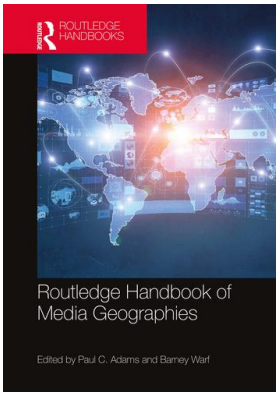

Routledge Handbook of Media Geographies

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Digital divides

Publication details
https://www.routledgehandbooks.com/doi/10.4324/9781003039068-3
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Published online on: 28 Oct 2021

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DIGITAL DIVIDES

James B. Pick and Avijit Sarkar

Digital divides constitute a foundational element of media geographies. Social media, radio, TV, streaming video and the spatial web depend on communications and increasingly on the broadband internet. These media services are provided over varied platforms ranging from wearables, to cell phones, tablets, laptops and servers. Messaging is sent by radio signals, fiber optic and other cables, and satellite transmission.

Against this backdrop, media content is generated and digitized. This chapter focuses primarily on digital divides as they relate to digital media. In various manifestations, digital media may include digital images, digital video, digital audio, digital audiovisual media, computer games, video games, digital books, digital text and the like. In 2020, digital media users spanning video games, electronic publishing, video-on-demand and digital music numbered 6.42 billion globally. This number is forecasted to balloon to almost 8 billion by 2025 (Statista 2020a). Global digital media revenue is estimated to be almost USD 200 billion in 2020, and projected to grow to USD 255 billion by 2025. While this projected growth has been somewhat stymied by the COVID-19 pandemic, the pandemic has nonetheless catalyzed the overall growth in digital media content and use in 2020. The crucial metric of success for media is whether or not the media users can read, understand and benefit from the content, and the extent to which they apply the content for entertainment, knowledge acquisition, business operations, management decision-making or leadership purposes. Users vary in their benefits from media, for instance a corporate leader might benefit by weighing a decision based on a news media, while a student might benefit by learning from it, or a retiree might be kept up-to-date about investments and retirement portfolios. Although media have undergone exponential growth, based on rapid technological advances, persistent issues continue to be the inequalities in availability, access, use, and the educational differences that imply varying levels of understanding and application of the content.

The digital divide is defined as the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information technology and media and to their use of the internet for a wide variety of activities (modified from OECD 2011). The concept of the digital divide (NTIA 1999) has become widely studied and applied, with thousands of studies of it and hundreds of national and regional governments applying it in practice. It does not imply a dichotomy of the technology rich and poor, but is viewed rather as a continuum of levels of digital access, use

DOI: 10.4324/9781003039068-4

and outcomes (van Dijk 2005; 2020). The digital divide is a complex phenomenon, not only involving technology infrastructure, but also people's motivation, skills, goals and outcomes, as well as the content of information, the cultural setting, and social and economic forces.

Has the digital divide narrowed so it is no longer relevant? This question is often asked; while some indicators of technology access and use are leveling off at high levels in advanced economies, such as internet access and access to broadband, these indicators have a long way to grow in developing countries. As seen in Figure 3.1, for 2005–2019, the number of individuals using the internet per 100 persons is considerably higher in developed countries than for intermediate (developing) or least developed countries (LDCs).

Although there is a huge and growing disparity in fixed broadband subscriptions between developed and developing countries/LDCs, which is ascribed to the expense in developing countries of installing optical fiber landlines (ITU 2019), the developing nations make up for this by adopting and using smartphones and other mobile devices. This is can be seen in Figure 3.2. By far the greatest increase in information technologies during this period was in mobile broadband, which allows developing nations to "leapfrog," skipping the older technology of fixed broadband and speeding up the attainment of full broadband capability. Another trend that is narrowing the digital divide is that 96 percent of the world population

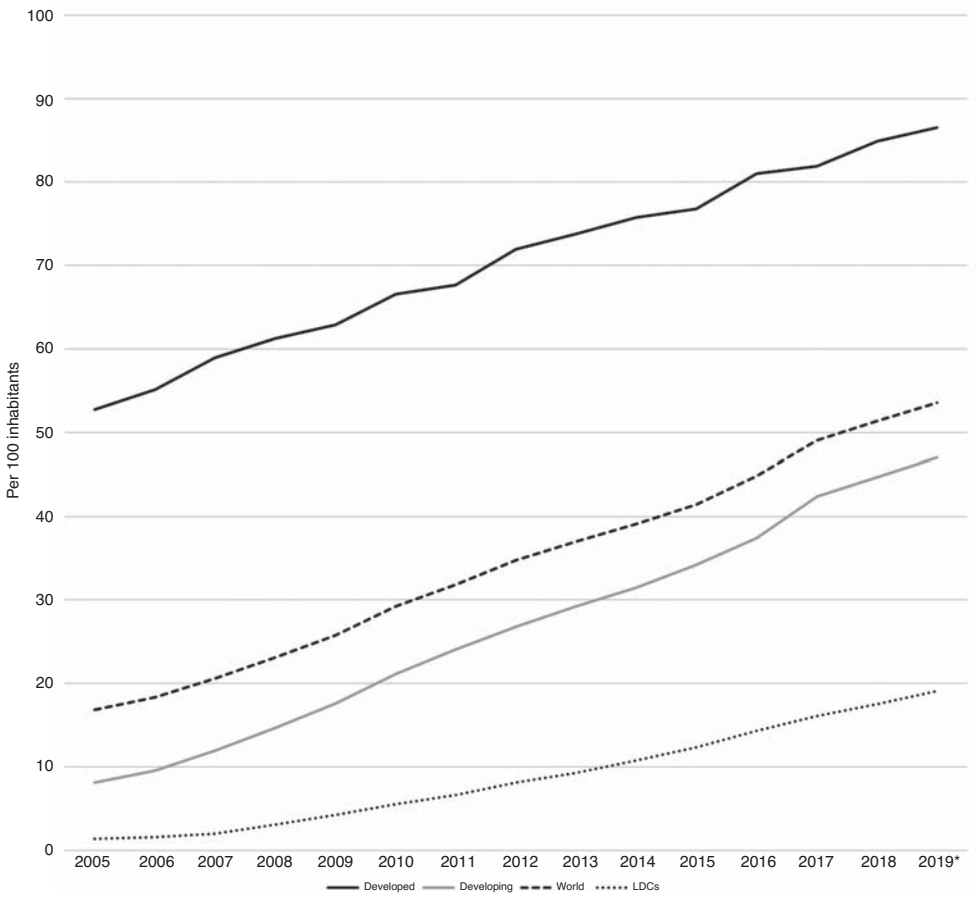

Figure 3.1 Number of individuals using the internet by development status, 2005–2019

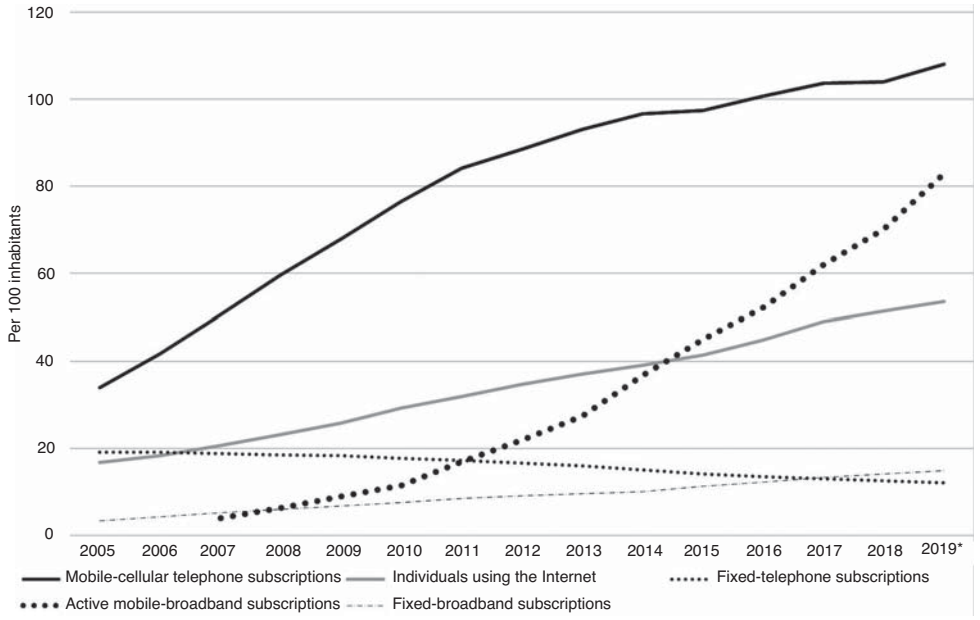

Figure 3.2 Worldwide subscriptions and use of technologies, 2005–2019

in 2018 resided within range of a mobile-cellular network, and 90 percent were within range of a 3G or higher-level network (ITU 2019). Yet only 4.6 billion people worldwide were internet users in 2018, so there is potential for 3 billion more people to access and use the internet (Population Reference Bureau 2018).

Another essential aspect of digital divides is the unit of analysis, which can be measured at different levels between individuals and the planet as a whole (Barzilai-Nahon 2006). Some important sub-national geographic units are states/provinces, counties/districts, neighborhoods and households. At each unit, the digital divide context differs. For instance, the digital divide among households in web streaming is different in meaning than the average web streaming for the states of New York and Missouri. The household differences might be explained by the geography of family structures in a census tract, whereas the state differences would likely be interpreted by effects from their educational systems, urbanization and income levels.

The choice of unit of analysis should be based on the research intent and the results should be interpreted relative to the unit level. In other words, the ecological fallacy applies, which calls for interpretation of associations between variables to reflect the nature of the units. Geographically, when units of analysis change, the modifiable areal unit problem (MAUP) must also be taken into account. MAUP cautions that at different levels of geographic units, for example, for census block groups, tracts and zip codes, the shifting arrangements of unit boundaries may alter average values for the entities within the units, so statistical findings for the same attribute may differ from level to level.

Four stages of digital divide progression over time

Digital divide research early on focused on physical access to technology. The focus later progressed to use, purposeful use and outcomes. This sequence was outlined in an early

digital divide model (van Dijk 2006). A subsequent educational digital divide model posited the steps of access, use, specific use by the subjects (youths), and outcomes (Warschauer & Matuchniak 2010). We and others propose that this series of steps is in accord with long-term technological and behavioral trends (van Dijk 2020). For example, consider that the access digital divide made sense in the US in 2000, when only 41% of US households had access to the internet (Newburger 2001), with large disparities between income, educational and ethnic groups. Since in 2018, 85% of US households had internet access (Statista 2020b), with convergence of the groups, there is a reduced need to study the access digital divide in the US. While in 2020 some indicators of access and use were over 90% on average in the US and other advanced economies, most developing nations in Africa, South America and the Middle East today still have limited technology access so, for them, the focus on access and use continues to makes sense. For instance, in 2019, 32 percent of Venezuelan adults and 30 percent of Indian adults do not own a mobile phone (Silver et al. 2019), highlighting the importance of access for them.

Purposeful use is differentiated from access by its specificity of goal. It is beginning to be differentiated in research and can be expected to have greater recognition in the future. An example would be the difference in studying digital divides in the access of social media, measured by subscribers per capita, compared to disparities in using social media for a specific purpose, such as marketing a consumer product, expanding one's professional network, applying for a job, or posting a photo or video. A final step in the progression is outcomes. What impacts or changes have come about as a result of use or purposeful use? Outcomes encompass most of the benefits of the technological activity, but are difficult to study, since an outcome is often delayed and sometimes intangible.

Methods that address the complexity and multiple dimensions of digital divides

As digital divide research has evolved over the past two decades, measurement of the divide has changed from narrow studies of access for a single technology indicator to studies incorporating indices of multiple dimensions of the divide, and to frameworks to explain the digital divide (Barzilai-Nahon 2006). The indices include the Networked Readiness Index (NRI) (WEF 2016), a group of five indicators tied to the UN Sustainable Development Indicators (UN 2015; ITU 2015; 2020), the Digital Divide Index (DDI) (Barzilai-Nahon 2006), several van Dijk models (van Dijk 2005; 2006; 2020) and the Spatially Aware Technology Utilization Model (SATUM) model (Pick & Sarkar 2015; 2016). These indices and models seek to capture the multiple dimensions of the digital divide concept. There is not yet any consensus on a leading or standard index or model. For the investigation of media geographies, these approaches give the researcher flexibility in choosing an approach. These models are all amenable to the inclusion of geography, but only the SATUM model includes geography as an endogenous component. The NRI, van Dijk framework and SATUM model are further explained in this chapter relative to media geographies.

The NRI originated at the World Economic Forum in 2001 and was expanded in 2012. The goal is to encompass a large set of dimensions of digital divide into a single index value, which can be applied for standardized comparisons between nations (WEF 2016). As seen in Figure 3.3, the model is divided into networked-readiness Drivers and Impacts. The index Drivers include infrastructure, affordability and skills, which broadly connote Access as stated earlier, while the usage connotes purposeful use of information and communication technologies by individuals, businesses, and governments – both within and between those

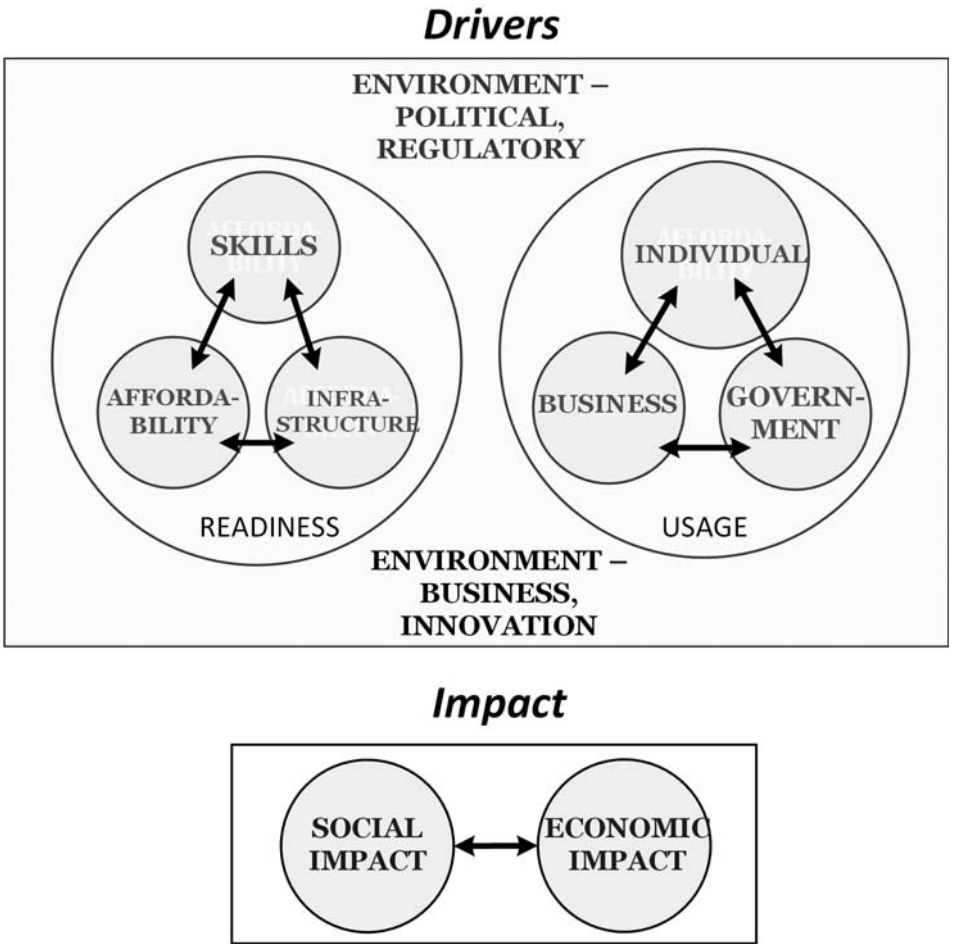

Figure 3.3 Networked readiness index framework

groups. An additional factor not referred to earlier is the NRI's Environment, which refers to the economic, regulatory, political and business macro environment, which influences the readiness and user of technology. Finally, the Impact of the Drivers is divided into economic and social impacts. The NRI has 53 specific indicators, with three to nine indicators comprising each of ten groups, eight of which are shown on the diagram as the grey circles (WEF 2016).

The NRI can be applied at the country level, and networked data were collected from international data sources and from WEF surveys from 2001 to 2016. The prominent NRI and its individual components have constituted a data source for digital divide research. The index has been criticized as not emphasizing and justifying the weighting assumptions for its 53 indicators. Although the WEF did not gather data for smaller units of analysis, the framework might be modifiable for use in studying provinces, cities and other micro units. Ideas from this framework can be useful in assessing the digital divides of media geographies, because many media types are instantiated by some or all of the 53 indicators.

The digital divide model of Jan A.G.M. van Dijk focuses on the individual unit of analysis, emphasizes inequalities and includes multiple constructs, some representing other units of

analysis (van Dijk 2005; 2020). The progression of steps for the individual to achieve digital capability follows the steps of motivation, material access, digital skills and usage (see Figure 3.4).

Motivation refers to the psychological motivators as well as inhibitors such as "computer anxiety," "technophobia" and stress. A positive attitude contributes to moving to material access, which includes affordable costs, and next to favorable technical characteristics which combine with resources to lead to use. By another route, material access leads to access to digital skills which encourage usage. The full model in Figure 3.4 also includes personal and positional characteristics which contribute to the resources. Positional categories of education, labor force, geographic unit and social network define the occupational, educational, social capital and geographic positioning of a person, which in turn influences resources. This model was utilized by van Dijk and others to survey and interview individuals about digital disparities. It has the advantages of focusing on the details of a person's motivation, behavior, skills and social positioning, while not being adaptable to larger geographic units of analysis such as counties or nations. It does include location as a positional characteristic so the model would need to be modified to more thoroughly incorporate geography.

The SATUM model consists of independent factors which are posited to be correlated with technology levels (Pick & Sarkar 2015). The independent factors include governmental, economic, education, demographic, societal openness, innovation and social capital attributes, or others known to influence the level of use of a media technology variable. The model can be applied at different geographic units of analysis, ranging from the individual to census tract

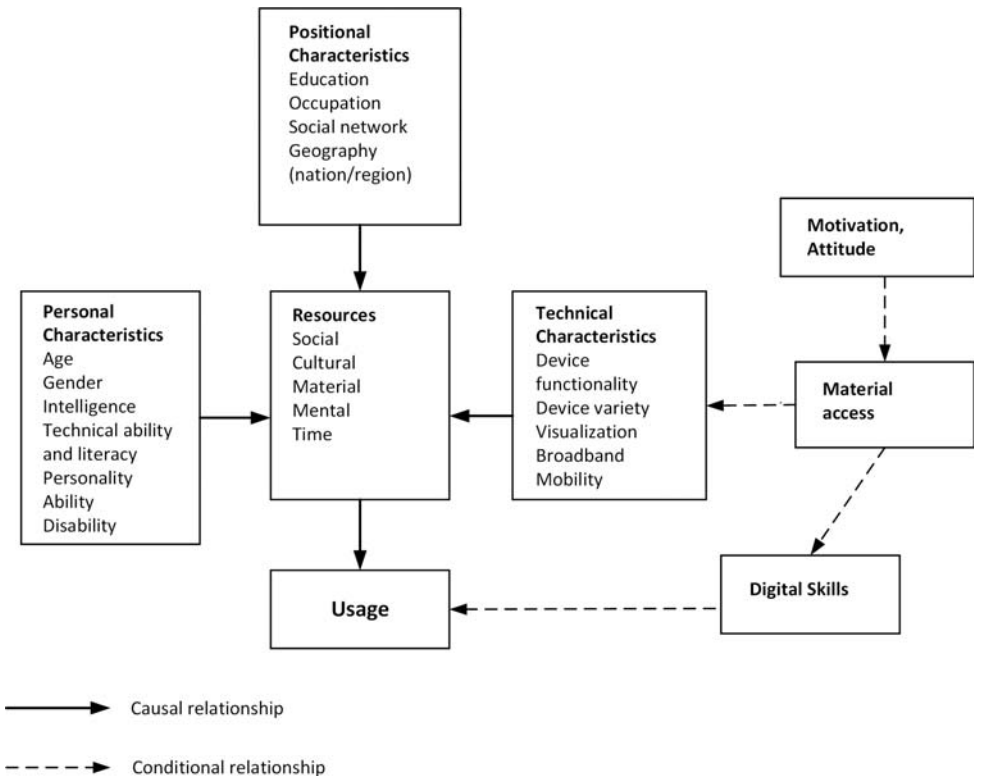

Figure 3.4 van Dijk model of divides of digital media use

all the way to small-scale units such as states/provinces and nations. Unlike the NRI and van Dijk model, the SATUM model implicitly includes mapping and spatial autocorrelation. As seen in Figure 3.5, SATUM performs OLS multiple regression to test models of determinants of levels of media access, use or outcomes, with spatial mapping and Local Indicators of Spatial Autocorrelation (LISA) testing (Anselin 1995) for both the dependent factors and residuals of the multiple regression. Accordingly, spatial bias can be addressed and adjusted for by including independent factors that account for geography. The model can be applied across the continuum of measures of digital divide, including access, purposeful use and outcomes. A weakness of this approach is that it assumes the relationships being studied are linear. Further the model is less suited for strongly behavioral studies at the individual level.

ICT trends worldwide

As shown earlier in Figure 3.2, internet penetration worldwide has steadily increased over the past two decades. This growth has been spurred by gradual improvements in fixed

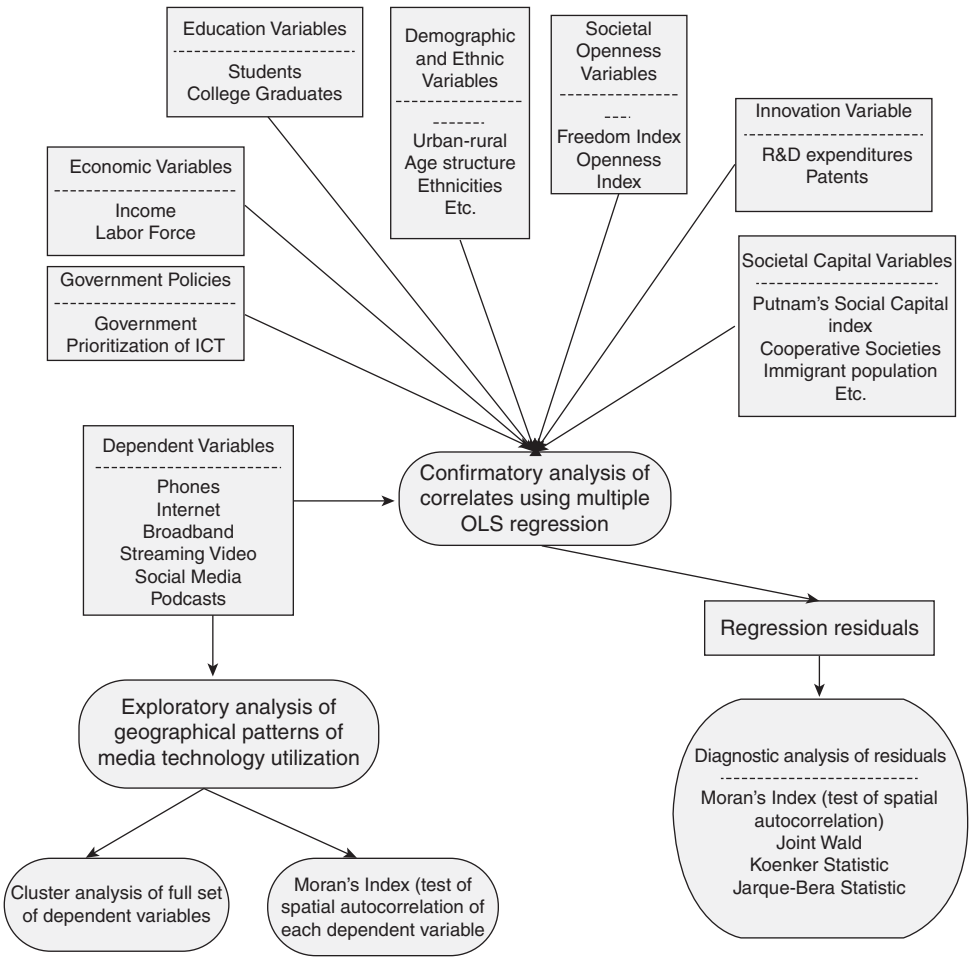

Figure 3.5 SATUM model of correlates of level of technology

infrastructure but more so in the rapid proliferation of mobile-cellular subscriptions, particularly smartphones, coupled with growth in mobile broadband availability. Compared to 2010, when there were 807 million mobile broadband subscribers with global penetration at 11.5 subscriptions per 100 inhabitants worldwide, mobile broadband subscriptions in 2019 reached 6,380 million, with a penetration of 83 (Figure 3.6).

Internet penetration gaps between the developed and developing nations continue to persist. In 2010, 21 individuals per 100 inhabitants used the internet in developing nations compared to 67 in developed nations. In 2019, the corresponding penetration rates were 47 and 87 respectively. Encouragingly however, the base of internet users has almost quadrupled over the past decade in the developing world, from 811 million in 2008 to 3,020 million in 2019, accounting for almost three-quarters of all internet users worldwide.

Mobile-cellular penetration gaps have however narrowed since 2010 between the developed and developing worlds. In 2010, there were 69 mobile-cellular subscribers per 100 inhabitants in the developing world compared to 113 in the developed world. The penetration gap narrowed respectively to 104 and 129 in 2019, yet a substantial gap remains. Similar to internet users, almost 80 percent of all 8.3 billion mobile subscriptions in 2019 are in the developing world, compared to 55 percent in 2005. Except Africa, where there were 80 mobile cellular subscriptions per 100 inhabitants, all other world continental regions exceeded 100 percent saturation levels by 2019. It is pertinent to note here that since mobile-cellular users may possess multiple devices, subscribe to multiple services, or use

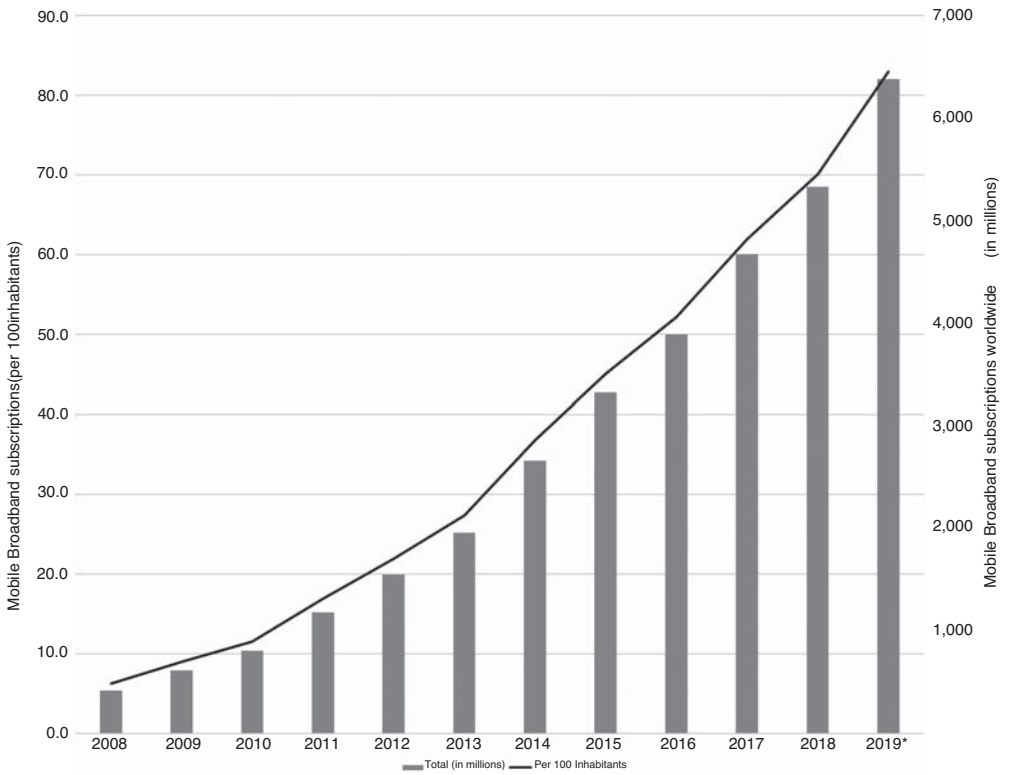

Figure 3.6 Mobile broadband subscriptions and penetration worldwide, 2008–2019

multiple SIM cards for a single device, mobile cellular penetration rates per 100 inhabitants exceeded 100 globally, for both developed and developing nations, in 2019.

The narrowing of the gap in mobile broadband penetration has kept pace with that of mobile cellular penetration. In the developed world, mobile broadband penetration improved approximately three-fold from 45 per 100 inhabitants in 2010 to almost 122 in 2019. The improvement was starker in developing nations where penetration increased from a paltry 4.5 active mobile broadband subscriptions per 100 inhabitants in 2010 to over 75 in 2019. Unlike mobile subscriptions, mobile broadband subscriptions lag in both Africa and the Arab world spanning the Middle East and Sub-Saharan Africa. At 34 mobile broadband subscribers per 100 inhabitants in Africa in 2019, mobile broadband technology holds promise for Africa and the developing world to leapfrog fixed technology and related infrastructural malaise and gradually improve connectivity and bridge digital disparities in this and other developing world regions.

Digital divides of the media

In this section, digital divides as they relate to media geographies are analyzed from several perspectives. The question of free versus paid access for media use relates to digital divides. This is further influenced by international cultural differences in media types and uses. The section finishes with a mini case study in which a radio organization, faced with the COVID-19 pandemic, had to make choices related to the potential to narrow the digital gap.

The prevalence of free versus paid access for some forms of media raises questions of digital inequalities. In key markets in six major nations (US, China, India, Germany, South Korea and UK), a preponderance of news audience (over 80%) and entertainment audience (over 90%) are listeners, viewers or readers of at least 24 hours per week of media (WEF 2020). Moreover, the overall percent of free uses is over 80% for news and over 56% for entertainment. For this massive base of free users, the access and use barriers of the digital divide are largely overcome, so the digital divide focus moves to purposeful use and outcomes. For the base of paid users, there may remain significant barriers to use. For example, a paid digital subscription for *The Economist*, one of the foremost economic and political news outlets, includes, beyond free content, access to entire print editions, online articles, audio editions, daily/weekly newsletters and an archive of over 100,000 articles. Accordingly, the smaller paid audience can be viewed as a source of digital inequality.

A mini-case study illustrates how the balances of equality of usages, geography, demography, cost to the consumer and tradeoffs to the media organization influence a media digital divide. The case involves an anonymous public radio organization, some details of which have been changed to protect their identity. The public radio organization, anonymously referred to as PRNEAST, serves a metropolitan area in the US Northeast and has been sustained mostly by membership contributions at varied levels as well as by underwriting from corporations. For five years, PRNEAST had been transforming from traditional fixed-schedule radio programming of news and music to a mixed format of traditional programming combined with digital offerings such as streaming of some music and initial local news podcasts. The organization had formed a new unit for internet, web and podcast innovation and production. PRNEAST served a traditional older radio audience and diverse younger internet-savvy audience located in fairly distinctive geographic areas within the metropolitan area.

Pre-COVID-19, PRNEAST had the choice to keep this mixed format or to go to a fully online platform, dropping traditional radio programming, which would appeal to its younger

listenership but considerably reduce older listeners. It stayed with the mixed format. When the COVID-19 pandemic struck in March of 2020, the new unit's online news services had a tremendous surge of over five-fold in listenership across a wide age range and with extensive geographical reach, providing critical information to homebound individuals and families, hungry for local news, especially in the initial three-month exponential growth of the pandemic. At the same time, PRNEAST had to downsize and deal with reduced membership and underwriting contributions in the pandemic-induced recession, while trying to preserve its digital capabilities. Pre-COVID, if PRNEAST had chosen to go to an entirely online platform, it would have experienced a more severe financial loss during the COVID pandemic, because it would have lost many older members and undermined its base of affluent donors. However, on a generational timeframe, PRNEAST will eventually have to face dropping much of its traditional radio programming—and fortunately it did not go out of business during the pandemic.

This mini-case demonstrates how the balance of digital media usage can be jolted into a narrowing of the digital divide by an emergency, how user geographies may be expanded as a consequence and how a media organization can likewise be transformed to put more emphasis on widespread free services while taking a financial hit.

Social, economic, political determinants of digital divides

As reflected earlier in the SATUM model in Figure 3.5, a variety of demographic, economic, social and political factors have influenced access, adoption and utilization of information and communication technologies (ICTs). In the vast digital divide literature, the roles of these factors in explaining digital divides in varying degrees has been examined in multiple contexts—for varied geographies, populations and extents of human development.

Among demographic determinants, important factors are age structure, gender, educational attainment, race/ethnicity and place of residence. All over the world, technology adoption and use are more prevalent among younger populations, particularly the youth. For example, in the United States, in November 2019 (NTIA 2020), 85 percent of those in the age group 15–24 years used the internet compared to 68% among those aged 65 and over. In 2010, the corresponding proportions were 86% and 45% respectively, indicating that the age-based digital divide has shrunk over time, yet significant disparities still remain. For particular types of internet use, these differences are starker. For example, 53% of those aged 65+ use the internet for social networking compared to 88% of those aged 15–24 years. In contrast, only 27% of those aged 65+ use the internet for streaming or downloading music, radio or podcasts, compared to 78% of those aged 15–24 (Pew 2019b; 2019c).

Gender-based differences in internet use often stem from historically patriarchal societies, such as in the Middle East and parts of Asia and Africa. Race/ethnicity-based differences are observed in both developed and developing nations. For example, African Americans have historically trailed Whites in internet use in the United States (76.5% compared to 83.1% in 2019, and 66.5% compared to 78.8% in 2010) (Pew 2019a). Prior digital divide research has consistently explained such race-ethnic disparities as stemming from the groups' differential social positions, particularly relating to income and educational attainment (Campos-Castillo 2015). Such disparities are often exacerbated among African-American and Hispanic households with lower incomes living in rural areas with inadequate access to computers and unreliable broadband connectivity. Educational attainment also plays a defining role in digital disparities, with college-educated populations often exceeding those with high school diplomas in internet use and in general in the use of digital media. Lastly, the increasing extent of

urbanization worldwide often magnifies urban-rural digital disparities. In rural Japanese prefectures, both internet and social media use were found to lag considerably behind those of large megacities such as Tokyo and its surrounding areas (Nishida et al. 2014). In the United States, urban users have a higher intensity of internet use to access online entertainment (watching videos online, streaming digital content online) compared to their rural counterparts, with a per capita gap of 10% in 2019. Infrastructural malaise in rural areas coupled with lower levels of income and educational attainment offer explanations for urban-rural digital disparities. Physical social interconnectedness at the community level, often measured by social capital, bridges digital gaps between those who have access to digital technologies such as the internet and possess related skills, and those who do not. Rural people may enjoy richer non-technology socializing, which might differ by life cycle stage—these are questions calling for future behavioral research.

Among economic factors, the role of income has been explored extensively in explaining global digital divides. Greater personal income is found to make technology more affordable for individuals, while higher national income enables communities, businesses, governments and individuals to invest in ICTs leading to higher per capita use (Pick & Sarkar 2015). Income is part of the well known, inter-correlated income-education-urbanization triad, and the roles of these interrelated factors have been explored by digital divide researchers and policy experts to shape policies to bridge ICT access and usage gaps.

Among notable social factors influencing digital divides are social capital and societal openness. Social capital, often thought of as the social interconnectedness of communities, has been increasingly found to be associated with ICT access and use including digital media. For example, in the United States, bonding social capital (i.e. social capital with strong personal ties) was found to be moderately associated with internet access and intensity of online communications (Chen 2013). Recent studies have found social capital to be associated with technology access in both technologically advanced and emerging nations such as the United States and India (Pick & Sarkar 2015). In the United States, social capital has been found to be positively associated with internet usage and broadband access in the household, and also with the use of Twitter. Oftentimes, social interconnectedness that is part of social capital facilitates access to ICTs including digital social media, and at other times puts those without the technology expertise and know-how in contact with those who are tech-savvy. This bridges the knowledge gap and provides training in an amenable social setting.

Among political factors, internet censorship has been examined especially in those contexts where authoritarian regimes resist democratic norms and often censor internet use (Warf 2011). Internet censorship restricts the free flow of information, curtails electronic communication between people and impedes societal openness.

Country and regional examples

Studies of the digital divide investigate digital patterns and disparities at various units—at the levels of individuals, businesses, households and geographic areas such as nations, national agglomerations, regions, states or provinces. Studies are often based on population and internet censuses conducted by national governments, with facts and figures reported at diverse levels of geographic resolution. One common unit of analysis is the state or provincial level. In this section, we first provide results from recent research into the digital divide in the United States at the state and county levels. Then, as a contrast, we present national comparisons of ICT adoption and utilization from two different parts of the world—Latin America and the Caribbean, and Africa. These major world regions account for almost 1

billion internet users as of May 2020 (Internet World Stats 2020) and have experienced the highest growth in the population of internet users since 2000, outside of the Middle East. Yet, alongside Asia, internet penetration (users as percent of total population) is among the lowest when compared to other world regions, representing major frontiers of the global digital access and use divide.

As an advanced digitally connected nation, the digital divide discourse in the United States has gradually evolved and shifted its focus from ICT access to purposeful usage. This is not to say that access gaps have been completely bridged. Lack of internet availability and inadequate access to computers in the household are among the main reasons for no online connectivity in some parts of the country. Yet, as smartphones have proliferated and mobile broadband penetration has increased, the spectrum of online activities among American internet users has grown and diversified. Americans use the internet to access education and entertainment, undertake financial transactions and purchasing activities such as e-commerce, access services and health-related information, work remotely, effect electronic communication including social networking, and connect with household devices embedded with sensors. For example, Figure 3.7 shows spatial patterns of internet use by Americans to watch videos online (2017).

It is evident from Figure 3.7 that the Rocky Mountain States and the West Coast states have some of the higher per capita use of the internet for e-entertainment purposes, while usage lags significantly in the Southern states and Appalachia—a region that has previously lagged in internet access as well. Surprisingly though, spatial patterns of internet use for social networking (Figure 3.8) show moderate to high intensity in the Southern states, sometimes slightly surpassing the digitally advanced states on the Eastern seaboard. Zooming in further, a recent study has found evidence that the major determinants of social media use in US counties are demographic factors, service occupations, ethnicities and urban location (Pick et al. 2019). These contrary findings—that social media use is moderate to high in rural areas of Southern states while urban location is positively associated with social media use, can be reconciled by observing that high social media use in traditionally rural areas (counties shown in grey) is often spurred by the presence of "tech islands" (counties shown in black) such as universities, medical and research institutions, and military installations, as shown in Figure 3.9. The four categories are comprised of statistically significant hotspots (High-High category—a county with high levels of social media use surrounded by similar high use counties), coldspots (Low-Low category) and outliers—a county with high levels of social media use surrounded by counties with low levels of social media use (High-Low), and vice-versa.

Compared to the United States, Latin America and Africa present significant contrasts. In Latin America and the Caribbean, English is often not the dominant local language and poses a language barrier for internet adoption and diffusion. In fact, a recent study (Pick et al. 2020) found that the factors "English as a primary language," "human development" and "civil liberties," influence ICT adoption and use in this world region, indicating socio-economic, language and societal openness dimensions of the digital divide here. The language barrier in the Latin American ICT landscape is being overcome by the development of web content and apps in Spanish, Portuguese and other native languages. This has spurred continued growth of social media in Latin America where Facebook penetration (63.4% in 2020, Internet World Stats) only lags behind North America (68.5% in 2020, Internet World Stats) among world regions. Figure 3.10 shows spatial patterns and agglomerations of Facebook penetration in Latin America and the Caribbean in the period 2013–2015. Despite the worldwide popularity of Facebook, other social media platforms such as WhatsApp and

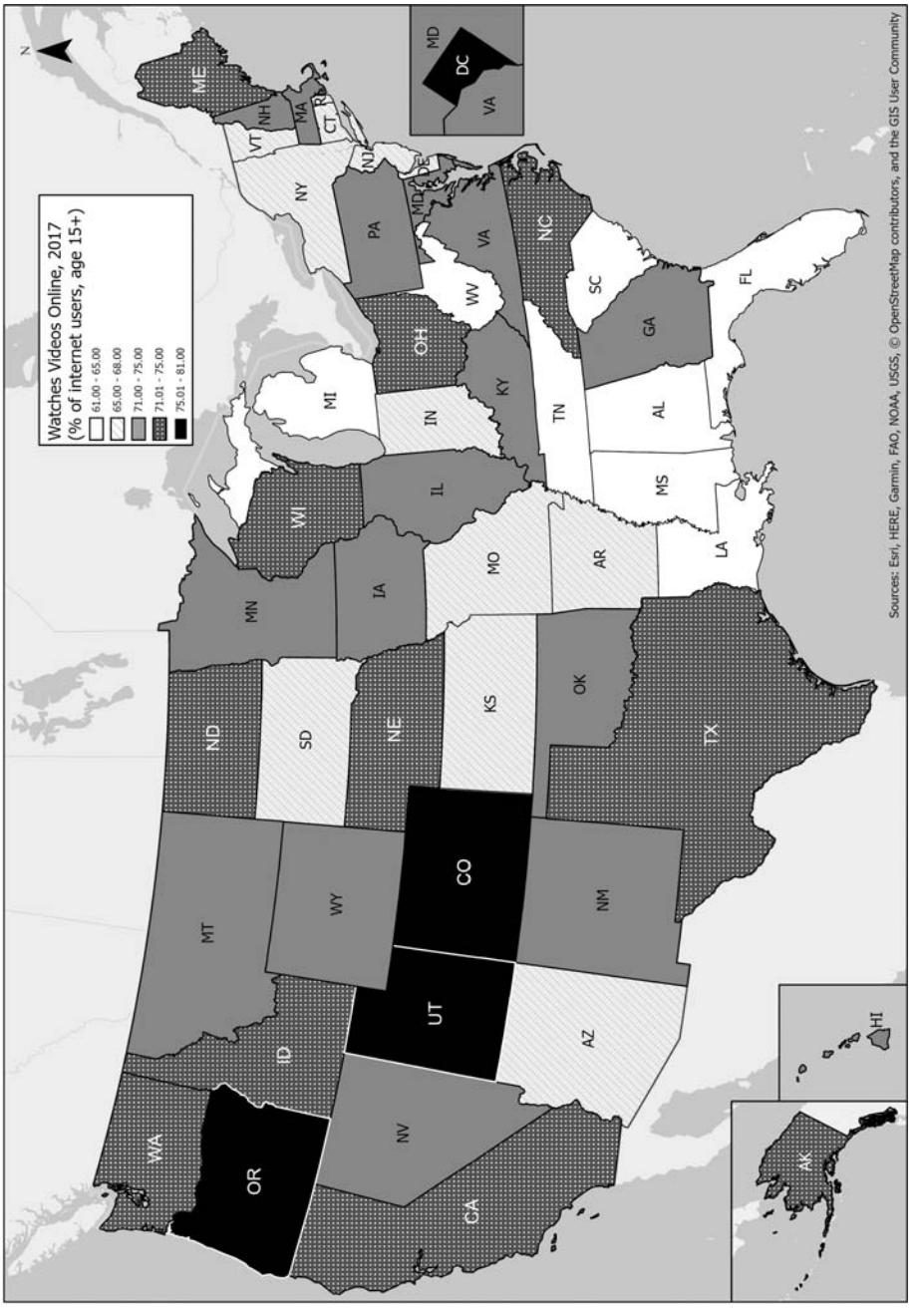

Figure 3.7 Internet use to watch videos online, United States, 2017

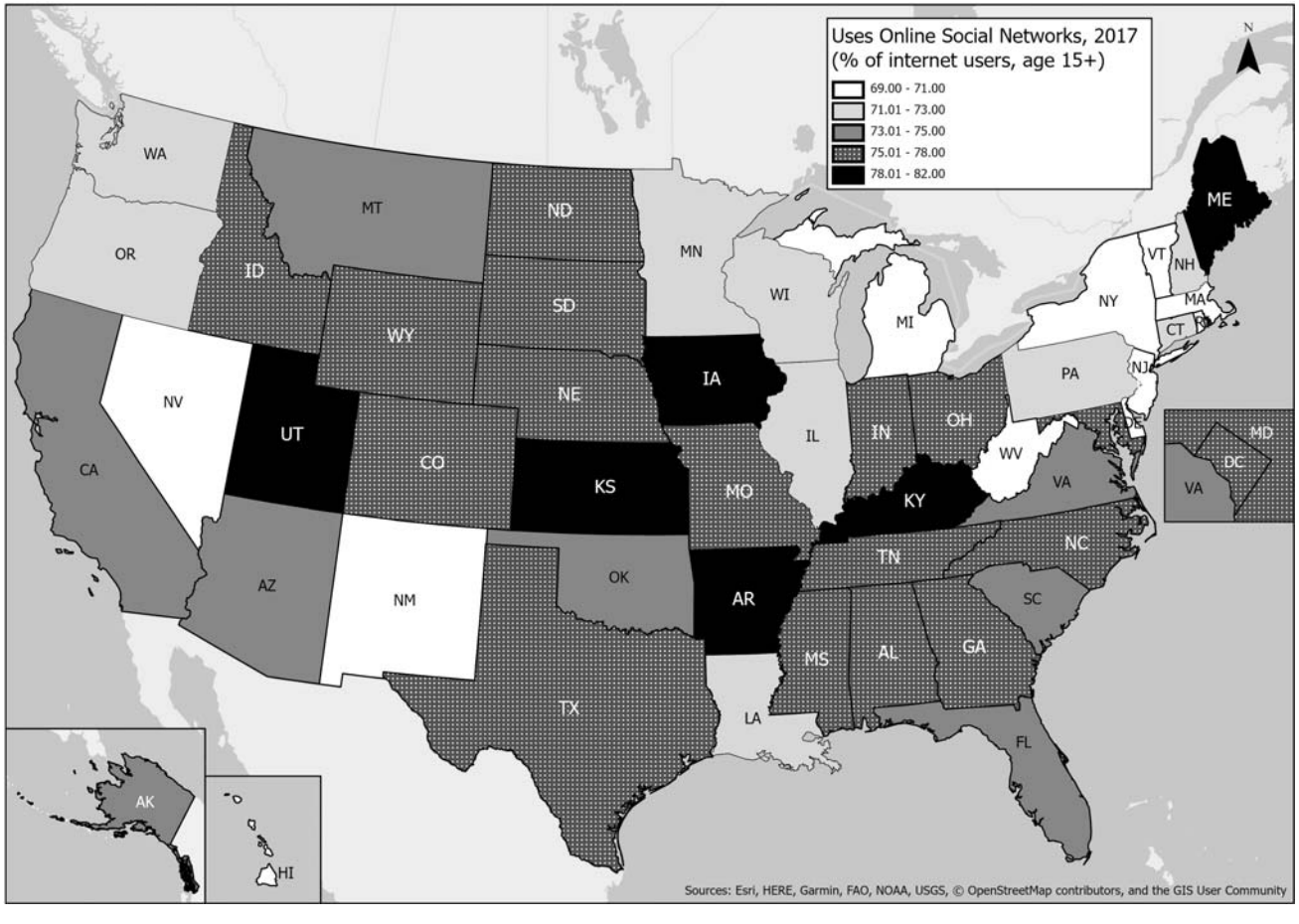

Figure 3.8 Internet use for social networking, United States, 2017

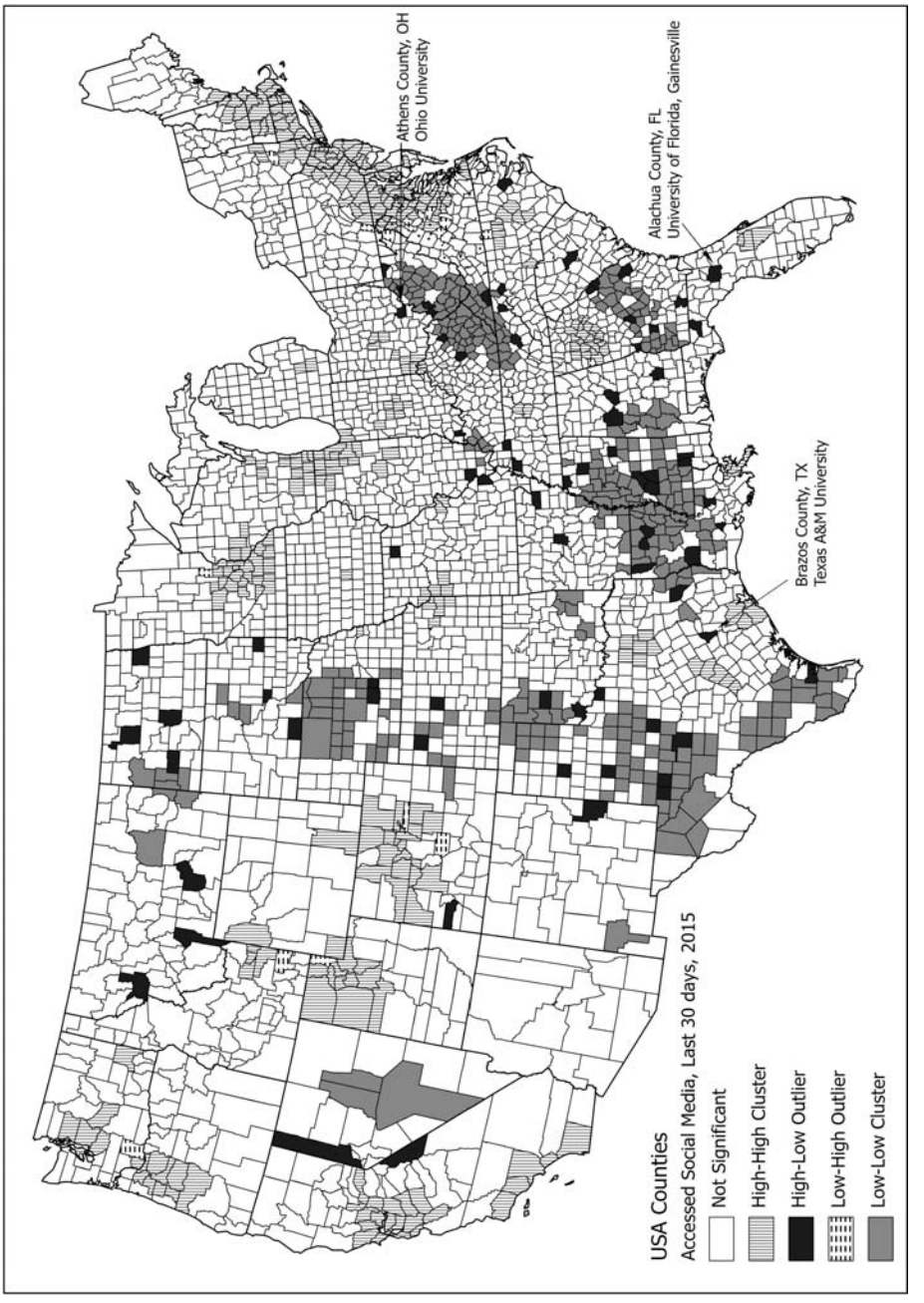

Figure 3.9 Internet use for social networking, United States counties, 2015

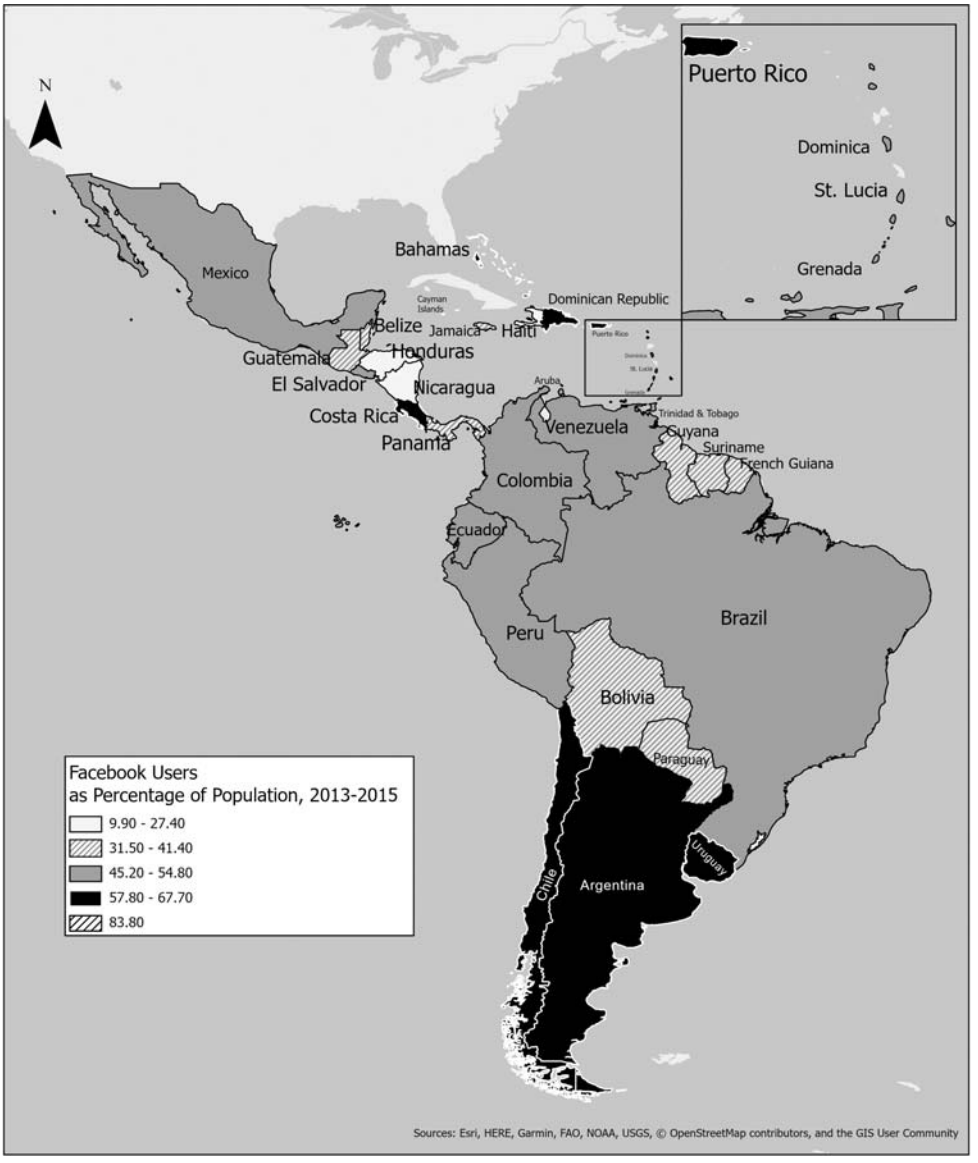

Figure 3.10 Facebook penetration, Latin America and the Caribbean, 2013–2015

WeChat have surged in prominence and use and are likely to provide a more comprehensive measure of global and regional ICT development.

In contrast, social networking in Africa, in particular Facebook penetration, is the lowest among all world regions (Internet World Stats 2020), much like overall internet penetration. As internet penetration in Africa catches up other world regions, mobile-cellular and mobile broadband subscriptions per capita in Africa continue to lag significantly behind. This presents impediments for bridging Africa's digital divide compared to the rest of the world. Within Africa, prior studies have found North Africa (Egypt, Libya, Morocco and Tunisia)

and some southern African nations (Mauritius, South Africa, Seychelles) to be ICT leaders, while western, central and large parts of sub-Saharan Africa are at the low end of the ICT utilization spectrum.

A study of Africa has also revealed that laws that relate to the use of ICTs are a dominant predictor of all forms of ICT utilization. The effectiveness of a national parliament/congress as a lawmaking institution has been found to be significantly associated with modern (broadband) as well as legacy forms (fixed telephones) of ICT (Pick & Sarkar 2015). This is consistent with prior literature which stresses the need for national governments in Africa to frame ICT sector policies for investment, privatization, deregulation and providing access in underserved areas.

Digital divides and government policies

Digital divides, including for media, can be influenced by government policies at the international, national, state/province and local levels. Governments can set goals and regulations that favor greater or lesser equality of access and use, influence the openness of content, provide resources to support infrastructure, training and education, or implement fair access rulings. Nearly all these issues are controversial, so the goal of this section is to raise the issues and opportunities for governments to influence the digital divide, but not to advocate a uniform solution.

Since the advent of the World Wide Web in 1991, national governments worldwide have struggled with the issues of internet openness, costs and privacy as seen in early comprehensive studies (National Research Council 1991). The internet grew in importance, and it was recognized as a human right by the UN in 2016 with the addition of Article 19 to the Universal Declaration of Human Rights (United Nations 2020), which states: "Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive, and impart information and ideas through any media and regardless of frontiers" (UN 2016).

Although established as a UN worldwide goal, nations have taken their own approaches; for instance since 2013 China has had a strong policy of internet censorship which restricts the viewing of censored information online and actively monitors microblogs, social media and messaging for information it considers threatening to the state (Economy 2018; New York Times 2019). An in-depth study (Zittrain et al. 2017) found that state-sponsored filtering and censoring of internet information were widespread in 26 nations, although it takes different forms, and a censoring government often shifts over time which content sources are being censored. The impact on the digital divide for media is that in many circumstances worldwide, even though access is widely available, some purposeful uses are barred, which restricts societal outcomes. It is important to mention that 80 percent of the world's national governments do not have censorship policies, encouraging the flow of information and offering the opportunity for deprived segments of the population across wide geographies to benefit from media technologies.

In the US, at the advent of the web in the early 1990s, it was an open platform. Jumping forward to the past 12 years, there have been shifts that relate to broadband access and net neutrality policies. In the Obama Administration, starting in 2009, the internet policy was to extend broadband access to technologically disadvantaged segments of the population through infrastructure investments and training (Obama White House Archives 2013; ICT Monitor Worldwide 2016). The Administration also sought to establish a federal policy of net neutrality, which was designed to prevent Internet Service Providers (ISPs) from

discriminating on delivery of internet content, equalizing access for all constituents, ranging from individuals to large corporations. Although the internet rollout to the disadvantaged had moderate success, net neutrality was approved and implemented by the Federal Communications Commission in 2015. In contrast, the Trump Administration shifted the thrust of its internet policy to emphasize rural broadband infrastructure (FCC 2020), while the FCC reversed course and overturned net neutrality in 2017, although California and some other states have since restored it. The Biden Administration supports providing broadband infrastructure to communities nationwide that have endured limited access to it.

The fits and starts in government policies and support have contributed to an uneven geography of broadband in the US and to regional inconsistencies about net neutrality. This uneven fabric has resulted in digital divide disparities at the county level. Accordingly, policymaking that influences digital divides in the US is partly done by metropolitan, county and state governments. At the county level, policies suggested by two studies (Sarkar et al. 2018; Pick et al. 2019) were the following: seek to establish free public broadband capabilities; support training programs for technologically deprived citizens; encourage citizens to leverage education and training to the next step which might be hiring or transfering into a job that centers on technologies including media; attract professional, scientific and technical workers; and support ways to broaden social capital and social networks that emphasize IT including media technology and its content production.

Summary

The COVID-19 pandemic has renewed attention on the digital divide. In much of the developed world, disparities in ICT and media access have steadily waned, particularly as smartphones have proliferated and mobile broadband connectivity has become ubiquitous. Yet, as the pandemic shuttered businesses and schools worldwide, millions transitioned to remote working, video conferencing and remote learning. Healthcare practitioners and patients transitioned to telehealth; millions of people shifted to live-streaming and podcasts for entertainment and the news, while millions of others expanded their social media presence. Consumers shopped with mobile apps for household supplies and essentials online. All these online activities imposed unprecedented demands on access to technologies as well as digital infrastructure even in developed countries.

In many metropolitan areas across the United States, school districts scrambled to provide laptops, tablets and portable hotspot devices to students in impoverished communities in their districts. For students in rural areas, similar challenges became an impediment to continuing learning and participating in schoolwork. Apart from the homework gap (Vogels et al. 2020), lower-income Americans also expressed concern about their ability to pay for a smartphone and digital media services, due to large-scale loss of employment reflecting underlying economic disparities that exacerbate digital divides. Unprecedented demand on bandwidth due to remote working, video conferencing, streaming and the sudden surge in demand to consume online entertainment and news has also slowed broadband speeds in many parts of the United States (Broom 2020). In the developing world, already existing access gaps became even more pronounced as households struggled with loss of employment, high data costs (in Africa) and unreliable digital infrastructure. In some nations such as South Africa, national governments remediated cost-related issues by making their COVID-19 website free of charge, with no data or airtime required, and local broadband providers doing the same for educational websites.

As governments, organizations, businesses and economic areas tackle the lack of internet and video conferencing skills, address gender disparities among digital communities, and improve fixed-broadband infrastructure and global internet penetration to meet the United Nations Sustainable Development Goals as part of accelerating human development worldwide, the pandemic is renewing attention on the existing dimensions of the digital divide and on pre-pandemic policies that had been formulated to bridge gaps in access and use of digital media and information.

Additional research is required to examine how such policies fared during the pandemic and what weaknesses and strengths have emerged as the pandemic recedes. As internet service providers all over the world experienced tremendous surges in demand due to teleworking, distance education and voracious consumption of e-entertainment content, it is essential to understand how existing regulations contributed to or relieved network stress. This will help inform additional regulatory actions and policy interventions that might be required in the post-pandemic world to best assist people who might continue to remain on the fringes of a global, networked society, or perhaps have now been pushed to the fringes. These are a handful of the issues that challenge digital divide researchers and policy experts. As the fallout from the COVID-19 pandemic continues to emerge worldwide, the value of information and digital media and the impacts of the digital divide have come to the forefront. It remains to be seen what the pandemic and the hurried public policy responses to it have taught us about information and media policies in the US and elsewhere.

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