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Digital inequalities and why they matter

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While the field of digital inequality continues to expand in many directions, the relationship between digital inequalities and other forms of inequality has yet to be fully appreciated. This article invites social scientists in and outside the field of digital media studies to attend to digital inequality, both as a substantive problem and as a methodological concern. The authors present current research on multiple aspects of digital inequality, defined expansively in terms of access, usage, skills, and self-perceptions, as well as future lines of research. Each of the contributions makes the case that digital inequality deserves a place alongside more traditional forms of inequality in the twenty-first century pantheon of inequalities. Digital inequality should not be only the preserve of specialists but should make its way into the work of social scientists concerned with a broad range of outcomes connected to life chances and life trajectories. As we argue, the significance of digital inequalities is clear across a broad range of individual-level and macro-level domains, including life course, gender, race, and class, as well as health care, politics, economic activity, and social capital.

Keywords: computer-mediated communication; digital divide; gender; race; ehealth

Digital inequalities: a call to action

The causes and consequences of inequalities are staples of social science research. Investigations of traditional axes of inequality such as race, class, and gender are at the heart of much social science inquiry and will remain such for some time to come. However, as the information

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society has evolved, new forms of inequality have surfaced alongside these long-standing forms of inequality. Digital inequality is one of the most prominent of these new forms, as it has the potential to shape life chances in multiple ways. Even though we are only at the dawn of the digital age, digital inequality has already gained a foothold and will continue to make its presence felt across many arenas of contemporary society.

In this article, we argue that digital inequality deserves a place alongside more traditional forms of inequality in the twenty-first century pantheon of inequalities. Digital inequality should not be only the preserve of specialists but should make its way into the work of social scientists concerned with a broad range of outcomes connected to life chances and life trajectories. It is increasingly clear that individuals' digital engagements and digital capital play key roles in a range of outcomes, from academic performance to labor market success to entrepreneurship to health services uptake. Those who function better in the digital realm and participate more fully in digitally mediated social life enjoy advantages over their digitally disadvantaged counterparts – a key linkage which social science is only beginning to grasp. Just as digital differentiation has implications for the substantive study of stratification writ large, it also is becoming a critical methodological issue. With the advent of internet-based data gathering, which often seeks to extrapolate conclusions to expansively defined populations, the extent of digital exclusion matters for research on topics as diverse as health and political participation.

As the internet matures, forms of digital exclusion proliferate. First-level digital disparities in access are joined by digital engagement gaps, chasms between content consumers and producers, and disparate forms of participation in the high-tech economy. First-level digital disparities still exist, even in developed countries such as the United States; according to Pew, some 14% of American adults still do not use the internet as of 2014. Second-level digital inequalities such as those related to skills, participation, and efficacy affect an even greater proportion of the population, even those nominally considered 'users'. As the internet is ever more seamlessly integrated in everyday routines, forms of disadvantage themselves mutate.

To study these forms of disadvantage, it is essential to take into account the social, economic, and cultural contexts of digital engagements. It is by now well understood that digital inequality and exclusion cannot be analyzed apart from the offline circumstances of individuals and groups and that specific forms of digital exclusion map onto particular kinds of offline disadvantage. From a more theoretical perspective, the very notion of digital differentiation is undergoing intensive scrutiny, as scholars reexamine the ways digital technologies are embedded in socio-technical networks to generate various kinds of (dis)advantage.

Digital inequalities continue to combine with race, class, gender, and other offline axes of inequality. Even in countries with high levels of smartphone adoption, basic access to digital resources and the skills to use them effectively still elude many economically disadvantaged or traditionally underrepresented segments of the population. Groups disadvantaged in offline terms may use the internet less intensively than their more advantaged counterparts. Research has established that race and ethnicity (Mesch & Talmud, 2011), gender (Ono & Zavodny, 2008), and socio-economic status (Witte & Mannon, 2010) can be determinants of internet usage and proficiency (Stern, Adams, & Elsasser, 2009). Thus, digital inequalities can reinforce existing social inequalities and even exacerbate them because they carry over preexisting differences in human capital into online settings (DiMaggio & Garip, 2012). Yet, we are also seeing the crystallization of distinctively digital disparities cutting across preexisting offline divisions such as participation or types of engagement.

Emergent disparities have implications not only for our general understanding of inequality but also for all social research which treats individuals' digital footprints as evidence generalizable to large aggregates of individuals. Thus, we also argue that to the extent that some individuals

leave no or little trace in the digital realm, studies which attempt to extrapolate from findings about highly connected individuals must take seriously the unequal distribution of digital resources within their study populations.

The authors contributing to this article all take as their starting point the contention that one cannot understand the social landscape of the twenty-first century without coming to grips with digital inequalities. Differences in individuals' digital engagements warrant close scrutiny in social research across a broad range of substantive areas, including the life course, gender stratification, racial stratification, economic stratification, and health and health care.

The life course

Digital inequalities surface at many points during the life course, leading to online and offline consequences we have only begun to grasp. Given the growing pervasiveness of digital resources throughout the life course, the consequences of digital differentiation from childhood to old age are both consequential and worthy of scrutiny. Social science has an important job to perform in generating more insights into the character of these inequalities and laying the groundwork for future inequality-mitigating interventions.

Increasingly, the digital footprint gap is widening between more and less connected populations, particularly among children. This has taken place because of the explosion of social media use by parents' social media communications about their children. In these families, the day-to-day lives of babies and infants are broadcast to other parties and sometimes the world at large, often without the knowledge or consent of the child. Such radical transparency is unknown in less connected families, including those lacking internet access and/or facility with social media sites. To what extent children in these highly connected families develop differently than their less connected peers is still unclear.

As the media would have it, digital inequality does not exist for children and adolescents, all of whom stay glued to their smartphones 24/7 and navigate the digital world with ease. Such a picture does not jibe with reality. In fact, there are significant variations among children and adolescents in terms of access, usage, and skills. Cotten, Davison, Shank, and Ward (2014) have shown that there is substantial variation in skill and usage among youth in the United States. By the time they reach middle school, some American children enjoy better access to digital resources than others, a gap which has several consequences for their digital engagements. In contexts where there is substantial economic disadvantage and institutions demand that youths engage with online resources, youths lacking adequate access are compelled to ration their screen time, often depriving them of opportunities to develop the kinds of valuable web skills which their less constrained peers enjoy (Robinson, 2012, 2011). At the same time, some students with unrestricted access spend so much time on nonacademic online activities that they neglect their studies: thus, the finding that excessive exposure to online content over three hours per average day actually harms academic performance for middle-school students (Mesch & Talmud, 2011). The long-term effects of these differences in daily internet engagements are as yet unknown, but they may well be significant.

Digital inequalities assume different forms during the young adulthood phase when individuals enter the workforce. For those individuals who take up positions in the white-collar world, increasingly digitized workplaces favor more tech-savvy workers. At the same time, joining the workforce can entail struggling to manage one's digital engagements, which can threaten to colonize more time and energy than one can spare (Chesley, 2014). Both white-collar and blue-collar workers can find it challenging to maintain boundaries between work and other life realms, given the omnipresence of the internet. Many workers are constantly encountering the distractions of cross-realm internet activities, whether it is their Facebook page at work or their work emails

at home (Berkowsky, 2013). Such cross-realm shifting can breed stress and other negative effects. Thus, a new form of digital inequality comes into being at this stage; individuals who can master multiple ongoing flows of digital information acquire an advantage over their peers who struggle to manage these information flows.

Reaching mid-life, the 'sandwich generation' (Chisholm, 1999) is responsible for both young children and elderly parents. For those who can make effective use of digital resources during this life stage, caretaking burdens can be eased. Maintaining constant contact with dependents becomes easier through the utilization of social media and even remote sensing technologies mediated through online platforms. To the degree that caretakers can deploy digital technologies effectively, they can stretch their scarce resources of time, energy, and attention more effectively. On the flip side, those who cannot avail themselves of these resources may fall behind as they fritter away their time and energies without the help of digital technologies.

Finally, as individuals move into retirement and older age, they run the risk of losing out on the myriad benefits afforded by effective digital engagements. For those who fall on the wrong side of the senior digital divide, typically older, less educated, and economically disadvantaged seniors, using online channels to keep in touch with caregivers is beyond their ability. More tech-savvy seniors, typically those who are younger, more educated, and have more economic resources, reap many benefits when they deploy their online skills in order to keep these channels of communication open (Cotten, Ford, Ford, & Hale, 2014).

Gender

Earlier research on gender and digital inequalities focused on identifying gaps and differences. More recent studies try to explore the mechanisms which underlie these differences and explore the consequences for outcomes such as building social capital, employment opportunities, and educational attainment.

Are women using computers, the internet, and mobile devices to the same extent as men? Evidence gathered from developed countries has shown that the gap between men and women has closed in terms of internet access (Blank & Groselj, 2014; Ono & Zavodny, 2003). The diminishing access gap does not imply a level playing field because gender gaps remain with respect to the range of activities that people perform when online. Compared to men, women have lower frequency of use (Wasserman & Richmond-Abbott, 2005); lower intensity of use (Hargittai, 2010); narrower range of online activities (Haight, Quan-Haase, & Corbett, 2014); and lower likelihood of reporting strong internet skills (Hargittai & Shafer, 2006).

The focus on gaps, however, has obscured more fundamental issues. Recent studies have tried to uncover some of the mechanisms which inform these differences and to explore the consequences for outcomes such as building social capital, employment opportunities, and educational attainment. These studies have exposed gender disparities with regard to the form of digital engagement among internet users. Recent evidence suggests that digital inequalities intersect with gender in two primary ways: (1) through the gendering of skills and content production patterns and (2) through gendered labor market processes associated with jobs involving technology. Both of these processes warrant further investigation.

First, our behavior online is an extension of broader social roles, interests, and expectations existent in society. Women are more likely to use the internet for communication and social support (Cotten & Jelenewicz, 2006). This is not surprising from a sociological perspective, as users' behavior online is an extension of those social roles, interests, and expectations which organize social life in the offline world (Colley & Maltby, 2008). Indeed, the gender stereotyping present in the offline world can appear in exaggerated forms in online environments. Robinson (2007) documents how the gender identity of users was exaggerated in multi-user domains to

resemble 'the types of physical bodies idealized in the offline world' (p. 99). Characters that were created in this virtual environment were typecast into rigid gender stereotypes: 'Male characters accentuate(d) aggressiveness, while female characters acquire(d) passive and diffident demeanors' (p. 99).

Second, women are more likely to underestimate their online skills and abilities compared to men. A gendered gap in self-perceptions is evident even among those internet users who develop objectively strong skills (Hargittai & Shaw, 2015). Women are more likely to underestimate their online skills and abilities compared to men. Even when men and women do not significantly differ in their actual online skills, women judge their own skills more modestly than their male counterparts (Hargittai & Shafer, 2006). Deficiencies in online skills, even if they are self-identified, are alarming because they can have real consequences for online behavior.

Third, even though women adopt and use IT at the same rates as men (Fountain, 2000), men still far outnumber women among IT developers and designers, a gap which will require policy interventions to narrow. Data regarding the gender composition of corporate IT positions bear out this trend. In 2012, women occupied about 24% of chief information officer positions at Fortune 100 companies (NCWIT, 2014). This absence of women is likely to persist into the next decade, as this gap is also present at the university level (Shade, 2014).

From a macrosocial perspective, gender gaps in IT usage vary across countries, even within the developed world. Ono and Zavodny (2007) illustrate how digital inequality across countries mirrors existing gender inequality in those countries. Gender gaps in IT use in countries such as Japan and South Korea exceed the gaps in more gender egalitarian countries such as Sweden and the United States. This pattern points to the role of social and economic macrostructures in generating and sustaining digital inequality in terms of gender and other socio-demographic attributes. It also suggests that, where women are not fully integrated into the workforce, gendered divides in usage may be particularly large. Future research is needed to examine in more detail how these patterns emerge in different countries and how cultural factors affect technology adoption, use, and impact.

Race and ethnicity

Multicultural societies are characterized by the existence of different social groups that hold different positions in the stratification system, particularly ethnic and racial minorities. The study of digital inequality is important to determine how different social groups access and use these technologies and how their differing digital engagements lead to the reduction or amplification of social disadvantages (Chen, 2013). As differentiated information and communication technologies (ICTs) use has been linked to varied access to informational, social, cultural, and political resources (Mesch, Mano & Tsamir, 2012), it is critical to determine how different racial and ethnic groups engage with these technologies.

Research on the potential consequences of digital inequalities has relied on two central perspectives, namely race and ethnicity. The stratification hypothesis holds that the process of ICT adoption and use replicates existing social inequalities, as digitally mediated networks replicate offline social network structures and because offline human capital carries over to the online world (DiMaggio & Garip, 2012). In terms of offline social networks, studies have shown that disadvantaged minorities in the United States have smaller networks and greater network homophily. Studies using a position generator approach find that disadvantaged minorities have less social capital (DiPrete, Gelman, McCormick, Teitler, & Zheng, 2011). According to the stratification hypothesis, this pattern would be repeated in the online world.

By contrast, the normalization/diversification hypothesis holds that individuals can transform their social networks and social capital by accessing online networks. According to this

perspective, those who could benefit from additional social capital, particularly minority racial and ethnic groups, may benefit from ICT usage. ICT use could open up new sources of information and opportunities (Mesch, Mano, & Tsamir, 2012). Structural inequality often results in homophily in the composition of social networks that restricts access to valuable information on educational and job opportunities. Minorities may use ICT to reduce network homophily and increase the number of weak ties to others, allowing them to increase the size of their network and reduce its homophily. Thus, social media may constitute a promising ICT-based mechanism for the reduction of inequalities by creating weak ties which translate into real changes in social capital.

From a global perspective, digital inequalities often augment racial and ethnic disparities because of the economic division between the Global North and the Global South. In the case of Africa, global digital inequalities have reinforced existing racial as well as economic chasms, shutting out a huge proportion of the continent from access to the internet. Although some 14% of the world's population resides in Africa, only 3% of the world's internet users live on the continent (Fuchs & Horak, 2008). Thus, internet exclusion coincides with other forms of marginalization. Such a global perspective also opens the doors to the exploration of dimensions of digital inequality which have to do with national and regional cultures. Social science would benefit from more attention and research geared to understanding such variation in the use and adoption of ICT globally. Insights into national and regional values might prove useful for understanding both between-group and within-group preferences in the adoption and use of ICT. Even within a specific nationality, variations in the use of the technology for social media production versus consumption activities might depend on group and individual values such as collectivism, power distance, masculinity, and uncertainty avoidance. Group-specific values may promote either the rejection or adoption of technologies such as ICTs. In traditional cultures, the process of technological adoption may follow the pattern of initial rejection, followed by partial acceptance and then full-bore adoption. Future research would do well to explore in-group variations in the adoption and use of ICT around the world.

The nexus between digital inequality and race presents an intriguing empirical puzzle for social science research. Internet use among ethnic and racial minorities is typically lower than use for racial majority groups. Yet, when it comes to the utilization of social media for content creation, US Latinos and African-Americans report more online content creation than comparable US whites (Correa, Willard-Hinsley & Gil de Zuniga, 2010). Among those online, African-Americans outpace whites in terms of content creation (Schradie, 2012). This finding holds even after controlling for Socio-economic Status (SES), gender, age, and internet expertise (Correa & Jeong, 2011). These preliminary results call for moving a step forward and investigating the extent to which activities such as content creation and the use of social media could potentially enhance the social capital of minority users. We need studies geared toward understanding the role of ICT in the reduction of social capital inequalities. In addition, we should investigate the role of group-specific values as they affect the adoption and usage of digital technologies around the world.

Economic inequalities, entrepreneurship, and consumption

The jury is still out whether gender and ethnic stratification orders will be transformed as a result of ongoing digital differentiation processes. However, it is clear that the road connecting economic and digital stratification runs in both directions. Digitally disadvantaged workers and entrepreneurs face barriers to full participation in the economy their more digitally advantaged peers do not confront. At the same time, it can be argued that the economic stratification order is already undergoing significant transformations relating to existing and emerging digital disparities.

First, among American adults, employment status and earned income both predict intensity of computer usage, as well as online activity footprints (Witte & Mannon, 2010). Second, the reverse causal relationship also holds, at least with regard to earned income. As DiMaggio and Bonikowski (2008) show, internet users enjoy an earnings premium over nonusers, particularly those who have used the internet continuously both in the workplace and at home. The earnings return to internet usage reaches even higher levels in developing countries, as one study of Latin America indicates (Navarro, 2010). Moreover, this earnings differential characterizes both salaried and self-employed workers. The shift toward 'networked work' – partly spurred on by technological transformations – has important consequences for organizational structure and job quality. In the United States, national data show that telework and ICT use are positively related to job autonomy and skill development.

Just as many individuals who use the internet more intensively and in more skillful ways tend to earn more money once employed, they also stand a better chance of securing employment. Digital competencies are playing more and more critical roles in job searching. Recent investigations into the role played by social media intermediaries such as LinkedIn in job searching reveal a pervasive gulf between those who navigate the social media landscape with ease and those who find it challenging. As the pervasiveness of these intermediaries grows in the economy, individuals who excel at curating their professional self-presentations will most likely gain an advantage in the labor market.

The intensity of internet usage and internet-related skills impacts the likelihood of earning higher wages but may also affect individuals' propensity to engage in entrepreneurial activity. Human capital, financial capital, and cultural capital affect both digital inclusion and entrepreneurship. There are marked ethnic and gender differences in entrepreneurial and digital activities. For example, women's businesses tend to be smaller, less profitable, and grow more slowly (Jennings & Brush, 2013). Women entrepreneurs are less effective in converting digital and network advantages into business advantages (Chen, Tan, & Tu, in press). Given the important role of social networks in getting entrepreneurial ventures off the ground, entrepreneurs who boast high levels of connectivity and good internet skills enjoy an advantage over their less well-connected and less-skilled counterparts. Benefits accrue to entrepreneurs who can use the internet and social and mobile media for seeking and sharing information (Gibbs, Rozaidi, & Eisenberg, 2013). Computer and internet skills are valuable for interacting with stakeholders and clients, raising financial capital, developing business plans, devising business models, and building social capital (Chen, 2006). For example, entrepreneurial firms which enlist the internet to screen potential business partners enjoy more success than firms which eschew the internet for such purposes (Arenius & Minniti 2005). Skillful use of crowdfunding platforms such as Kickstarter allows nascent entrepreneurs to raise funds easily from geographically distant actors. Future research needs to take into account the complexities of the multidirectional dynamics connecting digital technologies and entrepreneurship. One promising venue of research examines how digital communication technologies facilitate and constrain mobilization of glocalized entrepreneurial networks (Chen & Wellman, 2009).

Digital stratification may also exert a growing impact on consumer behavior. The digitally disadvantaged consumer has a hard time capitalizing on the consumption opportunities made available by the 'peer-to-peer' economy, as these opportunities are mediated through online sites such as Craigslist, Snapgoods, Uber, or Airbnb (Botsman & Rogers, 2010). The extent to which people across the digital engagement spectrum take part in this new form of consumption and economic activity deserves investigation. Such phenomena are relatively recent and have not yet attracted the attention of social science.

Finally, digital inequality also enters into larger debates about the future of the twenty-first century economy, specifically the changes in the organization of employment brought about by

computerization and automation. Radical digitization is likely to reshape the economic landscape and create new classes of winners and losers (Brynjolfsson & McAfee, 2014). Some economists foresee the potential for mass unemployment as robotics and artificial intelligence are introduced into practically every sector of the economy, rendering many jobs and skills obsolete. Because of this disruptive transformation, the importance of digital skills across the occupational system will only increase. Across the workforce, it is likely that digitally skilled workers will reap greater rewards while digitally unskilled workers lag further behind.

Health care

Health care in the United States is undergoing a rapid transformation through the introduction of ICT. This transformation is driven primarily by the recognition that the increasing cost of care is not sustainable (Berwick, Nolan, & Whittington, 2008). ICT is seen as a promising means to solve the challenges of delivering care, improving health outcomes, and creating a more equitable health care system. These technologies, variously termed eHealth, telemedicine, and connected health, are being used to improve access to clinical care, empower patients to monitor and self-manage their medical conditions, and control costs (Hale, 2014).

The connection between digital inequalities and other social inequalities is particularly important in understanding the potential for eHealth to narrow or widen social disparities (Hale, 2013). Disadvantaged social groups, who experience the greatest burden of poor health, also are the most likely to lack the access, skills, and attitudes associated with making effective use of eHealth systems. Inequalities in SES are a 'fundamental cause' of persistent health disparities (Link & Phelan, 1995), due to the dynamic nature of changes in diseases, risks, and medical treatment.

Many proposed eHealth solutions are 'patient-facing', with an emphasis on shifting greater responsibility and control for preventative health, treatment decisions, and care management onto patients. It is possible that eHealth initiatives will disproportionately benefit the more digitally advantaged segments of the population, even though such initiatives would do the most good among the digitally disadvantaged who also bear the greatest burdens in terms of poor health. Longitudinal research is needed to understand whether eHealth in clinical care benefits all people equally or if the more advantaged will also derive greater benefits from the technological transformations underway in health care.

A good deal of preliminary research demonstrates the importance of first-level digital inequalities in the use of eHealth. Early research focused on socio-demographics and type of internet connection and found that younger adults, women, and whites are more likely to search online for health information (Goldner, 2006). Education is a particularly strong predictor of eHealth activities – people with higher levels of education are more likely to search online for health information (Cotten & Gupta, 2004), search more frequently (Ayers & Kronenfeld, 2007), and do more health-related activities (Hale, Cotten, Drentea, & Goldner, 2010) than those with lower levels of education. Digital inequalities in access also matter in people's use of eHealth. Davison and Cotten (2003) found that speed of internet connection, measured as broadband versus dial-up modem, was a more important factor that explains differences in online activities than other digital inequality factors. Despite the wide adoption and diffusion of digital technology, these inequalities have remained persistent. A recent analysis of Pew Research Center survey data finds that digital inequalities in online health information seeking have changed little between 2002 and 2010 (Hale, Goldner, Stern, Drentea, & Cotten, 2014).

The often unforeseen importance of digital inequalities is thrown into sharp relief in the case of the American HealthCare.gov website launched in 2013. The website was intended to be the primary resource for insurance plan information, decision-making aids, and online enrollment. A

number of problems with the site made it cumbersome for people with limited internet access or skills. First, the site was designed for viewing on larger desktop monitors. This made crucial text and links hidden to people with smaller screens or portable devices and difficult to navigate. Second, the process of creating an account was overly complex. As a result, as few as 1% of the millions of visitors to the site during the first week successfully completed the enrollment process (Ford, 2013). The tribulations of the Healthcare.gov remind us that not all users of eHealth resources have the ideal devices or optimal skills.

Digital inequality research is important to understand how existing inequalities contribute to differential access, use, and benefits derived from emerging eHealth systems. This development gives rise to a number of pressing questions. How can eHealth systems be designed and implemented to narrow social health disparities? Are there certain design practices, intervention strategies, and balance of face-to-face and digital health care that are more beneficial to socially disadvantaged groups? Finally, with increasing responsibility for health and self-management placed on individuals, what are the digital and related skills needed for these people to make effective use of new eHealth tools?

To maximize the potential for eHealth to improve health care delivery and outcomes, we need a better grasp of digital inequalities. Topics that warrant research include: (1) social status differences in the adoption and use of eHealth; (2) the long-term effects of eHealth use on health outcomes; (3) the potential for mobile devices to bridge digital inequalities and improve care for socially disadvantaged groups; and (4) the potential for exclusion of the digitally disadvantaged from the datasets on which emerging methods of health research will be based.

Data collection

The world of primary data collection has changed dramatically in the last 20 years. Nowhere is this trend more apparent than in the realm of survey research. In recent years, survey research has had to grapple with a dramatic decline in response rates across survey modes. Hardest hit are telephone and other interviewer-based forms of surveying. In the early years of the internet, web-based surveys appeared as a solution to this problem. Many researchers hoped that web surveys and social media surveys would ultimately replace telephone surveys and paper surveys, resolving long-standing problems with traditional forms of respondent recruitment.

To realize the potential of web-based surveys, however, researchers cannot overlook forms of digital inequality which can affect participation. Researchers relying on web-based recruitment strategies must address concerns about representativeness of the respondents and, correlatively, coverage and nonresponse errors. Whatever the web-based data collection strategy, whether general population web surveys, social media, online panels, or any other method, failure to consider and understand internet penetration and proficiency can potentially lead to inaccurate estimates. The significance of digital inequality for web survey response rates remains unclear, leading to well-documented unknowns regarding modes of contact, coverage, and issues of mobility (Stern, Bilgen, & Dillman, 2014).

Responses to mailed web survey invitations depend not only on education and income levels but also on high-speed internet penetration rates. This conclusion emerges from a study using spatial modeling to assess web survey response to nationally representative sample frames (Stern, Fiorio, & English, 2013). Thus, digital access inequalities play a significant role in determining who will respond to survey solicitations and who will take part in web-based surveys. Since residents of rural areas often lack broadband connectivity compared with their urban peers, surveys which rely on online communication channels may favor urbanites in problematic ways. It is also probable that residents in communities lacking connectivity also lag their more wired counterparts in terms of their IT proficiency and diversity of internet activities, a systematic

difference which might also influence response rates. Stern et al. (2009) have shown that, when broadband is available, technological proficiency increases along with the diversity of internet activities. However, research has also shown that these patterns do not necessarily map directly on to social media usage.

Social media surveying may present a different set of concerns than web-only surveys, as usage patterns for social media platforms might not line up with access disparities. The undercoverage concerns relating to web-only surveys may not apply to social media surveying. Indeed, research has uncovered potentially important divergences between the disparities in internet access and the variation found within social media usage. In fact, research has shown that social media sites can be quite useful for targeting underrepresented populations (Nunan & Knox, 2011). A key concern among researchers considering social media concerns the age of potential respondents, in particular the undercoverage of older respondents. Although users of social media do skew younger, recent research has shown that over 50% of individuals 50–64 years old reported using a social networking site, and 32% of people age 65 and older reported doing so (Duggan & Brenner, 2013). Still, social media usage is not necessarily a proxy for proficiency. As a result, to date, we do not know much about the determinants of social media usage and how differences across users might affect social media surveying.

Researchers using online panel designs must also deal with the potentially problematic consequences of digital inequalities. The prevalence of such panel designs – both in the capacity of primary data collection designs and as augmentations of existing data collection modes – makes it all the more urgent to explore the various forms of digital inequality which could impact survey administration and participation (Terhanian & Bremer, 2012). Whether the panel design enlists probability-based methods akin to traditional random-sample survey methods or non-probability methods such as convenience or opt-in samples, it raises issues regarding coverage and representativeness. Both designs must confront the confounding potential of digital inequalities covarying with key sociodemographic variables connected to differences in respondents' substantive responses. This issue applies to both behavioral and attitudinal measures (Duffy, Smith, Terhanian, & Bremer, 2005). After all, proficient internet users tend to be more highly educated and wealthier, personal characteristics that covary with measures of political affiliation, views toward community change, and civic/political engagement (Stern & Dillman, 2006).

Future digital inequality research

Research on digital inequality is in its infancy and is evolving rapidly, along with its object of study. It is as yet unclear which long-standing inequalities will be amplified, which new ones introduced, and which forms of inequality mitigated in the Digital Age. What we do know is that scholars of digital exclusion must come to terms with the recasting of power relations. They must do so in terms of both existing social inequalities such as race, class, and gender, and emergent inequalities from the digital realm.

From an empirical perspective, the research frontier in the study of digital inequality is expanding in many directions. Some lines of research focus on elucidating unidirectional or bidirectional causal linkages. Such causal linkages typically connect specific forms of offline (dis) advantage and specific forms of digital (dis)engagement on the part of individuals distinguished by attributes such as gender, class, and race or resources such as time and money. Other developing lines of investigation probe the interrelations of digital inequalities with institutions such as labor markets, schools, organizations, and state.

Aside from these dynamic substantive areas, research projects focused on the relationship of digital inequalities and big social data will undoubtedly materialize in the future, as big social data inserts itself into more and more areas of social science (Halavais, 2015). Researchers considering

online data collection need to take advantage of the multidisciplinary research which has already been done on digital inequality, in addition to work on research design and survey methodology. We must move forward by simultaneously building on what we have learned about data collection in the pre-internet era and capitalizing on the possibilities afforded by digital technologies. An integrative and forward-looking approach which retains the lessons of the past will serve us well.

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