

Wireless Technology Uses and Activities by People with Disabilities

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Abstract

Access to and use of wireless consumer technology (e.g., mobile devices like cellphones, smartphones, tablets, software and services) has become ever more critical to social and economic participation, particularly for people with disabilities. Rates of *ownership* of wireless devices among people with disabilities have risen considerably in recent years, narrowing substantially the gap in ownership rates with the general population. But what do people with disabilities *actually do* with their wireless devices? This article presents findings from the Survey of User Needs (SUN), a national survey on use and usability of mainstream wireless technology by people with disabilities. Data from the most recent SUN conducted in 2012-2013 will be presented, focusing on the wireless activities of people with disabilities. Data on the following uses will be analyzed: accessing the internet, text messaging, emailing, downloading and using mobile apps, social networking, using GPS and location based services. Results show that as a group, people with disabilities and use wireless services at rates similar to the general population. However, substantial variation exists in use of some services between disability types, mainly those with hearing, speech or vision loss.

Keywords

Wireless, use, accessibility, cellphone, smartphone, tablet

Introduction

Access and use of mainstream wireless technology is increasingly important to full social and economic participation. More than 326 million wireless service subscriber connections in the United States (CTIA-The Wireless Association). The Pew Internet and American Life Project reports a steadily rising rate of cellphone ownership among American adults in recent years, from 73% in 2006 to 91% in 2013, with current smartphone ownership at 56%, and tablet computer ownership at 34% of American adults (Pew Research Center, January 2014).

Fortunately, people with disabilities seem to have access to wireless technology at rates that are only somewhat lower than or equal to those for the general population. Survey research data collected by the Rehabilitation Engineering Research Center for Wireless Technologies show that 84% of people with disabilities own or use a wireless device such as a cellphone or smartphone. Including tablet owners raises wireless device ownership to 91% (Wireless RERC, July 2013). Smartphone ownership and tablet ownership were reported by 54% and 31% of respondents, respectively (Morris, et al., 2014). These figures are comparable to those for the general population.

Overall ownership rates of mobile wireless devices, particularly “smart devices” (smartphones and tablets) provide a fundamental indicator of access to wireless technology. However, understanding *what people with disabilities do with their devices* sheds light on whether they are taking advantage of the rapidly expanding potential of their technology. Additionally, analysis by disability type (blindness, deafness, difficulty speaking, etc.) can provide insight into the specific needs of each group and perhaps identify opportunities for serving them better.

This article presents findings from the Survey of User Needs (SUN), a multi-year survey on use of mainstream wireless technology by people with disabilities. Data are presented on the activities which people with disabilities perform on their wireless devices, including voice calling, text messaging, emailing, using the internet, downloading and using mobile apps, social networking, using GPS, listening to music and participating in video calls/chat.

Originally launched in 2002, the SUN has been updated 3 times to keep up with the rapid pace of technological change. The results presented in this paper focus on the fourth and most recent version (SUN 4) launched in the fall of 2012. Participants were recruited across the eight general disability categories listed in Table 1. These are based on the categories used by the U.S. Census Bureau's American Community Survey (ACS), augmented with categories adapted from the National Health Interview Survey (NHIS) conducted by the Centers for Disease Control and Prevention (CDC). The SUN questionnaire also permits finer segmentation of respondents by disability sub-types (e.g., blindness and low vision as subtypes of difficulty seeing; deaf and hard of hearing as subtypes of difficulty hearing).

Table 1. Survey of User Needs: Sample by Disability Type

Disability Type	Respondents (%)*
Difficulty walking or climbing stairs	39%
Difficulty hearing	36%
- Hard of hearing	25%
- Deaf	12%
Difficulty seeing	28%
- Low vision	16%
- Blind	8%
Difficulty using hands or fingers	25%
Difficulty concentrating, remembering, deciding	25%
Frequent worry, nervousness, or anxiety	23%
Difficulty using arms	17%
Difficulty speaking so people can understand me	16%

*Many respondents reported having more than one disability type.

Source: Wireless RERC, Survey of User Needs, 2012-2013.

Data were collected from September 6, 2012 through October 9, 2013 using convenience sampling to draw a sample of adults over age 18 with any type of disability. The protocol for this study was approved by the local institutional review committee at the grant recipient's home institution, as well as the subcontracting researchers' home institution. Minors under age 18 were not recruited due to concerns over conducting research with vulnerable populations. The questionnaire was made available in English and Spanish. Participants were recruited through the Wireless RERC's Consumer Advisory Network (CAN), a nationwide network of consumers with

disabilities. The research team also engaged its Internet and social media assets, including Yahoo! Groups, the Wireless RERC website, and its Twitter, Facebook and LinkedIn accounts. Contacts among organizations focused on disability issues at the national, state and local levels. These contacts were engaged to disseminate the invitation to participate to their networks of people with disabilities. These organizations included Federal Emergency Management Agency (FEMA), the Federal Communications Commission (FCC), American Foundation for the Blind, Hearing Loss Association of America, American Foundation for the Blind, National Emergency Numbering Association (NENA), Telecommunications for the Deaf and Hard of Hearing (TDI), Coalition of Organization for Accessible Technology, Shepherd Center, and others.

A total of 1381 people responded to the survey, with 1088 reporting having at least one of the disability types listed in Table 1. Females constitute 58% of the respondents. The somewhat high mean age of 49 for respondents with disabilities is partially attributable to excluding minors under the age of 18.

Discussion

Response data are analyzed to address several key questions related to the impact of income, age and urban-suburban-rural place of residence. These same questions are addressed for the general population using survey data from the Pew Internet and American Life Project. Comparative analysis is conducted between SUN respondents with disabilities and general population respondents to the Pew survey on mobile technology use. Finally, data on wireless activities and uses are analyzed across the several disability types in the SUN survey.

For convenience, the questions to be addressed are listed below.

1. Within each disability group, does income affect use of these wireless functions and services? (income divide, Wireless RERC, March 2013)

2. Do younger adults with disabilities use wireless technology more broadly and more intensively (use of more functions with greater frequency and duration) than older users? (age divide, Wireless RERC, July 2013)
3. Across all disability groups, does residing in rural areas affect use of wireless functions and services? (rural connectivity divide, Duggan 2013)
4. Do people with disabilities use functions and services such as mobile internet, text messaging, email, mobile apps, and GPS at the same rate as the general population?
5. Do people with certain disabilities use these functions and services more or less than people with other disabilities?

Because the list of potential wireless activities and uses can be very extensive, we focus here on just a few core functions (beyond voice communications): accessing the internet, text messaging, emailing, downloading and using mobile apps, using GPS and location based services, listening to music, and video calling/chat. These activities were also chosen in order to compare SUN results with those for the general population as reported by the Pew Research Center's Internet and American Life Project (Duggan 2013). For both surveys the results are for cellphone users, regardless of whether the device is a smartphone or regular "feature" phone. SUN respondents who own only a tablet (i.e., no cellphone) were excluded from this analysis so that the data would be comparable to the Pew Research Center results.

In general, SUN respondents with disabilities who own cellphones report rates of use for a range of wireless activities that are similar to the rates reported for the general population sampled by the Pew Research Center (Table 2). Percentages of cellphone users who use text messaging (71% and 81%, respectively) and email (61% and 52%) in each survey vary

substantially. However, they do not vary much for the other 5 activities listed. Furthermore, the rank orders from most commonly used to least commonly used activity are very similar.

Table 2. Wireless activities for cellphone users with disabilities and in the general population

Wireless Activities	SUN*	Pew**
Send or receive text messages	71%	81%
Access the internet	60%	60%
Send or receive email	61%	52%
Download and use apps	48%	50%
Social networking/use social media	48%	Not available
Get directions, recommendations (GPS)	45%	49%
Listen to music	41%	48%
Participate in a video call or video chat	25%	21%

* *Source:* Wireless RERC. Survey of User Needs, 2012-2013.

***Source:* Duggan, Maeve. "Cellphone Activities, 2013." Pew Research Center, September 16, 2013. Web. May 5, 2014.

Three of the activities in Table 2 – web browsing/mobile internet, text messaging, and downloading and using mobile apps) – were selected for closer examination of possible effects on usage caused by income, age and residential location (urban, suburban, rural) of the respondent (Tables 3, 4 and 5, respectively).

The SUN questionnaire asks respondents to identify their income from a list of 7 income ranges. This is intended to minimize respondent concerns over privacy and promote higher response rates. Unfortunately, the SUN income ranges do not exactly match the income ranges

reported by the Pew Center. We collapsed our lowest 5 income ranges to best approximate the income ranges in the Pew. The upper two income ranges for both surveys match exactly. Despite some differences in the income ranges for each sample, both samples show that income has similar direct positive effects on usage rates for the three wireless activities (Table 3): as income rises, so do usage rates for all three wireless activities for both groups.

Notably for both groups, rates for text messaging are higher than for web browsing and downloading/using apps in each of the 4 age ranges, rising from 66% and 78% of SUN and Pew respondents, to 81% and 88%, respectively. This likely reflects the relative simplicity and low cost of text messaging compared to mobile web browsing, and the fact that effective and reliable text messaging was available long before the debut of contemporary app ecosystems and the smart devices capable of running them.

Table 3. Do you use your cellphone for web browsing, text messaging, and using apps?

(By gross annual household income)

Survey of User Needs

Cellphone Uses	Less than \$35,000	\$35,000 - \$49,999	\$50,000 - \$74,999	\$75,000 or more
Web browsing	54%	61%	61%	76%
Text messaging	66%	76%	70%	81%
Using apps	44%	45%	48%	65%

Source: Wireless RERC. Survey of User Needs, 2012-2013.

Pew Internet Survey

Cellphone Uses	Less than \$30,000	\$30,000 - \$49,999	\$50,000 - \$74,999	\$75,000 or more
Web browsing	55%	60%	63%	79%
Text messaging	78%	80%	88%	88%
Using apps	41%	48%	50%	66%

Source: Duggan, Maeve. "Cellphone Activities, 2013." Pew Research Center, September 16,

2013. Web. May 5, 2014.

As expected, for both samples age generally has an inverse relationship to use of web browsing, text messaging and downloading/using apps: as age rises, usage rates decline (Table 4). For the SUN sample of cellphone users with disabilities, usage rates actually rise from the lowest age group (18-29) to the next age group (30-49), before continually dropping through the last two age groups for all three wireless activities. This trend does not appear in the Pew data for the general population of cellphone users, which shows a continuous decline in usage from the youngest through the oldest age group for all three wireless activities. Low levels of usage among 18-29 year olds in the SUN sample might reflect difficulties paying the cost of wireless

technology, possibly resulting from the lower levels of employment and income of people with disabilities (Brault 2012). Separately, as with income, rates for text messaging use are higher than for web browsing and downloading and using apps in each of the age ranges.

Table 4. Do you use your cellphone for web browsing, text messaging, and using apps? (By age)

Survey of User Needs

Cellphone Uses	18-29	30-49	50-64	65+
Web browsing	63%	73%	57%	40%
Text messaging	69%	81%	71%	56%
Using apps	55%	58%	45%	28%

Source: Wireless RERC. Survey of User Needs, 2012-2013.

Pew Internet Survey

Cellphone Uses	18-29	30-49	50-64	65+
Web browsing	84%	72%	45%	19%
Text messaging	97%	94%	75%	35%
Using apps	77%	59%	33%	14%

Source: Duggan, Maeve. "Cellphone Activities, 2013." Pew Research Center, September 16, 2013. Web. May 5, 2014.

Generally, it is expected that people living in rural areas would report lower levels of use of various wireless services due to more limited access to wireless (especially, high-speed) service. This rural connectivity divide could perhaps also impact newer suburban areas that are more distant from urban centers as well.

Data from the two surveys show little or no difference in the usage rates among urban and suburban cellphone users for web browsing, text messaging, and downloading/using apps for

both surveys (Table 5). However, they show substantially lower rates for rural cellphone users for web browsing and downloading/using apps in both surveys. Again, text messaging stands out as an exception, mostly likely for the same reasons mentioned above: simplicity, low cost and reliability due to very low data bandwidth requirements.

Table 5. Do you use your cellphone for web browsing, text messaging, and using apps? (By urban-suburban-rural residency)

Survey of User Needs

Cellphone Uses	Urban	Suburban	Rural
Web browsing	60%	63%	56%
Text messaging	70%	72%	71%
Using apps	48%	50%	43%

Source: Wireless RERC. Survey of User Needs, 2012-2013.

Pew Internet Survey

Cellphone Uses	Urban	Suburban	Rural
Web browsing	65%	62%	47%
Text messaging	82%	82%	76%
Using apps	52%	52%	39%

Source: Duggan, Maeve. "Cellphone Activities, 2013." Pew Research Center, September 16, 2013. Web. May 5, 2014.

Closer inspection of wireless activities by disability type is also needed to understand how certain physical, sensory and cognitive limitations might impact usage of wireless services.

Table 6 shows usage data by general disability type for the 3 services listed in the tables above,

plus voice calling and social media. The data show little variation in usage rates for each service across disabilities, with three exceptions: respondents with hearing and speech limitations use voice calling services at much lower rates than respondents with other disabilities. Conversely, they use wireless internet services and text messaging at substantially higher rates than the other disability groups. The third exception is that respondents with visual limitations use social media at substantially lower rates than respondents with other disabilities.

Table 6. Do you use your cellphone for voice calling, text messaging, internet, using apps, and social media? (By disability or impairment)

Disability/Impairment	Voice call	Texting	Internet	Apps	Social media
Cognitive	80%	81%	68%	53%	58%
Anxiety	71%	85%	69%	58%	56%
Seeing	80%	79%	65%	57%	48%
Hearing	54%	87%	74%	57%	53%
Speaking	49%	84%	76%	56%	60%
Using arms	76%	75%	66%	57%	52%
Using hands, fingers	75%	77%	68%	57%	56%
Walking, climbing stairs	75%	75%	63%	51%	52%

* *Source:* Wireless RERC. Survey of User Needs, 2012-2013.

People with hearing and vision limitations can be further segmented by degree of sensory loss: deaf and hard of hearing, and blind and low vision. Table 7 shows that people who are deaf use voice calling at very low rates (14%), while those who are hard of hearing use voice calling at rates much closer to those for other disabilities (68%). Also people who are deaf use text messaging and mobile internet at substantially higher rates than people who are hard of hearing.

Table 7. Do you use your cellphone for voice calling, text messaging, internet, using apps, and social media? (By disability or impairment)

Disability/Impairment	Voice call	Texting	Internet	Apps	Social media
Deaf	14%	95%	83%	58%	59%
Hard of hearing	68%	84%	71%	59%	52%
Blind	81%	74%	55%	58%	37%
Low vision	75%	81%	65%	54%	51%

Source: Wireless RERC. Survey of User Needs, 2012-2013.

Differences between people who are blind and those with low vision in the use of voice calling and text messaging are less stark. These two groups show much more substantial differences in rates of use of mobile internet and social media, both of which rely more on visual presentation and content.

Conclusions

The data presented here show that as a group, cellphone users with disabilities use wireless functions and services at similar rates as their counterparts in the general population. Furthermore, for both groups income, age, and residential setting had similar effects on the use of three distinct wireless services: mobile internet, text messaging and downloading and using mobile apps. Income was positively related to rates of use of mobile internet and apps, but little

effect on use of text messaging for both groups. Age was inversely related to use of all three services, including text messaging. Finally, there did seem to be some evidence of a rural connectivity divide for mobile internet and apps use for both groups. However, the effect was stronger for the general population than for people with disabilities. This rural connectivity divide was much weaker for text messaging for the general population, and not in evidence for people with disabilities.

Some differences in the use of wireless services were detected between and among the disability groups in the SUN, centered primarily among people with complex communications needs (hearing and speech), and also among people with vision loss. People with hearing and speech limitations, use voice communications less than people with other disabilities. Conversely, they use visual based communications (text messaging and mobile internet) more than other groups. People who are blind use voice communications at high rates, and they use mobile internet and social media at much lower rates than people with other disabilities.

These results point to two main conclusions. First, as a group, people with disabilities behave similarly to the general population in terms of use of wireless services. Second, there is some variability in the use of some wireless services between disability groups. Designers, engineers, and the wireless industry should take both of these conclusions into account when developing and marketing wireless technology and services to people with disabilities. This population represents a large and growing market that can often, but not always, be served by technologies intended for the general population.

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