The Importance of Large-Screen Device Ownership

A RESEARCH REPORT - NOVEMBER 2021

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The Importance of Large-Screen Device Ownership

The following report provides an evidenced-based discussion for why access to large-screen computing devices (e.g. laptops, desktops) is essential, as well as recommendations for how to close this technology gap nationwide. Policymakers and the press have made compelling arguments for ensuring nationwide high-speed internet access [e.g. 26, 80], but relatively less attention has been paid to disparities in device ownership.

Disparities in ownership by race and income are substantial ... and devices can vary dramatically in their quality and reliability.

Substantial disparities

There are substantial disparities in ownership by race and income [3, 90], and devices are often split between multiple people, and can vary dramatically in their quality and reliability [31, [32, 70, 86, 90]. This may be in part because, for the last decade, over 75% of American homes have a desktop or laptop device [79].

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Insufficient access to large-screen devices can have negative consequences

Insufficient access to large-screen devices can have negative consequences for people of all ages, but especially students and other vulnerable populations. The costs of persistent "under-connectedness" [70] has only become more urgent in light of the surge in computing dependence during the COVID pandemic, as millions of people worldwide have started to work and learn from home. In response, this report lays out key arguments for why device ownership is a critical issue that deserves attention from both public and private stakeholders.

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The Infrastructure of Access

There is no question that computing technology has radically transformed 21st life. Today, everything from grocery shopping, enrolling in school, paying bills and showing up for work involves access to computers in one form or another.

Before the 2020 global pandemic

Even before the 2020 global pandemic accelerated dependence on computers for daily living, there was evidence that being online was associated with:

- Professional advancement [2,5]
- Better academic performance [4, 55, 75]
- Improved health outcomes [21, 65, 67]
- Greater political participation [53]
- Emotional support from family and friends [64, 65, 84, 92]

Of course, the internet is not a universally pleasant place. Cyberbullying [78] and social isolation [83] for example, are risks associated with internet communication.

But, despite risks, this report argues that everyone in the U.S. should at least have the option of being online in order to reap the benefits that reliable, high-quality computing technology can provide.

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The need for broadband internet services

Much of the research and policy on the digital divide over the last three decades has emphasized the need for broadband internet services. As Americans began moving from dial-up to highspeed internet, it became readily apparent that broadband was important for maximizing the online experience [34, 43].

But, despite the benefits of highspeed internet access, it is important to remember that internet service alone is not enough.

This report serves as a reminder that for internet access to yield value it requires a stable, functioning computer.

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The Smartphone Stopgap

Smartphones have often served as primary means of accessing the internet, especially for low-income populations.

As an efficient "all-in-one" tool for staying connected, low-income households have been at the forefront of those dropping landline service [see 9 and later reports] and primarily using phones to get online [60] as "mobile-only."

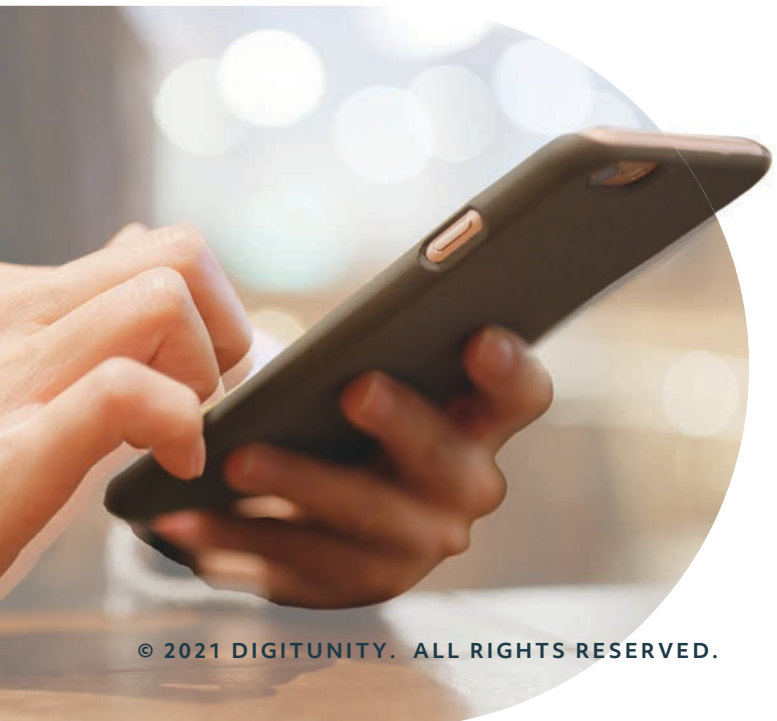
Though costly, a smartphone bill is often more affordable than the up-front cost of a large-screen device. Moreover, their built-in mobility means that smartphones are easily transported to libraries, coffee shops or loved ones' homes when at-home internet service is too expensive.

As a result of all of this, in many cases cell phone adoption has filled computing gaps, especially in places where telephone and electricity infrastructure is lacking [12, 61].

Across the globe

Smartphone adoption has been associated with:

- broadened political engagement [53]
- improved health [14, 23, 64]
- improved social and economic capital [7]



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The Smartphone Stopgap

Limited computing experience

Despite these benefits, there is also evidence that mobile-only users have more limited computing experiences and may reflect persistent digital inequalities. For example, being low-income, a person of color and having less education are all associated with mobile-only internet use [82].

Relying on smartphones for internet access has also been shown to:

- limit the range of one's online activity [54, 59]
- being a mobile-only internet user may also limit one's digital skills [16].

In short, smartphones may be a valuable stopgap in getting people online, but they should not be the only way for users to access the internet, especially when it comes to work, school, or other critical life activities.

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The Need for (Large) Screens

To highlight the importance of large-screen device ownership, this report summarizes research findings on the effects of device ownership across different target populations.

Targeted populations

- students
- people with disabilities
- individuals experiencing chronic illness
- people without secure housing

Research squarely in this area is somewhat limited, with some key pieces dating back to a time when device ownership was less common. However, a review of scholarship on the topic is important in order to develop a more nuanced picture of why device ownership matters and what is missing. [1]

[1] To maintain focus, this report will neither delve into research on the consequences of in-home internet access or digital skills independent from device access, nor will it delve into policy analysis or ICT for development (i.e. ICT4D).

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Device Ownership Matters

Personal device ownership provides a unique computing experience that cannot be replicated through public use of computers or shared devices.

Of course, access to the internet and word processing in any form is often valuable, but personal device ownership provides additional control over when and how people get online. That enhanced sense of efficacy is a key driver of the need for object ownership more generally, which can contribute to an object becoming an extension of the self [61]. This is certainly true of computing devices; which users sometimes relate to as an additional appendage [41].

This added sense of proprietorship manifests in greater psychological satisfaction and control over an object [61]. This may be especially important when it comes to sources of information and entertainment. Just as in-home book ownership is key for early literacy development [27], here we make the case for personal device ownership as a key requirement of closing the digital divide.

Personal device ownership provides additional control over when and how people get online.

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Relevant Concepts

Before reviewing the research on device ownership, it is useful to first consider theoretical concepts developed to explain how digital inequities occur and how they affect quality of life. One of those is the resources and appropriation theory [87, 88], which frames access to computing technology as a sequence that requires first motivation, then physical availability of resources, then sufficient skill, and finally a breadth of usage. It is through this sequence that one can then benefit from the full range of social and economic offerings online (e.g. eGovernent, eHealth, news consumption, employment opportunity, etc.).

Appropriation theory frames the computing technology sequence:

1. requires motivation first
2. then physical availability of resources
3. then sufficient skill
4. lastly a breadth of usage.

J.A. Van Dijk's model is important because he not only recognizes that physical access is part of a larger composition of factors determining digital access, but he also recognizes the circular nature of access and inequalities such that one's standing in society affects access to resources, including digital resources, which then shapes one's standing in society.

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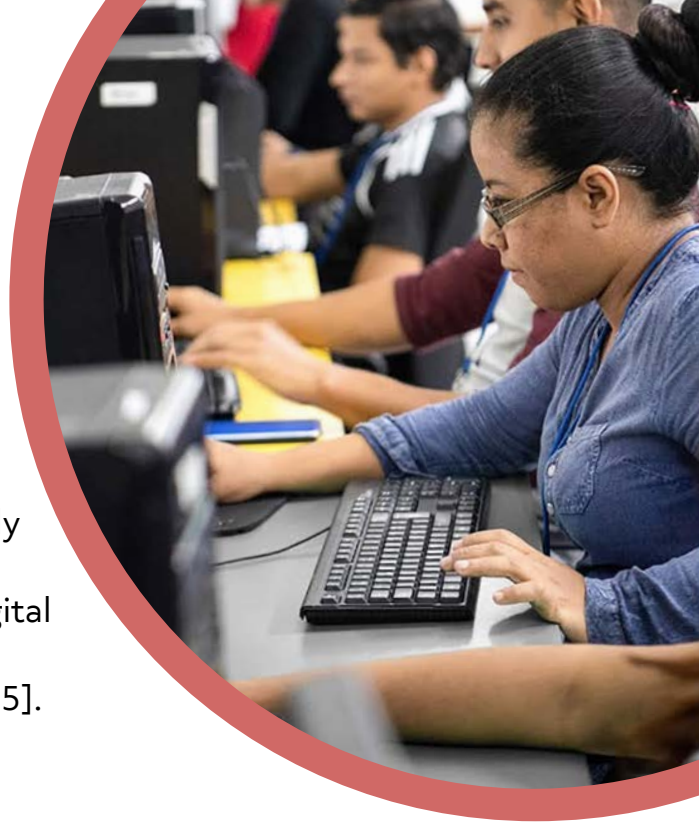
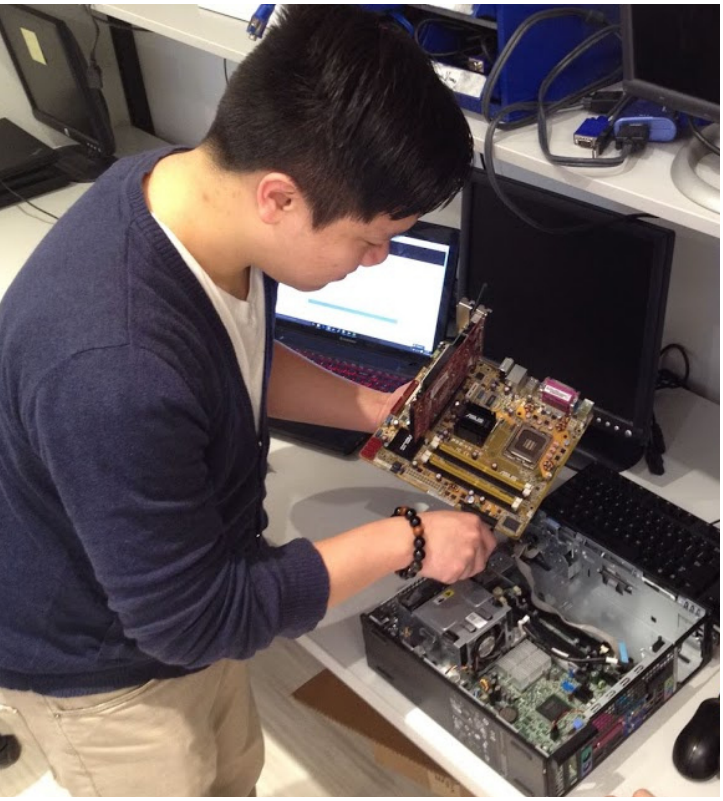
First-level digital divide



Another relevant concept is that of the first-level digital divide. This construct, which refers primarily to physical access to devices and internet service, has taken shape in relation to the second-level digital divide, or idea that without sufficient digital skills, computing devices only provide limited benefit [35].

Although research on digital skills is incredibly important, it is not our focus here. Moreover, researchers have recognized that persistent disparities in the first-level divide have at times been overlooked and continue to plague many users, including those in otherwise wealthy countries [e.g. 86].



Technology maintenance

Related to this, another important theoretical concept is that of technology maintenance—the ongoing work required to stay physically connected to digital technology given that devices are inevitably lost, broken or shared and must be fixed or replaced [31, 32]. Conceptualizing physical access as a continuous process, involving cycles of dependable instability for many low-income users [31, 32], highlights the complex and ongoing work that is required of stakeholders to help reduce these inequities.

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Target Populations

A review of scholarship on large-screen device ownership yields a range of studies from across different contexts. We focus on contexts and sub-groups frequently represented in the ownership literature:

- **Students**
- **People with disabilities and chronic illness**
- **The housing insecure**

There are many other subgroups that have been studied when considering the benefits of internet access, but these three are the groups primarily represented in studies on ownership.

Students

Certainly, the subgroup most frequently studied when assessing the value of device ownership was students. Computer-owning students performed better than those without computers.

To start, across multiple studies, elementary school students in households that owned computers performed better than students from households that did not own computers [4, 55, 75]. Authors controlled for a range of other variables, including household income, to ensure that ownership was not simply a proxy for socio-economic standing. Although students in both low- and high-income households benefited from computer ownership, evidence suggests that higher income students benefited more from computer access than lower-income students [4].

2 It is worth noting that, on the one hand, some of these sub-groups are more likely to live in poverty and their struggles with access may partially reflect an income-based divide. On the other hand, members of these sub-groups also face unique barriers to and benefits from device ownership that merit consideration.

Early studies were also interested in examining gender differences, and some found that male students benefited more from ownership [4], and perceived different benefits of the devices than female students [45]. These gender differences may be less relevant today as gender disparities in computer use have shrunk substantially [60].

Older Students

Older students also benefit from device ownership. In one study, university students that owned a laptop performed better in school than those that did not own a laptop [69], and students with computers in the home were more likely to enroll in high school [24] and were also more likely to graduate from high school [6, 25]. High school students with computers in the home also had an easier time completing school assignments and passing exams [6, 76]. However, as with elementary school students, wealthier high school students seemed to benefit more from access to computers than low-income students [74]. Because access to devices can also help contribute to improvements in digital literacy for students [13, 47, 56, 77] and may also improve digital confidence [77], there is reason to believe that device access is important across socio-economic levels.

> Students with computers in the home were more likely to enroll in high school and were also more likely to graduate from high school.

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Parent involvement

Not surprisingly, parental involvement plays a role in how students use and benefit from devices in the home. Within low-income households, parents who engage the internet have children who do the same, and better physical access is important for prompting that engagement for parents [40]. Interestingly, unlike previous studies, in this study the benefits of physical access were greatest for the lowest-income families.

However, low-income families are also sometimes skeptical that the internet may distract students from schoolwork [81]. In fact, there is some evidence that over time, in-home ownership may actually reduce grades when the device is a distraction from schoolwork [47, 89] which further underscores the need for parental involvement and effective parental literacy.

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Outside the classroom

Finally, some studies examined the effects of device ownership for youth outside the classroom, including access to employment [58], health-information seeking [8], and psycho-social well-being [71]. In these instances, ease of access to computing devices made it easier for youth to seek information related to employment and healthcare [8, 68], and lack of access caused psycho-social problems, such as shame or stigmatization [71].

Things made easier outside of the classroom:

1. access to employment
2. health-information seeking
3. psycho-social well-being

These studies remind us that the impact of computer ownership for youth goes far beyond the classroom.

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People with Disabilities or Chronic Illness

Students are not the only ones that benefit from device ownership. Those with a disability or a chronic illness have historically been less likely to own devices and access the internet [20, 27]. At the same time, there is evidence that these populations in particular benefit from in-home internet and device ownership, given that they may have more limited physical mobility and a frequent need for new medical information [11 27, 33].

> The benefits of having in-home internet and devices are particularly evident in these populations, given their limited mobility and frequent needs for medical information

For example, greater use of internet communication is associated with larger social networks and better health outcomes on a variety of dimensions for people with spinal cord injuries [21], and device ownership is predictive of greater doctor-patient communication for cancer survivors [39].

People with both mental and physical disability or chronic illness can also benefit from exchanging social support with others that share similar and often difficult life experiences[11, 64, 65]. In-home computing can help make that support readily accessible at any time of day, and is in fact associated with greater health information seeking across the population [48].

People with Disabilities or Chronic Illness

These benefits are not limited to those that face physical disability or illness. People with an intellectual disability may also benefit greatly from access to computing devices, though they may face multiple barriers to access including cost, navigability and sensorimotor fit [46].

Those experiencing mental health problems may also benefit from in-home computing [15], though may face some of the same demographic barriers to device ownership as the general population [e.g. race, age, etc., 22]. In short, in-home device ownership seems to provide not only educational benefits, but also key health benefits, especially for those that are chronically-ill or have a disability.

Housing Insecure Individuals

Finally, houseless individuals and others without stable housing (e.g. refugees, recently incarcerated individuals, individuals in deep poverty), may also have an especially strong need for personal digital device ownership. That is, without a stable address, remote communication becomes essential for staying in contact with community resources and loved ones [37].

Digital connections help with:

- doctor-patient communication
- access to health information
- participation in psycho-social support networks
- facilitates job-seeking
- reducing the risks of falling even deeper into poverty

Many of the research studies demonstrate that digital connections are especially important for mental and physical health for housing insecure individuals by helping to enable doctor-patient communication, access to health information, and psycho-social support networks [14, 23, 67].

There is also evidence that computing technology is important for job-seeking for the very poor [2, 29] and may even reduce the risks of those living at the margins falling even deeper into poverty [95].

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Maintaining digital access

But maintaining digital access for the housing insecure is not easy. Although much of the research on device ownership in this population focuses on the benefits of smartphone ownership, as mobile phones are easier to store, there is also evidence that large-screen computers are used and guarded with great care [e.g., 29]. Refugees [49] and recently incarcerated individuals [68] also rely on digital technologies to maintain ties to old networks and build important new ties and resources in new environments.

Complications

But sustaining device access to mobile and large-screen devices can be complicated without a stable living environment. Keeping devices charged and dry is difficult [28, 36, 50], and a lack of savings means that devices are hard to replace when they are lost are stolen and monthly bills are often unpaid [29, 31, 32].

- Keeping devices charged and dry is difficult
- Lack of savings makes it difficult to replace devices lost or stolen, and monthly bills are often unpaid

Given the well-substantiated benefits of computer ownership for this population, stakeholders should continue to work to find solutions to improve physical access for the housing insecure.

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Necessary but Not Sufficient

Despite these benefits across different sub-populations, it is worth reiterating that device ownership is necessary but not sufficient for ensuring digital access and reducing digital inequalities. Steady access to high-quality devices and internet service must be paired with digital navigation training to optimize the online experience and reap the full benefits of computing technology [30, 35, 87, 88].

For optimal online experience and to reap the benefits of computing technology, stable access to high-quality devices and high-speed internet service must be combined with training in digital navigation

There is also evidence that existing social capital, the personal connections to high-status and well-resourced people [10], is necessary to leverage opportunities for socio-economic advancement presented online [52, 94]. This is consistent with the idea that digital inequalities contribute to, but are also a function of, other inequalities [72, 87, 88], and that attempting to combat a single aspect of the digital divide will result in limited success.

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Essential first step to end disparities

At the same time, digital device ownership has become an imperative in industrialized contexts, making it important that efforts are made to address all of these barriers. Although device ownership is not enough to singlehandedly enable digital access, it is an essential first step and persists as a problem, even as ownership rates rise.

Certainly, across the globe there are enormous disparities in device ownership [38], but even in wealthy countries income-based under-connectedness is a frequent problem [31, 32, 70, 86, 90]. The scope of this has only come further into focus over the last 2 years during the COVID-19 pandemic.

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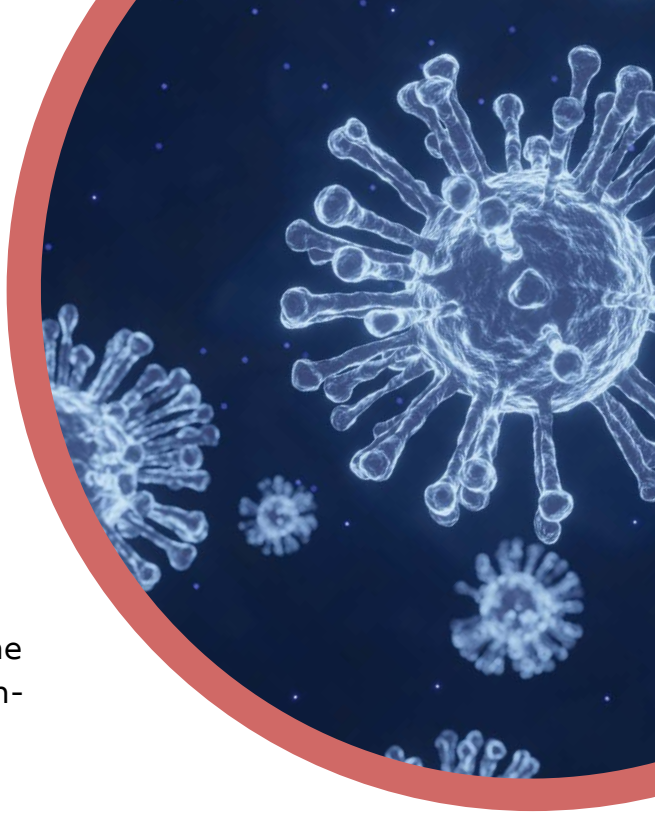
Implications of COVID



Educators, medical professionals and policymakers were all made keenly aware of persistent digital inequalities during the COVID pandemic because social distancing made digital access an imperative.

Doctors discussed the need for reliable computer-based healthcare (e.g. telehealth consultations; online health information seeking; vaccine registration) as in-person healthcare became increasingly risky [e.g. 66] noting that existing digital disparities could lead to worse health disparities [1, 18].

Doctors discussed the need for reliable computer-based healthcare:

- telehealth consultations
- online health information seeking
- vaccine registration

For example, those with worse device access were less effectively able to get the internet-based COVID related information they needed [85], and in many cases digital disparities overlapped with COVID-disparities, such that seniors, gig-workers or incarcerated individuals had their COVID risks amplified due to poor digital access [73].

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Consequences of the pandemic on education

- concerns of completing schoolwork
- students have inadequate device support
- less proficient during remote learning
- mental health and educational stressors

There have also been concerns about the consequences of the pandemic on education, as many students around the globe do not have any computing devices in the home, while others are sharing devices or trying to complete coursework on a smartphone [73].

In the U.S. specifically, 36% of low-income households expressed concern about children completing schoolwork during COVID due to a lack of a device in the home [89]. And at the university level, students with inadequate device support (e.g. slow or shared devices; smartphone reliance) were less proficient during remote learning [70], and reported mental health as well as educational stressors as function of moving all learning online [17].

COVID has hastened the trajectory towards a more internet-dependent world.

There is reason to believe that many of the transitions to remote learning and working that occurred in the last year may become permanent fixtures going forward and could, as a result, lead to greater inequality (Nguyen et al., 2020). This is all the more reason that we must take bold steps to ensure reliable device ownership for all who desire it, and to do so as quickly as possible.

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Recommendations

As the number of daily life tasks requiring internet access continues to rapidly multiply, we must explore bold, creative solutions to closing the technology gap. The following are a few key recommendations for policy makers, researchers, technology companies and non-profits serving low-income technology users. This is by no means an exhaustive list of recommendations, but it highlights key concerns of stakeholders in the digital equity sphere:

1. Increase the rate of device ownership. The last year and a half underscored the problem of insufficient large-screen device access. Sharing devices undermines use, yet it remains common. Ensuring that each individual in a household can access a laptop or desktop as needed for work and school is essential.

2. Ensure device quality. As we adapt to a rapidly digitized world, and even distribute as many low-cost devices as possible to people in need, we need to protect against the creation of a second class digital citizen. We must ensure that affordable devices are reliable and provide a range of services; we cannot compromise quality for quantity.

3. Prepare for digital disruption. Organizational decision makers – ranging from those designing digital interfaces to social service providers to researchers– must prepare for the reality that technology is not stable, especially devices used in low-income households. This means maintaining redundancies in services (i.e. keeping both "paper" and "plastic" options available at all times) and ensuring that as much computing as possible can take place with a smartphone.

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Recommendations

4. Pair devices with digital skills training. We must pair physical access with support and training so that new computer owners can feel confident exploring a range of device capabilities. This is especially important for families with children—parents must be supported in their digital literacy development so that they can support their children.

5. Protect shared device spaces. Ensuring that libraries and other public terminals are plentiful and well-staffed helps keep a buffer in place for those that are unable to get reliable in-home computers, and also serves as an important secondary space for accessing technical support and on-the-go computing.

6. Research more and widely. Researchers must not stop measuring in-home internet access and device ownership, though they must also assess the quality and stability of device ownership as these factors are important predictors of quality-of-life outcomes. Researchers should broaden the sub-populations studied, and also should implement and evaluate interventions to close socio-economic gaps that predict computer use and ownership.

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Bio:

Amy Gonzales is an Associate Professor in the Department of Communication at the University of California, Santa Barbara. Her work examines the effects of social interaction via communication technologies on individual identity, social support, and well-being and the consequences of disrupted access to communication technology. Her work aims to advance theoretical understanding and real-world solutions that may help mitigate the long-term consequences of new digital infrastructures that may otherwise exacerbate social inequalities.

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