Creating a 21st Century Workforce

2019

CompTIA.
Advocacy

Overview

American innovation depends on an inspired and skilled workforce. Indeed, the country's greatest assets are the skilled workers committed to the continued innovation, global competitiveness, and growth of the companies they work for. Unfortunately, too many jobs in cutting-edge industries remain unfilled. The number of jobs that require a background in science, technology, engineering, and math ("STEM") is growing faster than the number of workers with the adequate skillsets to fill them, creating an unrelenting skills gap.[1] This skills gap could be exacerbated by the increasing deployment of emerging technologies such as artificial intelligence ("AI"). While the United States' technology industry is experiencing tremendous growth, especially in AI, it is anticipated that there will be 1.8 million unfilled technology jobs in the United States by 2024.[2] In 2018 alone there were more than 3.5 million postings for open technology occupations in the United States, and nearly 400,000 of those in emerging technology.[3] Such a skills mismatch threatens not only American innovation and economic vitality in the global marketplace, but also the upward mobility of the American worker.

There is no denying AI will play a significant role in transforming society. What is less clear is the role it will have on the American workforce. Some research suggests nearly 70 percent of the American workforce is at "high risk" of being affected by AI.[4] Other research suggests that only about 1 in 10 American jobs are at "high risk" of being affected by AI.[5] Still, other research concluded that AI will *create* about 58 million jobs in the United States.[6] Whatever the end result, workers will need to be prepared for AI's increased role in the workplace. Whether programming, repairing, or working side-by-side with AI, these new technologies will play a considerable role in the marketplace.

In the near-term, modernizing the nation's immigration system will help ensure AI innovation and job creation remain strong. While the U.S. remains a key education resource for much of the world's top talent, outdated immigration policies are limiting our abilities to attract and retain these students after graduation, despite the economy's high demand for them. Just last year, almost half of all science and engineering workers in the United States were foreign-born.[7]

There are other longer-term investments that will help shrink the skills gap and prepare workers for the increased role of AI. Exposing students to STEM education at an early age and continuing that exposure through high-school and post-secondary education is critical in today's ever-changing economy. In addition, the widespread adoption of technology workforce development programs such as apprenticeships would provide additional pathways into the workforce, especially for displaced workers.

As the first piece of CompTIA's series on AI, this paper offers policy recommendations to strengthen the U.S. workforce through high-skilled immigration, STEM education, and technology workforce development programs. Today's economy is one of constant evolution, and absent a concerted commitment to investing in the nation's workforce, American AI ingenuity and job and economic growth could wane.

Technology as a Job Creator

Technology plays a crucial role in today's economy. The technology industry alone employs more than 7.3 million workers. There are another 7.8 million technology jobs in adjacent industries including healthcare, finance, media, government, and others.[8] Technology jobs –whether in the technology industry or elsewhere –are plentiful.

Tech Industry vs. Tech Occupations [9]

TECH INDUSTRY JOBS 7.3 million

TECH OCCUPATION JOBS 7.9 million

46% intersection=
11.8 million NET TECH EMPLOYMENT
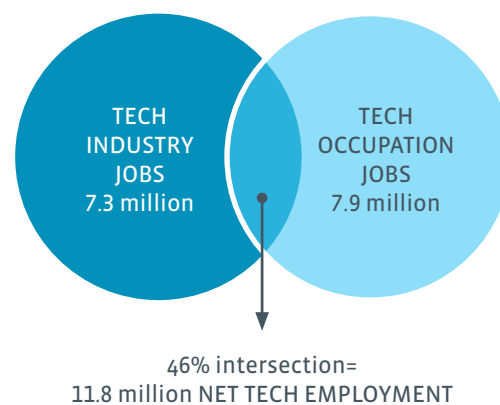
In 2018, there were 261,000 new technology jobs added in the United States, helping to make it one of the strongest technology industries in the world.[10] The global technology industry is on pace to reach $5 trillion in 2019, with the United States making up just over a third of the industry (31 percent or $1.6 trillion).[11] Notably, since 2017, half of all growth in technology has stemmed from emerging technologies such as the Internet of Things ("IoT"), robotics, augmented and virtual reality ("AR/VR"), and AI. The American technology industry and the workers that power it are a key component to the economy.

The Skills Gap and Industry Growth

While the technology industry is experiencing solid growth, the reality remains that the labor pool from which it draws is not growing as fast. Too few workers are armed with the requisite skillsets to compete in today's economy. Recent research found that nearly 9 in 10 executives agree there is a talent shortage in the U.S. which could cost the economy $2.5 trillion over the next decade.[12] While it is difficult to pinpoint a single cause for the talent shortage, a study of technology executives found that nearly 9 in 10 respondents believe neither K-12 schools nor colleges are preparing students for today's workforce.[13]

And the effects of the skills gap can be felt across technology firms of all sizes. 57 percent of large-size firms, 47 percent of small-size firms, and 44 percent of medium-size firms all indicate that the skills gap has grown in scope and depth over the previous two years.[14] What is more, looming retirements could exacerbate this problem as nearly 800,000 technology workers are expected to retire by 2024.[15]

To compound the problem, many foreign competitors are aggressively investing in STEM education programs to better-prepare their citizens for the new economic landscape. Teenagers in the United States, for instance, consistently rank in the middle of the pack when measured against their peers abroad according the OECD Programme for International Student Assessment

Top IT Skills Gap Areas[16]
Bases on NET gaps (moderate gaps + significant gaps)

1   Emerging Tech, i.e. IoT, AI, automation **[59%]**

2   Integrating different apps, data sources, platforms, devices **[59%]**

3   Cloud infrastructure/cloud apps **[57%]**

4   Digital business transformation/modernizing legacy HW or SW **[57%]**

5   Cybersecurity **[55%]**

6   Software or app development **[55%]**

7   Data management/data analytics **[53%]**

> "Beaing able to integrate new software quickly enough, and having efficient people to do so."
>
> —Senior IT executive in professional services industry

(PISA). The most recent PISA data show the U.S. ranked 38th in math and 24th in science among the 71 countries measured.[17] Just 29 percent of Americans rank the U.S. K-12 STEM education as above average or the best in the world.[18] And there are more alarming findings in higher education. In China, for example, 77.7 million people are college graduates, of which 4.7 million have STEM degrees –or 6.05 percent. Additionally, 78 million Indians have a college degree, of which 2.6 million have STEM

degrees –or 3.33 percent. By comparison, the United States has 67.4 million college graduates, of which 568,000 are STEM graduates –or just .84 percent.[19]

Without question, the skills gap has become a significant problem for the U.S. technology industry and workers. STEM investments abroad and our inability to attract and retain high-skilled immigrants leaves the U.S. at risk of ceding its role as the world's economic hub.

Ways Skills Gaps Negatively Impact Business[20]

Primary Consequences of Skills Gaps on organizations	OVERALL	INDUSTRY		FIRM STAFF SIZE				TECH ROLL TO BUSINESS	
		IT	Non-IT	Micro 1-9	Small 10-99	Medium 100-499	Large 500+	Primary	2ndary/ Non
Lower staff productivity	52%	50%	53%	46%	49%	56%	53%	53%	51%
Lower levels of customer service / customer engagement	38%	**45%**	36%	23%	40%	34%	**46%**	38%	37%
Lower sales or profitability	37%	42%	36%	**49%**	42%	30%	36%	38%	36%
Insufficient levels of innovation / new product development	33%	39%	32%	**18%**	31%	37%	37%	35%	29%
Insufficient speed to market with new products or services	32%	**41%**	30%	25%	25%	**36%**	**38%**	**38%**	16%
Insufficient cybersecurity safeguards / defending against malware, hacking, etc.	32%	34%	31%	11%	27%	**38%**	37%	**36%**	21%
Inability to keep up with competitors	30%	**36%**	28%	21%	28%	31%	32%	**32%**	23%
None of the above	6%	5%	6%	**16%**	3%	6%	5%	5%	**10%**

CompTIA's Policy Recommendations for Immigration Reform

1 Increase Employment-Based Green Cards for High-Skilled STEM Graduates

Increase access to employment-based (EB) green cards for high-skilled STEM graduates by expanding exemptions and eliminating the annual per-country limits. Doing so will drive job creation by keeping much

needed and highly sought-after professionals living, working, and innovating in the United States. Too many bright minds are trained in the United States and then forced to leave the country while waiting for an EB green card. This is counterproductive and hurts American innovation.

2 Create New Visas for Entrepreneurs

The U.S. is one of just a handful of industrialized nations without a visa category specifically tailored for foreign-born entrepreneurs. Current law forces would-be entrepreneurs to navigate an antiquated immigration framework that can take months or even years to issue a

visa. This landscape can deter foreign-born entrepreneurs from pursuing groundbreaking AI work in the U.S. CompTIA also supports the International Entrepreneur Rule. This rule allows the Department of Homeland Security to temporarily "parole" entrepreneurs whose startups provide a significant public benefit through a strong potential for rapid growth and job creation.

3 Market-Based Visa Caps

Eliminate the arbitrary cap on H-1B visas and transition to a market-based approach. Using market-based caps for H-1B visas is the most effective avenue to adjust to the supply and demand of a talented workforce in the United States. For the last five years, H-1B visa applications have reached the statutory caps (limited to 85,000) within days of the application period opening.

CompTIA's Policy Recommendations to Modernize the Education System

"It's well-known the speed of innovation makes it difficult for many educational institutions to keep pace. It's not their fault. Evolutions in the global marketplace are constantly creating new workforce demands. However, this problem has a solution. It'll take leadership, focus, change, and most of all, funding, to support quality STEM education for both students and teachers."

Ryan Weber, President
KC Tech Council

1 Public investments in P-20 STEM education

A 21st century commitment to education should align programming, funding, and expectations from the earliest years of a student's development, through the K-12 system, and into and through postsecondary education. Policymakers should make targeted investments in early education STEM programs to ensure key concepts are introduced at a young age.

2 Public investments in underrepresented communities

Disparities in STEM education persist and could leave entire communities behind. The nation has long battled inequities in access, participation, and success in STEM subjects. These inequities exist along racial, socioeconomic, gender, and geographic lines, as well as among students with disabilities. For example, one U.S. Department of Education study found that just 35 percent of all STEM bachelor's degrees awarded in 2014 went to females.[21] Additionally, in that same year, just 11 percent of STEM bachelor's degrees went to African Americans, 14 percent to Hispanics, and 14 percent to American Indian/Alaska Natives.[22] The paucity of STEM degrees in some communities is carrying over to the workplace. African Americans make up just 9 percent of the STEM workforce and Hispanics just 7 percent.[23] Policymakers should redouble their STEM investments in these communities to ensure all Americans are equipped with the skillsets today's economy demands.

3 Increased emphasis on the "T" in STEM

For too many policymakers, computer science has become synonymous with STEM. Policymakers must ensure that supporting computer science in the classroom does not become the full extent of the nation's commitment to STEM education. An increased emphasis on the "T" (technology) in STEM will help open additional career pathways. While it is true software development is one of the largest occupations in STEM, it is also true that computer user and computer network support specialists are two of the fastest growing STEM occupations.[24]

4 Increased adoption of experiential learning

Mentorships and internships can go a long way in upskilling Americans. In addition to providing hands-on learning, these programs can bridge the "confidence gap" and grow the talent pool by giving students the opportunity to learn from someone like themselves –someone who shares a similar background, career pathway, or was similarly fearful of having to learn new skills at one time. One National Science Foundation researcher found that female STEM students who have had one-on-one contact with other women experts or peers in STEM are more like to feel like they "belong" in the field.[25]

CompTIA's Policy Recommendations to Modernize the Workforce

"Our regional IT apprenticeship consortium in San Luis Obispo, California, has been the ticket into tech jobs for a wide range of eager job candidates. We saw this an economic development, social and entrepreneurial project to solve the workforce shortage employers in our area face. It had the bonus of increasing diversity too. If something works in San Luis Obispo, it could work anywhere."

Amy Kardel, Co-Founder
Clever Ducks

1 Increased promotion of alternative pathways into the workforce

To date, policies around educating the workforce of the future have centered largely on traditional workforce pathways such as four-year colleges. The reality, however, is that there are an increasing number of STEM jobs that do not require a four-year degree.[26] These "middle-skill" jobs –jobs that require more than a high school degree but less than a four-year college degree – could be filled with workers who have pursued industry-recognized certifications and credentials instead of traditional degrees. Business leaders have pointed to on-the-job experience like internships and apprenticeships as one of the most effective methods to shrinking the skills gap.[27] Research suggests that those with certifications or credentials are almost 10 percent more likely to be employed full-time and earn about $20,000 more than their peers without these postsecondary accomplishments in the technology industry.[28]

2 Increased deployment and adoption of private sector-led initiatives that align with local and regional workforce demands and developing trends in the industry

The private sector, too, has a role to play in helping to prepare workers for the new economy. For example, CompTIA's leading foundation, Creating IT Futures, is providing on-ramps to technology careers. Creating IT Futures' IT-Ready program provides critical technology job training and placement for unemployed and under-employed adults free of charge, and its NextUp program creates foundational awareness of technology careers for teenagers.[29] In 2017, CompTIA announced a partnership with the Mission, Texas Economic Development Corporation, Workforce Solutions, CodeRGV, and the Texas Workforce Commission to launch a cybersecurity program in Mission, Texas, to provide in-demand skillsets.[30] The private sector should continue to lead in this space. In addition, lawmakers should encourage public-private partnerships to ensure curricula and programs are aligned with local and regional workforce demands.

Conclusion

As AI is increasingly adopted in the workplace, a workforce armed with the requisite skillsets to program, repair, and work with these technologies is needed now more than ever. Many of the root causes of the skills gap can be easily resolved. There is broad, bipartisan support for modernizations to STEM education and workforce development programs in Congress, and that support should be leveraged to meet the policy needs of today's workforce. In doing so it will be important to modernize both policies and perceptions within STEM education and focus on the areas that have the best potential for rapid growth of skilled workers for the technology industry.

Should these policies be implemented – reforms to the nation's high-skilled immigration system, stronger P-20 STEM education programs for everyone, equal access to STEM education among underserved communities, STEM career opportunities through non-four-year institutions, and out of classroom training – the workforce will have the tools it needs to compete in an AI marketplace.

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