



**University of
Zurich**^{UZH}

**Zurich Open Repository and
Archive**

University of Zurich
University Library
Strickhofstrasse 39
CH-8057 Zurich
www.zora.uzh.ch

Year: 2017

Old Dogs, New Clicks: Digital Inequality in Internet Skills and Uses among Older Adults

Hargittai, Eszter ; Dobransky, Kerry

Abstract: Research on digital inequality tends to collapse people above a certain age into one “older adults” category, seemingly assuming that this is one homogeneous group when it comes to internet uses. Drawing on national survey data of adults in the United States, this article examines the online skills and behaviour of this group. Findings reveal diversity among older adults in internet skills and uses. Those with higher education and higher income have higher-level Web-use skills. While those of higher socioeconomic status are also more likely to use the internet for diverse types of activities from which they may benefit, once Controlling for skills, these differences are less pronounced.

DOI: <https://doi.org/10.22230/cjc.2017v42n2a3176>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-148144>

Journal Article

Accepted Version



The following work is licensed under a Creative Commons: Attribution 4.0 International (CC BY 4.0) License.

Originally published at:

Hargittai, Eszter; Dobransky, Kerry (2017). Old Dogs, New Clicks: Digital Inequality in Internet Skills and Uses among Older Adults. *Canadian Journal of Communication*, 42(2):195-212.

DOI: <https://doi.org/10.22230/cjc.2017v42n2a3176>

Hargittai, E., & Dobransky, K. (2017). Old Dogs, New Clicks: Digital Inequality in Skills and Uses among Older Adults. *Canadian Journal of Communication*, 42(2), 195–212. <https://doi.org/10.22230/cjc2017v42n2a3176>

Old Dogs, New Clicks: Digital Inequality in Skills and Uses among Older Adults

Eszter Hargittai
University of Zurich
Kerry Dobransky
James Madison University

ABSTRACT

Research on digital inequality tends to collapse people above a certain age into one “older adults” category, seemingly assuming that this is one homogeneous group when it comes to internet uses. Drawing on national survey data of adults in the United States, this article examines the online skills and behaviour of this group. Findings reveal diversity among older adults in internet skills and uses. Those with higher education and higher income have higher-level Web-use skills. While those of higher socioeconomic status are also more likely to use the internet for diverse types of activities from which they may benefit, once controlling for skills, these differences are less pronounced.

Keywords: Digital divide; Digital inequality; Digital literacy; Internet skills; Older adults

RÉSUMÉ

Les travaux sur les inégalités numériques regroupent généralement les individus au-dessus d'un certain âge dans une catégorie de «personnes âgées», faisant l'hypothèse qu'il s'agit d'un groupe homogène en ce qui concerne leurs usages d'Internet. À partir de données d'enquêtes nationales auprès des adultes aux États-Unis, cet article examine les compétences et le comportement de ce groupe sur le Web. Les résultats révèlent la diversité des pratiques numériques des personnes âgées. Ceux qui ont un niveau d'éducation plus élevé et un revenu plus élevé possèdent des compétences d'utilisation du Web de niveau supérieur. Les individus ayant un statut socioéconomique plus élevé utilisent également Internet de façon plus diversifiée. Cependant, une fois leur niveau de compétence pris en compte, ces différences sont moins prononcées.

MOTS CLÉS Fracture Numérique, Inégalité Numérique, Compétences Numérique, Personnes Âgées

Eszter Hargittai is Professor and Chair of Internet Use & Society at the Institute of Mass Communication & Media Research (IPMZ) at the University of Zurich, Andreasstrasse 15 CH-8050, Zurich, Switzerland. Email: pubs@webuse.org.

Kerry Dobransky is Associate Professor of Sociology at James Madison University, 800 S Main St, Harrisonburg, VA 22807, USA. Email: kerry.dobransky@gmail.com.

Introduction

Digital inequality research has established that people from less privileged societal positions are less likely to be internet users and when they do go online, they tend to partake in fewer capital-enhancing activities than their more privileged counterparts, a finding that has been consistent across several national contexts (Bonfadelli, 2002; Correa, 2010; Hargittai & Hinnant, 2008; Livingstone & Helsper, 2010; Ono & Zavodny, 2007; Selwyn, Gorard, & Furlong, 2005; van Deursen, van Dijk, & Peters, 2011; Zillien & Hargittai, 2009). That is, even among internet users, less privileged people are less likely to use the Web for activities such as looking up health and financial information, interacting with government services, and seeking educational opportunities, in other words, activities that may improve their life chances. These are all activities from which adults of all ages may benefit, but older adults who are more likely to have mobility limitations and other disabilities may be especially well positioned to profit from online services.

Although some of the reasons for the discrepancies of differentiated internet uses are not clear, studies have found that less autonomy of use and lower Web-use skills both contribute to fewer types of beneficial online activities (Correa, 2010; Hargittai, 2010; van Deursen et al., 2011). These findings highlight potential areas of intervention in order to get people from more diverse backgrounds more active online. An important limitation in this literature, however, is that even when studies are of the general population, most data sets either do not include information about older adults or tend to collapse people above a certain age into one overarching category (e.g., 55 and over in Loges & Jung, 2001; 65 and older in the report of the National Telecommunications and Information Administration, 2013; 65 to 90 in Olson, O'Brien, Rogers, & Charness, 2011;

“digital immigrants” born before 1980 in Taipale, 2016; 50 to 80 in van Deursen et al., 2011). Accordingly, it is difficult to know from existing work whether such variation also exists among older adults—even though research has argued that a simple approach to older adults’ internet uses is insufficient (Selwyn, Gorard, Furlong, & Madden, 2003).

In particular, we do not know whether internet skill differences persist into older ages and, if they do, whether they are linked to socioeconomic status and to differentiated online behaviour—relationships observed among younger cohorts. The goal of this article is to analyze a unique data set that includes information about the internet uses and skills of over one thousand older adults, including several hundred in their eighties and nineties. We extend the literature on digital inequality by seeing whether Web-use skills differ among adults of older ages, whether such differences are linked to socioeconomic status, and how skills and socioeconomic status relate to types of online activities among older cohorts.

Older adults and internet access and use

Aging is not just a temporal process. Growing older brings changes in physical and social developments that hold significance when examining internet use among older adults. John Mirowsky and Catherine Ross (1992) highlight the complexity of the aging process by outlining five different ways to understand age. First, age is maturity, with people gaining experience and wisdom in their lives. This is characterized by increased satisfaction personally and professionally and less risk-taking. However, a second understanding of age as decline points to accumulating negative experiences with age. As people enter their later years, chronic illnesses are more common and physical and mental functioning, which are stable for most of life,

deteriorate. In age as a lifecycle stage, the third way to understand it, we see major life transitions happening as people move through their lives, with young adults gaining education and finding romantic partners, settling into careers and family life in middle age, and then entering the later years, retiring from work and experiencing widowhood and shrinking social networks.

Next we have age as generation, which emphasizes socio-historical change and how those born in particular time periods have distinct experiences. An example here would be that those who lived through World War II would have different experiences at age 65 than those who were born 25 years earlier or later. Another relevant example is that old age is less likely to be associated with disability than in the past (Manton, 2008). Finally, with age as survival, the demographic reality is highlighted that those who live to old age, especially after age 70, have more characteristics that are associated with surviving to that age. Taking the different viewpoints together, we see that aging is a very complex and non-uniform process. It needs careful investigation that goes beyond grouping all people above 65 into one category. Despite this diversity of experiences and processes, most internet research has treated people of more advanced ages as one homogenous group. We address this limitation of the literature by comparing the internet experiences of adults of varying mature ages.

Age is one of the most consistent predictors of basic internet access (Loges & Jung, 2001). Across different national contexts and subgroups within nations, older individuals have lower rates of internet adoption than their younger counterparts (Dutton, Helsper, & Gerber, 2009; National Telecommunications and Information Administration, 2013; Zickuhr & Madden, 2012).

The relationship is linear; even among older adults, the most senior have the lowest rates of internet use (Dutton et al., 2009; Friemel, 2016; Gell, Rosenberg, Demiris, LaCroix, & Patel, 2015; Zickuhr & Madden, 2012). So, within the United States, while 79 percent of those under 45 years old go online, that rate falls to 76 percent for those between 45 and 64, and drops dramatically to 52 percent among those 65 and older (National Telecommunications and Information Administration, 2013). Further, over and above simple internet access, older individuals also lag in the prevalence of faster broadband connections (National Telecommunications and Information Administration, 2013). While much of society incorporates digital technologies into their lives, seniors often opt for offline, analogue, face-to-face alternatives (Olson et al., 2011; Taha, Sharit, & Czaja, 2009; Yuan, Hussain, Hales, & Cotten, 2016). While these choices may provide comfort for seniors, they can also disadvantage them as they miss out on the myriad opportunities offered by online interactions.

Once online, older users differ from their younger peers in how they use the internet. In general, senior users tend to have a narrower experience than younger users. For instance, senior users are less likely to have accounts on social network sites, though their rates of usage are growing quickly (Haight, Quan-Haase, & Corbett, 2014). When older users do adopt services such as Facebook, they tend to share less and to be less emotionally intense in their interactions (Van House, 2015). One study found that senior online shoppers searched for fewer products than younger shoppers, although they purchased the same amount (Sorce, Perotti, & Widrick, 2005). Another study found older users much less likely to use synchronous forms of online communication, such as instant messaging and internet calls (Taipale, 2016). Among older adults, those over 65 are particularly notable in their low rates of usage and their cautious

approach to the online world (Zickuhr & Madden, 2012; Zulman, Kirch, Zheng, & An, 2011). These older users have less trust in the internet and report being confused and overwhelmed by the amount of information online (Zulman et al., 2011). Nonetheless, older adults who are online are figuring out how to incorporate digital media into their lives in various ways, from news consumption to library use (Quan-Haase, Martin, & Schreurs, 2016).

A major factor underlying digital differences by age is that people enter other disadvantaged statuses in society as they age. For instance, retirement, sometimes mandatory, leads to seniors entering the ranks of those not employed in full-time work. Not only does this remove the need to use or learn computer or internet skills for a job, it also reduces income, making older adults more likely to occupy lower-income groups, and thus have fewer financial resources to devote to technologies. Those who are employed are more likely to have internet access than the unemployed or those out of the labour force (Dutton et al., 2009; National Telecommunications and Information Administration, 2013).

Advanced age is also, however, when disadvantages experienced over the course of life accumulate. Thus, Michelle Silver (2014) found that older adults who occupied a lower socioeconomic status (SES) in childhood (controlling for SES at other points) were less likely to have internet access currently, while those who had a high SES at some point during their lives were more likely to have current internet access.

Perhaps one of the most significant aspects of aging regarding the digital divide is the number of impairments older adults come to have that impact their interactions with information and

communication technologies (ICTs). Limitations in cognitive and physical capacity that often accompany advanced age can impede internet adoption (Dobransky & Hargittai, 2006, 2016; Gell et al., 2015). Those designing ICT hardware and software may not take these limitations into sufficient consideration, making it difficult for older adults to use ICTs (Chevalier, Dommes, & Martins, 2013; Meiselwitz, Wentz, Brian, & Lazar, 2010; Yang & Chen, 2015). While government policies do mandate accessibility in some sectors of the online world, they are limited in their depth and scope (Yang & Chen, 2015).

These limitations, as well as the relatively recent arrival of digital technologies in the lives of older adults, likely underlay findings that seniors have lower levels of internet skills. Alexander Van Deursen and Jan van Dijk (2015) report that older adults in the Netherlands lag younger users in the skills to operate digital media as well as skills to handle the formal structures of the internet, such as menus and hyperlinks. This lack in online skills can lead to a view of the internet as overwhelming, an untrustworthy, risky place, with too much information and where navigation is too difficult (Hakkarainen, 2012; Zulman et al., 2011). Such views would presumably discourage those who hold them from expanding how they incorporate the internet into their lives.

The digital divide by age is all the more troubling because there is a wide range of benefits demonstrated for older adults who go online. Advanced age and its attendant shrinking of social networks, through attrition and limitations in mobility, often lead to loneliness. Going online has been shown to ameliorate such feelings (Cotten, Anderson, & McCullough, 2013; Fokkema & Knipscheer, 2007; Shapira, Barak, & Gal, 2007; Shillair, Rikard, Cotten, & Tsai, 2015;

Winstead, Anderson, Yost, Cotten, Warr, & Berkowski, 2012). Limitations to activities of daily living in older adults have also been shown to be lower among internet users than among nonusers (d'Orsi, Xavier, Steptoe, de Oliveira, Ramos, Orrell, Demakakos, Marmot, 2014). Internet use has also been shown to improve older adults' sense of self-efficacy, general life meaning and life satisfaction, mental well-being, as well as their self-evaluations and others' evaluations of them (Cotten, Ford, Ford, & Hale, 2014; Lam & Lam, 2009; Lelkes, 2013; Xie, 2007). Given such diverse benefits stemming from internet use, it is important to understand what may be holding back more members of this population from going online and embracing more online services.

Data and methods

We analyze data from the U.S. Federal Communication Commission's 2009 National Consumer Broadband Service Capability Survey (Horrigan, 2010). The survey conducted telephone interviews with a representative sample of 5,005 non-institutionalized U.S. adults. The study relied on a random-digit-dial (RDD) sample of landline phones as well as cellphones. The response rate was 22 percent for the landline sample and 19 percent for the cellphone sample (Horrigan, 2010). The survey asked a wide range of questions regarding internet access, skills, and uses, in addition to demographic background and socioeconomic status items. The data set is unique in coupling nuanced measures of internet use with a considerable number of older adults included in the data with their exact ages. We know of no data sets that are more recent with detailed internet use measures, including skills, and a sufficiently large number of older adults to allow for the analyses necessary to answer our research questions.

Demographic background and socioeconomic status

The original data set of 5,005 respondents includes 2,281 people ages 55 and over with the oldest respondents reporting 97 years of age. We focus our analyses on this group. Table 1 presents descriptive statistics about the full sample as well as those who are internet users.

Table 1: Sample descriptives (full sample and internet users only)

	Full sample		Internet users	
	Percent	<i>N</i>	Percent	<i>N</i>
Age				
55–64	42	963	55	702
65–79	43	971	40	508
80–97	15	347	6	73
Female	59	1,342	54	693
Male	41	939	46	590
Race				
White	87	2,166	90	1,121
African American	9	198	7	82
Native American/Pacific Islander	3	65	2	27
Asian American	1	18	1	13
Hispanic	5	105	3	38
Education				
High school or less	44	995	26	338
Some college	25	558	28	360
College degree or more	31	712	45	580
Income*	\$52,718	1,752	\$65,958	1,039
Employed	32	737	44	570
Married or cohabiting	54	1,227	65	834
Has a disability	40	901	27	344

* Mean

The average age among these older adults is 68 (standard deviation [std]: 9.4). We created three age categories to use in our analyses. The first category includes adults 55–64 (963 people). These are people who qualify for membership in the American Association of Retired People (AARP), but who often are still employed, as retirement age tends to be 65. The next category includes people 65–79 (971 respondents). These are people who were still likely in the labour force when the internet started diffusing to the mass population and thus may have gained experiences with the medium at that time. The final category is made up of those 80–97; these are 347 older adults who had reached mature age by the time the internet diffused broadly and thus their connectivity would have to depend on initiatives outside of workplace exposure.

Somewhat more than half of the respondents are female (59 %). Most respondents are White (87 %), 9 percent are African American, 5 percent are Hispanic, 3 percent are Native American or Pacific Islander, and less than one percent is Asian American. (The high proportion of Whites is likely explained by the demographic shift in the racial and ethnic makeup of the United States over the past several decades, and the lower life expectancy of African Americans compared to other groups.) The mean annual income is about \$52,700. Forty-four percent have a high school education or less, 25 percent have some college education but no degree, and 31 percent have a college degree. Just under a third (32 %) of respondents were employed full or part time at the time of data collection, 54 percent reported being married or cohabiting, and 40 percent reported some type of disability ranging from difficulty hearing or seeing to difficulty with movement.

Internet experiences and skills

The survey asked all respondents the following question about their internet uses: “Do you ever access the internet ... or send and receive e-mail?” We use this question to determine internet users in the sample. They constitute 56 percent of respondents or 1,283 participants. These respondents make up the sample of all subsequent analyses on internet skills and uses since, understandably, details about internet uses were only asked of this portion of the sample.

The instrument inquired about the quality of internet connection in people’s homes, if they had internet access at that location. We created a dummy variable to indicate the availability of a high-speed internet connection at home, which 70 percent of internet users reported having. Table 2 presents these statistics for the full sample of internet users, as well as broken down by age group. For an additional measure of autonomy of use, we look at the number of locations where respondents report having accessed the internet (after Hassani, 2006 and others). The average number of access locations was just over two for the internet-user sample, with a range of zero to seven. The survey also asked about accessing websites using a cellphone. We assigned a dummy variable to those who said this is something they do, which was 11 percent of the sample.

Table 2: Descriptive statistics about the sample’s internet experiences and skills, full sample and by age group

Full sample	Ages 55–64	Ages 65–79	Ages 80–97
-------------	------------	------------	------------

Has high-speed connection at home	70%	73%	70%	47%
Number of use locations (0–7)	2.2	2.5	1.9	1.5
Years of internet use	11.0	11.3	11.0	9.8
Use of the Web on cellphone	10%	14%	7%	5%
Internet skills (1–5)	2.3	2.5	2.1	1.7
Number of capital-enhancing activities (A) (0–5)	2.8	3.1	2.6	1.3
Number of capital-enhancing activities (B) (0–6)	2.0	2.3	1.7	1.2

To measure experiences with the internet, the survey asked how many years the respondent has “been an Internet user.” If the person said one year or less then the question was followed with a query about the number of months. We calculated use years by assigning a portion of a year to those who had been online for less than a year. The average years of use was 11, ranging from 0 to 20 or more, top-coded as 20 in the data set.

Web-use skills were measured by asking respondents their level of understanding of six internet-related terms (similar to measures used by others, e.g., Hargittai, 2010; Wasserman & Richmond-Abbott, 2005): internet browser cookie, spyware and malware, operating system, refresh or reload, widget, and JPEG file. The respondents chose their level of understanding on a 1–4 scale ranging from “not at all” to “very well.” The six items are consistent with a Cronbach’s alpha value of 0.88. We take the average of the six items’ score to get the skills measure, which

has a mean of 2.3 (std = 0.9) for the sample. As the data in Table 2 indicate, there are considerable differences by age group when it comes to most internet experience measures.

The survey also included an extensive list of questions regarding people's internet activities, asking: "Please tell me if you EVER use the internet to do any of the following things. Do you ever use the internet to ... [activity]?" followed by a yes or no answer. Literature on digital inequality has often considered use of the Internet for so-called "capital-enhancing activities," as these may support upward mobility and benefits to improve users' life chances (DiMaggio, Hargittai, Celeste, & Schafer, 2004; Hargittai & Hinnant, 2008; McCloud, Okecsukwu, Sorensen, & Viswanath, 2016; Zillien & Hargittai, 2009). We look at respondents' experiences with 11 capital-enhancing activities. The sample was split into two, randomly, in terms of the activities asked. One group (633 respondents, we refer to this group as Group A) was asked about the following five activities: getting local or community news online; visiting a local, state, or federal government website; buying a product online, such as books, music, toys, or clothing; submitting a review about a product or service; and uploading or sharing something they have created, such as a video to a video-sharing site or a photo. The other group (650 participants, referred to here as Group B) reported on the following six activities: getting international or national news online; taking a class online; getting advice or information from a government agency about a health or safety issue; getting information about or applying for a job; banking online; posting to their own blog or a group blog in which they participate. In both groups, we sum the number of activities for a measure ranging from 0 to 5 for Group A and 0 to 6 for Group B. We run the analyses concerning capital-enhancing online activities separately for the two groups.

In what follows, we first look at who is online among older adults. Next, we examine how age and socioeconomic status relate to Web-use skills among internet users in the group. Then, we look at how age, socioeconomic status as well internet experiences and Web-use skills relate to the types of capital-enhancing activities older adults pursue online. First, we present binary relationships and then, using regression analyses, we take a closer look at the association between these factors.

Findings

Internet adoption among older adults

Table 3 shows the results of the logistic regression analysis looking at who reported accessing the internet at all. With the omitted category the youngest of the group (55–64), results clearly suggest that older groups are significantly less likely to be online even among those of mature ages. Socioeconomic status also matters, with both higher income and higher education associated with a higher likelihood of internet use. Being employed and cohabiting show a similar relationship. Those who report a disability are much less likely to be internet users. These findings show that the first-level digital divide of use versus non-use is very much present among older adults, with those in more privileged societal positions much more likely to be using the internet.

Table 3: Logistic regression on internet adoption

	Internet adoption
Age (base = 55–64)	

Ages 65–79	0.59	(0.08)	***
Ages 80–97	0.16	(0.04)	***
Female	1.05	(0.13)	
Race/ethnicity			
Asian American	0.64	(0.44)	
African American	0.61	(0.13)	*
Native American	0.63	(0.22)	
Hispanic	0.74	(0.24)	
Education (base = college degree or more)			
High school education or less	0.21	(0.03)	***
Some college education	0.54	(0.10)	***
Income	1.00	(0.00)	***
Employed	1.51	(0.23)	**
Married or cohabiting	1.41	(0.19)	**
Has disability	0.50	(0.06)	***
Pseudo R ²	0.27		
N	1,682		

$p = <.1$; * $p = <.05$; ** $p = <.01$; *** $p = <.001$; odds ratios reported with standard errors in parentheses

Older adults' internet skills

As the descriptive statistics in the last row of Table 2 indicate, respondents differ in their internet skills by age category, with those 55–64 reporting the highest-level skills and those in the 80–97 category the lowest-level skills. Are these differences solely about age, however? Using ordinary least squares regression analysis with internet skills as the outcome, we next look at whether digital inequality is at play among older adults when it comes to their online abilities. The results in Table 4 indicate that in addition to age, education and income are also related to older adults'

Web-use skills. Those with only a high school education or less are significantly less skilled than those with a college education, and higher income is also related to higher skills. Women tend to exhibit lower-level skills, as do those who report a disability.

Table 4: OLS regression on internet skills

	Internet skills			Internet skills		
Age (base = 55–64)						
Ages 65–79	-0.26	(0.06)	***	-0.16	(0.06)	**
Ages 80–97	-0.65	(0.13)	***	-0.33	(0.13)	*
Female	-0.26	(0.06)	***	-0.21	(0.05)	***
Race						
Asian American	-0.06	(0.11)		-0.10	(0.10)	
African American	0.20	(0.25)		0.01	(0.23)	
Native American	0.05	(0.18)		-0.16	(0.17)	
Hispanic	-0.16	(0.17)		-0.13	(0.15)	
Education (base = college degree or more)						
High school education or less	-0.44	(0.07)	***	-0.17	(0.07)	*
Some college education	-0.09	(0.07)		0.03	(0.06)	
Income	0.00	(0.00)	**	0.00	(0.00)	
Employed	0.04	(0.06)		0.00	(0.06)	
Married or cohabiting	-0.01	(0.06)		0.00	(0.06)	
Has disability	-0.11	(0.06)	#	-0.12	(0.06)	#
Internet experiences						
High-speed connectivity at home				0.34	(0.06)	***
Number of use locations				0.15	(0.02)	***
Use of cellphone for Web				0.33	(0.09)	***

Number of use years				0.06	(0.01)	***
Intercept	2.65	(0.09)	***	0.33	(0.09)	***
Adjusted R ²	0.15			0.36		
N	1,001			879		

$p = <.1$; * $p = <.05$; ** $p = <.01$; *** $p = <.001$; numbers in parentheses are standard errors

Next, we controlled for internet experience variables to see whether we could pinpoint what exactly is associated with lower-level skills. Once we control for having high-speed internet access at home, the number of locations used to access the internet, the use of one's cellphone to access the Web, and the number of use years, income is no longer a significant correlate of skill. This suggests that it is through online experiences and autonomy of use that older adults develop their online skills. Age, gender, and disability status remain linked to lower-level skills.

Older adults' use of the internet for capital-enhancing activities

What explains using the internet for a larger number of capital-enhancing activities, such as getting news, consulting government services, and obtaining information about job opportunities? To recap, the sample was randomly split into two, with each group having been asked about a different list of activities. This works well for the purposes of testing the relationship of user background and internet experiences as it allows for similar analyses on two sets of activities.

Tables 5a and 5b report on the results of regression analyses on the number of capital-enhancing activities in which respondents partook, first including only demographic and socioeconomic variables, and then introducing information about people's internet experiences and skills to the

models. Without the latter controls, in the case of both Groups A and B, those in the lowest educational category (a high school degree or less) and those with lower income levels use the internet for fewer capital-enhancing activities than their more privileged counterparts. Older users also report fewer types of such online activities.

Table 5a: OLS regression on use of the internet for capital-enhancing activities (Group A)

	Capital-enhancing activities			Capital-enhancing activities controlling for online experiences		
Age (base = 55–64)						
Ages 65–79	-0.28	(-0.28)	*	-0.02	(0.13)	
Ages 80–97	-1.60	(-1.60)	***	-0.68	(0.29)	*
Female	0.18	(0.18)		0.38	(0.12)	***
Race						
Asian American	0.04	(0.04)		-0.09	(0.20)	
African American	0.71	(0.71)		0.08	(0.52)	
Native American	-0.28	(-0.28)		-0.94	(0.39)	*
Hispanic	0.12	(0.12)		0.23	(0.35)	
Education (base = college degree or more)						
High school education or less	-0.58	(-0.58)	***	-0.15	(0.15)	
Some college education	-0.05	(-0.05)		0.14	(0.14)	
Income	0.00	(0.00)	***	0.00	(0.00)	*
Employed	0.15	(0.15)		0.01	(0.13)	
Married or cohabiting	0.00	(0.00)		0.06	(0.12)	
Has disability	0.08	(0.08)		0.20	(0.13)	
Internet experiences						
High-speed connectivity at home				0.23	(0.13)	#
Number of use locations				0.24	(0.05)	***
Use of cellphone for Web				0.08	(0.18)	
Number of use years				0.01	(0.01)	

Web-use skills				0.62	(0.07)	***
Intercept	2.64	(0.21)	***	0.10	(0.28)	
Adjusted R ²	0.15			0.37		
N	501			443		

$p < .1$; * $p < .05$; ** $p < .01$; *** $p < .001$; numbers in parentheses are standard errors

Table 5b: OLS regression on use of the internet for capital-enhancing activities (Group B)

	Capital-enhancing activities			Capital-enhancing activities controlling for online experiences		
Age (base = 55–64)						
Ages 65–79	-0.44	(0.13)	***	-0.21	(0.12)	#
Ages 80–97	-0.96	(0.28)	***	-0.39	(0.27)	
Female	-0.09	(0.12)		0.05	(0.11)	
Race						
Asian American	0.08	(0.23)		0.11	(0.22)	
African American	-0.88	(0.54)		-0.63	(0.50)	
Native American	-0.08	(0.37)		0.18	(0.36)	
Hispanic	0.37	(0.35)		-0.01	(0.32)	
Education (base = college degree or more)						
High school education or less	-0.55	(0.16)	***	-0.04	(0.15)	
Some college education	-0.14	(0.15)		0.12	(0.14)	
Income	0.00	(0.00)	***	0.00	(0.00)	
Employed	0.06	(0.13)		-0.11	(0.12)	
Married or cohabiting	0.10	(0.13)		0.05	(0.13)	
Has disability	0.07	(0.14)		0.10	(0.13)	
Internet experiences						
High-speed connectivity at home				0.31	(0.13)	*
Number of use locations				0.31	(0.05)	***
Use of cellphone for Web				0.31	(0.21)	

Number of use years				0.01	(0.01)	
Web-use skills				0.53	(0.08)	***
Intercept	1.92	(0.21)	***	-0,31	(0.28)	
Adjusted R ²	0.15			0.37		
N	507			436		

$p = <.1$; * $p = <.05$; ** $p = <.01$; *** $p = <.001$; numbers in parentheses are standard errors

Once we introduce internet experiences and skills to the basic models, respectively, we no longer find differences among respondents of different educational levels and only in one of the cases (Group A) does income still matter. In both instances, autonomy of use (operationalized as the number of use locations) and Web-use skills are significantly linked to more capital-enhancing types of activities. Even age is no longer that relevant, suggesting that as long as people have easy access to the technology and have adequate skills to navigate the internet, they are similarly likely to embrace it for capital-enhancing activities regardless of their age.

There is one difference in the results of the two models when we take internet experiences and skills into consideration: women use the internet for more of the capital-enhancing activities in the first group versus the second. Exploring these differences here is beyond the scope of this article, but we point the reader to work elsewhere that has considered online activities and skill differences by gender (Hargittai & Shafer, 2006; Hargittai & Walejko, 2008; Schradie, 2015).

Discussion and conclusion

Drawing on a national survey of older adults in the United States, this study finds that the oldest among them, those who were already advanced in years when the internet became widely

diffused, are the least likely to be internet users, have the lowest Web-use skills, and use the internet for the fewest capital-enhancing activities online. Further, we find that among older adults, internet adoption is consistent with wider societal trends, whereby those in advantaged societal positions are more likely to use the internet and do so for activities from which they may benefit. We also demonstrate that among older users, age is negatively related to internet skills, and internet experiences and autonomy appear to explain this relationship at least in part, though the trend remains even after taking internet experiences into account. Finally, we find that age is also negatively related to the number of capital-enhancing activities older adults pursue online. This relationship is partially explained, however, by taking into account internet experiences and skills, as the negative association only remains significant for those aged 80 to 97 for one group and 65 to 79 for the other after including the online experience variables in the analyses.

There is evidence in our findings that digital inequality by age is more complex than is often described, and in fact has generational and life-cycle components to it (Mirowsky & Ross, 1992) among older adults. Given the relatively recent diffusion of the internet, its incorporation into daily living is likely a distinct experience for those at different stages of their life cycles. For those older adults below 65 years of age, many are still using the internet in their work life. For those 65–79, though many are retired, they are young enough to have experienced the diffusion of the online world into their daily work and home lives in a way those older did not. Those aged 80 to 97 would have, for the most part, completed the bulk of their work lives before the internet came to permeate society. Without on-the-job training or workplace incentives to learn the many aspects of navigating the internet, these individuals may well lack the resources and inclination to familiarize themselves with digital technologies. Designers of these technologies adhering to

cultural stereotypes of the oldest adults as “technophobes,” and thus not investing the necessary resources to make these technologies accessible and usable to the population could compound this (O’Hara, 2004). Such findings are unfortunate, given the promise the internet holds for warding off or adapting to the decline, disability, and loneliness that becomes more common as age advances in older adults (Cotten et al., 2013; d’Orsi et al., 2014; Dobransky & Hargittai, 2016). Thus we see that age is a significant factor among older adults in internet adoption, internet skills, and the extent of capital-enhancing activities.

Internet skills and experiences appear to explain much of the difference between different age groups when it comes to the number of capital-enhancing activities in which they engage, although some differences remain. Given that disability/impairment and employment status are also included in the models, it is notable that the relationship persists. It seems that this elder group of online older adults uses the internet in different ways than younger groups, even within the rubric of seniors. Given their stage in the life cycle, they may be more concerned with leisure pursuits, deprioritizing capital enhancement online or social mobility more generally. It may also be that they are more focused on interpersonal communication through digital technologies rather than the types of information-seeking pursuits our instrument measures. Future research can explore whether this is a durable generational trend or a historically specific stage in the development of an increasingly online society.

As noted above, a limitation of this study is that the data do not allow us to look at the use of interpersonal communication tools such as video chat or communication with loved ones on social network sites, which is undoubtedly an important potential source of benefit, especially for

older adults who are often otherwise isolated from their networks. It may be that the most mature respondents in our sample use the internet for those types of activities as much as their younger counterparts. Our project does not allow us to address that question, but it is an important area of inquiry for future work.

The findings in this article show that having data about older adults disaggregated by age is important, as people 65 and over are not one homogeneous group with identical online behaviours. Future data-collection efforts should make sure to collect specific age information about older adults and include a sufficient number of such respondents that allows for analyses among subgroups. This is important in order to understand whether the observed differences are age effects or cohort effects. It may be that those who were still in the labour force when the internet started diffusing to society at large will carry the technology into their most mature ages, having already embraced it. However, some research has suggested that this may not be the case since on-the-job equipment is usually not owned by the employee and thus continued use cannot be assumed (Selwyn, 2004). Additionally, it may be that circumstances in older ages, such as the increased prevalence of disability, will reduce the likelihood of time spent online. It is important that hardware and software are made accessible and usable to older adults in order to reduce barriers to adoption and use (Lazar, Cornejo, Edasis, & Piper, 2016). We need more data sets about detailed internet uses that include a larger proportion of older adults in order to investigate these questions better.

Given the clear importance of internet skills in understanding who does what online, the study also shows the significance of collecting data on people's online abilities. Too few data sets

include such measures, making it difficult to examine how Web-use skills affect people's internet uses in diverse contexts. Since understanding how the internet and online services work is something that can be taught and is thus open to intervention, it is an important factor to examine in work on digital inequality. This is especially relevant for a group that continues to be the least connected among all age groups. Such information could also prove useful to demonstrating the importance of accessible design and post-hoc interventions to make technology more accessible to all users. And it is also significant since we observe socioeconomic factors as a relevant source of differentiated online behaviour, even among older adults.

For well over a decade, research on digital inequality has highlighted that people from less privileged backgrounds are less likely to be online, have lower-level Web-use skills, and use the internet for fewer capital-enhancing activities than their more privileged counterparts (Hargittai & Hsieh, 2013), findings that have been replicated across several national contexts (Bonfadelli, 2002; Livingstone & Helsper, 2010; Ono & Zavodny, 2007; Selwyn et al., 2003; Zillien & Hargittai, 2009). Little prior research has investigated, however, whether these inequalities persist into mature adulthood. Most work tends to collapse older adults above a certain age leaving a gap in the literature regarding details about their internet uses and skills. Despite research highlighting that a more nuanced approach to understanding older adults' internet uses is needed (Selwyn, 2004), lack of data sources with detailed information about internet uses and skills coupled with a sufficient number of older adults with specific age information has made such analysis difficult. This article fills a gap in the digital inequality literature and work on technology use by older adults by taking advantage of a data source that includes such

information. Results show that differences in internet skills persist into most mature ages, as do differences in visiting capital-enhancing sites. However, once we control for skills, age differences are much less apparent when it comes to beneficial online activities. This finding is significant as it offers a potentially productive path to intervention that could result in less variation in opportunities for people from diverse backgrounds to benefit from their digital media uses. These interventions could help spread the benefits the internet holds for older adults.

References

- Bonfadelli, Heinz. (2002). The Internet and knowledge gaps: A theoretical and empirical investigation. *European Journal of Communication*, 17(1), 65–84.
- Chevalier, Aline, Dommès, Aurélie, & Martins, Daniel. (2013). The effects of ageing and website ergonomic quality on Internet information searching. *Ageing and Society*, 33(6), 1009–1035. URL: <https://doi.org/10.1017/S0144686X12000323> [April 5, 2017]
- Correa, Teresa. (2010). The participation divide among “online experts”: Experience, skills and psychological factors as predictors of college students’ web content creation. *Journal of Computer-Mediated Communication*, 16(1), 71–92. URL: <https://doi.org/10.1111/j.1083-6101.2010.01532.x> [April 5, 2017]
- Cotten, Shelia R., Anderson, William A., & McCullough, Brandi M. (2013). Impact of Internet use on loneliness and contact with others among older adults: Cross-sectional analysis. *Journal of Medical Internet Research*, 15(2), e39. URL: <https://doi.org/10.2196/jmir.2306> [April 5, 2017]
- Cotten, Shelia R., Ford, George, Ford, Sherry, & Hale, Timothy M. (2014). Internet Use and Depression Among Retired Older Adults in the United States: A Longitudinal Analysis.

- The Journals of Gerontology: Series B*, 69(5), 763–771.
<https://doi.org/10.1093/geronb/gbu018> [April 5, 2017]
- d’Orsi, Eleonora, Xavier, Andre Junqueira, Steptoe, Andrew, de Oliveira, Cesar, Ramos, Luiz Roberto, Orrell, Martin, Demakakos, Panayotes, & Marmot, Michael Gideon. (2014). Socioeconomic and lifestyle factors related to instrumental activity of daily living dynamics: Results from the English longitudinal study of ageing. *Journal of the American Geriatrics Society*, 62(9), 1630–1639. URL: <https://doi.org/10.1111/jgs.12990> [April 5, 2017]
- DiMaggio, Paul, Hargittai, Eszter, Celeste, Coral, & Schafer, Steven. (2004). Digital inequality: From unequal access to differentiated use. In K. Neckerman (Ed.), *Social inequality* (pp. 355–400). New York, NY: Russell Sage Foundation. URL: <https://www.russellsage.org/research/reports/dimaggio> [April 5, 2017]
- Dobransky, Kerry, & Hargittai, Eszter. (2006). The disability divide in Internet access and use. *Information, Communication and Society*, 9(3), 313–334.
- Dobransky, Kerry, & Hargittai, Eszter. (2016). Unrealized potential: Exploring the digital disability divide. *Poetics (Journal of Empirical Research on Culture, the Media and the Arts)*, 58. URL: <http://dx.doi.org/10.1016/j.poetic.2016.08.003> [April 5, 2017]
- Dutton, William H., Helsper, Ellen J., & Gerber, Monica M. (2009). *The Internet in Britain 2009*. Oxford, UK: Oxford Internet Institute, University of Oxford.
- Fokkema, Tineke, & Knipscheer, Kees. (2007). Escape loneliness by going digital: A quantitative and qualitative evaluation of a Dutch experiment in using ECT to overcome loneliness among older adults. *Aging & Mental Health*, 11(5), 496–504. URL: <https://doi.org/10.1080/13607860701366129> [April 5, 2017]

- Friemel, Thomas N. (2016). The digital divide has grown old: Determinants of a digital divide among seniors. *New Media & Society*, 18(2), 313–331. URL: <https://doi.org/10.1177/1461444814538648> [April 5, 2017]
- Gell, Nancy M., Rosenberg, Dori E., Demiris, George, LaCroix, Andrea Z., & Patel, Kushang V. (2015). Patterns of technology use among older adults with and without disabilities. *The Gerontologist*, 55(3), 412–421. URL: <https://doi.org/10.1093/geront/gnt166> [April 5, 2017]
- Haight, Michael, Quan-Haase, Anabel, & Corbett, Bradley A. (2014). Revisiting the digital divide in Canada: the impact of demographic factors on access to the Internet, level of online activity, and social networking site usage. *Information, Communication & Society*, 17(4), 503–519. URL: <https://doi.org/10.1080/1369118X.2014.891633> [April 5, 2017]
- Hakkarainen, Päivi. (2012). “No good for shovelling snow and carrying firewood”: Social representations of computers and the Internet by elderly Finnish non-users. *New Media & Society*, 14(7), 1198–1215.
- Hargittai, Eszter. (2010). Digital na(t)ives? variation in Internet skills and uses among members of the “net generation.” *Sociological Inquiry*, 80(1), 92–113.
- Hargittai, Eszter, & Hinnant, Amanda. (2008). Digital inequality: Differences in young adults’ use of the Internet. *Communication Research*, 35(5), 602–621.
- Hargittai, Eszter, & Hsieh, Yuli Patrick. (2013). Digital inequality. In William H. Dutton (Ed.), *Oxford handbook for Internet research* (pp. 129–150). Oxford, UK: Oxford University Press.

- Hargittai, Eszter, & Shafer, Steven. (2006). Differences in actual and perceived online skills: The role of gender. *Social Science Quarterly*, 87(2), 432–448. URL: <https://doi.org/10.1111/j.1540-6237.2006.00389.x> [April 5, 2017]
- Hargittai, Eszter, & Walejko, Gina. (2008). The participation divide: Content creation and sharing in the digital age. *Information, Communication and Society*, 11(2), 239–256.
- Hassani, Sara Nephew. (2006). Locating digital divides at home, work, and everywhere else. *Poetics*, 34(4–5), 250–272.
- Horrigan, John B. (2010). *Broadband adoption and use in America* (The FCC Omnibus Broadband Initiative [OBI] Working Paper Series). Washington, DC: Federal Communications Commission.
- Lam, Lawrence, & Lam, Mary. (2009). The use of information technology and mental health among older care-givers in Australia. *Aging & Mental Health*, 13(4), 557–562. URL: <https://doi.org/10.1080/13607860802607306> [April 5, 2017]
- Lazar, Amanda, Cornejo, Raymundo, Edasis, Caroline, & Piper, Anne Marie. (2016). Designing for the third hand: Empowering older adults with cognitive impairment through creating and sharing. In *Proceedings of the 2016 ACM Conference on Designing Interactive Systems* (pp. 1047–1058). New York, NY: ACM. URL: <https://doi.org/10.1145/2901790.2901854> [April 5, 2017]
- Lelkes, Orsolya. (2013). Happier and less isolated: Internet use in old age. *Journal of Poverty and Social Justice*, 21(1), 33–46. URL: <https://doi.org/10.1332/175982713X664047> [April 5, 2017]

- Livingstone, Sonia, & Helsper, Ellen. (2010). Balancing opportunities and risks in teenagers' use of the Internet: The role of online skills and internet self-efficacy. *New Media & Society*, 12(2), 309–329. URL: <https://doi.org/10.1177/1461444809342697> [April 5, 2017]
- Loges, William E., & Jung, Joo-Young. (2001). Exploring the digital divide: Internet connectedness and age. *Communication Research*, 28(4), 536–562. URL: <https://doi.org/10.1177/009365001028004007> [April 5, 2017]
- Manton, Kenneth. (2008). Recent declines in chronic disability in the elderly U.S. population: Risk factors and future dynamics. *Annual Review of Public Health*, 29, 91–113.
- McCloud, Rachel F., Okecsukwu, Cassandra A., Sorensen, Glorian, & Viswanath, Kasisomayajula. (2016). Entertainment or health? Exploring the Internet usage patterns of the urban poor: A secondary analysis of a randomized controlled trial. *Journal of Medical Internet Research*, 18(3), e46. URL: <https://doi.org/10.2196/jmir.4375> [April 5, 2017]
- Meiselwitz, Gabriele, Wentz, Brian, & Lazar, Jonathan. (2010). Universal usability: Past, present, and future. *Foundations and Trends® in Human–Computer Interaction*, 3(4), 213–333. URL: <https://doi.org/10.1561/11000000029> [April 5, 2017]
- Mirowsky, John, & Ross, Catherine. (1992). Age and depression. *Journal of Health and Social Behavior*, 33, 187–205.
- National Telecommunications and Information Administration. (2013). *Exploring the digital nation: America's emerging online experience*. National Telecommunications and Information Administration and Economic and Statistics Administration, US Department of Commerce.

- O'Hara, Karen. (2004). "Curb cuts" on the information highway: Older adults and the Internet. *Technical Communication Quarterly*, 13(4), 423–445.
- Olson, Katherine E., O'Brien, Marita A., Rogers, Wendy A., & Charness, Neil. (2011). Diffusion of technology: Frequency of use for younger and older adults. *Ageing International*, 36(1), 123–145. URL: <https://doi.org/10.1007/s12126-010-9077-9> [April 5, 2017]
- Ono, Hiroshi, & Zavodny, Madeline. (2007). Digital inequality: A five country comparison using microdata. *Social Science Research*, 36(3), 1135–1155.
- Quan-Haase, Anabel, Martin, Kim, & Schreurs, Kathleen. (2016). Interviews with digital seniors: ICT use in the context of everyday life. *Information, Communication & Society*, 19(5), 691–707. URL: <https://doi.org/10.1080/1369118X.2016.1140217> [April 5, 2017]
- Schradie, Jen. (2015). The gendered digital production gap: Inequalities of affluence. In *Communication and Information Technologies Annual* (Vol. 9, pp. 185–213). Bingley, UK: Emerald Group Publishing Limited. URL: <http://www.emeraldinsight.com/doi/full/10.1108/S2050-206020150000009008> [April 5, 2017]
- Selwyn, Neil. (2004). The information aged: A qualitative study of older adults' use of information and communications technology. *Journal of Aging Studies*, 18(4), 369–384. URL: <https://doi.org/10.1016/j.jaging.2004.06.008> [April 5, 2017]
- Selwyn, Neil, Gorard, Stephen, & Furlong, John. (2005). Whose Internet is it anyway?: Exploring adults' (non)use of the Internet in everyday life. *European Journal of Communication*, 20(1), 5–26. URL: <https://doi.org/10.1177/0267323105049631> [April 5, 2017]

- Selwyn, Neil, Gorard, Stephen, Furlong, John, & Madden, Louise. (2003). Older adults' use of information and communications technology in everyday life. *Ageing & Society*, 23(5), 651–582.
- Shapira, Natanel, Barak, Adiel, & Gal, Idan. (2007). Promoting older adults' well-being through Internet training and use. *Aging & Mental Health*, 11(5), 477–484. URL: <https://doi.org/10.1080/13607860601086546> [April 5, 2017]
- Shillair, Ruth J., Rikard, R.V., Cotten, Shelia R., & Tsai, Hsin-Yin Sandy. (2015). Not so lonely surfers: Loneliness, social support, Internet use and life satisfaction in older adults. In *iConference 2015 Proceedings*. Newport Beach, CA: iSchools. URL: <http://hdl.handle.net/2142/73666> [April 5, 2017]
- Silver, Michelle Pannor. (2014). Socio-economic status over the lifecourse and Internet use in older adulthood. *Ageing and Society*, 34(6), 1019–1034. URL: <https://doi.org/10.1017/S0144686X12001420> [April 5, 2017]
- Sorce, Patricia, Perotti, Victor, & Widrick, Stanley. (2005). Attitude and age differences in online buying. *International Journal of Retail & Distribution Management*, 33(2), 122–132. URL: <https://doi.org/10.1108/09590550510581458> [April 5, 2017]
- Taha, Jessica, Sharit, Joseph, & Czaja, Sara. (2009). Use of and satisfaction with sources of health information among older Internet users and nonusers. *Gerontologist*, 49(5), 663–673. URL: <https://doi.org/10.1093/geront/gnp058> [April 5, 2017]
- Taipale, Sakari. (2016). Synchronicity matters: defining the characteristics of digital generations. *Information, Communication & Society*, 19(1), 80–94. URL: <https://doi.org/10.1080/1369118X.2015.1093528> [April 5, 2017]

- van Deursen, Alexander J.A.M., & van Dijk, Jan A.G.M. (2015). Toward a multifaceted model of Internet access for understanding digital divides: An empirical investigation. *The Information Society*, 31(5), 379–391. URL: <https://doi.org/10.1080/01972243.2015.1069770> [April 5, 2017]
- van Deursen, Alexander J.A.M., van Dijk, Jan A.G.M., & Peters, Oscar. (2011). Rethinking Internet skills: The contribution of gender, age, education, Internet experience, and hours online to medium-and content-related Internet skills. *Poetics*, 39(2), 125–144.
- Van House, Nancy A. (2015). Entangled with technology: Engagement with Facebook among the young old. *First Monday*, 20(11). URL: <https://doi.org/10.5210/fm.v20i11.6311> [April 5, 2017]
- Wasserman, Ira M., & Richmond-Abbott, Marie. (2005). Gender and the Internet: Causes of variation in access, level, and scope of use. *Social Science Quarterly*, 86(1), 252–270.
- Winstead, Vicki, Anderson, William A., Yost, Elizabeth A., Cotten, Shelia R., Warr, Amanda, & Berkowsky, Ronald W. (2013). You Can Teach an Old Dog New Tricks: A Qualitative Analysis of How Residents of Senior Living Communities May Use the Web to Overcome Spatial and Social Barriers. *Journal of Applied Gerontology*, 32(5), 540–560. <https://doi.org/10.1177/0733464811431824> [April 5, 2017]
- Xie, Bo. (2007). Older Chinese, the Internet, and well-being. *Care Management Journals*, 8(1), 33–38.
- Yang, Y. Tony, & Chen, Brian. (2015). Web accessibility for older adults: A comparative analysis of disability laws. *The Gerontologist*, 55(5), 854–864. URL: <https://doi.org/10.1093/geront/gnv057> [April 5, 2017]

- Yuan, Shupe, Hussain, Syed A., Hales, Kayla D., & Cotten, Shelia R. (2016). What do they like? Communication preferences and patterns of older adults in the United States: The role of technology. *Educational Gerontology*, 42(3), 163–174. URL: <https://doi.org/10.1080/03601277.2015.1083392> [April 5, 2017]
- Zickuhr, Kathryn, & Madden, Mary. (2012). Older adults and Internet use. *Pew Internet & American Life Project*, 6.
- Zillien, Nicole, & Hargittai, Eszter. (2009). Digital distinction: Status-specific Internet uses. *Social Science Quarterly*, 90(2), 274–291.
- Zulman, Donna M., Kirch, Matthias, Zheng, Kai, & An, Lawrence C. (2011). Trust in the Internet as a health resource among older adults: Analysis of data from a nationally representative survey. *Journal of Medical Internet Research*, 13(1), e19. URL: <https://doi.org/10.2196/jmir.1552> [April 5, 2017]