Research Article **IJOAR (2020) 3:60**

International Journal of Aging Research
(ISSN:2637-3742)

Determinants of a Digital Divide Among Able-Bodied Older Adults: Does "Feeling Too Old" Play a Role?"

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ABSTRACT

While younger adults have embraced internet technology, older adults have lagged behind in internet adoption. An age-based digital divide has developed globally. This is a concern because digital literacy is becoming an essential, rather than an optional, skill. This paper investigates the reasons why some able-bodied older adults with access to the internet choose not to use the internet. Previous studies of the age-based digital divide have identified income and education, and perceived need, as factors that influence internet use. This paper adds to knowledge on the age-based digital divide by studying the internet behavior of able-bodied older adults with internet access (rather than all older adults) and by investigating the association between "feeling too old to use the internet" and the internet use decision. This paper offers suggestions for bridging the age-based digital divide and discusses whether this divide will continue as younger adults, who are digital natives, become older adults.

Keywords: age-based digital divide, internet use, older adults, too old for internet use, ageism, senior centers, internet need, technophobia, internet benefits

Funding: This study was supported by partial funding by the University of Massachusetts Lowell College of Fine Arts, Humanities, and Social Science and the author's overhead funds. This research received approval from the University's Institutional Review Board. The author declares no potential conflicts of interest.

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How to cite this article:
Carol C. McDonough.Determinants of a Digital Divide Among Able-Bodied Older Adults: Does "Feeling Too Old" Play a Role?". International Journal of Aging Research, 2020, 3:60

eSciPub LLC, Houston, TX USA.
Website: https://escipub.com/

Introduction

When the internet was first developed, both supply and demand factors contributed to relatively low levels of internet use. On the supply side, the internet industry was building out its fixed-wire infrastructure. Wireless internet transmission was not yet available. Today most regions in developed countries have one or more fixed-wire internet providers and wireless and satellite internet access may also be available. Economies of scale associated with the mass production of equipment and devices, and industry competition, have reduced computer and internet costs. Free internet access is often available at public libraries, community centers, and through WiFi networks.

With more available internet access, dramatic advances in functionality, and more attractive pricing, internet demand has soared. However, while younger adults have embraced internet technology, older adults have lagged behind in internet adoption. An age-based digital divide has developed.

Globally, eighty to ninety percent of all adults in developed countries currently use the internet [21]. In the United States, 10 percent of all adults do not use the internet, but 27 percent of adults ages 65 and older are non-users [1]. While internet use among Canadians aged 15-64 is 97.2%, internet use among Canadian older adults is 68 percent [16]. Similar age-based digital divides have been reported in Brazil, South Korea, the European Union, and the United Kingdom.[1] Although internet use among older adults has increased significantly in recent years,[2] older adults as a group, both in the U.S. and globally, remain on the negative side of the digital divide.

This age-based digital divide is of concern because the internet enables users to expand their lifestyles and to increase exponentially their social, informational, financial, health-related and entertainment activities. Not using the internet may limit older adults' access to transportation, health, financial and other services.

Studies have shown that internet use by older adults reduces loneliness and depression [50] and [14], is associated with greater psychological well-being [12], reduced anxiety [13], improved mood and self-efficacy [36], a healthy lifestyle,[57] and [43] and enhanced cognitive and emotional functions [29].

Moreover, as public and private sector services migrate to an online delivery mode, digital literacy is becoming an essential, rather than an optional, skill. As the retirement age increases, career and job changes may occur more frequently, and older adults may seek part-time employment. Employers increasingly use digital technology for job postings and applications, and jobs often require internet skills.

In addition, internet nonuse among older adults may drive up societal costs for the provision of health and social services for older adults. Finally, the age-based digital divide may continue as current younger adults advance into older age.

This paper reviews research on internet use and investigates the internet behavior of able-bodied older adults, a group not yet studied. Previous studies of internet use have been based on

[1] In Brazil, the probability of internet access decreases significantly among those over age 60 [37] . While internet usage is practically universal among younger South Koreans, only 82.5 percent of South Koreans aged 60-69, and 31.8 percent of those over age 70, use the internet [52] . In the Economic Union, where the overall internet penetration rate is 90.3 percent [27] , only 45 percent of elderly use the internet at least once a week [20] . SHARE (Survey of Health, Ageing and Retirement in Europe) reports that, across 17 countries surveyed, only 49 percent of older adults use the internet. In the United Kingdom, with an overall internet penetration rate of 88 percent, 35 percent of older adults aged 65 to 74, and 53 percent of those aged 75 and over, do not use the internet [38] and [39] .

[2] Over the past two decades, there has been a 55 percent increase in U.S. older adults using the internet [2] .

national telephone or online surveys, on surveys of all age groups, or on surveys of older adults regardless of physical and/or cognitive ability. This study interviewed physically and cognitively- able older adults at senior centers about their internet use. Demographic and attitudinal characteristics were recorded. By surveying able-bodied older adults with at least limited internet access, we studied internet demand among older adults who had the option of using the internet and thus truly had a choice about internet use. The results of this research may be helpful in designing interventions that would boost internet use among able-bodied older adults.

Research Questions

This study focused on the following questions:

1) Is there an association between gender, education, income and disability and the internet behavior of able-bodied older adults? On the basis of previous research, we hypothesize that education and income will have significant positive associations with the internet use decision.
2) Among able-bodied older adults, how do skill level, perceived need, and attitude, including feeling "too old to use the internet," affect the internet use decision?
3) Among able-bodied older adults, is there an association between gender, income, education and disability and the choice of internet mode?

Background

Early studies discussed the psychological and attitudinal factors that contributed to internet adoption. Davis' Technology Acceptance Model [17] found that perceived usefulness in the workplace was more influential than perceived ease of use in driving internet usage behavior. Parasuraman's [42] Technology Readiness Index identified a positive relationship between technology use and innovation and optimism, and a negative relationship between technology use and discomfort and insecurity. In Lin's Technology Readiness and Acceptance Model [30] , consumers who viewed themselves as technologically incompetent refused or delayed their adoption of technology by devaluating its benefits and usefulness. Bandura [4] and Igbaria et al [24] identified self-efficacy as an important determinant of computer usage. Igbaria reported that, in the workplace, self-efficacy had a significantly negative effect on computer anxiety and a positive effect on perceived ease of use, resulting in greater internet use.

As studies of internet use expanded to include demographic characteristics, it became apparent that age had a negative effect on internet use. Porter et al [39] reported that internet usage was greater among younger (and more educated, white and wealthier) individuals, because these individuals had more positive attitudes about the internet's usefulness and ease of use. Donat et al [19] found that negative attitude toward the internet, and technophobia, were important predictors of internet nonuse, and that less educated persons, and older adults, were more likely to have a negative internet attitude. According to Yoon et al [58] , computer anxiety was a significant predictor of internet nonuse, and higher levels of computer anxiety were commonly observed among older, female and less educated individuals.

In Whitacre's [55] study of internet un-adopters and never-adopters, never-adopters were older and poorer and less-educated than un-adopters. Van Deursen and Helsper [53] associated older age, as well as lower income and education, with lower rates of internet use. Zheng et al [60] attributed internet nonuse among older adults to lack of self-efficacy and perceived lack of need. Lee et al [31] concluded that low education or income, rather than just growing older, could be the reason for internet nonuse. Chang et al [11] reported that the most frequently-cited barrier to internet use among older adults was lack of knowledge/internet skills, followed by mistrust of the internet. Studies have also linked the age-

related digital divide to cognitive and physical challenges related to the aging process.[3]

Materials and Methods

This study used a cross-sectional survey aimed at understanding able-bodied older adults' internet use. The survey targeted able-bodied older adults who attended senior centers. A total of 202 participants at five senior centers in northeastern Massachusetts were interviewed in-person about their internet use.

To increase the likelihood of participants with varying socioeconomic characteristics, the municipalities selected had differing income and education profiles: City/town median household incomes ranged from $48,002 to $129,082, and higher education levels, measured as bachelor's degree or higher, persons age 25+, ranged from 21.9 to 71.9 percent. Surveys were administered only to older adults who were physically and cognitively able, in the assessment of the interviewer, to function independently at the centers. Day-care clients were not included. Because the senior centers provided free internet access, these older adults had at least limited access to the internet. To include older adults with varied interests, older adults were interviewed during the lunch hour or in the common room, and not during a particular activity, such as computer group. The sample was selected based on accessibility to the researchers and may not be representative of the able-bodied older adult population.

A survey questionnaire was developed and refined by reviewing existing surveys and the findings of previous research, and by preliminary testing by the research team. The survey instrument was designed to collect data from able-bodied older adults about their internet behavior. Participants were asked whether they currently used the internet, had used the internet in the past but no longer did so (un-users) or had never used the internet (never-users). The survey also included questions about gender, income, education, ethnicity, and disability. Gender, income, and education were recorded as binary variables. Gender: male v. female; Income: above or below $40,000; Education: post-secondary education v. graduated high school or less. Although ethnicity and disability were recorded as multi-categorical variables, ethnicity and disability were converted to binary variables because the vast majority of the participants were Caucasian and not disabled.

Building on previous research that linked internet use to psychological factors, attitudinal questions were included in the survey. Internet users were asked why they decided to use the internet. Possible responses included usefulness for email, shopping, etc.; enjoying the challenge of using technology; desire to keep up with family and friends who used the internet; and sufficient skills. Multiple responses were allowed. Internet users were also asked about their choice of internet mode: fixed only, mobile only, or both.

Both un-users and never-users were asked why they did not use the internet. Possible responses included negative attitude toward the internet, no need, privacy/security concerns, too old to use the internet, cost concerns about equipment and internet connection, physical challenges and lack of skill. Negative attitude was defined as being uneasy, uncomfortable, or anxious about using the internet. Multiple responses were allowed. Un-users and never-users were also asked if they would be interested in internet training.

[3] Czaja [15] noted that as part of the normal aging process, older adults may experience declines in eyesight and audition, and motor skills, which may make it difficult to use input devices such as a mouse or keyboard, or a small screen display. She also identified age-related changes in cognitive abilities, such as working memory, attentional processes and spatial cognition and states that these abilities decline with age, especially under conditions of complexity or when confronting new technology. According to Arch [4], there are five major age-related limitations to internet use: vision decline, hearing loss, motor skill diminishment, and multiple sensory loss and function impairments.

Trained University students and the author administered the surveys, interviewing participants and recording responses on the survey forms. The administrators answered questions, offered explanations as needed, and encouraged respondents to provide specific and detailed answers.

Results and Discussion

TABLE I displays information on the survey participants.

TABLE 1

	TOTAL	USERS	FIXED	MOBILE	BOTH	UNUSERS	NEVERUSERS
TOTAL	202	143	66	19	58	13	46
MALE	64	45	29	3	14	4	15
FEMALE	137	98	37	16	44	9	30
CAUCASIAN	195	140	64	19	56	13	42
NON CAUC	5	3	2	0	1	0	2
LOW INCOME	97	57	33	8	16	10	30
HI INCOME	60	55	20	2	32	0	5
LESS EDUC	73	35	14	10	9	7	31
MORE EDUC	121	105	50	9	46	5	11
NOT DISABLED	137	103	49	10	44	5	16
DISABLED	50	29	14	7	10	8	26

70.8% of the participants used the internet, and 29.2 % did not: 6.4% were un-users and 22.7% were never-users. This finding is consistent the Pew report that 33 % of older adults did not use the internet in the year of the study. Internet use was greater (92%) among higher- income participants than lower-income participants (59%). More-educated older adults used the internet at a higher rate (87 %) than less-educated older adults (48%). There was a high positive association between income and education, (p=.00). However, while less education was strongly associated with lower income (90%), only approximately one-half (57%) of higher-educated older adults were in the higher income category. This likely is the result of the negative effect of retirement on income.

Male and female participants reported approximately the same rate of internet use (70% v. 72%). Non- disabled participants had a higher rate of internet use (75%) than those reporting a disability (58%).

Chi Square tests showed a significant association between higher income and internet use, greater education and internet use, and non-disability and internet use, and no significant association between gender and internet use (TABLE 2).

TABLE 2 CHI SQUARE TESTS OF ASSOCIATION

	Use/Not Use
Male/Female	X2(1,201)=.02, p=.88
High/Low Income	X2(1,157)=19.6, p=.00 *
High/Low Education	X2(1, 194)= 34.2, p=.00 *
No Disability/ Disability	X2(1,187)=5.6, p=.02 *

*significant at the .05 level

Internet users, un-users and never-users were asked about the reasons for their internet behaviors. These results are presented in Tables 3, 4, and 5 and discussed below.

The most frequent reason given for internet use was perceived usefulness for email, shopping, news and social networking (78%). The second most popular response was internet use by one's social group (family and friends) and not wanting to be left behind (47%). The challenge of learning a new technology was identified by 37 percent as a reason for internet use.

Table 3 Reasons for Internet Use

	Use for Email, Shopping, News, and Social	Like a Challenge	Because Friends/Family Use	Was Taught How to Use Internet	Other
Total(143)	111	53	67	48	33
Male(45)	33	15	15	11	12
Female(98)	78	38	52	37	21

Approximately one-half of both un-users and never-users, both male and female, reported that they had "no need" to use the internet. The significance of no need as a reason for internet nonuse among older adults has been reported in earlier studies [38] and [54] . Among un-users, women reported "no need" at a significantly higher rate than men. Previous studies have linked the "no need for the internet" response to a perceived lack of sufficient skill: those who view themselves as technologically incompetent may refuse adoption of technology by devaluing its benefits and usefulness [34] .

Twenty-five percent of un-users and never-users reported a negative attitude toward the internet. Negative attitude did not differ significantly by gender (p=.61). Negative attitude was more prevalent among un-users (39%) than never-users (22%), and likely for different reasons. For never-users, negative attitude toward the internet is based on perception, rather than experience. For un-users, negativity may be experience-based; i.e., internet experience led to a negative attitude and subsequently, internet un-use.

Forty-eight percent of never-users, and 8 percent of un-users, reported that they were "too old" to use the internet. This difference is not surprising; since un-users had previously used the internet, they were less likely to feel too old for internet use. Feeling too old was significantly more prevalent among male never-users (67%) than among female never-users (37%). The "too old" response could be related to internal factors such as disability and external factors such as ageism. The association between "too old" and disability was insignificant, suggesting some of the source of the "too old" attitude may be external and related to ageism.

Ageism is the systematic stereotyping and discrimination against people simply because they are old, to include demeaning behaviors such as telling a person they are too old to learn something new. Ageism may be prevalent in today's youth-oriented culture. In 2018, the World Health Organization launched a global campaign to combat ageism. [4] To illustrate ageism, (1) a leading U.S. cable provider advertises its technology with the Slowskys, a family of turtles whose parents are adverse to internet advances, while their millennial son embraces technology and (2) a furniture company ad features the founder's mother and

4. According to the World Health Organization [40], older adults experience ageism from others, but also from themselves, because of the unconscious internalization of society's negative attitudes and stereotypes towards older people. This helps to explain why older people often try to stay young, feel shame about getting older and limit what they think they can do instead of taking pride in the accomplishment of ageing.

her older adult friends offering to put family pictures “on (the clothes) line.”

It is interesting to note that never-users tended to attribute their internet nonuse to no need, being too old, or negative attitude, rather than to lack of skill. Only 28% of never-users claimed lack of skill and experience. In contrast, almost one –half of un-users responded that they had stopped using the internet because they lacked experience and skills. Perhaps these un-users had used the internet while working but now, retired, they were unable or unwilling to update these skills. Un-use because of insufficient skill was more prevalent among male than female un-users. Many of the un-users reporting insufficient skill responded that they would be interested in internet training programs.

Reasons for un-use and never-use that did not have high response rates were privacy concerns, insufficient time, high connectivity cost, high device cost, and physical challenges. It is important to note that internet costs were not a major deterrent to internet use for this group of able-bodied older adults. This might have been because the senior centers offered free internet, or because internet and equipment costs have decreased and free WiFi is often available. Costs were reported as a reason for un-use or never-use only by several women.

Data on internet un-use and never-use are reported in Tables 4 and 5.

TABLES 4 and 5

REASONS FOR INTERNET UN-USE				
	Total(13)	Male(4)	Female(9)	
Negative Attitude	5	2	3	
No Need	7	1	6	
Too Old	1	0	1	
Lack Skills	6	3	3	
High Connection Cost	1	0	1	
High Computer/Device Cost	2	0	2	
Privacy/Security Concern	2	1	1	
Insufficient Time	2	0	2	
Physically Challenging	2	0	2	

REASONS FOR INTERNET NEVER-USE				
	Total(46)	Male(15)	Female(31)	
Negative Attitude	10	4	6	
No Need	24	8	16	
Too Old	22	10	11	
Lack Skills	13	3	10	
High Connection Cost	2	0	2	
High Computer/Device Cost	4	0	0	
Privacy/Security Concern	2	0	2	
Insufficient Time	3	0	3	
Physically Challenging	1	0	1	

Users were asked about their choice of internet mode: fixed only, mobile only or both.

These results are reported in Table 1 above. Single-mode internet access was more popular (59%) than dual-mode (fixed and mobile) access. Among single- mode users, fixed access was the more frequent choice, with 78 percent of single-mode users reporting fixed use only. While 54 percent used mobile technology both singly and together with fixed access, relatively few (13 %) reported using only mobile technology. This result aligns with the finding that older adults have lagged behind the overall population in smartphone adoption.[5]

Among single-mode users, male gender, and higher levels of education and income, were significantly positively associated with fixed access. Being disabled was positively associated with mobile access. Use of both fixed and mobile internet technology was significantly positively associated with higher income and higher education, but not with gender or disability. The results of Chi Square tests of association for modal choice are shown in Table 6.

TABLE 6

CHI SQUARE TESTS OF ASSOCIATION:MODAL CHOICE		
	Single Mode Fixed/Mobile	Both/Single Mode
Male/Female	$\chi2(1,85)=6.56$, p=.01*	$\chi2(1,143)=2.24$, p=.14
High/Low Income	$\chi2(1,63)=5.64$, p=.03 *	$\chi2(1,112)=12.59$, p=.00 *
High/Low Education	$\chi2(1,83)= 5.72$, p=.02*	$\chi2(1,138)=4.84$, p=.03 *
No/Slight Disability	$\chi2(1,80)=5.60$, p=.02 *	$\chi2(1,134)=1.84$, p=.18
* significant at .05 level		

Conclusion

This study found that internet nonuse among able-bodied older adults is related to perceived lack of need for the internet, insufficient skills, feeling too old to use the internet, as well as lower income and education levels. Almost fifty percent of never-users reported that they thought they were too old for internet use. Since these older adults were able-bodied, it is likely that ageism played a role in their perception of being too old. Ageism is the unconscious internalization of society's negative attitudes and stereotypes towards older people.

Lack of skill was reported primarily by un-users, with fifty percent of un-users reporting lack of sufficient skill as the reason for no longer using the internet

These findings lead us to question whether the digital divide affecting older adults is a temporary phenomenon that will fade as younger adults, who are digital natives, advance to older age. The answer to this question has significant societal and economic consequences and informs the importance of the current digital divide.

The age-based digital divide may continue as cohorts of younger adults advance to older age. As internet technology advances, older hardware and software become obsolete. No longer in the workplace, and perhaps without internet support, future generations of older

[5] Pew [1] reports smartphone ownership 42 % for older adults v 81% for all adults.

adults may lack the skills necessary to adopt new technologies and may opt out of internet usage.

Moreover, some future older adults may share current older adults' trepidation about adopting new technologies, even if they are given opportunities to update their internet skills. This study found that negative attitude, perceived lack of need, and feeling too old, were primary reasons why able-bodied older adults chose not to use the internet. Some of these attitudes and perceptions are related to the aging process. Psychological changes such as increased risk aversion [47] may reduce older adults' desire to learn new technologies, resigning themselves to the perception that there is "no need" for the new technologies. Changes in brain chemistry associated with aging may lead to less than optimal calculation of the utility or benefit of a given outcome or activity [10]. Finally, in the continuing youth-oriented culture, future generations of older adults may also experience societal ageism. Therefore the attitudes and perceptions that have led members of the current cohort of able-bodied older adults not to use the internet may persist with future generations of older adults, especially regarding gradations of internet use.

One of the major conclusions from a policy perspective is that a uniform demand side policy will not be the most effective way of reducing the age-based digital divide among able-bodied older adults. Specific measures stratified by socioeconomic factors (income and education) would be more helpful. Older adults may benefit from clearer, more emphatic, and more supportive messaging regarding internet benefits. Messaging to promote internet use should reframe aging and emphasize that age is not a barrier to internet use. Internet training opportunities to improve and update internet skills for able-bodied older adults will also help to shrink this digital divide.

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