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The Promise and Perils
of the Future of Work

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The potential impacts of robotics, artificial intelligence, and digital economy technologies on American workers raise alarming questions. Which occupations will survive? Which workers will be the winners, and which the losers? Will jobs disappear? How will workers, employers, educators, and policymakers manage these challenges? As we consider these questions, it is essential to recall lessons from previous cycles of technology-driven worker displacement throughout American history.

In the early twentieth century, the mechanization of farming and the assembly-line production of automobiles and other durable goods eliminated and created job opportunities by the millions. Toward the end of the twentieth century, robots began replacing assembly-line workers, and personal computers wiped out millions of jobs. Today, advanced software, smart phones, the Internet, and cognitive computing are disrupting the retail, media, transportation, education, and health-care industries.

With each wave of technology, from the steam engine to cloud computing, dire predictions about the scope and characteristics of workforce disruptions have often been exaggerated (McAfee and Brynjolfsson 2017). Our crystal balls are cloudy because we cannot estimate the true extent of economic change, how workers and businesses will adapt, and the new opportunities and enterprises that will emerge. As the great baseball player and quipster Yogi Berra said, "The future ain't what it used to be." Recent predictions about the impact of artificial intelligence on worker dislocation range from the Organisation for Economic Co-operation and Development's estimate that 9 percent of jobs will disappear in the next two decades (Overly 2016) to the analysis of Oxford University scholars, who conclude that nearly half of current jobs could be in jeopardy (Frey and Osborne 2017).

Regardless of the pace of technological innovation and economic disruptions, unemployment rises during economic downturns. Growth rates, inflation, and the availability of capital create and destroy jobs and companies. The Great Recession, which wiped out trillions of dollars of economic wealth and tossed millions of workers out of their jobs, was brought about by irresponsible lending practices and financial schemes. The global trade, economic competition, mergers, and acquisitions that eliminate jobs are not driven by technology. Hence, the decline of the American-based steel industry was due in large measure to the failure of American companies to invest in new production methods. U.S. textile manufacturing plummeted because companies moved production to countries where workers are paid a small fraction of the wages earned by U.S. workers. It's not technological innovation that typically motivates most mergers and acquisitions in telecommunications, banking, and health care, but rather the desire to maximize profits and grow market shares. Simple business innovations, such as Walmart's decision to move checkout counters to the front of the store, similar to grocery stores, instead of having them scattered throughout the store by department, eliminated legions of sales clerks long before direct delivery by Amazon entered the scene.

We do not know whether the current bundle of technological changes, including artificial intelligence, semiautonomous vehicles, and the Internet of Things, will eliminate more net jobs than previous innovations. However, those who have limited formal education or skills and who are not retrained for new opportunities will likely be at risk of losing jobs and remaining unemployed. Many technology-vulnerable jobs require limited independent judgment; workers rely more upon their strength and stamina than upon their intellect. The enduring negative impacts of economic disruptions, regardless of the cause, are often shouldered by older workers with long tenure in a firm or occupation, because employers replace them with less expensive younger workers. These replaced workers may suffer a double penalty: they may be stigmatized by employers for being unemployed, and they may also be discriminated against because of their age.

U.S. policymakers have been slow to respond to the disruptive impact of technological innovation on workers who must transition from job to job or from career to career. Congress set aside modest funds for workers dislocated by automation in the Manpower Demonstration

and Training Act of 1962, but there have been no sustained, large-scale programs since. The United States consistently spends far less than other developed countries on labor force readjustment programs (Bentolila and Jansen 2016). The largest share of U.S. government workforce program funding is distributed through an unemployment insurance system that provides temporary and partial income replacement rather than skill development, job coaching, and placement. In calendar year 2017, the United States spent roughly $30 billion on unemployment insurance (Statista.com 2018), whereas federal spending on adult and dislocated worker retraining programs was just over $2 billion (Employment and Training Administration 2017).

The federal Workforce Innovation and Opportunity Act programs and the Wagner-Peyser Employment Service are chronically underfunded in relation to demand. As such, administrators concentrate their efforts on matching unemployed workers with job openings and short-term training programs. Also as such, better-prepared job applicants are more likely to be served than long-term unemployed job seekers (Van Horn, Krepcio, and Heidkamp 2015). Postsecondary financial aid programs, such as Pell Grants, are mainly designed to aid full-time students pursuing associate's or bachelor's degrees. Laid-off mature workers who need to update their skills or obtain certificates through short-term training courses receive limited federally funded benefits.

PERSPECTIVES ON TECHNOLOGY AND THE FUTURE OF WORK

The five chapters in this section address some of the most pressing issues about how individuals, employers, and policymakers can manage the inevitable disruptive changes affecting the economy and labor market. Taken together, these essays offer a wide array of evidence-based solutions to meeting these challenges.

"Navigating the Future of Work: Can We Point Business, Workers, and Social Institutions in the Same Direction?," by John Hagel, Jeff Schwartz, and Josh Bersin, identifies major labor market transformations that are due in large part to rapid changes in technology. While

many of these disruptive forces are already occurring, businesses, policymakers, and individuals have not adjusted to these fundamental changes. According to the authors, "Unless all three of these constituencies manage to align in their understanding and actions to address emerging opportunities and challenges, the road to the future of work will be bumpy at best" (p. 176). The authors provide detailed recommendations for how that alignment can occur.

Chauncy Lennon and Sarah Steinberg, in "From Want Ads to Mobile Apps: Realizing the Promise of Technology in Labor Market Matching," describe how digital technology, including online job postings and the computer algorithms that employers use to sort applicants, have transformed the job search and hiring process. They propose strategies for helping job seekers and employers navigate an increasingly complex labor market. "Technology may ultimately have the potential to transform labor market matching for the better," the authors argue, "but serious challenges in the existing technology remain" (p. 203). Lennon and Steinberg conclude by outlining recommendations for policymakers, businesses, and job seekers.

In "Personalized Education: From Curriculum to Career with Cognitive Systems," Michael King, Richard Cave, Mike Foden, and Matthew Stent present extensive research on the educational opportunities made available through significant advancements in digital education and cognitive systems. These transformative developments enable educators to deliver personalized education and improve educational outcomes. "We believe that education is potentially at the dawn of a new era," the authors write (p. 215). However, they say, "educators will need to evolve by embracing cognitive systems to deliver personalized learning in order to drive improved outcomes for all" (p. 232).

Rachel Zinn and Bryan Wilson, in "All Data Big and Small: Using Information to Guide Workforce Development," review the progress by state governments in linking and analyzing administrative data systems collected by departments of education, higher education, labor, and other social service agencies. Overall, they conclude that while these "big data" initiatives have not reached their full potential, "there are compelling examples of data making a difference in building America's skilled workforce" (p. 234). They cite, as evidence, improved decision making regarding targeting resources to those most in need, better information for job seekers and students when they are choosing aca-

demic majors and careers, and improved service delivery by government agencies, educational institutions, and nonprofits.

Finally, Jordana Barton, in "Preparing Workers for the Expanding Digital Economy," emphasizes that without broadband digital access and literacy, rapid technological changes will make lives more difficult for individuals and communities. "Broadband is now a basic infrastructure essential to the well-being of all communities," she writes. Yet "these innovations are not available to all Americans" (p. 251). Fewer than half of households earning $25,000 or less have access to them. Barton reviews initiatives supported by the Federal Reserve System to expand broadband access by encouraging financial institutions to help close the digital divide, including through allocation of Community Reinvestment Act funds to support digital inclusion programs.

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