case of agricultural workers, out of the home working. Additionally, most Armenians live in multigenerational households and thus, it is more likely that some adult is home and available to be interviewed. Therefore, response rates are high because the probability of someone being home is higher than in nuclear family homes (in the current dataset, the mean number of adult household members was 2.95 and the *SD* 1.37). The Caucasus Barometer conducted by the Caucasus Research Resource Center (n.d.) annually has a 70–90% response rate. Even telephone surveys in Armenia have a typical response rate of 80% (Center for Health Services Research & Development, 2007).

Measures

All respondents (Internet nonusers and users, $n = 1420$) were asked about Internet access and sociodemographics. *Internet access*. Respondents were asked, Have you used the Internet in the past 12 months (0 No 70.3%, 1 Yes 29.7)? *Gender*. Interviewers noted if the interviewee was a man or a woman (0 Male 39.1%, 1 Female 60.5). *Age*. Respondents were asked to report their year of birth; this was transformed into age by subtracting that year from 2011 ($M = 45.2$, $SD = 18.11$, range = 16–92). *Education*. Respondents were asked to self-report their education as one of six levels (1 Primary 2.3%, 2 Incomplete secondary 10.6, 3 Completed secondary 31.2, 4 Secondary technical 5.8, 5 Incomplete higher .3, 6 Completed higher 22.5, 7 Postgraduate 0.7; $M = 3.9$, $SD = 1.41$). *Economic well-being*. Although many studies use income as a single indicator of socioeconomic status, certainly income is not a complete or direct measure of total economic well-being (Ringen, 1998). Here, the measure is a person's subjective assessment of their satisfaction of basic needs (Boarini & Mira, 2006). Respondents were asked, What phrase best describes your family's financial situation? and given six levels (1 We don't have enough money even for food 33.5%, 2 We have enough money for food but not for clothes 25.8, 3 We can buy food and clothes, but not more expensive things 26.8, 4 We can buy some expensive things like a TV or washing machine 9.5, 5 We can buy expensive goods and car, have a vacation, but not buy an apartment 2.7, 6 We can also buy an apartment 0.4; $M = 2.2$, $SD = 1.12$).

Urban. Interviewers determined if the household was located in a rural area, an urban region, or the capital (0 Rural 33.3%, 1 Urban region 31.2, 2 Urban capital 35.5; $M = 1.0$, $SD = 0.83$). Urban regions in post-Soviet countries are defined as a settlement with more than 10,000 residents and the majority must not be employed in agriculture (Buckley, 1998); a capital city is the country's capital. We conceptualize these values as belonging to a range from rural to urban (see Cossman, Cossman, Cosby, & Reavis, 2008, on the rural–urban continuum). *English*. Respondents were asked, "What is your English language knowledge?" and provided four levels (1 No basic knowledge 61.8%, 2 Beginner 16.0, 3 Intermediate 16.8, 4 Advanced 5.4; $M = 1.7$, $SD = 0.94$).

Internet users only ($n = 420$) were asked about device type, usage frequency and duration, and activities. *Internet device*. Respondents were asked, "Which device do you use the most for Internet access?" and given the choice of "none," "mobile phone," or "PC." Some respondents reported that they used their mobile phone and PC equally and could not choose one as the "primary" device, so were marked as "both" (mobile 15.7%, PC 71.0, both, 13.3). *Usage frequency*. "How often do you access the Internet?" (1 Once or several times a month 7.2%, 2 Once a week 3.8, 3 Several times a week 17.0, 4 Every day 36.4, 5 Several times a day 35.6; $M = 2.1$, $SD = 1.1$). *Usage duration*. Interviewers asked the open-ended question, "How many hours on average do you spend daily using the Internet?" ($M = 3.6$, $SD = 2.9$). *Activities*. "When you access the Internet, which of the listed below do you usually do?" (Internet for work 24%, e-mail 29, Search engine [Google, Yahoo] 46, Play games 23, Download music 16, IM [Skype, ICQ, MSN, etc.] 37, SNS [Odnoklassniki, Facebook, Twitter, etc.] 62, Blog 6, Watch videos [YouTube, Vimeo] 31, Online news 35). *Activity breadth*. This is the total number of the above activities in which respondents engaged ($M = 3.1$, $SD = 2.0$). The list of Internet activities was derived by the local staff of the Armenian office of the Caucasus Research Resource Center as well as based on previous media and technology surveys conducted by the organization.

Results

Access and usage

H1a: Univariate analysis of variances (ANOVAs) were conducted to identify sociodemographic differences between nonusers and users (Table 1, columns A, B, and C). Nonusers were significantly different from users on all factors except gender: older, lower education, lower economic well-being, less urban, and less knowledge of English. However, the binary logistic regression of access (Table 2, column A) showed that all the sociodemographic factors, even gender (with males being slightly more likely to be users), were significant influences on access, with a Nagelkerke R^2 of .46.

H1b: Those with lower age, more education, and greater economic well-being used the Internet significantly more *frequently* (adj. $R^2 = .10$), but only greater English skills was significantly associated with greater *usage duration* (adj. R^2 only .02) (Table 2, columns C and D).

Device

H2a, *H2b*: For users, the likelihood of all sociodemographic factors, except for gender, varied significantly overall across the three device types (Table 1, columns D–G). The associations exhibited much lower partial *eta*^{2} values than for access, as implied by the usage gap model's argument that the access gap involves the greatest disparities. While those using mobile phone or both were more likely to be younger, those using PC or both were more likely to have higher education, greater economic well-being, to be more urban, and to have greater English skills. The multinomial logistic regression (Table 2, column B) also showed much less influence of sociodemographics on device. Mobile-based users were more likely to have significantly lower economic well-being. (Although the betas for education, urban, and English here all had larger

Table 1 Means, Standard Deviations, and ANOVA Tests for Access and for Device

	Access: Nonusers and Users			Device: Users Only			
Measures	A Nonusers	B Users	C*F*, Partial η^2	D Mobile Based	E PC Based	F Both	G *F*, Partialη^2
N	1,000	420		66	298	56	
Gender (0 M 1 F)							
M	0.62 a	0.58 b	1.5***	0.47	0.60	0.57	2.0
SD	0.50	0.49	0.00	0.50	0.49	0.50	0.01
Age							
M	50.1 a	33.8 b	281.2***	26.2 b	36.3 a	26.7 b	22.2***
SD	17.54	13.6	0.17	8.49	13.16	9.36	0.10
Education (1–7)							
M	3.6 b	4.7 a	206.3***	3.8	4.9 a	4.7 a	19.1***
SD	1.31	1.32	0.13	1.20	1.28	1.36	0.09
Economic well-being (1–6)							
M	2.0 b	2.8 a	189.3***	2.3 b	2.9 a	3.1 a	8.5**
SD	1.01	1.16	0.12	1.03	1.19	0.84	0.04
Urban (0–2)							
M	0.88 b	1.37 a	113.8***	1.1	1.4 a	1.5 a	8.0***
SD	0.83	0.72	0.08	0.76	0.69	0.76	0.04
English (1–4)							
M	1.4 b	2.3 a	351.5***	1.8	2.4 a	2.5 a	8.6***
SD	0.72	1.07	0.20	0.89	1.1	1.1	0.04
Usage Frequency (1–5)							
M				2.2	2.1	1.8	2.4
SD				1.1	1.2	1.0	0.01

Table 1 Continued

	Access: Nonusers and Users			Device: Users Only			
Measures	A Nonusers	B Users	*CF*, Partial η^2	D Mobile Based	E PC Based	F Both	G *F*, Partialη^2
Duration							
M				2.7	3.7 a	3.9 a	3.3*
SD				1.8	3.1	2.6	0.02
Activities							
Internet for work				0.05 b	0.30 a	0.16 ab	10.7***, 0.05
E-mail				0.26	0.30	0.27	0.63, 0.00
Search engine				0.32 b	0.47 ab	0.55 a	4.4**, 0.02
Play games				0.21	0.22	0.29	0.99, .01
Download music				0.17	0.15	0.20	0.17, 0.00
IM				0.09 b	0.43 a	0.36 a	11.1***, 0.06
SNS				0.85 a	0.53 b	0.80 a	13.1***, 0.07
Blog				0.05	0.06	0.09	0.14, 0.00
Watch videos				0.23	0.32	0.34	0.69, 0.00
Online news				0.08 b	0.40 a	0.39 a	12.8***, 0.06
Activity breadth							
M				2.3 b	3.2 a	3.5 a	7.4***
SD				1.7	2.1	1.7	0.04

Note: Means with same letters (a, b) are not significantly different. ANOVA = Analysis of variance; IM = instant messaging; SNS = social networking sites.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table 2 Regression of Sociodemographics on Access, Device, and Usage

	Access: Nonusers and Users	Device and Usage: Users Only			
	A	B		C	D
		Device[b]			
	Nonusers/Users[a]	Mobile-based	PC-based	Usage Frequency[c]	Usage Duration[c]
Gender	−.40**	.10	−.09	−.03	−.09
	(.15) .67	(.43) 1.1	(.33) .92		
Age	−.06***	−.03	.06***	−.19***	−.06
	(.01) .95	(.02) .97	(.02) 1.1		
Education	.38***	−.33	.02	.11*	.02
	(.06) 1.5	(.18) .72	(.14) 1.0		
Economic well-being	.32***	−.55**	−.10	.21***	.06
	(.07) 1.4	(.19) .58	(.14) .91		
Urban	.47***	−.52	−22	.08	.02
	(.10) 1.6	(.43) .60	(.25) .80		
English	.46***	-.49	.24	.06	.13**
	(.09) 1.6	(.24) .67	(.18) 1.3		
Mobile-based	—	—	—	−.02	−.11*
PC-based	—	—	—	−.04	−.03
				R^2 ch. = 0.0	R^2 ch. = .01*
Intercept	−2.1***	5.5***	−.22	—	—
	(.34) .13	(1.1)	(.86)		
	$\chi^2 = 534$***	$\chi^2 = 107.4$***		$F(3,400) = 15.2$***	$F(2,367) = 5.4$**
	Nagelkerke $R^2 = .46$	Nagelkerke $R^2 = .29$		Adj $R^2 = .10$	Adj $R^2 = .02$
	% correct = 80.1				
N	1,389	65	291	403	369

Note: A = binary logistic regression (unstandardized beta coefficients, standard error, exp(*B*)); B = multinomial logistic regression (“Both PC and mobile” is used as the reference category so that the other two are distinct comparisons $n = 52$; unstandardized beta coefficients, standard error, exp(*B*)); C, D = multiple regression (standardized beta coefficients; hierarchical with 1st block demographics, 2nd block devices, dummy coding for Mobile-based and for PC-based).

*$p < .05$. **$p < .01$. ***$p < .001$.

betas than for the access analyses, because of the small device sample sizes, they were not significant at $p < .05$.) PC-based users differed only by being slightly older.

H2c: *Frequency* of usage did not significantly vary by device, though *duration* did, with likelihood of more time spent by those using either a PC or both PC and mobile phone, and by those with greater English language skills (Table 1, columns D–G). Regressions on usage frequency and duration used two hierarchical blocks—demographics and device—reflecting the separate and sequenced usage gaps introduced in the review. Usage *frequency* likelihood was associated with younger age, more education, and greater economic well-being, but not device (Table 2, column C). Mean usage *duration*, however, had slightly but significantly lower odds by mobile-based users (Table 1, columns D–G), and by those with greater English language skills (Table 2, column D).

Activity frequency

The percent of users engaged in Internet activities ranged from a high of 62% for social networking services and 46% for search engines, to a low of 16% for downloading music and 6% for reading or writing blogs.

Table 3 presents the binary logistic regression results for the socio-demographic, device, and usage influences on the ten activities. These three hierarchical blocks reflect the sequenced usage gaps introduced in the review. Nagelkerke R^2 ranged from .04 for play games to .24 for using social networking sites.

Activity type and breadth

H3a, *H3b*: In the regressions, all the sociodemographic factors except gender and economic well-being significantly influenced the likelihood of engaging in at least two activities each.

H3c, *H3d*: Activity likelihood significantly varied by device for Internet for work (greater likelihood for PC, then both, and lowest for mobile), using search engines (highest likelihood for both, then PC, and lowest for mobile), instant messaging (highest likelihood for PC and then both, lowest for mobile), social networking sites (highest likelihood for mobile and both, lowest for PC), and reading online news (highest likelihood for PC and both, lowest for mobile) (Table 1, columns D–G). Though one might expect IM to be more frequently used on mobile phones, instant messaging and Skype have functional equivalents on mobile devices—SMS and voice calls, both of which more people than use than they do IM or Skype. Unlike previous studies, we found no significant likelihood difference in e-mail by device type.

In the regressions, PC-based device users (dummy variable, compared to mobile-based and both) were more likely to engage in more Internet for work and more video watching, but less likely for social networking sites. Mobile-based device users (compared to PC and both) were less likely to engage in instant messaging, and online news reading.

H3e: Usage *frequency* positively influenced the likelihood of engaging in all activities except Internet for work, using search engines, and instant messaging. This

Table 3 Regression of Sociodemographics and Device on Access, Device, and Usage

	Internet for Work	E-mail	Search Engine	Play Games	Download Music	IM	SNS	Blog	Watch Videos	Online News	Activity Breadth
Gender	—	—	—	—	—	—	—	—	—	—	—
Education	.23*	—	—	—	—	—	—	—	—	.36***	—
	(.11) 1.25									(.10) 1.4	
Age	.03**	.02**	—	—	−.05***	—	−.04***	−.05*	−.05***	.02	—
	(.01) 1.03	(.01) 1.02			(.01) .95		(.01) .96	(.02) .95	(.01) .95	(.01) 1.02	
Economic well-being	—	—	—	—	—	—	—	—	—	—	—
Urban	—	—	.37*	—	—	—	.35*	—	.36*	—	—
			(.16) 1.4				(.17) 1.4		(.18) 1.4		
English	.40**	.35**	.22*	—	—	—	—	—	—	.28*	.15**
	(.14) 1.5	(.12) 1.4	(.11) 1.2							(.13) 1.3	
Mobile-based	—	—	—	—	—	−1.8***	—	—	—	−1.5**	−.14**
						(.45) .16				(.50) .23	
PC-based	.97**	—	—	—	—	—	−1.2***	—	.62*	—	—
	(.37) 2.6						(.32) .31		(.13) 1.3		
R^2 change	.03**						.04***		.02*	.04***	.02*
Frequency	—	.41***	—	.44**	.37*	—	.40***	1.0**	.26*	.26*	.26***
		(.13) 1.5		(.14) 1.6	(.17) 1.5		(.12) 1.5	(.40) 2.8	(.13) 1.3	(.12) 1.3	
Duration	—	—	—	—	—	—	—	—	—	—	—
R^2 change		.04***			.02*		.04***	.07***	.01*	.02*	.07***
Intercept	−4.9***	−4.1***	−1.2***	−3.0***	−1.7*	−.31**	.67	−5.7***	−1.2	−4.3***	—
	(.71) .01	(.76) .02	(.30) .31	(.63) .05	(.89) .18	(.12) .74	(.59) 1.95	(2.0) .003	(.68) .31	(.84) .01	
χ^2	44.3***	23.9***	14.6***	10.9***	24.4***	24.5***	70.1***	19.5***	43.7***	64.2***	F(4,
df	4	3	2	1	2	1	4	2	4	5	363) = 16.5***
Nagelkerke R^2	.17	.09	.05	.04	.11	.09	.24	.14	.16	.22	Adj R^2 = .15
% correct	76.4	71.7	56.5	77.4	83.7	62.5	71.9	94.0	70.4	67.4	—

Note: $n = 368$; Cell values are unstandardized beta coefficients, (standard error), exp(B) from logistic regression with three hierarchical blocks; cell values for Activity breadth are standardized beta coefficients from multivariate linear regression with three hierarchical blocks (for activity breadth).

$p < .05$. $^{**}p < .01$. $^{***}p < .001$.

implies that using these activities is not a result of greater exposure or familiarity, but they may be required (work) or fundamental (search engines, IM) activities. Once frequency was taken into account, *duration* (correlated with frequency $r = .31$, $p < .001$) had no unique significant influence on likelihood of any activity.

Activity breadth

H3f: Likelihood of activity breadth varied by device, significantly higher for PC-based and both than for mobile-based (Table 1, columns D–G). In the regression, significant influences were greater English language skill, less use of mobile-based device, and greater usage frequency, explaining 15% of the variance. Greater English ability increases the likelihood of seeking and using a slightly wider breadth of sites and activities. Perhaps the wider functionality, larger screen, and possibly greater bandwidth of the PC enables more kinds of usage. Though this study did not measure skills, greater frequency of usage may foster more skills and opportunities to become aware of, and know how to use, more activities (van Deursen & van Dijk, 2009).

Discussion

Implications

Based on prior theorizing and research, we found pervasive differential divides for access, pervasive but weaker divides for device type, fewer divides for usage frequency, almost no divides for usage duration (which is positively related to usage frequency), and many (including some device and some usage frequency) divides for activities.

To address our larger question, first, the general usage gap model applies even in this particular and unique context of high poverty, high educational attainment, recent adoption of the Internet, and high proportion of mobile-online users.

Second, there was a device divide in that device access was differentially influenced by digital divide sociodemographic variables. As of the time of this survey, relatively early on in the widespread diffusion of the Internet in Armenia (via PC, mobile, or both), access to the Internet by mobile phones is more likely by *lower* sociodemographic levels and those with *lower* English skills. This result supports the notion that this device may be an alternative route to Internet resources and thus reduce some gaps over time, compared to the traditional PC-based Internet use, with its attendant access, technology, complexity, skill, and cost factors. But, as noted above, mobile phone access, service, and use have their own limitations.

Both sociodemographics and device influence usage, though demographics matter more than device type for nearly all activities. However, those gaining access via mobile devices only are in general *less* likely than PC-based or both users to use the Internet as frequently or as long, to engage in some common Internet activities, or to engage in as much activity breadth. Thus, a (small) device divide does exist in terms of access, usage, and activities.

As noted earlier, different devices offer different attributes or affordances. Basic activities requiring text entry (e-mail, IM) seem sufficiently supported by both devices.

Perhaps unexpectedly, most entertainment activities (playing games, downloading music, and watching videos) also do not vary much across devices, perhaps due to a tradeoff between display size and convenience, and the simple strong attraction of entertainment. Other activities seem better supported by aspects of PC-based Internet, such as larger keyboard and display, access to associated files and functions, and printing (use for work, using search engines, IM, and reading online news). Thus, one could argue that PC-based Internet allows for a more optimal experience, while mobile-based Internet requires compromises, though more accessible and affordable.

For non-English users, device may play a role because of language availability. For example, Armenian script is not easily supported on most mobile devices, making it difficult to read news or search for a term in the user's native language. On a PC, one has much greater ability to read and write in Armenian. However, though social networking sites were popular amongst many users, PC Internet users were much less likely to use such sites than were mobile Internet users. And as social networking sites can allow for social support and cohesion, their popularity is not surprising in Armenia where strong family and friendship ties allow for social, economic, and political advancement (Ishkanian, 2008). ICTs can foster this kind of connectedness and sociability (Rice & Hagen, 2010).

Third, different Internet activities are differentially influenced by the sociodemographic variables, the access device, and extent of use. Thus mobile-based users, who do not engage in as much potentially online capital-enhancing activities, may not be likely to gain as much economic, material, or cultural benefits from the Internet. This is not because of less frequency of use, though possibly due to shorter usage duration, and possibly due to some of the different characteristics and usage contexts of the two devices. However, we note that this issue does not apply to the half of the activities where neither device had any influence, and even for the influenced activities only about 3% of the variance was explained by device. For these activities, mobile-based users may thus, to a small extent, be reinforcing their lower social status and increasing their knowledge and usage gaps relative to PC-based users. However, the greater number of Armenians accessing the Internet via mobile phones may be strengthening their interaction capital via social networking sites.

Concerning Internet activities, there is a conventional assumption that some activities are "better" than others (e.g., reading the news vs. playing games). While we reject this notion, and argue that there are good and bad implications (sometimes simultaneously) of all media use (see Katz & Rice, 2002), we do agree with van Dijk and van Deursen (2013) that "[S]ome activities offer users more chances and resources in moving forward in their career, work, education and societal position than others that are mainly consumptive or entertaining" (p. 3). Those authors included health and government interactions, personal development, and news and information as beneficial, and music and videos, commercial transactions, and social communication as consumptive or entertaining. Similarly, Zillien and Hargittai (2009) argue that there are capital-enhancing uses of the web that can improve one's life chances. They include seeking political or government information online, exploring career or job opportunities online, or financial or health information seeking. The Internet activities in the current dataset do not include all of these. However, we suggest that Internet for work, online news, and blogs are more capital-enhancing, while consumptive or entertaining ones include play games, download music, and watch videos. These are not exclusive categories, though. Videos could be entertaining or educational (ideally both), for example. With that in mind, some of the Internet activities could involve either category: e-mail, search engine, Skype/IMing, and social networking. We note that we did conduct a principal components analysis of the activities, but no clear dimensions emerged, so this proposed grouping of activities is speculative.

Limitations and future research

This particular context, Armenia, has some characteristics which may make findings about technology adoption and use less generalizable: the combination of high literacy and high poverty, a special emphasis on kinship, and a notable migrant worker population who may transfer technology upon return or have left-behind relatives more likely to use technology (Pearce, Slaker, & Ahmad, 2012). However, Armenia also provides a research site in which a noteworthy proportion of Internet users only access via mobile devices and likely have no experience with PC-based Internet. This is important because "[T]he research community knows far less about the behaviors of the community of users who will access the Internet primarily or exclusively via mobiles. These gaps are an impediment to needed improvements in theory, policy, and design" (Donner et al., 2011, p. 575). This study moves the discussion of device-driven differences in Internet use to better understand the relative influence of devices and demographics. Further, as claims about the ability for mobile devices to bridge digital divides abound (Smartphones Bridge US Digital Divide, AFP, 2012), this study provides evidence that mobile devices are less able to bridge the usage gap for both technical and sociodemographic reasons. Although mobile Internet is available for those on the wrong side of the digital divide, those mobile Internet users do not engage as much in many online activities that could be capital-enhancing. It is essential for policymakers and the public to move beyond the framing of the digital divide as a technical access problem to a more resource-driven issue (both for antecedents and outcomes of technology use).

While distinguishing between devices (including the overlap of "both"), the survey prompt of "Which device do you use the most for Internet access?" does not distinguish between levels of "most." Thus PC-based users could use mobile for some activities, and vice-versa. Better measures, such as usage of each device for each activity, would provide better bases for analyses of activity divides.

As noted earlier, different studies use various categories of and specific items for Internet activities. Including activities such as education, civic engagement, or financial/business information seeking may very well capture more influence of sociodemographics, especially those related to civic engagement and social inclusion. Qualitative research could help confirm or clarify other Internet activities which the staff at CRRC may have overlooked, or one of the better-developed typologies (e.g., van Deursen & van Dijk, 2009; van Dijk, 2005) could be used.

We note that form of connectivity (in Armenia, these include dial-up, cable, Wi-Fi, mobile phone connection, USB flash card) is another technological divide, though not analyzed here. Broadband allows being "always on," more audio and video, more interactivity, greater immediacy and satisfaction, and greater usage of more diverse activities. But broadband also involves greater cost and may be more complex to install, leading to a broadband elite who engage in more activity breadth, thus creating another cycle of divides.

Another divide not studied here is skills, representing experience, competence, and cognitive abilities. van Deursen and van Dijk (2009) provide conceptual foundations, and develop subdimensions and survey items, for four kinds of Internet or digital skills (operational, medium-related, and content and search behavior, and goals and benefits) and related problems experienced. The ability to know how to evaluate and apply knowledge obtained from the Internet are also necessary cognitive and cultural skills (Rice, McCreadie, & Chang, 2001). More recently, divides of participation (content creation and sharing) are emerging (Schradie, 2011).

Future research could also look at the role of skill and Internet experience on activities. Additionally, as tablet PCs grow in popularity and become more affordable, it is possible that some of the challenges associated with mobile device Internet use will be reduced and a new device category will emerge. Moreover, research in other contexts in which device divides exist, including the United States, should also look at the effect of device on activities.

The existence of influences of sociodemographics on the digital divide, and on Internet activities, has two somewhat symmetric implications. The first is that these individual and structural factors can help maintain or even increase social inequalities. The second is that policies and user strategies could focus on those influential aspects that might be improved (e.g., learning, self-efficacy, skills, and breadth of activities; Helsper & Eynon, 2010).

These results somewhat reframe the general and expanding digital divide discussion. Both demographics and device type matter, being associated with differential access and usage. It may be the case that mobile Internet has the potential to provide an avenue to reduce the access digital divide in rural areas or less developed countries, also known as leapfrogging (James, 2009). However, to the extent that engaging in the wide variety of activities available through the Internet (whether via PC, mobile phone, or both) is associated with positive benefits and resources, these mobile-based Internet users may suffer somewhat from the Matthew effect.

References

Beeline coverage map. (2011). http://mobile.beeline.am/ru/main/zone/3gzone.wbp.

Boarini, R., & Mira, M. (2006). *Measures of material deprivation in OECD Countries*. Paris. doi:10.1787/866767270205

Bonfadelli, H. (2002). The Internet and knowledge gaps: A theoretical and empirical investigation. *European Journal of Communication*, **17**, 65–84. doi: 10.1177/0267323102017001607

Buckley, C. (1998). Rural/urban differentials in demographic processes: The Central Asian states. *Population Research and Policy Review*, **17**, 71–89. doi: 10.1023/A:1005899920710

Caucasus Research Resource Centers. (n.d.) Caucasus Barometer. Retrieved from http://www.crrccenters.org

Central Intelligence Agency. (2011). *CIA world factbook: Armenia*. Washington, DC. Retrieved from http://1.usa.gov/80sfRL

Chen, W., & Wellman, B. (2004). The global digital divide-within and between countries. *IT & Society*, **1**, 39–45.

Chigona, W., Beukes, D., Vally, J., & Tanner, M. (2009). Can mobile Internet help alleviate social exclusion in developing countries? *The Electronic Journal of Information Systems in Developing Countries*, **36**, 1–16.

Cossman, R. E., Cossman, J. S., Cosby, A. G., & Reavis, R. M. (2008). Reconsidering the rural-urban continuum in rural health research. *Population Research and Policy Review*, **27**(4), 459–476.

Cui, Y., & Roto, V. (2008). How people use the web on mobile devices. *Proceeding of the 17th international conference on World Wide Web — WWW '08* (p. 905). New York, NY: ACM Press. doi:10.1145/1367497.1367619

Danet, B., & Herring, S. C. (2007). Introduction: Welcome to the multilingual Internet. In B. Danet & S. C. Herring (Eds.), *The multilingual Internet: Language, culture, and communication online* (pp. 3–42). Oxford, England: Oxford University Press.

van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2009). Using the Internet: Skill related problems in users' online behavior. *Interacting with Computers*, **21**, 393–402. doi: 10.1016/j.intcom.2009.06.005

Van Deursen, A. J. A. M., & Van Dijk, Jan A. G. M. (2013). The digital divide shifts to differences in usage. *New Media & Society*; *preprint online at http://nms.sagepub.com/content/early/2013/06/05/1461444813487959.abstract*

van Dijk, J. A. G. M. (2005). *The deepening divide: Inequality in the information society*. Thousand Oaks, CA: Sage.

van Dijk, J. A. G. M. (2012). The evolution of the digital divide: The digital divide turns to inequality of skills and usage. In J. Bus, M. Crompton, M. Hildebrandt, & G. Metakides (Eds.), *Digital enlightenment yearbook 2012* (pp. 57–75). Fairfax, VA: IOS Press, Inc.

Van Deursen, A. J. A. M., & Van Dijk, Jan A. G. M. (2013). The digital divide shifts to differences in usage. *New Media & Society*; *preprint online at http://nms.sagepub.com/content/early/2013/06/05/1461444813487959.abstract*

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

Dolničar, V. (2011). Key methodological fallacies of digital divide research. In L. Haddon (Ed.), *The contemporary Internet* (pp. 190–205). Frankfurt, Germany: Peter Lang.

Donner, J., Gitau, S., & Marsden, G. (2011). Exploring mobile-only Internet use: Results of a training study in urban South Africa. *International Journal of Communication*, **5**, 574–597.

Gallup Organization (2011). *Gallup World Poll*. Washington, DC: Gallup Organization.

Guillén, M. F., & Suárez, S. L. (2005). Explaining the global digital divide: Economic, political and sociological drivers of cross-national Internet use. *Social Forces*, **84**, 681–708. doi: 10.1353/sof.2006.0015

Hargittai, E. (1999). Weaving the Western web: Explaining differences in Internet connectivity among OECD countries. *Telecommunications Policy*, **23**, 701–718. doi: 10.1016/S0308-5961(99)00050-6

Helsper, E. J. (2011). Digital disconnect: Issues of social exclusion, vulnerability and digital (dis)engagement. Perspectives of web 2.0 for citizenship education in Europe. Brno, Czech Republic, April. bit.ly/TWqGx2.

Helsper, E. J. (2012). A corresponding fields model for the links between social and digital exclusion. *Communication Theory*, **22**(4), 403–426. doi: 10.1111/j.1468-2885.2012.01416.x

Helsper, E. J., & Eynon, R. (2010). Digital natives: Where is the evidence? *British Educational Research Journal*, **36**, 503–520. doi: 10.1080/01411920902989227

Heritage Foundation. (2008). *Armenia country report: World Development*. Washington, DC. herit.ag/nCdbIT

Hilbert, M. (2011). The end justifies the definition: The manifold outlooks on the digital divide and their practical usefulness for policy-making. *Telecommunications Policy*, **35**, 715–736. doi: 10.1016/j.telpol.2011.06.012

International Monetary Fund. (2012). *World economic outlook*. Washington, DC. Retrieved from http://www.imf.org/external/pubs/ft/weo/2012/01/pdf/text.pdf

International Telecommunication Union. (2010). *ITU development index*. Retrieved from http://www.itu.int/ITU-D/ict/statistics/

Ishkanian, A. (2008). *Democracy building and civil society in post-Soviet Armenia*. London, England: Routledge.

James, F. (2009). Leapfrogging in mobile telephony: A measure for comparing country performance. *Technological Forecasting and Social Change*, **76**(7), 991–998.

Jung, J.-Y. (2009). Where do you go online? A comparison of Internet connectedness via personal computers and mobile phones in Japan. *International Journal of Mobile Communications*, **7**, 21–35.

Katz, J. E., & Rice, R. E. (2002). *Social consequences of Internet use: Access, involvement, and interaction*. Cambridge, MA: MIT Press.

Kennedy, T. L. M., Wellman, B., & Amoroso, J. (2011). Can you take it with you? Mobility, ICTs, and work-life balance. In J. E. Katz (Ed.), *Mobile communication: Dimensions of social policy* (pp. 191–210). New Brunswick, NJ: Routledge.

Livingstone, S., & Helsper, E. J. (2007). Gradations in digital inclusion: Children, young people and the digital divide. *New Media & Society*, **9**, 671–696. doi: 10.1177/1461444807080335

Madden, M., & Zickuhr, K. (2011). *65% of online adults use social networking sites*. Washington, DC: Pew Internet and American Life Project. Retrieved from http://www.pewinternet.org/~/media/Files/Reports/2011/PIP-SNS-Update-2011.pdf

Marsden, G. (2007). What is the mobile Internet? *Interactions*, **14**, 24–25. doi: 10.1145/1300655.1300672

Moore, K. (2011). *71% of online adults now use video sharing sites*. Washington, DC: Pew Internet and American Life Project. Retrieved from http://pewinternet.org/~/media/Files/Reports/2011/Video%20sharing%202011.pdf

Mossberger, K., Tolbert, C. J., & Stansbury, M. (2003). *Virtual inequality: Beyond the digital divide*. Washington, DC: Georgetown University Press.

Nielsen, P., & Fjuk, A. (2010). The reality beyond the hype: Mobile Internet is primarily an extension of PC-based Internet. *The Information Society*, **26**(5), 375–382. doi: 10.1080/01972243.2010.511561

Ono, H., & Zavodny, M. (2007). Digital inequality: A five country comparison using microdata. *Social Science Research*, **36**, 1135–1155. doi: 10.1016/j.ssresearch.2006.09.001

Orange coverage map. (2011). Retrieved from http://www.orangearmenia.am/en/help_centre/mobile_help/coverage-map/

Orange Internet Now cost. (2011). Retrieved from http://www.orangearmenia.am/en/internet/internet-hima/

Pearce, K. E. (2011). *Armenian media landscape: Formative research for the Alternative Resources in Media Program*. Yerevan, Armenia. Retrieved from http://crrc.am/store/armedia/CRRC_ArMediaSurvey Report_FINAL KP_edited.pdf

Pearce, K. E. (2013). Phoning it in: Theory in mobile media and communication in developing countries. *Mobile Media and Communication*, **1**, 76–82. doi: 10.1177/2050157912459182

Pearce, K. E., Slaker, J. S., & Ahmad, N. (2012, March). *Mobile Internet for mobile people: Armenian labor migrant families' use of mobile Internet*. Paper presented at the Third Joint International Conference of the Pan-American Mobilities Networks and the Cosmobilities Network, Raleigh, NC.

Pew Internet and American Life Project. (2008). *Usage over time spreadsheet*. Washington, DC: Pew. Retrieved from http://pewinternet.org/Trend-Data/Usage-Over-Time.aspx

Purcell, K. (2011). *Search and email still top the list of most popular online activities*. Washington, DC: Pew Internet and American Life Project. http://fe01.pewinternet.org/~/media/Files/Reports/2011/PIP_Search-and-Email.pdf

De Reuver, M., Ongena, G., & Bouwman, H. (2013). Should mobile Internet be an extension to the fixed web? Fixed-mobile reinforcement as mediator between context of use and future use. *Telematics and Informatics*, **30**(2), 111–120. doi: 10.1016/j.tele.2012.02.002

Rice, R. E., & Hagen, I. (2010). Young adults' perpetual contact, social connection, and social control through the Internet and mobile phones. *Communication Yearbook*, **34**, 2–39.

Rice, R. E., & Katz, J. E. (2003). Comparing internet and mobile phone usage: digital divides of usage, adoption, and dropouts. *Telecommunications Policy*, **27**, 597–623. doi: 10.1016/S0308-5961(03)00068-5

Rice, R. E., McCreadie, M., & Chang, S.-J. (2001). *Accessing and browsing information and communication*. Cambridge, MA: MIT Press.

Ringen, S. (1988). Direct and indirect measures of poverty. *Journal of Social Policy*, **17**(2), 351–365. doi: 10.1017/S0047279400016858

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.

Schradie, J. (2011). The digital production gap: The digital divide and Web 2.0 collide. *Poetics*, **39**, 145–168. doi: 10.1016/j.poetic.2011.02.003

Selwyn, N. (2004). Reconsidering political and popular understandings of the digital divide. *New Media & Society*, **6**, 341–362. doi: 10.1177/1461444804042519

Smartphones Bridge US Digital Divide. (2012, April 13). *AFP*. http://www.google.com/hostednews/afp/article/ALeqM5hfCIivMDxkemn5uEIZbKBpoCsHOA?docId=CNG.9e33b431a43400c66dbfa377830edfbb.251.

Tichenor, P. J., Donohue, G. A., & Olien, C. N. (1970). Mass media flow and differential growth in knowledge. *Public Opinion Quarterly*, **34**, 159–170. doi: 10.1086/267786
United Nations Educational Scientific and Cultural Organization. (2011). *Literacy, poverty and development*. http://www.unesco.org/en/efa/international-cooperation/e-9-initiative/8th-meeting/main-theme/poverty-and-development/.
Vivacell Coverage Map. (2011). Retrieved from http://mts.am/en/individual-customers/help-and-support/service-zone/coverage-map
Vivacell GPRS costs. (2011). bit.ly/UTG15U.
Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. Cambridge, MA: MIT Press.
Web.am Internet costs. (2011). http://www.web.am/en/prices/
Wei, L. (2012). Number matters: The multimodality of Internet use as an indicator of the digital inequalities. *Journal of Computer-Mediated Communication*, **17**, 303–318. doi: 10.1111/j.1083-6101.2012.01578.x
Witte, J. C., & Mannon, S. E. (2010). *The Internet and social inequalities*. New York, NY: Routledge.
World Bank. (2009). *Armenia*. Washington, DC. http://data.worldbank.org/country/armenia.
World Internet Project. (2012). Los Angeles, CA. http://www.worldinternetproject.net.
Zainudeen, A., & Ratnadiwakara, D. (2011). Are the poor stuck in voice? Conditions for adoption of more-than-voice mobile services. *Information Technologies & International Development*, **7**, 45–59.
Zickuhr, K., & Smith, A. (2012). *Digital differences*. Washington, DC: Pew Internet & American Life Project. Retrieved from http://pewinternet.org/Reports/2012/Digital-differences.aspx
Zillien, N., & Hargittai, E. (2009). Digital distinction: Status-specific types of internet usage. *Social Science Quarterly*, *90*, 274–291. doi: 10.1111/j.1540-6237.2009.00617.x