

# Preparing Workers for the Expanding Digital Economy

Jordana Barton

*Technology is advancing so rapidly that . . . it is always going to outpace the law, the government or the public's capacity to fully understand its ramifications. The genie is never going back into its flip phone. . . . Future startups are going to make decisions that will impact the lives of millions, defining the world the way religions and empires used to. iPhones and tweets and more convenient taxis were one thing. But the wave on the horizon now—artificial intelligence, genetic engineering, nanotechnology—will be something else entirely.*

—Steinmetz and Vella (2017, p. 28)

The digital revolution has led to a rise in e-commerce, the gig economy, automation, artificial intelligence, and other digital technologies that have disrupted traditional economic sectors such as manufacturing and retail. Broadband—high-speed Internet access that is always on—is one of the most transformative technologies to emerge. The Internet and the digital innovations it has enabled have dramatically changed the nature of work, education, health care, public safety, and access to government and financial services.

Broadband is now a basic infrastructure essential to the well-being of all communities (Barton 2016). Despite incredible advancements in broadband technology, these innovations are not available to all Americans. According to the Federal Communication Commission's (FCC) *2016 Broadband Progress Report*, 34 million Americans lack access to fixed broadband at speeds of at least 25 megabits per second (Mbps) for downloads and 3 Mbps for uploads (FCC 2016).<sup>1</sup> U.S. households making \$25,000 or less have a broadband adoption rate of 47 percent, while those making more than \$100,000 have an adoption rate of 92 percent

(U.S. Census Bureau 2013). The digital divide is the gap between people who have access to broadband services and know how to use the Internet and those who do not have such access or knowledge (Levin and Linn 2015). Those who find themselves on the wrong side of the digital divide—including low-income people, those with less formal education, rural populations, the elderly and older workers, and minorities—suffer further economic, social, health, and political disparities resulting from disconnection.

## **WORKFORCE DEVELOPMENT**

Workforce development is a valuable tool for lifting people out of poverty and for creating upward mobility. Closing the digital divide is an essential step toward capturing the economic benefits of a skilled workforce. Workforce opportunities are hindered when low- and moderate-income (LMI) communities lack broadband access. According to Smith (2015) of the Pew Research Center, 79 percent of Americans used the Internet in their most recent job search. Smith further finds that “37 percent of nonbroadband adopters indicate that it would *not* be easy for them to create a professional resume if they needed to do so; 30 percent would find it difficult to contact an employer via email, or fill out an online job application; and 27 percent would have a hard time finding online lists of available jobs in their area” (p. 4). Additionally, many education and job training programs are offered only online. For individuals who live in areas without workforce development centers or community colleges, or who lack transportation or experience barriers due to long distances, Internet access could help them participate in training and certification programs and work from their homes for companies that employ a remote workforce.

Kang (2016b) highlights the impact of the digital divide in Detroit, which has “the worst rate of Internet access of any big American city, with four in 10 of its 689,000 residents lacking broadband. . . . The consequences appear in the daily grind of finding connectivity, with people unable to apply for jobs online, research new opportunities, connect with health insurance, get college financial aid or do homework.” Pub-

lic libraries are often looked upon as replacements for broadband in the home; however, this solution has limitations. Time limits on computer use and long wait times at public libraries and community centers can prevent those most in need from accessing the Internet for these basic services (Kang 2016b). Even if someone goes to the library to apply for a job online, he may not be able to return to the library every day to check email to see if he has been granted an interview.

### **Education and the Homework Gap**

Internet access and skills effectively have become essential for educational and economic opportunity. File and Ryan (2013) of the Census Bureau report that education and broadband adoption are positively related, meaning that households with less educational attainment have lower rates of broadband adoption. Only 43 percent of individuals without a high school diploma use the Internet, compared with 90 percent of those with a college degree (File and Ryan 2013). To provide a curriculum that is relevant and prepares students for the job market, teachers are increasingly assigning homework that requires Internet access. Low-income students are at a distinct disadvantage. It is common to hear stories of students doing their homework in fast-food restaurants or outside of school buildings after hours to access free Wi-Fi hot spots (Kang 2016a).

The digital divide is growing in classrooms because of unequal access to essential learning technology resources at home. Horrigan (2015) of the Pew Research Center explains that “Roughly one-third (31.4 percent) of households whose incomes fall below \$50,000 and with children ages 6–17 do not have a high-speed Internet connection at home. This low-income group makes up about 40 percent of all families with school-age children in the United States. . . . By comparison, only 8.4 percent of households with annual incomes over \$50,000 lack a broadband Internet connection at home. In other words, low-income homes with children are four times more likely to be without broadband than their middle or upper-income counterparts” (Horrigan 2015). This is referred to as the “homework gap.”

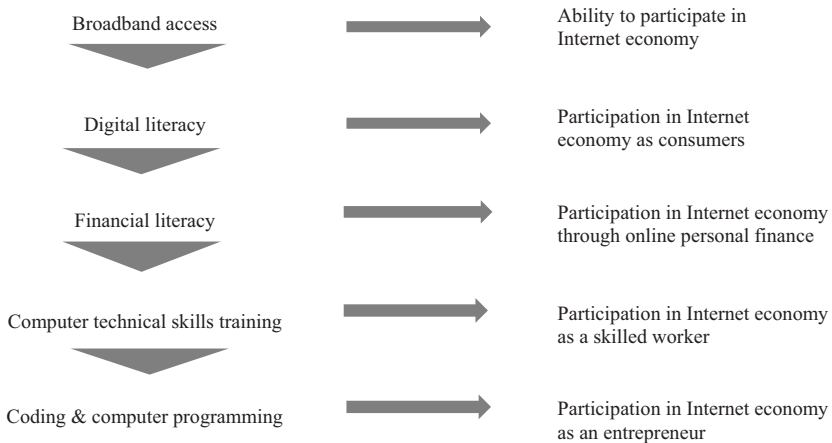
## Digital Skills Gap

Computer and Internet skills are critical in today's job market. A report by Burning Glass Technologies (2015, p. 1) notes, "As the nation has recovered from the Great Recession, growth for digital-intensive middle-skill jobs has been equivalent to the growth of high-skilled positions over the same period (4.8 percent for digital middle skills and 4.7 percent for high-skill positions from 2010–2013)." According to this report, middle-skill jobs are those with less than 80 percent of postings calling for a bachelor's degree and with a median hourly wage above the national living wage of \$15. The report notes that almost 8 in 10 middle-skill jobs require digital skills. Word processing and spreadsheet proficiencies in particular have become a basic requirement for most middle-skill occupations. Middle-skill jobs with intensive digital requirements have grown more than twice as fast as other middle-skill jobs in the past decade, and pay wages, on average, 18 percent higher than middle-skill jobs without a digital component. Indeed, middle-skill jobs without major digital requirements—which are often in transportation, construction, and installation/repair—have grown less than even low-skill positions. Between 2004 and 2013, nondigital middle-skill jobs grew by 1.9 percent compared to low-skill jobs, which grew by 2.9 percent (Burning Glass 2015, pp. 1–2).

"New collar" is a term coined by IBM CEO Ginni Rometty to describe middle-skill jobs that don't require a traditional four-year degree but do require digital skills. Some of these new-collar jobs include cloud administrator, cybersecurity architect, software developer, technology support technician, and diagnostic medical sonographer. IBM created the New Collar program, which focuses on finding more employees without four-year college degrees—but with tech skills that meet their hiring needs. According to Sam Ladah, vice president of human resources at IBM, "About half a million technology jobs go unfilled in the U. S., and it's because employers can't find what they're looking for. The country is only producing about 50,000 computer science grads each year, and that's the skills gap" (Ryssdal, Bodnar, and Henderson 2017). IBM and Microsoft are supporting tech skills training programs to create new pathways to digital-intensive middle-skills jobs to close the tech job gap. Skillful, an organization

that provides training in the areas of technology, advanced manufacturing, and health care, is working with 90 companies to refine and clarify their job descriptions and skills. Lohr (2017) quotes Zoe Baird of the Markle Foundation (which supports Skillful): “We’re trying to use the very forces that are disrupting the economy—technology and data—to drive a labor market that helps all Americans.” Many cities, such as San Antonio, are seeing a rise in new-collar training programs such as Codeup and the Rackspace Open Cloud Academy. Also emerging are programs such as Youth Code Jam and the U.S. Department of Housing and Urban Development and San Antonio Housing Authority Connect-Home digital skills training program (in partnership with Goodwill), which can directly lead to tech jobs or prepare LMI people to qualify for the more advanced new-collar training certification programs. In addition, long-standing workforce development programs such as Project Quest have added career tracks in cybersecurity, health information technology, computer programming, and software development, to name a few. Figure 1 shows the relationship between digital skills training programs and the ability to participate in the Internet economy.

**Figure 1 The Relationship between Digital Literacy Training and the Internet Economy**



SOURCE: Federal Reserve Bank of Dallas.

## MANUFACTURING AND RETAIL JOBS

A significant decline in traditional manufacturing and retail jobs has resulted in unemployment for large segments of the population who lack postsecondary education credentials or digital skills and/or who live in rural communities. In a report analyzing their top demand occupations, the San Antonio Manufacturer's Association finds that the growth of automation and technological complexity within the San Antonio manufacturing industry is increasingly requiring digital workforce skills (Dewey 2015). Moreover, as reported by the Brookings Institution, "[t]he rise of cognitive computing systems [artificial intelligence] brings a potentially massive shift in the way that work is done, which could lead to an equally massive displacement of the workforce" (Desouza, Dawson, and Santiago 2017). Machines are affecting low- and medium-skill jobs by augmenting or completely replacing human labor. Researchers from the University of Oxford report that 47 percent of total U.S. employment is at high risk because of significant automation across a wide variety of blue-collar and white-collar professions (Frey and Osborne 2013).

Automation and globalization have transformed manufacturing and resulted in plant closings in small cities across the United States. Abrams and Gebeloff (2017) describe the effect of this disruptive workforce transformation. Additionally, they examine the subsequent closing of retail stores caused by the proliferation of e-commerce. For example, "Johnstown [Pa] . . . eventually became prosperous from its steel [mills] and offered a clear path to the middle class. For generations, people could walk out of high school and into a steady factory job. But today, the area bears the marks of a struggling town. Its population has dwindled, and addiction treatment centers and Dollar Generals stand in place of corner grocers and department stores. . . ." The authors detail the experience of workers who are facing unemployment nationwide "as the retail industry struggles to adapt to online shopping." The monumental change in retail is evidenced by the decline of the shopping mall. In the past, malls were not only places to shop, but they served as town centers and social gathering places. With the rise in e-commerce between 2010 and 2013, mall visits declined by 50 percent (Sanburn 2017). Malls are closing at a rapid pace, and new malls are not being built.

The country is losing retail jobs due to e-commerce; however, “[g]rowth in e-commerce jobs like marketing and engineering, while strong, is clustered around larger cities far away. Rural counties and small metropolitan areas account for about 23 percent of traditional American retail employment, but they are home to just 13 percent of e-commerce positions” (Abrams and Gebeloff 2017). For example, in September 2017 e-commerce giant Amazon announced that it is planning a second headquarters in the United States and made a formal request for proposals from cities. Among Amazon’s requirements: a city with a diverse population of one million or more, good schools, evidence of fiber optic Internet connections and a coverage map showing strong cellular phone service at the location, and lists of universities and statistics on the qualifications of local workers (Wingfield and Cohen 2017).

## **BUSINESS DEVELOPMENT IN LOW-INCOME AND RURAL AREAS**

Broadband infrastructure and workers who have digital skills are necessary to attract business and industry (i.e., jobs) to underserved communities. Of the 7.75 million businesses in the United States, 97 percent are considered small business (U.S. Census Bureau/American FactFinder 2016). The Small Business Administration (2016) defines small business as “an independent business having fewer than 500 employees.” In terms of net job creation small business has been responsible for about 65 percent of job gains over the past 25 years (U.S. Bureau of Labor Statistics 2017). Furthermore, small businesses employ nearly half of private sector workers (Federal Reserve System 2018).

The digital divide limits business development in low-income areas of cities and in rural areas. Businesses need high-speed Internet access so that they can thrive. Broadband infrastructure is a critical component of creating an ecosystem that supports entrepreneurship, enabling businesses to expand market reach and customer bases. It also allows the emergence of tech-related start-ups. Therefore, broadband infrastructure is important for the creation of jobs and the revitalization of under-

served areas, as well as for unleashing the potential for LMI people to become entrepreneurs through the Internet economy.

A paper by the International Telecommunication Union (ITU), prepared for a special session of the Broadband Commission for Sustainable Development (Philbeck 2016), analyzes a significant body of international research on the economic impact of broadband and concludes that broadband has a beneficial impact on economic growth. The paper notes that the impact of broadband includes direct effects through large-scale infrastructure investments that lead to increased economic activity in the investment area, indirect or long-term effects that spur innovation and productivity through improved broadband speeds, and induced effects such as spillover into other economic sectors. From the analysis, the author holds that “a 10% increase in broadband penetration is likely to have a positive impact, and could raise economic growth by between 0.25% –1.4%. If broadband speed is doubled, GDP may increase, potentially up to 0.3%” (p. 3).

Communities in the United States with high-speed broadband infrastructure provide an environment that promotes small-business development. In a study by Sosa (2014), he notes that “communities where gigabit broadband was widely available enjoyed higher gross domestic product [GDP], relative to similar communities where gigabit broadband was not widely available” (p. 1). The 14 communities in the study “enjoyed over \$1 billion in additional GDP when gigabit broadband became widely available” (p. 1). The study refers to the Chattanooga, Tennessee, municipal-owned gigabit broadband service that has attributed “1,000 new jobs, increased investments, and ‘a new population of computer programmers, entrepreneurs and investors’” (p. 6).

A study by the Boston Consulting Group (Dean et al. 2012) finds that the impact of the Internet on GDP in the United States is 4.7 percent; that is, the Internet accounted for \$684 billion, or 4.7 percent of all U.S. economic activity in 2010. The study further reports that “the Internet economy in the developed markets of the G20 will grow at an annual rate of 8 percent over the next five years, far outpacing just about every traditional economic sector, producing wealth and jobs” (p. 6). Membership in the G20 includes 20 of the world’s largest advanced and emerging economies “representing about two-thirds of the world’s population, 85 percent of global gross domestic product and over 75 percent of global trade” (G20 2015).



The key to growing entrepreneurship in the Internet economy is to promote the expansion of broadband networks. Consider that before the advent of the Internet, telecommunications and information technology innovations happened at the center of the network and were created by the engineers working in the industry. The Internet, however, makes unbounded innovation possible on the periphery of the network; that is, with people and their computers (Fransman 2001). Closing the digital divide for budding and established entrepreneurs makes it possible for them to have Internet access to realize their innovative business ideas.

The implication for rural communities is significant because access to high-speed broadband can help businesses thrive and no longer be dependent on physical proximity to a broad customer base. Having broadband infrastructure has the potential to make geography irrelevant for some types of businesses. Furthermore, broadband infrastructure will help curb the “brain drain” of young people from rural areas since it allows them to return to their hometowns to open businesses or work remotely for companies in larger cities.

## **THE DIGITAL ECONOMY AND THE SHRINKING MIDDLE CLASS**

Bonvillian (2016), of the Massachusetts Institute of Technology, discusses how “technological advances in industry require an ever-increasing level of technological skill in the workforce.” He argues, “Higher education since the Industrial Revolution has become increasingly tied to economic well-being. . . . For more than a hundred years, the education curve stayed ahead of the technology implementation curve, but starting in the 1970s, the higher education graduation rate began to stagnate while the required workforce skills continued to rise.” This dynamic in educational attainment, and the decline in traditional middle-skills occupations in manufacturing and retail discussed previously, has led to a shrinking middle class and job polarization. The phenomenon helps explain the growing economic inequality in the United States. Recent research reveals that between 1979 and 2015, high-skill occupations increased from 25 to 39 percent. However, traditional middle-skill occupations declined from 61 percent to 43 percent, while

low-skill occupations increased from 14 percent to 18 percent (Blum and Groves 2016, p. 4).

It is imperative that workforce development programs and higher education systems respond to the ever-increasing level of technological skill required in the workforce by providing timely and relevant content and experiences to meet present and future workforce demands. The skills-based training for new-collar digital-intensive jobs represents an on-ramp to the middle class for people without a four-year college degree the way traditional manufacturing provided in the past. Alternative pathways to the middle class and beyond are important for creating a strong economy where everyone can participate.

Furthermore, as Kaplan (2015) notes in *Humans Need Not Apply*, “[t]he . . . mistake is the tacit assumption that first you go to school, and when you are done, you go get a job. This made sense when jobs and skills changed on a generational timescale, but it does not in today’s fast-moving labor markets. These two phases of life need to be strongly interleaved, or at least the opportunity for new skill acquisition must be explicit and omnipresent” (p. 153). The pace of change has dramatically increased; thus, educational institutions and workforce development agencies will be ever more important in helping workers become lifelong learners and competitive participants in the digital economy.

## **STEPS FORWARD**

Increasingly, digital inclusion represents economic inclusion. Thus, the Federal Reserve System and the Federal Reserve Bank of Dallas have taken steps to provide evidence-based research and serve as a resource to help financial institutions and communities close the digital divide and thereby create a more inclusive economy.

The Federal Reserve Board, the Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation published updated guidance on the Community Reinvestment Act (CRA), the 2016 Question and Answer (Q&A). The CRA is a law that encourages banks to make loans, investments, and provide services to LMI communities. In the 2016 update, broadband is included as a form of infrastructure investment, and the agencies identify communications infra-

structure as an essential community service and describe how investing in new or rehabilitated communications infrastructure is consistent with the CRA regulatory definition of community development.

The 2016 update also provides guidance on the CRA service test and notes that banks should provide evidence that their “alternative delivery systems” using online banking and financial technology are being used/adopted and are effective in providing services to LMI individuals. This was an important update that recognizes that banking has become increasingly digital. It is also a recognition that the industry may develop innovations in fintech, or financial technology, and online and mobile banking; however, if the financial services industry does not innovate in reaching LMI people with these innovations, the country may have increasingly more people unbanked and underbanked and outside the financial mainstream.

In recent years, Banks across the Federal Reserve System have published research highlighting uneven access to broadband. The Dallas Fed published a how-to guide or framework to be used across the country to accompany the 2016 Q&A, “Closing the Digital Divide: A Framework for Meeting CRA Obligations” (Barton 2016). In addition, the New York Fed published “Closing the Digital Divide: A Case Study” (Franco, Cruz, and Long 2017) to accompany the framework and serve as an interactive teaching tool to help banks and their community partners understand how to close the digital divide in their communities and support digital inclusion programs. In a similar effort, the Cleveland Fed published “Broadband and High-Speed Internet Access in the Fourth District” (Arvind and Fee 2016), and the Minneapolis Fed published “Border-to-Border Dreams” (Davies and Harrington 2017), an account of how Minnesota’s Border-to-Border grants have not reached many rural areas of the state.

Furthermore, the Dallas Fed is working with local governments and partners to map broadband access and adoption in cities and counties and help them create their digital inclusion plans as a part of their economic development plans. The communities are using the “Closing the Digital Divide” publication (Barton 2016) as a guide. And, in South Texas border communities, the Dallas Fed convened a collective impact demonstration project, Digital Opportunity for the Rio Grande Valley, to close the digital divide in an area of concentrated poverty that has one of the lowest rates of broadband connection in the country.

## CONCLUSION

This chapter documents how technological disruptions call for new approaches to developing a workforce that has the skills to participate fully in the Internet economy and prepare for jobs that increasingly require digital skills. Broadband infrastructure and access are essential to support both workers (on the supply side) and to attract and sustain business and jobs (on the demand side).

As basic services and tools that are fundamental to upward mobility become increasingly digitized, the digital divide creates a structural barrier to closing the income and wealth gaps in the United States. Income and wealth inequality are at the highest levels since the Great Depression. The Survey of Consumer Finances (SCF) issued by the Board of Governors of the Federal Reserve System (2017) finds that “the distribution of income and wealth has grown increasingly unequal in recent years” (p. 10). For example, according to the SCF, “The share of income received by the top 1 percent of families was 20.3 percent in 2013 and rose to 23.8 percent in 2016. . . . Correspondingly, the rising income share of the top 1 percent mirrors the declining income share of the bottom 90 percent of the distribution, which fell to 49.7 percent in 2016” (p. 10). As Fry and Kochhar (2014) of the Pew Research Center note, “America’s upper-income families have a median net worth that is nearly 70 times that of the country’s lower-income families, also the widest wealth gap between these families in 30 years.” The digital divide creates a barrier to LMI individuals’ ability to move up the economic ladder through education, workforce development programs, employment, and entrepreneurship. Indeed, to prevent downward mobility for LMI families, the investment in broadband infrastructure and digital inclusion programs is essential.

### Note

1. The Federal Communications Commission defines broadband as a download speed of 25 Mbps (megabits per second) and an upload speed of 3 Mbps.

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