

The Future Is Now: Workforce Opportunities And The Coming TIDE

A Call To Action

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EXECUTIVE SUMMARY

The rise of artificial intelligence (AI) and robotics will generate unprecedented opportunities and challenges for employers and workers. The accelerating pace of automation will likely lead to productivity increases on a scale not seen since the Industrial Revolution, while displacing tens of millions of American workers from their current occupations. Too often, news reports dramatically focus on AI and robots as job killers. Unfortunately, the debate over whether jobs eliminated will outnumber jobs created ignores two related and no less important questions:

- (1) With the fast-paced arrival of innovative and transformative technologies, will workers whose jobs are most likely to be disrupted have the skills and training required for the new jobs being created?
- (2) Will employers be able to fill existing vacancies as this unstoppable transformation occurs?

The widely supported goal of creating meaningful, well-paying jobs is anchored in the belief that a resilient and motivated American workforce can acquire the training and skills needed to perform the jobs of the 21st century. Sadly, the needed training and vocational education programs are far too few and do not properly leverage the educational potential of modern technology. Preparing today's workforce with the knowledge and skills required to participate in the workplace of the future represents the greatest human talent challenge of the last 100 years.

This Report addresses the above issues and provides a practical roadmap on how employers, industries, communities, educators, and government can work together to prepare the workforce for the coming technology-induced shockwaves while taking full advantage of the opportunities that will be created.

Turning to the nature and timing of the workplace's ongoing technological transformation, considerable variation will occur across industries; nonetheless, the following large-scale trends are expected:

- In the medium- to long-term, productivity increases should lower costs for consumers and spur greater demand for labor across the economy as a whole.
- In the short-term, automation will displace many affected workers from their current jobs and force hundreds of millions of workers worldwide to transition to new occupations within the next 15 years.
- At the same time, some classes of workers, such as those with disabilities, will see the range of jobs available to them increase substantially as automation advances.
- Recognizing, preparing for, and confronting this *technology-induced displacement of employees* (hereinafter, "TIDE") will be the primary challenge that employers and the entire workforce will face in the coming years as automation advances.

The TIDE will disrupt the labor market and bring unprecedented challenges to industries, workers, and governments alike. By far the greatest workforce challenge will be matching human skills and capabilities with the continuously changing needs of technologically transformed workplaces and, in many cases, the redefinition of work itself. Public and private companies, organizations, governments, and educational institutions will have to address and overcome a number of structural, regulatory, and legal barriers in the American labor market that will make responding to the TIDE difficult:

- Already, there is considerable anxiety about an apparently growing "skills gap" in the labor market. The accelerating pace of technological change will make it even more challenging to find job candidates who come ready-made with the skills and training needed for the future workforce.
- Finding new work for millions of displaced workers—a daunting task in and of itself—will be made more difficult by the accelerating pace of disruptive technological change. Rapid advances in automation will make it challenging to predict where increases in demand for labor will arise in the coming years and decades.
- Given the quickening pace of automation, powered by the surge of AI and robotics in the workplace, it is likely we are entering an era when the traditional concept of a single, decades-long "career" in the same occupation—already far less common than it was a generation ago—will fall by the wayside. Workers will instead often have to switch occupational categories every few years as automation

displaces them from an increasing number of existing jobs, and retirements and cultural expectations result in a loss of workers with the necessary physical skills and capabilities.

- The United States currently lags behind other countries in the attention and resources it devotes to worker training, and in synchronizing regulatory and legal standards with the changing face of talent.

Eventually, the sheer scale and scope of automation's impact will significantly change the nature of the U.S. economy and labor market. To prepare for and overcome these challenges, most American employers—including organizations creating projects and other tasks requiring workers—will have to radically change their approach to talent planning and provide, facilitate, and encourage life-long worker training by:

- Conducting and participating in organization-specific and industry-wide talent forecasting and planning;
- Elevating the importance and status of talent planning and development;
- Identifying the need for improved and expanded lifelong learning programs;
- Implementing workplace training and partnering with trade groups, educational institutions, and worker organizations to provide workers with access to additional vocational educational resources and training opportunities both in the community and online; and
- Placing TIDE-related issues front and center on policymakers' radar including legislative, regulatory, and legal barriers and opportunities.

Individual companies will, in all likelihood, be unable to control the broad social and economic changes that technological advances will bring. Moreover, looking solely to government-subsidized programs and traditional educational institutions to provide the necessary training will almost certainly prove a woefully inadequate approach given the urgency of the TIDE's arrival and the years-long process of establishing and implementing large-scale, government-subsidized worker training programs.

America's employers and other organizations dependent upon human talent must therefore take it upon themselves to work together to put themselves and their workers in the best possible position to prepare for the TIDE, adapting and adjusting to the sweeping changes that emerging technologies promise to bring. Those that do will be able to adapt and move forward in the economy of the future. Those that do not, and instead hope that outside forces will intervene to cultivate the skills they require, will likely find themselves unable to compete in the economy of the future.

BACKGROUND: A NEW TECHNOLOGICAL REVOLUTION

The two most significant technological revolutions in human history—the Agricultural Revolution and the Industrial Revolution—forever changed the very nature of how humans subsist and interact with one another. The Agricultural Revolution led to the establishment of civilizations and the creation of the first written legal codes, many of which addressed relationships and activity in what would today be called the labor market. The Industrial Revolution saw the rise of urbanization and wage labor, creating the basic labor market model that predominates in modern developed and emerging economies.

A more recent wave of technological change, often termed the “Digital Revolution,” has had an impressive impact on productivity, upended key sectors of developed-world economies, and radically changed the manner in which many jobs are performed and services delivered. But the Digital Revolution did not generate radical changes in the structure of human economies and societies on the scale of its Agricultural and Industrial predecessors. The laws that govern the labor market and employment relationships are largely the same today as they were in the 1970s, before the rise of the personal computer, the Internet, and mobile phones. With the rise of AI and robotics, however, that is likely to change. These new forms of automation may bring transformational change to the workforce on a scale that will equal, if not exceed, the Industrial Revolution.¹

¹ Klaus Schwab, *THE FOURTH INDUSTRIAL REVOLUTION* vii-1 (2016) (recognizing “today’s transformation is unique in terms of the great speed with which new ideas and technologies are spreading around the world. Every company across every industry is now compelled to reconsider their traditional ways of doing business to keep pace with rapidly changing technology and consumer expectations”).

The past decade has seen exponential progress in AI and robotics, which had previously been more the subject of science fiction than technological reality. For the first time in human history, AI allows for the automation of intellectual tasks. The simultaneous rise of smaller, more dexterous, and more versatile AI-powered robots means that machines can also perform a wider array of physical tasks.

As a result of these developments, more jobs are vulnerable to automation than ever before. Moreover, while the Agricultural Revolution unfolded over the course of several millennia and the Industrial Revolution took a half-century to fundamentally change the labor market, the progression of the latest technological revolution will radically reshape the workforce within the next decade. Legal systems are struggling and will continue to struggle to keep up with the pace of technological, economic, and social change, leaving employers facing great economic and legal uncertainty. That risk will be heightened by other radical changes taking place in the labor market.

THE COMING TIDE

The Big Picture: How AI and Automation Will Affect the Workforce

Two and a half centuries ago, the first Industrial Revolution transformed economies dominated by agriculture—with most people surviving through subsistence farming—into economies based on manufacturing and services. The first and second Industrial Revolutions helped make the two countries at the forefront of technological change (Great Britain and the United States, respectively) into the world's preeminent economic powers, spurring the creation of the middle class and dramatically raising the standard of living and workers' economic security. But technological change also had a disruptive impact, rendering some individual jobs obsolete and radically changing the nature of many other jobs. The Industrial Revolution is remembered as much for its significant social and economic disruption as for the long-term economic growth and improved standards of living it helped create.

Emerging technologies, particularly AI and robotics, have the potential to bring similarly revolutionary changes to the labor market. The increasing sophistication of AI and robotics means that even jobs thought to be immune from technological displacement will suddenly find themselves in the crosshairs of automation. At the same time, the rise of these technologies will create many new types of jobs—some of which we probably cannot even conceive of today, just as a person in 1750 could not have conceived of the job of “electrician.” New technologies will also increase demand for workers in many existing fields. As a result, we are standing on the edge of an era in which the labor market will experience disruption on an unprecedented scale.

Popular attention on the impact of automation and AI on the labor market tends to focus on the destruction of jobs in industries experiencing automation. This is, to be sure, a very real effect of automation. But automation, and the technological progress that drives it, have strong positive impacts on the workforce as well by creating and increasing demand for workers with certain skills. Most immediately and directly, the increasing ubiquity of automated systems in people's daily lives—both at work and at home—will greatly increase demand for workers performing services related to those systems, which will require regular maintenance and periodic repair to keep the complex electronic and digital systems that power them in working order. There also will be increased demand for workers trained to build and test autonomous systems.²

Historical and empirical analyses indicate that the efficiency and productivity gains from automation help spur job creation across the economy as a whole. On the aggregate and over the long-term, increased demand for workers to perform some tasks tends to counteract the drop in demand for others, thus offsetting many of the negative labor market effects created by technological advancement.³ Even in sectors experiencing rapid automation, if the increases in demand exceed the increases in productivity, the sector will experience increased demand for workers rather than reduced demand.⁴ As a result, automation, in the

2 See Prachi Patel, *Will Automation Kill or Create Jobs*, THE INSTITUTE (Mar. 7, 2017), available at <http://theinstitute.ieee.org/ieee-roundup/blogs/blog/will-automation-kill-or-create-jobs> (noting “people with tech skills will be needed in every industry to set up and operate the automation systems”); see also *Automation and Anxiety*, THE ECONOMIST (June 25, 2016), available at <https://www.economist.com/special-report/2016/06/25/automation-and-anxiety> (providing examples of new jobs created by the impact of automation and AI such as remote operators for self-DRIVING vehicles to cope with emergencies, ride-along concierges who knock on doors and manhandle packages, and writers for dialogue used by corporate chatbot, and customer-service AIs).

3 James Bessen, *Automation and Jobs: When Technology Boosts Employment*, BOSTON UNIV. SCH. OF LAW & ECON. PAPER NO. 17-09 (rev. Mar. 2018), available at <https://www.bu.edu/law/files/2017/03/autogro-03232018.pdf>.

4 *Id.*

medium- to long-term, generally increases labor demand across the economy as a whole and sometimes even in the very sectors experiencing automation.

The notion that automation and productivity-enhancing technologies will increase employment is somewhat counterintuitive, but there is ample historical precedent. One famous example is the impact of the invention of textile weaving machinery in Britain around the time of the Industrial Revolution. Fearful that the new machines would deprive textile factory workers of their livelihood, followers of the Luddite movement destroyed weaving machinery as a form of protest. “Luddite” has remained a byword for intransigent opposition to technological progress ever since.

In fact, demand for textile factory workers increased after the invention and implementation of weaving machinery in textile mills. Wages also increased, buoyed by a combination of increased demand as productivity improved and prices fell. Rising profits led owners to invest even more in their businesses, further increasing demand for workers. The technological disruptions to the textile industry did, to be sure, destroy demand for specific *jobs*. But it did not destroy demand for *work*.

A similar trend is likely to play out during the AI and Robotics Revolution. In 2017, McKinsey Global Institute (“McKinsey”) released a report titled *Jobs Lost, Jobs Gained*, which analyzed different scenarios relating to changes in the job market due to automation.⁵ The report discusses changes likely to occur in advanced and developing countries and concludes that while technology will lead to the change in or elimination of some types of work in advanced countries, including the United States, it will also increase demand for certain existing positions as well as create new occupations that did not previously exist. Even in jobs where key tasks are susceptible to automation, demand for workers may not diminish if workers are called upon to perform new tasks and if overall demand for the occupation, due to falling prices, overwhelms the rate of automation. According to the report, examples of existing jobs that are likely to see at least short- to medium-term increases in demand include computer scientists, engineers, and IT administrators.⁶

Counterintuitively, AI and robotics are slow to displace workers who perform more complex physical tasks that are not overly predictable. In other words, AI-empowered robots excel at performing intellectual (cognitive) tasks such as playing chess, while humans are superior at physical tasks such as assembling a chair.⁷ This forecasts significant job openings as baby boomers in the vocational trades retire and will primarily require human replacements, not AI-empowered robots. Increased use of AI and robotics in the management of complex construction projects is actually predicted to increase demand for workers in the construction industry.⁸

The increased production made possible by new technologies will also reinforce the job creation trends expected as developing economies continue to add millions of individuals into the consuming class each year and demand for goods and services increases. Rising demand for healthcare and other services for the planet’s aging population will also be aided by technology in ways that are expected to support job growth for doctors, nurses, health technicians, home health aides, personal care aides, and nursing assistants in many countries.

But the long-term benefits of automation are by no means guaranteed. On the contrary, the immediate effect of automation will displace many workers from their current jobs and force many to abandon their occupations altogether. Unlocking the broader potential labor-market opportunities from automation

5 McKinsey Global Inst., *Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation*, 5, MCKINSEY & Co. (Dec. 2017), available at <https://www.mckinsey.com/featured-insights/future-of-organizations-and-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages> (hereinafter, “McKinsey, *Jobs*”).

6 *Id.* at 7.

7 The phenomenon of advanced technology being unable or too costly to perform various physical tasks that humans have mastered through 200 million years of evolution—while easily performing tasks that humans have only learned to perform in the modern era—is known as Movarec’s paradox. It evolved from a study by futurist Dr. Hans Movarec, an adjunct faculty member of the Robotics Institute at Carnegie Mellon University. Contrary to traditional assumptions, high-level reasoning requires comparatively little computation while low-level sensorimotor skills, such as hand-eye coordination, require enormous computational resources. Sean Lannan, *IKEA Furniture and the Limits of AI*, THE ECONOMIST (Apr. 21, 2018), available at <https://www.economist.com/leaders/2018/04/21/ikea-furniture-and-the-limits-of-ai>.

8 Construction workers are good examples of older workers retiring and in most categories human replacements are required as opposed to AI-empowered robots or AI systems. Used in a management capacity, advanced technology is actually expected to increase headcount. “As construction projects become increasingly more complex, robots and AI software will make it easier to keep projects on schedule and within budget by improving human efficiency and productivity, which in turn will allow construction companies to take on more work and increase headcount.” Kendall Jones, *Will Robots & Automation Replace Construction Workers?*, CONSTRUCT CONNECT (Feb. 2, 2018), available at <https://www.constructconnect.com/blog/construction-technology/will-robots-automation-replace-construction-workers/>.

will thus require hundreds of millions of workers to acquire new skills. In the absence of broad-scale worker retraining and lifelong education programs, many workers whose jobs focus on tasks vulnerable to automation will find themselves unable to transition smoothly (or at all) into new jobs.⁹

The most important challenge facing the labor market will be ensuring that workers in jobs vulnerable to automation are not left behind as technology races forward. Given the speed at which the next wave of automation is likely to progress, accomplishing that goal will be no small feat. McKinsey Global Institute projects that by 2030, 400 million workers worldwide will be displaced by automation. Between 75 and 375 million of those workers will need to change occupational categories and learn new skills to remain part of the workforce.¹⁰

Complicating matters further is the difficulty in predicting precisely what sorts of jobs and tasks will see an increase in demand with further advances in automation and emerging technologies. At this point, certain jobs—such as truckers and assembly-line manufacturing workers—appear to be particularly vulnerable to automation. As explained above, others jobs, particularly those requiring a high level of knowledge coupled with creativity, specialized training, or more complex physical tasks that involve problem solving (e.g., appliance repair) appear relatively safe. But with the astounding advances occurring in machine learning and the certainty that some technological advances will not live up to their hype, these assessments could easily change. As a result, viable worker-retraining programs will not only need to become ubiquitous, they also must become nimbler and more flexible.¹¹

Critically, while the disruptive effects of technological change will be felt the world over, the share of workers who will be forced to change careers will likely be the highest in advanced economies such as the United States'. McKinsey Global Institute predicts that the hardest-hit workers will be those performing “predictable” physical tasks as examined above. But many white-collar workers—including workers in financial services, computer support, and office support roles—will also see significant declines in demand in the coming years.¹² Indeed, with the accelerating pace of advances in machine learning, even established and highly educated professions such as law and medicine may find significant portions of their current jobs being automated.¹³ Failing to prepare for the disruptive effects of these technologies could have dire consequences for individual workers, companies, and the labor market as a whole.

9 This will be particularly true in certain geographic regions. A recent study by Northwestern University’s Kellogg School of Management found that workers in smaller cities will be more vulnerable to automation than larger cities, since larger cities tend to have a higher concentration of managerial and knowledge professions. *How Will Automation Affect Different U.S. Cities?*, KELLOGG INSIGHT, Apr. 10, 2018, available at <https://insight.kellogg.northwestern.edu/article/how-will-automation-affect-different-united-states-cities> (citing Morgan R. Frank, et al., *Small Cities Face Greater Impact from Automation*, 15 J. ROYAL SOCIETY INTERFACE 946 (Feb. 2018)). Recognizing the unevenly distributed impact of the changes underway in the modern economy, the tax reform bill passed in 2017 included a new “Opportunity Zones” program that offers tax incentives for companies that invest in low-income areas of the country. See Amy Lee Rosen, *Tax Pros Excited About Opportunity Zones But Want Clarity*, LAW360, Apr. 27, 2018, available at <https://www.law360.com/articles/1038134/tax-pros-excited-about-opportunity-zones-but-want-clarity>.

10 McKinsey, *Jobs*, *supra* note 5, at 2.

11 Jana Kasperkevic, *No degree required: More tech employers looking for skills rather than a diploma*, MARKETPLACE (Feb. 13, 2018), available at <https://www.marketplace.org/2018/02/07/business/no-degree-required-more-tech-employers-looking-skills-rather-diploma> (recognizing an increase in the number of job postings within the tech industry not requiring a four-year degree but instead specific skills, like familiarity with programming language).

12 McKinsey, *Jobs*, *supra* note 5, at 9-10.

13 Bertalan Meskó, M.D., PhD, writes on his website, the Medical Futurist.com, that eight areas of medicine are already experiencing significant automation-related disruption, and predicts this is “only the beginning.” See THE MEDICAL FUTURIST (2018), available at <http://medicalfuturist.com/artificial-intelligence-will-redesign-healthcare/>. The legal profession is starting to experience the same transformation, as AI becomes an essential tool in the practice of law. See, e.g., Jane Croft, *Artificial intelligence disrupting the business of law*, FIN. TIMES (Oct. 5, 2016), available at <https://www.ft.com/content/5d96dd72-83eb-11e6-8897-2359a58ac7a5>. Nonetheless, some independent studies have found that the hype surrounding these technologies may be just that, opining that, although AI will allow doctors and lawyers to escape from a staggering list of routine tasks and improve the quality of their services, widespread automation in these industries is not imminent. Mark A. Cohen, *Artificial Intelligence Will Not Replace Lawyers With IQ And EQ*, FORBES (Mar. 20, 2017), available at <https://www.forbes.com/sites/markcohen1/2017/03/20/artificial-intelligence-will-not-replace-lawyers-with-iq-and-eq/2/#25e8c3926fe8>; Will Knight, *Google x-ray project shows AI won't replace doctors any time soon*, MIT TECH. REV. (Mar. 27, 2017), available at <https://www.technologyreview.com/s/610552/google-x-ray-project-shows-ai-wont-replace-doctors-any-time-soon/>.

The Promise and Peril of Automation for Workers

Just as emerging AI and robotics technologies will have both positive and negative effects across the entire labor market, the TIDE will likely prove a mixed blessing for workers in many individual occupations. This is perhaps most true for workers in physically dangerous jobs and those in jobs with repetitive tasks. As a result, the most mundane and the most physically dangerous jobs will increasingly be performed by machines.

In industries where the nature of the work is quite dangerous, there is considerable pressure to automate jobs out of concern for employee safety. The timber and logging industry, for example, has the highest rate of deaths per employee in the American labor market.¹⁴ The heavy machinery, rough terrain, sharp blades, and the weight and momentum of felled trees all make the logging industry a prime target for automation. With safety and productivity as the highest priorities, forestry automation is on the rise. Logging companies have begun controlling some of their heavy machinery remotely, greatly decreasing employees' exposure to the dangers inherent in working in close proximity to powerful machines. A similar dynamic has been seen in industrial welding—historically one of the most hazardous manufacturing-sector tasks—where the market for industry-specific robotics surpassed \$2 billion in 2016 and is projected to grow an additional 30% over the next four years.¹⁵

Even in jobs where workers' roles are not automated, new technologies will increase workers' capabilities and reduce the risk of injury in many dangerous jobs. Firefighters have been able to use exoskeleton suits to “supplement muscle performance and help . . . manage all the extra weight without impeding the freedom of movement.”¹⁶ Shipyard workers in South Korea are currently using exoskeletons, giving them super-human strength.¹⁷ Such devices may make many traditionally dangerous jobs less hazardous.

Jobs where the essential tasks are predictable or repetitive are also likely to become heavily automated. Fast food employees, for example, repeat the same rote tasks with limited variation, day after day, in standardized, highly controlled environments. These tasks have seemed impervious to automation since previous generations of automated systems lacked the combination of fine motor skills and the ability to interact with human customers necessary to perform such tasks. But as robots become smarter, less physically unwieldy, and more affordable, these fast-food jobs and other similar occupations will increasingly be replaced by machines that will be able to perform the tasks with greater precision and reliability.

McKinsey Global Institute predicts that “a wide range of jobs carried out in predictable settings, such as assembly line workers, dishwashers, food preparation workers, drivers, and agricultural and other equipment operators” will see substantial declines in employment.¹⁸ Food preparation jobs alone are projected to decrease by more than 35% by 2030 in the United States. At the same time, demand for workers in fields that are more dynamic or that require creativity—such as construction, architecture, and design—are projected to increase significantly during the same timeframe.¹⁹

Workers displaced by automation in these industries could also be retrained to fill the increasing demand for workers with the ability to operate, monitor, maintain, and repair those automated systems. In the past two years, two separate global e-commerce companies have automated many of the tasks that human warehouse workers used to perform. Instead of laying off those warehouse employees, both companies retrained them to operate and repair the robots that had essentially forced them out of their former roles.²⁰ So while the repetitive work was ultimately replaced by machines, the change created new, more mentally stimulating jobs that required different skill sets. And by helping their existing workforce develop those skills, the companies saved themselves not only from the backlash that can accompany mass layoffs, but also the uncertainty and recruitment costs of finding new employees to fill the new positions.

14 Samuel Stebbins, et al., *Workplace Fatalities: 25 most dangerous jobs in America*, USA TODAY (Jan. 9, 2018), available at <https://www.usatoday.com/story/money/careers/2018/01/09/workplace-fatalities-25-most-dangerous-jobs-america/1002500001/>.

15 *Robot Automation Leads Solid Growth in Welding Products Global Market*, BCC RESEARCH (Dec. 15, 2016), available at <https://www.bccresearch.com/pressroom/avm/robot-automation-leads-solid-growth-in-welding-products-global-market>.

16 See Glenn McDonald, *Firefighter Exoskeleton to the Rescue*, DISCOVERY NEWS (May 21, 2014), available at <http://news.discovery.com/tech/robotics/firefighter-exoskeleton-to-the-rescue-140521.htm>.

17 Hal Hodson, *Robotics Suit Gives Shipyard Workers Super Strength*, NEW SCIENTIST (July 30, 2014), available at <https://www.newscientist.com/article/mg22329803-900-robotic-suit-gives-shipyard-workers-super-strength/>.

18 McKinsey, *Jobs*, *supra* note 5, at 9.

19 *Id.* at 10.

20 Sarah Ashley O'Brien, *Boxed warehouse brings in robot workers — keeps humans too*, CNN (Apr. 27, 2017), available at <http://money.cnn.com/2017/04/27/technology/automation-jobs-boxed/index.html>.

Eventually there will be a shift in many industries as wages, workers' compensation insurance, safety needs, and a variety of other costs outweigh the cost of purchasing and maintaining automated systems. As in the Industrial Revolution, where some of the most physically laborious and tedious jobs in agriculture and manufacturing were the first to succumb to automation, the next wave of automation is likely to first affect jobs that are dangerous, require little or no creativity, and/or can be performed in predictable, tightly controlled environments.

Of course, the automation of many of these jobs may meet with considerable resistance. The logging industry workforce, for instance, is heavily unionized, and it seems unlikely that those unions would quietly assent to the automation of the nearly five million jobs held by American loggers. A preview of this dynamic was evident recently in Las Vegas, where 50,000 casino workers announced a strike to protest against the rise of automation.²¹

Employers in other industries are likely to face similar challenges; a worker who has a dangerous job typically will prefer to keep that job if the alternative is having no job at all. The key for employers and government agencies will be to provide workers with access to the training and education that will prepare them for the types of jobs that will be available in the new economy.

Another likely impact of AI and robotics is more unambiguously positive: advanced technologies could provide unprecedented opportunities for individuals with disabilities. Technologies in development or currently on the market will help individuals with physical conditions that impair their vision, hearing, mobility, dexterity, or physical strength to perform tasks—and work in occupations—that were previously closed to them.

Robotic arms or legs with capabilities far exceeding the static prosthetics of the past allow individuals with physical disabilities to operate without physical restrictions. A battery-operated exoskeleton that is being developed in Japan can be worn to increase mobility and muscle function in those with musculoskeletal disabilities.²² Self-driving vehicles and other advanced transportation technologies will make it possible for deaf or blind workers to cost-effectively commute much longer distances, thus opening the range of job opportunities available to them. Honda's ASIMO can assist a wheelchair user by performing manual operations like turning on a light switch, opening doors, and carrying objects. These technologies have the potential to mitigate disabilities based on mobility and muscle function, significantly broadening employment opportunities for disabled workers.

Human enhancement technologies designed to improve and repair brain function could have an equally dramatic impact. Already, the capabilities of these technologies can have life-changing effects for workers with disabilities. In 2017, a man paralyzed below the neck after a bike crash had electrical implants placed in the motor cortex of his brain and sensors inserted in his forearm, allowing the muscles of his arm and hand to be stimulated in response to signals from his brain, decoded by computer. After eight years of paralysis, he is able to drink and feed himself without assistance.²³ This means that many workers who otherwise would be permanently forced out of the labor market due to injury or illness may eventually be able to rejoin the workforce.²⁴

The federal Americans with Disabilities Act (ADA) prohibits discrimination on the basis of disability in employment, state and local government programs, public accommodations, commercial facilities, transportation, and telecommunications. Nonetheless, workers must be able to perform the essential functions of the job with or without reasonable accommodation. One online magazine predicts that reasonable accommodation for disabled employees will include artificial intelligence in the workplace.²⁵ In

21 Andres Oppenheimer, *Las Vegas hotel workers vs. robots is a sign of looming labor challenges*, DALLAS NEWS (June 4, 2018), available at <https://www.dallasnews.com/opinion/commentary/2018/06/04/las-vegas-hotel-workers-vs-robots-sign-looming-labor-challenges>.

22 See N.V., *Difference Engine: The Caring Robot*, THE ECONOMIST (May 14, 2013), available at <http://www.economist.com/blogs/babbage/2013/05/automation-elderly>.

23 Jon Hamilton, *Paralyzed Man Uses Thoughts To Control His Own Arm And Hand*, NPR (Mar. 28, 2017), available at <https://www.npr.org/sections/health-shots/2017/03/28/521665654/paralyzed-man-uses-thoughts-to-control-his-own-arm-and-hand>.

24 Newsroom, *Robots and Artificial Intelligence at the Workplace for People with Disabilities*, MORNING FUTURE (Jan. 8, 2018), available at <https://www.morningfuture.com/en/article/2018/01/08/robot-artificial-intelligence-people-disabilities/199/> (stating “artificial intelligence will change the way the disabled access the labour market on three levels: language, the environment, and the detection of habits;” and “in the future, reasonable accommodation for people with disabilities will undoubtedly include artificial intelligence”).

25 *Id.*

the future, the synthesis of AI with human enhancement technologies will give employers the ability—and perhaps eventually a legal obligation—to reasonably accommodate more disabled workers.

As these examples illustrate, it would be foolish and futile to attempt to stop the coming TIDE of automation, which has the potential to dramatically improve the economic opportunity and quality of life for millions of American workers. Employers and policymakers should instead attempt to maximize the benefits of automation while providing displaced workers with the skills that their employers will need in the future.

Convergence with Other Economic Trends

The coming wave of robotic and AI-driven automation will undoubtedly interact with other economic trends that have recently taken hold in the American labor market. Three trends are particularly relevant in the context of assessing how the American workforce and the distribution of work will change in the coming years: (1) the widening gulf between the skills employers expect workers to have and the skills those workers actually have; (2) the growing contingent workforce, including freelancers; and (3) increasing concerns about economic inequality.

The Skills Gap

The coming wave of automation also appears to be on a collision course with another labor market trend—the growing *skills gap*. While the exact meaning and source of the “skills gap” is controversial, the term generally refers to a mismatch between the skills workers actually have and the skills employers expect them to have. Different groups offer different proposed explanations for the skills gap, but they all revolve around a common theme: American workers are not getting the education and training they need to acquire the skills that employers demand. Controversy surrounds the issue of where, exactly, the skills pipeline breaks down. Some attribute the gap to a decline in American K-12 education, particularly in science, technology, engineering, and mathematics (STEM);²⁶ others attribute the gap to deficiencies in vocational training, or post-secondary or lifelong education;²⁷ while yet others point to a decline in formal employer-backed training programs such as apprenticeships.²⁸

The most complete explanation undoubtedly involves a combination of these three factors. But it is the last factor—that the skills gap is an outgrowth of the modern American approach to workforce education and training—that is most within employers’ control.

One explanatory factor, which does not appear to be much-discussed in past scholarship, is that American law provides very little incentive for employers to invest in worker training. In many other industrialized countries, employers generally have robust worker-training programs because their legal regimes greatly restrict the circumstances under which companies can terminate employees. A company wishing to close down a division or automate a set of tasks usually must find another position within the company for the affected employees, which generally requires retraining that employee to perform the tasks of the new position.

But in America, private-sector employees generally are at-will and employers are under no obligation to find ways to retain the services of employees whose existing job is facing elimination. Perhaps as a result, a sense of complacency regarding worker training is often evident in the United States. Companies expect employees to come to them already having the skills needed to perform the work for a particular position. Given the choice between an external candidate who already has completed the necessary training and who possesses the requisite skills, and an internal candidate whose training for the position would have to be subsidized by the company, companies have little incentive to choose the latter route. Companies, in effect, have come to expect others to provide their workers with the necessary skills.

Regardless of the underlying cause, the fact remains that there is a real mismatch between the skills American employers seek, and the skills American workers currently have. Worse, even ignoring the impact of automation, the skills gap could increase substantially in the coming years due to the twin impacts of an

26 Mikhail Zinshteyn, *The Skills Gap: America's Young Workers Are Lagging Behind*, THE ATLANTIC (Feb. 17, 2015), available at <https://www.theatlantic.com/education/archive/2015/02/the-skills-gap-americas-young-workers-are-lagging-behind/385560/>.

27 Mary Alice McCarthy, *Beyond the Skills Gap*, LUMINA FOUND. (Oct. 2014), available at <https://www.luminafoundation.org/files/resources/beyond-the-skills-gap.pdf>.

28 Peter Capelli, *The Skills Gap Is a Myth: The real issue is that employers need to provide more on-the-job training*, SOC'Y FOR HUMAN RES. MGMT. (Nov. 28, 2017), available at <https://www.shrm.org/hr-today/news/hr-magazine/1217/Pages/the-skills-gap-is-a-myth.aspx>.

aging workforce and a poor vocational education pipeline to replenish the ranks of retiring skilled workers. This trend is evident in fields as diverse as trucking and aerospace engineering. The median age of truck drivers is 50, and the average age is 45 in the aerospace industry, where just 4.19% of workers are between the ages of 22 and 25.²⁹

For these reasons, the American labor market would likely be facing significant disruption even if it was not facing waves of automation. But with the TIDE approaching, the American labor market appears to be on the precipice of an unprecedented transformation. Whether that transformation helps or hurts the long-term competitiveness of American workers and companies, and whether it results in an improved quality of life for Americans, is largely dependent on whether America's employers, workers, and policymakers can maximize the opportunities that AI and robotics will bring while minimizing the harmful effects that workers experience when their skills become obsolete.

The Rise of the Contingent Workforce

The paradigm of the 20th century workforce is undergoing profound change given the emergence of the contingent workforce. Broadly defined, the contingent workforce includes “independent contractors, self-employed individuals, freelancers, temporary agency workers and individuals working full-time or when they want via online platforms.” The broad definition also includes employees with no expectation of long-term work, often working on a project-by-project basis.³⁰ Contingent workers can be entirely digital, physically present, or work through a combination of virtual and physical presence. They may also be made available through a contractor, staffing agency, or a professional employer organization. They may be administered through a Vendor Management System (VMS) or Managed Service Provider (MSP).³¹

The growth of this workforce significantly accelerated after the 2008 recession as employers and other organizations recognized the need for more flexibility in quickly adjusting the size of the workforce and matching needs with available skills.³² At the same time, technology increasingly made it possible for workers to perform tasks remotely and on a project-by-project basis; algorithmically enhanced search technology is making it easier for freelancers to find projects (and clients to find qualified freelancers). This greatly increased flexibility and provided access to a vast range of skilled workers regardless of their location. Cost savings were also a factor and, initially, many traditional employees became part of the contingent workforce because they offered the best available opportunities following the recession. This

29 Jim Freaner, *Aerospace Skills Gap: Workforce Declines, As Talent Needs Increase*, AREA DEVELOPMENT (2015), available at <http://www.areadevelopment.com/Aerospace/q3-2015-auto-aero-site-guide/Aerospace-Skills-Gap-Workforce-Declines-Needs-Increase-45711.shtml>.

30 *The Rise of the Contingent Workforce*, FIN. TIMES (Apr. 4, 2018), available at <http://www.ftiecla.com/2018/04/04/the-rise-of-the-contingent-workforce/>. Although some studies exclude certain professional worker categories that make up the contingent worker category, the consensus is that a contingent employment relationship is temporary, not permanent, and/or project based. See Jennifer Dorning, *Professionals in the Contingent Workforce*, DEP'T FOR PROF. EMPLOYEES (Aug. 2016), available at <http://dpeafclcio.org/programs-publications/issue-fact-sheets/professionals-in-the-contingent-workforce/> (providing that contingent workers are employed in non-permanent positions as independent contractors, temporary workers, contract workers, on-call workers, consultants, freelancers, or are self-employed); Edelman Intelligence, *Freelancing in America 2017*, UPWORK (2017), available at <https://www.upwork.com/i/freelancing-in-america/2017/> (providing that contingent workers include independent contractors, moonlighters, diversified workers, temporary workers, and freelance business owners); Julia Frontier, *What Is A Contingent Worker*, HCM WORKS (Jul. 14, 2015), available at <https://www.hcmworks.com/blog/what-is-a-contingent-worker> (specifying that contingent workers include freelancers, ICs, consultants, or other outsourced and non-permanent workers who are hired on a per-project basis).

31 The most recent Bureau of Labor Statistics (BLS) report on contingent and alternative workers defines the term “contingent workers” as “people who do not expect their jobs to last or who reported that their jobs are temporary. They do not have an implicit or explicit contract for continuing employment.” Bureau of Labor Statistics, *Contingent and Alternative Employment Arrangements — May 2017*, News Release, June 7, 2018, available at <https://www.bls.gov/news.release/pdf/conemp.pdf>. The BLS report also defines a category termed “alternative employment arrangements,” which includes some contingent workers as well as “people employed as independent contractors, on-call workers, temporary help agency workers, and workers provided by contract firms.” *Id.* This Report uses the term “contingent workers” in a broad sense, covering all of the above work categories.

32 The size and growth of the contingent workforce is the subject of intense study and debate. The most recent BLS survey indicates that the number of contingent workers and workers in alternative work arrangements decreased slightly between February 2005 and May 2017. According to the report, 10.1% of workers had primary jobs that met the BLS definition of “alternative work arrangements,” and approximately 3.8% of workers were “contingent workers” under BLS’s narrow definition of that term. Bureau of Labor Statistics, *supra* note 31. But some reports by private-sector groups and think tanks place the number of contingent workers far higher than does the BLS survey, and generally project strong growth into the future for the contingent workforce. See generally Robert McGuire, *Ultimate Guide to Gig Economy Data, A Summary of Every Freelance Survey We Can Find*, Nation1099, Jan. 29, 2018, available at <https://nation1099.com/gig-economy-data-freelancer-study/>. Notably, the BLS survey focuses on individuals’ primary job, a definition which discounts the fact that for many workers, contingent or alternative work may be an important source of supplemental income. Regardless of the definition used, there does not appear to be any dispute that contingent works comprise a vital part of the workforce that will be essential to companies’ workforce planning in the fact of the TIDE.

trend was reinforced as advancing technology made freelancing easier and accelerated the growth of the sharing economy in the decade that followed.³³

But relying on freelancers and other contingent workers for the operation of a company's core business can have drawbacks. Most freelancers are independent contractors normally provide services to multiple organizations. They may lack detailed knowledge about a particular business or organization for which they perform work. Their legal status demands greater freedom to set schedules and restricts companies' ability to control the manner in which they provide services. Companies may refrain from applying policies and practices such as progressive discipline to independent contractors because courts may view enforcement of such policies as indicia of control. Similarly, in-house training is generally not available because of companies' legitimate concerns that providing such training could threaten a worker's classification as an independent contractor. Accordingly, many companies still favor traditional employer-employee relationships, particularly for long-term core functions.

Nevertheless, a company's future success will depend on being adept in managing core traditional employees with qualified contingent workers. Achieving, maintaining, and managing this balance will prove even more difficult in the face of the TIDE. Failure to train and upgrade existing employees will intensify the negative impact of the skills gap. While temporarily certain hard-to-find skills may be provided by a freelancer, such workers will resist accepting traditional full-time employment or becoming too dependent on a particular client.

From a worker's perspective, freelancers and other independent contractors in the sharing economy earn an income with a higher degree of independence than traditional corporate employees. Independent contractor status allows contingent workers to control when, where, and how to perform the work. As a result, several surveys have found that freelancers are increasingly happy with their status as independent contractors and prefer it to a traditional employment relationship.³⁴

But the current U.S. legal regime was shaped in response to the labor market changes of the Industrial Revolution, during which a rural society dominated by independent farmers and artisans was transformed into a society where the labor market was dominated by urban employees who earned a fixed wage from a specific company. The laws that govern the American workplace and workforce thus were written with traditional fixed-wage employees rather than independent workers in mind. Freelancers, like traditional employees, are concerned about the access to affordable health care, debt, the financial ability to save, and retirement savings, but current laws were not written with their concerns in mind.

Two seemingly irreconcilable forces appear to be in direct opposition with each other. Freelancers are a large and critical part of the workforce, and most place a high value on their independence. Pushing against this seemingly unstoppable force is the fact that our social safety net, military, and infrastructure are primarily funded and maintained through traditional employment-based taxes, as well as a growing national and state government crusade to provide independent contractors with additional protections and guarantees traditionally accorded only to employees. Canadian courts recognized these opposing forces early on and created a new "dependent contractor" category blending characteristics of employment with those of independent contractor status. Some efforts and experiments are taking place at the state and local level in the United States,³⁵ but the discussion is not yet taking place with anything approaching the urgency required.

33 A prominent example of the technologically-driven expansion of the contingent workforce is Upwork, the world's largest "global freelancing platform where businesses and independent professionals connect and collaborate remotely." Upwork's website lists over 5,000 skills, and it also offers a chat feature to facilitate collaboration and networking. Advanced algorithms can narrowly identify the key skills associated with a posted project and then notify qualifying freelancers that the project is available. Characteristic of third-party platform technology, the decision of the freelancer and the client to work together is entirely between the parties. And Upwork is hardly alone; in 2017, Forbes listed 79 active sites where freelancers could find digital work. Abdullahi Muhammed, *79 Websites To Get Freelance Jobs Fast*, FORBES (June 16, 2017), available at <https://www.forbes.com/sites/abdullahimuhammed/2017/06/16/79-websites-to-get-freelance-jobs-fast/#5e26770c1688>. In September 2018, the BLS will issue a supplement to its most recent survey that will analyze, for the first time, "individuals who found short tasks or jobs through a mobile app or website and were paid through the same app or website." Bureau of Labor Statistics, *supra* note 31. A 2015 survey by economists Lawrence Katz and Alan Krueger found that 0.5% of respondents reported engaging in such online-platform work as their primary job. Lawrence F. Katz and Alan B. Krueger, Jay Shambaugh, et al., *Independent workers and the modern labor market*, Brookings Institution Up Front, June 7, 2018, available at <https://www.brookings.edu/blog/up-front/2018/06/07/independent-workers-and-the-modern-labor-market/>.

34 EDELMAN INTELLIGENCE, *FREELANCING IN AMERICA 2017*, available at <https://www.upwork.com/i/freelancing-in-america/2017/>.

35 Robert Maxim & Mark Muro, *Rethinking worker benefits for an economy in flux*, BROOKINGS (Mar. 30, 2018), available at <https://www.brookings.edu/blog/the-avenue/2018/03/29/rethinking-worker-benefits-for-an-economy-in-flux/>.

The convergence of the contingent workforce with the quickening pace of automation due to AI and robotics will bring changes to the labor market on a scale not seen since the height of the Industrial Revolution. Just as the Industrial Revolution eventually forced the creation of the existing regulatory framework for the American workforce, the transformative changes coming to the current workforce will likely require a radical rethinking of how to manage the new realities of the 21st century labor market. Laws, regulations, and the fundamental assumptions that underpin them will need to evolve and adapt to the changing needs of the Information Age workforce.

Economic Inequality

Concerns regarding economic inequality have become a political flashpoint, with several surveys finding that the gains from America's impressive economic growth over the past several decades have not provided many American workers with economic security. A study conducted as part of the United Way's ALICE project found that 43% of Americans do not have incomes sufficient to pay for the basic necessities such as food, housing, transportation, and health care. The acronym "ALICE" stands for "Asset Limited, Income Constrained, Employed"—the last word highlighting the fact that these economic struggles are a reality for tens of millions of Americans who are actively employed.³⁶

Many economists have raised concerns that any existing economic inequalities will be exacerbated by a new wave of automation. According to some, rapid advances in technology have historically increased income inequality, particularly in the United States, by lowering demand for workers in occupations that require little formal education or training.³⁷ If a machine replaces a worker, thereby maintaining or increasing production while eliminating the need for a human worker, the resulting return on the investment in the machine would inure to the benefit of the employer, thus increasing the employer's return on capital. At the same time, the elimination of the need for the human worker would lower the amount of income that goes to wages.³⁸

According to the Organisation for Economic Co-operation and Development (OECD), the share of national income that has gone to labor has decreased significantly since the 1990s, with technology accounting for 80% of this change.³⁹ According to some projections, the incorporation of AI and robotics in the workplace is likely to exacerbate this trend by accelerating the pace of automation, particularly affecting workers whose jobs require predictable physical labor.⁴⁰ If that scenario plays out, the effect of automation will be to further damage the return on labor for wage earners—unless there is substantial investment in programs that ensure displaced workers can quickly find new employment. This underscores that meeting the TIDE is not just an economic necessity, but also a profound ethical responsibility.

FACING THE TIDE

Automation will present serious challenges to employers, workers, educators, and governments. Those who try to stop or slow the deployment and implementation of these technologies will be at a disadvantage. Those who effectively manage the disruptive effects of automation and ensure that the human workers who are displaced have the skills necessary to remain part of the workforce (or have access to education or training programs that will provide them with such skills) will remain relevant and competitive in the marketplace.

The key steps employers can take include: (1) identifying the tasks that its workers will need to perform in the future, based on their projected areas of operations; (2) assessing whether they have a sufficient number of employees with the skills necessary to perform each task; and (3) establishing in-house training programs or partnering with educational institutions or other outside organizations to establish programs that provide workers with the skills needed to perform those tasks. In addition, employers can continue to engage and educate policy-makers on TIDE-related issues.

36 UNITED WAY ALICE PROJECT, <https://www.unitedwayalice.org/>.

37 See David Rotman, *Technology and Inequality*, MIT TECH. REV. (Oct. 21, 2014), available at <https://www.technologyreview.com/s/531726/technology-and-inequality/>.

38 Sree Ramaswamy & Anu Madgavkar, *What will automation mean for wages and income inequality?*, MCKINSEY GLOBAL INST. (Mar. 2018), available at <https://www.mckinsey.com/featured-insights/future-of-organizations-and-work/what-will-automation-mean-for-wages-and-income-inequality>.

39 *Workers' share of national income: Labour pains*, THE ECONOMIST (Oct. 31, 2013), available at <https://www.economist.com/finance-and-economics/2013/10/31/labour-pains>.

40 McKinsey, *Jobs*, *supra* note 5, at 30.

Forecasting Future Talent Requirements

One of the core requirements of any organization is strategic planning. This requires understanding the industry, the business or organization, and forces of change, as well as spotting future needs and anticipating technological transformation. From the mission and vision statements to the priorities of leadership, the most important asset is human capital.⁴¹ But even though companies often claim that workforce planning is a central priority, many organizations fail to adequately assess future talent requirements because it has not been made an operational priority in practice.⁴² Forecasting future talent requirements needs to be a continuous process involving leadership from across the organization, often facilitated and guided by HR. When specific skills are difficult to predict, seeking workers capable of learning a range of skills is important.

Ironically, the development of AI, big data, and predictive analytics—which are themselves major job-disrupting forces—also provides a valuable resource for predicting future talent needs as well as better assessing hidden talent within the current workforce.⁴³ AI has the power to process multiple sources of communications and work product within a business or organization. Algorithms can assess the aptitude of the workforce for learning especially in areas of technology.

A less intrusive but highly effective tool is an employee survey. As noted by Pierre Gurdjian and Oliver Triebe in *McKinsey Quarterly*:

[M]any training programs don't yield the desired results. One reason is that they are usually launched without sufficient knowledge of where the gaps in employee skills exist. We find that a good way to pinpoint these learning needs is to survey employees and let them evaluate the current skill levels of their peers and estimate the skill level their group must reach in order to be successful. An added advantage of this inclusive approach is that it heightens employees' awareness of their learning needs and helps break down any resistance to learning new skills.⁴⁴

Forecasting human talent should also include a review of trends identified by industry groups, as well as projected workforce requirements by human resource associations, accounting firms, institutes, private and public educational groups, and government.

While training and upgrading must be one of the highest priorities, inevitably, positions will be created demanding skills and expertise that cannot be filled with the existing workforce. Meeting this challenge requires classifying the open positions as to whether they are best filled by direct hires or contingent workers, most likely freelancers. Inevitably, positions requiring skills in high demand such as in cybersecurity and data analytics may require months of recruitment. Contingent workers may be needed to fill the positions during the interim as well as staff positions that could change or be disrupted in the short run. Also positions that are more tangential to the organization are well suited for contingent or freelance workers, even though they require special skills and command significant compensation.

41 Harvard Business School, *Why human capital is your company's greatest asset*, QUARTZ, also available at <https://qz.com/403391/why-human-capital-is-your-companys-greatest-asset/> (“The most important asset at your company isn't something you can put your hands on. It isn't equipment or the physical plant, and it isn't data, technology, or intellectual property. The most valuable part of your company is the people—the human capital—and any plans to move your business forward have to start there.”).

42 Peter Louch, *Workforce Planning Is Essential to High-Performing Organizations*, SOC'Y FOR HUMAN RES. MGMT. (Oct. 3, 2014), available at <https://www.shrm.org/resourcesandtools/hr-topics/technology/pages/louch-workforce-planning.aspx>.

43 A National Bureau of Economic Research study “pitted humans against computers for more than 300,000 hires in high-turnover jobs at 15 companies. Human experience, instinct, and judgment were soundly defeated: people picked by computers stayed far longer and performed just as well or better. This wasn't the only such finding. University of Minnesota professors analyzed 17 studies and found that hiring algorithms outperform humans by at least 25 percent.” Scott Keller & Mary Meaney, *Attracting and retaining the right talent*, MCKINSEY & COMPANY, Nov. 2017, available at <https://www.mckinsey.com/business-functions/organization/our-insights/attracting-and-retaining-the-right-talent>.

44 Pierre Gurdjian & Oliver Triebe, *Identifying Employee Skill Gaps*, MCKINSEY QUARTERLY (May 2009), available at <https://www.mckinsey.com/business-functions/organization/our-insights/identifying-employee-skill-gaps>.

Similarly, and somewhat counterintuitively, an essential step in talent acquisition planning is recognizing the role of *non*-human talent. Employers must be able to identify when AI, machine learning, deep learning, data analytics, robotics, or advanced automation can and cannot be substituted for human talent. This will help employers identify the areas in which they should focus their efforts in fostering human talent.

Improving and Expanding Lifelong Learning Programs for Workers

To ride the TIDE, the paramount priority for employers will be implementing expanded and improved workforce training and education programs so that employers, workers, and the economy as a whole can manage the enormous disruptions that AI, robotics, and automation will bring. There is broad consensus on two points with respect to the impact of automation on the labor market: (1) the productivity and efficiency gains from automation will create new, more dynamic employment opportunities; and (2) automation will cause a substantial number of workers to lose their current jobs and force many of those workers to change careers. These twin impacts are consistent with historical experience. As stated in a report on the economic impact of technological change prepared more than 50 years ago at the behest of President Lyndon B. Johnson:

The basic fact is that technology eliminates jobs, not work. It is the continuous obligation of economic policy to match increases in productive potential with increases in purchasing power and demand. Otherwise the potential created by technical progress runs to waste in idle capacity, unemployment, and deprivation.⁴⁵

The phenomenon of workers losing their jobs as a result of automation is often referred to as “technological unemployment.” But the use of the word “unemployment” implies that the inevitable consequence of automation is that affected workers will be left with no job at all. That is unnecessarily fatalistic, because both historical experience in the United States and current practices in other developed economies demonstrate that workers whose jobs are automated can end up somewhere other than the unemployment line or early retirement. That is why our acronym for the disruptive labor-market effects of automation stands for “Technology-Induced *Displacement* of Employees,” rather than “Technology-Induced Destruction of Employment.”

The challenge in managing the impact of the TIDE is easy to articulate but difficult to achieve. Workers who lose their jobs due to technological change must be given the tools they need to perform work that will be in demand in the economy of the future. But the scale of that task is immense and its simplicity belies its difficulty. According to McKinsey Global Institute’s previously cited recent report, between 400 and 800 million workers worldwide—including 73 million in the United States alone—will be forced out of their current jobs by 2030.⁴⁶ At the same time, however, the rise of automated systems will increase demand for workers in many industries, not least for workers trained to design, assemble, program, and maintain automated systems.

The focus of employers and policymakers should not be on an ultimately losing effort to hold back the TIDE, but rather on preparing the workers swept up by the TIDE for the jobs that will exist.

Companies will face ever-increasing pressure in the coming years to modernize their operations and workforce in the face of accelerating technological change. Given the scale and urgency of the task—and the unlikelihood of meaningful national legislation in the short-term—employers must move quickly to prepare themselves and their workers for the TIDE. Workforce planning has been rising in importance within company HR departments for the past two-plus decades. But, by and large, companies have devoted most of their workforce planning efforts to identifying areas of need, rather than on cultivating workers to fill those needs. At the same time, employer-sponsored vocational programs and formal workplace training have historically been neglected in the American labor market for a variety of social and economic reasons. Instead, employers generally hire workers with the expectation that they will be able to be productive employees with little or no company-provided training aside from cursory orientation sessions and informal on-the-job shadowing during an employee’s early days or weeks of work.

45 NAT’L COMM’N ON TECH., AUTOMATION & ECON. PROGRESS, 1 TECHNOLOGY AND THE AMERICAN ECONOMY 9 (1966).

46 McKinsey, *Jobs*, *supra* note 5, at 10-11.

Such an approach will not be tenable in the face of accelerating technological change, which will continuously create demand for new skills and diminish demand for others on ever-shorter timescales. This will widen the skills gap that employers face today. Employers will not be able to rely upon external recruitment efforts to fill areas of anticipated need, because there will not be an adequate supply of outside workers who already have the necessary skills. Relying on government programs and outside educational institutions to cultivate those skills will likely prove equally untenable in an era of rapid technological change; the curricula for traditional vocational education programs are generally set more than a year in advance and the institutions that operate such programs generally lack the resources to provide the kind of targeted training that individual companies will require for their workers.

Implementing Workplace Training and Partnering With Trade Groups, Educational Institutions, and Worker Organizations to Provide Workers With Access to Vocational Education Resources and Training Opportunities Both in the Community and On-Line

Employers will have to take proactive steps to close the skills gap. This will require most employers to substantially modify their approach to job training. While some employers may be able to provide the necessary training in-house, most will find it beneficial to partner with technical schools, online education platforms, and community colleges, many of which engage in vocational education and have experience in developing the necessary curricula and coursework. Through such partnerships, companies can craft targeted programs that can efficiently provide employees with the necessary skills by combining their own knowledge of the specific skills they will require with the chosen learning institution's general educational expertise. This effort should be geared toward providing workers with the specific, relevant skills needed to perform a job, rather than on obtaining an academic degree or even a professional certificate.⁴⁷

A comprehensive approach might involve establishing firm-sponsored apprenticeship programs that mix vocational education and on-the-job training, as many companies in Germany do. This model has been adopted with success in the United States, with perhaps the most prominent example coming from an auto manufacturing plant in Spartanburg, South Carolina—a factory operated, perhaps unsurprisingly, by a German-owned company. The Spartanburg plant is 98% automated, but the company has invested substantial resources in an apprenticeship program for mechanics to monitor, maintain, and repair the 2,000 robots that perform the production work at the 1.2-million-square-foot facility. The apprenticeship program, established in 2011, has been so successful that the company announced in January 2018 that it was doubling the size of the program.⁴⁸

Companies can also partner with industry groups to establish standardized, industry-specific training programs for the jobs and skills projected to be in demand. Working with other companies and industry groups will help employers get the benefit of economies of scale, which would help offset the upfront costs of establishing an appropriate vocational education or training program.

While establishing such programs will be a formidable undertaking, it is easier than ever to provide workers with new skills. With the advent of massively open online courses (MOOCs), there are an unprecedented number of online programs in data science, computer programming, and other related fields, as well as in more traditional vocational programs. Many of these programs do not require enrollees to have more than a high-school-level education, a critical feature given that the coming TIDE of automation will hit workers without college degrees especially hard. Many are also self-paced or provided in an on-demand format, thus permitting learners to progress through programs on their own schedule—a major benefit for companies whose employees may be working while enrolled in these programs.

The costs of online education programs tend to be comparable to or less than similar programs offered at community colleges and traditional adult education centers. In addition, with the advent of low-cost hardware platforms like Raspberry Pi—which sells for \$35 and can be used to control numerous robotic and computer systems—there is an enormous opportunity to develop curricula that can train American workers of all ages in robotics and related fields at costs far lower than traditional technical training.

47 Traditional education institutions and online learning platforms offer programs that can be completed in six months and provide workers with new skills that would enable them to change careers, although unfortunately, these programs remain woefully underutilized by workers and employers alike.

48 Anna B. Mitchell, *BMW doubles down on tech apprenticeship program*, USA TODAY (Jan. 31, 2018), available at <https://www.usatoday.com/story/money/2018/01/31/bmw-doubles-down-tech-apprentice-program/1080832001/>.

The necessity of establishing such programs is heightened, not diminished, by the growing importance of the contingent workforce. Freelancers are motivated to routinely upgrade skills so as to remain qualified as technology changes the goal posts. But most will lack the financial ability to do so as the growing TIDE sweeps up an increasing number of jobs at an accelerating pace. Employers must therefore work together to establish programs that reach and provide skills for this vital segment of the workforce. Individual companies may resist sponsoring such freelancer-focused programs themselves, both for legal reasons and because the company would not appear to benefit from providing such training. But companies can and should financially contribute to industry groups and outside organizations to design programs that reach the contingent workforce. Freelancers will greatly appreciate such efforts, and employers will reap the benefits of having a better-qualified contingent workforce.

Employers increasingly are recognizing an ethical obligation to the people that make the business or organization possible as well as the overall economy, the environment, and the society. Improving in-house training and opening the door to life-long learning is essential for survival, matching skills with good jobs created by technology, and providing a future for displaced workers and their families. It is far better for society and human dignity to remain an activate contributor in the economy, learning about and participating in the future, rather than being forced to accept long-term government assistance or becoming distant from the dreams, goals, and discoveries that inspire life's journey.

Regardless of the approach taken, it will be essential for employers to recognize that adapting to the future economy will be an ongoing process. The cycle of innovation, adoption, and obsolescence has been accelerating ever since the start of the Digital Revolution and is likely to accelerate even further as next-generation technological advances in areas such as deep learning, quantum computing, and nanotechnology further transform the technological landscape for employers. Consequently, companies can no longer assume that they will be able to find workers that come with all the necessary training needed for a position. The companies that adapt will succeed in this new economy, while companies that do not will fall ever-further behind.

Placing TIDE-Related Issues Front and Center on Government's Radar Including Legislative, Regulatory, and Legal Barriers and Opportunities

Employers can work with policymakers at all levels of government to address the critical needs and action required because of the coming TIDE. This will require considerable outreach efforts to educate the government on the imminence and scale of the TIDE.

Internationally, the United States appears increasingly alone in the lack of concrete governmental planning to prepare its labor market for the disruptive impact of automation. The world's other major economic powers have developed national public-private strategies designed to reap the benefits and minimize the social costs of the coming wave of automation.

China has been particularly proactive in this regard, with the national government pouring resources into reorienting its economy and workforce to reap the benefits of the anticipated growth in the AI and robotics industries. Last year, the Chinese Ministry of Science and Technology released a "Next Generation Artificial Intelligence Development Plan," promising to "vigorously use governmental and social capital" in an effort to achieve Chinese dominance of the AI industry. The plan's goal is to establish China as the world's leader in AI by 2030. In addition, the Chinese government is orchestrating the early retirement of more than 1.8 million coal and steel workers, with each worker receiving a \$600/month pension, as part of a mass pivot from traditional industries toward 21st century technologies.⁴⁹ Chinese provincial governments are also investing aggressively in automation technologies and in providing workers with the skills needed to operate them.

China is hardly alone. In Germany—long one of the world's leaders in the deployment of robotics—companies have partnered with the government to aggressively incorporate AI into the German manufacturing sector as part of Germany's "Industry 4.0" initiative. Similarly, the Japanese government is implementing a 91-page "New Robot Strategy" calling for increased education and vocational training in robotics. South Korea, Russia, and the European Union have also developed national strategies relating to automation technologies.

49 Letter from Michael J. Lotito, Shareholder, Littler Mendelson P.C., et al., to The Hon. R. Alexander Acosta, Secretary of Labor, United States Department of Labor (Dec. 5, 2017), available at <http://prime-policy.com/wp-content/uploads/2017/12/DOL-Comments-re-Automated-Systems-Final.pdf>.

There have been periods in American history when domestic or international crises forced the public sector to take a more active role. Likewise, when it comes to infrastructure and other projects involving large-scale coordination and the investment of substantial resources, governmental entities have consistently played a leading role in coordination, funding, or both.

When it comes to the disruptive impact of AI, robotics, and other automation technologies, the United States faces a potential labor market crisis on a scale not seen since at least the Great Depression, and quite possibly since the height of the Industrial Revolution. The types of employer-sponsored training programs described above will require the investment of substantial resources that many individual companies simply do not have. Likewise, there will be individual states and regions that will be harder hit by the TIDE than others, just as the states of the industrial Midwest were hit harder by the decline of the manufacturing sector over the past several decades. To ensure that the disruptive impact of automation is minimized and that all American workers and companies have the opportunity to partake in the benefits of technological progress, a considerable level of involvement by both federal and state policymakers may ultimately be necessary.

The required policy responses must address several issues. At the federal level, the government must engage in a concerted effort to modernize both its regulations and its overall mindset when it comes to automated systems. An essential first step will be to leverage the power of data analytics to identify the workers and industries most vulnerable to automation and the areas in which future job growth can be expected. Voluminous data on American workers—as well as the labor market as a whole—are already available through the Bureau of Labor Statistics (BLS), the Census Bureau, other government agencies, NGOs, and private companies. By and large, these statistics remain a vast untapped resource in terms of the insights they could provide.

As recommended by the McKinsey Global Institute, these existing stores of data should be combined with “real-time data on the adoption of automation technologies, job openings, labor market dynamism, skills in demand, and how individuals are coping with job transitions.”⁵⁰ This information can then be updated and published regularly so that companies can engage in more effective workforce planning and partner with educational and vocational training institutions to develop programs that will provide at-risk workers with the necessary skills. Armed with this information, the U.S. Department of Labor (DOL) and equivalent state agencies could then establish programs that increase the availability of mid-career training opportunities for workers, with a focus on providing workers with the specific skills rather than accredited degrees.

Just as employers’ response to the coming TIDE will require a radical change in their collective mindset regarding workforce training, a well-calibrated governmental response will have to depart substantially from prior governmental efforts regarding vocational programs. The experience of other countries demonstrates “the importance of focusing labor agencies on reemployment and the acquisition of new skills, rather than simply handing out unemployment benefits or controlling for fraud,” by adopting an approach “that nudges workers to take a more active role in their own retraining and provides tools for them to be successful.”⁵¹ The ultimate aim of government involvement would not, therefore, be simply to provide money to companies or workers, but instead to foster programs that would give workers and companies an incentive to engage in the necessary training. In addition, measures intended to improve labor mobility, such as tax credits for the relocation expenses of workers whose jobs are displaced by automation, would help maintain a flexible labor market.

To coordinate these efforts, the White House could establish a Future Workforce Bureau. This bureau would not serve as a source of new and potentially innovation-stifling regulations. Rather, it would be tasked with identifying regulations and standards relevant to automated systems that need to be updated, publishing timely and relevant data on labor market trends, and identifying and developing new policies and programs to ensure that the American workforce does not fall behind those of other countries. Appropriate federal and state agencies could also launch initiatives to respond to and mitigate job losses, regional economic disparities, and related societal concerns associated with the impact of automation.

To ensure that public policy mitigates, rather than exacerbates, the disruptive effects of automation, employers and other labor market stakeholders will have to make a concerted effort to educate policymakers regarding the importance of these issues and the nature of potential solutions to them.

⁵⁰ McKinsey, *Jobs*, *supra* note 5, at 125.

⁵¹ *Id.* at 124.

The public sector has historically been slow both in adopting new technologies for their own operations and in updating laws and regulations to reflect new technological realities. By urging policymakers to update or discard legal rules that do not reflect the current technological landscape, employers will both directly create a climate more conducive to unlocking the gains from AI and robotics while also educating public-sector actors more generally regarding the underlying technologies. In addition, companies can draw attention to the importance of workforce training by establishing company- and industry-sponsored apprenticeship and vocational education programs, which could then serve as a model for future workforce training programs on a national scale.

At present, it appears that national legislation on these issues is unlikely until some event forces Congress to engage. If, at that time, policymakers do not understand the tangible benefits that AI and robotics can bring to workers, the most likely response is the enactment of laws and regulations that attempt to suppress emerging technologies rather than leverage them. Employers therefore must demonstrate the benefits of robust workforce training and ensure that the potential benefits of AI and robotics are not lost on policymakers amidst the cacophony of fears that typically surround discussions relating to automation.

Preparing for the Long-Term

In the longer-term, the enormous impact of these transformative technologies may force a fundamental rethinking of the structure of the U.S. economy and society. The American economy and labor market simply are not designed to absorb the rapid displacement of jobs that automation threatens to bring. The traditional American system requires employers to provide social services, like health insurance, unemployment insurance, and workers' compensation, while the government, through education and government-sponsored training and apprenticeship programs, is charged with providing workers with the skills they need to participate in the labor market.

In many ways, the American system seems to have it backwards. After all, employers, not government agencies, are in the best position to know what skills their workforce requires and to provide any necessary training. Indeed, in many other developed economies, the reverse model prevails, with the government providing essential health and social services and employers largely responsible for workforce training. The Swedish labor market, an exemplar of this latter model, is proving particularly well-suited for managing the disruptive effects of emerging technologies.⁵²

The necessity of nimbler and more precisely catered worker training programs will likely prove even more vital in the coming decades if, as many predict, we are entering an era where the traditional career-based employment model breaks down. The traditional American middle-class career trajectory involved a worker completing his or her education and then, within a few years, choosing a line of work. The necessary level of education and training differed from job to job; coal miners and office clerks may require a high school education, whereas others such as physicians and lawyers may have to complete many years of postsecondary education before beginning the earning portion of their career. But in either case, the worker could reasonably expect to work in the same line of work—often with the same employer—for the next several decades without any need for education or training designed to prepare them for a different career.

But with the accelerating pace of automation, new types of jobs will arise and existing jobs will be automated at a much faster pace than in previous technological revolutions. Lifelong education and training will become the rule rather than the exception. By the time the younger cohorts of the current workforce reach what would today be considered “retirement age,” the notion of a 30-year career in the same field may seem thoroughly quaint. More ominously, if large numbers of employees repeatedly find themselves without jobs and without access to programs that will provide them with the skills necessary to re-enter the modernized workforce, the financial underpinnings of the American economy could rapidly break down.

In an era of rapid and continuous automation, only employers will possess the expertise to provide job re-training. Traditional government-sponsored apprenticeship and lifelong education programs typically are planned years in advance. Absent radical restructuring, these programs simply will not be able to retool and train workers quickly enough to meet employers' demands.

Similarly, with the continuation of rapid automation, employers likely will not be able to continue to fund employee benefits in the same manner, forcing more Americans to look to the government for assistance.

52 Peter S. Goodman, *The Robots Are Coming, and Sweden Is Fine*, N.Y. TIMES (Dec. 27, 2017), available at <https://www.nytimes.com/2017/12/27/business/the-robots-are-coming-and-sweden-is-fine.html>.

But some commentators warn that the same labor-market turbulence that drives these working-age citizens to seek government assistance could also hamper the government's ability to provide that assistance. Most social insurance programs are funded by income taxes, and their proper functioning thus depends on the presence of a critical mass of employees and a sufficient level of overall wages. In an era of rapid automation, the decreased need for employees in certain industries may reduce overall labor force participation. Those jobs that remain may experience depressed wages.

In the absence of clear “landing spots” within the labor market for those displaced employees, automation could undercut the pay-as-you-go model of social insurance by reducing the number of available workers and the pool of taxable wages over which the costs can be spread. This would be a potentially calamitous outcome given the strain that the social safety net is already facing due to an aging population. For example, using robot waiters in a restaurant would likely reduce the number of human waiters. That, in turn, would reduce the wages being paid into the funding of social insurance, while also increasing the number of unemployed workers potentially claiming unemployment benefits.

Consequently, there is considerable concern that the coming TIDE—with tens of millions of American workers potentially needing to change careers in the next decade alone—will place additional stress on already strained social programs, most of which are funded by income taxes. This trend will be further accelerated by the increasing importance of the contingent workforce, which will mean that some workers will no longer receive benefits such as health insurance and workplace injury coverage from an employer.

In other countries, the struggle between government funding and the technological transformation of the workforce has led to a compromise—accepting the growing contingent workforce while extending to contingent workers some of the benefits of traditional employment. Under Canada's “dependent contractor” category, which blends characteristics of employment with those of independent contractors, a contractor primarily working with one company can acquire layoff rights and severance pay intended for employees. Given the current political polarization in the United States, it is unlikely any compromise will be forthcoming from the federal government. At the state and local levels, various efforts and experiments are taking place.⁵³

Fundamental changes to the tax administration and social insurance programs would require a complete policy overhaul, something lawmakers have historically opposed. One possibility already being mooted by many economists and tech industry leaders would be to provide some sort of guaranteed income that all citizens receive regardless of whether they perform services traditionally in the employment context.⁵⁴ Such a universal basic income would replace the current numerous disjointed social programs, and could be graduated by age, wealth, or other factors. Such a system would have the virtue of simplicity, reducing the administrative cost and complexity of operating numerous and not-infrequently-overlapping programs. Economists and policy advocates continue to debate how universal basic income would interact with current social safety net programs, including whether universal basic income could replace all existing social benefit programs.

Such a dramatic change seems unthinkable in the United States at present, but absent dramatic action on the part of employers to stabilize the labor market, the social and political disruptions of automation may force policymakers to seriously consider such radical options. Governments elsewhere in the world are already preparing for their future roles, as the need to develop social programs not based upon the traditional employment relationship becomes clear. America risks losing its position of economic leadership—and foreclosing on the economic well-being of future generations—if it is complacent in the face of the TIDE.

Another, perhaps less drastic approach to managing the coming labor-market paradigm shift would be a sort of economic “grand bargain” between the public and private sectors. America's current system asks employers to provide employees with important social benefits such as health insurance while mostly relying on the government to manage worker education, training, re-training, and transition programs. A reversal of this model would better align the competencies of employers and government agencies.

⁵³ See *supra*, note 35.

⁵⁴ See, e.g., Catherine Clifford, *Elon Musk says robots will push us to a universal basic income—here's how it would work*, CNBC (Nov. 18, 2016), available at <https://www.cnn.com/2016/11/18/elon-musk-says-robots-will-push-us-to-a-universal-basic-income-heres-how-it-would-work.html>; Eric I. Cantor, *The social safety net is not ready for the next tech revolution. Here's why*, WORLD ECON. FORUM (Jan. 22, 2018), available at <https://www.weforum.org/agenda/2018/01/the-social-safety-net-is-not-ready-for-the-next-tech-revolution-here-s-why/>.

Regardless, employers and workers alike must come to terms with the very real possibility that the current social and economic systems will not be able to withstand rapid job replacement through automation. These tasks are daunting, but they could hardly be more urgent for both workers and employers. Without proper planning, the potential of emerging technologies to dramatically improve Americans' quality of life may be squandered by the erosion of the underpinnings of the American labor market and the social safety net that it supports. Nothing less than the future of American workers is at stake.

CONCLUSION

For America's employers, the decision to automate must be the starting point, not the finish line. The TIDE of automation will do two things:

- (1) displace many workers from their current jobs; and
- (2) create job opportunities, both in emerging economic sectors and in occupations that do not yet exist.

America's employers should work together to minimize the disruption of (1) while maximizing the benefits of (2). It is no exaggeration to state that the future of the American labor market, economy, and society depends on ensuring that the workers displaced by automation have the skills necessary to remain part of the workforce, or have access to education or training programs that will provide them with such skills.

That task is enormous—perhaps the most significant structural challenge that the American economy has faced since the height of industrialization. Unfortunately, despite welcome recent developments such as the White House's formation of an advisory committee on AI-related issues, there has been little in the way of concrete action by policymakers in preparing for the TIDE, and it is possible that policymakers may not act until there is a crisis. In the case of the TIDE, waiting for a crisis is not an option, both because the necessary solutions will take years to implement—hardly an option given the breakneck pace of technological change—and because panic is rarely conducive to the formulation of good public policy.

Employers have both a strong economic incentive and a powerful ethical obligation to help provide an economic safety net for displaced workers. It is far better for society and the individual to be able to earn a living rather than be forced to take government assistance or some type of extended severance support. If America's employers can harness the enormous economic potential of the TIDE, America will race ahead and solidify its standing as the economic leader of a more prosperous world for both workers and employers. But if they instead follow the path of ignoring the TIDE, America will quickly become less prosperous, less prominent, and less equal.

At present, there is no employer-focused, non-partisan group dedicated to educating the employer community and policymakers about the issues surrounding the TIDE, much less an organization whose mission is achieving the twin goals of maximizing the economic and social benefits of the TIDE for America's companies and workers while minimizing its disruptive effects. The time has come for the formation of such an organization, led by companies and industry groups that are willing to collaborate both within their industries and outside of them to help their organizations and workers ride the TIDE, both by identifying and implementing recommended practices for robust and market-responsive worker-training programs and by encouraging policymakers and non-governmental organizations to devote greater attention to TIDE-related issues.

To that end, Littler Mendelson, P.C. and Prime Policy Group announce the formation of the EMMA Coalition. The Coalition is an employer-focused, non-partisan group dedicated to educating the employer community and policymakers about the issues surrounding the TIDE, and maximizing the economic and social benefits of the TIDE for America's companies and workers while minimizing its disruptive costs for workers and companies. The Coalition will directly engage policymakers, educating them on the importance of confronting the TIDE and attempting to shape policy through thought leadership and advocacy. In addition, the Coalition will engage with employers themselves to establish recommended practices and create training programs designed to provide employers with workers possessing the skills needed to compete in the post-TIDE economy.

For both levels of engagement, the Coalition will seek to achieve its goals by combining thought leadership, public dialogue, and advocacy. It will aid America's employers and workers by creating a baseline of common knowledge for Coalition members. Its website will provide historical readings, contemporaneous articles and writings, and interviews with relevant governmental, legal, academic, technology, and business leaders. The Coalition will create public awareness of the TIDE and the urgency of addressing it by holding conferences, seminars, and more.

The companies that are willing to devote the time, effort, and resources necessary to establish such an employer coalition will not only secure the betterment of their workers and the stabilization of their labor talent pool, but also help ensure that the American economy and society continues to prosper for generations to come. Let's begin.

