



INSIDER WHITEPAPER



Can We Fill the Robotics Skills Gap?

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NEW IDEAS AIM TO ADDRESS SKILLS SHORTAGE

Companies, education institutions, and governments combine efforts to find new ways to address technology skills and labor shortages.

By Phil Britt

Despite an increase in science, technology, engineering and math, aka STEM, programs worldwide, robotics developers and companies continue to report shortages of skilled workers. This shortage continues to challenge companies as they meet needs today and for the future.

To address this gap, companies, governments, and educators are trying new methods to get more workers. Enrollment in STEM programs is increasing, robotics and related companies are offering their own training, and online courses are helping to fill holes. Automation and artificial intelligence systems are helping take over some tasks, as well as identifying people with the aptitude to learn to take over more complex work. But challenges on filling the skills gap remain.

DEMAND OUTWEIGHS SUPPLY

Matt Sigelman, CEO of Burning Glass Technologies, a job markets analytics company, said a recent study his company did for the U.S. Commerce Department found that engineering demand is ahead of supply by 15%. In some areas, such as cybersecurity, the demand outweighs supply by even more.

A new report from technology firm Catalant found that 63% of companies have a “future of work” plan, but need to rethink how talent is acquired and the functions to make it succeed. The report, “Reimagining Work 20/20,” outlined the top three challenges:

- Training (44%)
- Planning and budgeting (38%)
- Technology (37%)

While companies are beginning to address these challenges, the report states most are realizing that traditional ways of finding talent aren’t working. Survey results show that many employers take 90 days or more to fill key roles, and that there are technology solutions that could resolve the talent problem.

NEW EDUCATION METHODS NEEDED

While traditional education can help, most experts said it will only fill a portion of the skills gap.

Fortunately, the word has gotten out about the need for workers with STEM skills, so related courses are filling up quickly at colleges and universities, including Carnegie Mellon University, said Elizabeth Holm, professor of materials science and engineering.

“I think that we have changed the direction for the educational pipeline in science, math, and programming skills,” Holm said. “We’ve seen a significant uptick in the engineering colleges, doubling the enrollment in mechanical, electrical engineering, artificial intelligence and robotics.”

Skills learned through these disciplines will be used not only for engineering, robotics, automation, and other traditional high-tech jobs, but also for traditionally non-technical professions, such as paralegals, human resources, etc., as they continue to become more technical, Holm said.



*Elizabeth A. Holm,
Professor of
Materials Science
and Engineering*



MOVING BEYOND STEM WITH OTHER SKILLS

Even with more students learning STEM skills, many of these degree programs take four or five years to complete. Even when they finish, there won't be enough of these newly minted graduates to fill employers' skills needs.

Sigelman and others argue that the answer to addressing the skills gap doesn't rely solely in traditional education. Instead, he said, there should be a focus on lifelong learning, emphasizing technical skills that evolve over time.

“You need to have the technical and the data skills that allow you to drive the technology,” Sigelman said. “The difference is driving the technology or getting

run over by it.”

In addition, people will need to learn skills that go beyond STEM, said Craig Nelson, partner in organizational change management at ISG, a technology advisory firm. He sees the following skills as critical: The ability to think, create, communicate and build relationships. People who have those skills can adapt and pick up the technical skills, which evolve over time.

“Design thinking is an absolutely critical ability for the workforce of the future,” Nelson said.

MAKING TECHNOLOGY EASIER TO USE

Another way to reduce the amount of training needed on technology offerings is to make them easier to use. Companies are developing more user-friendly technology that workers can use with a minimal amount of training, said John Santagate, IDC’s research director, service robots.

“One of the great things about the newer generation of robotics is that the manufacturers have worked diligently to make their robots user friendly,” Santagate said. “They realized that buyers don’t have roboticists on staff, nor do they want them. They want technology that is easy to deploy, use and manage.”

In addition, companies have invested in building up networks of robotics integrators that can support their users, Santagate said. End user companies that are deploying robotics are doing this because they are having challenges finding human workers to fill open jobs.

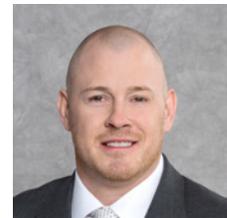
“Automation technology helps alleviate labor challenges by taking on certain tasks, which enables the existing workforce to become more productive, and thus, do more with less,” Santagate said.

JOBS SHIFTING, NOT DISAPPEARING

The rise of robotics, AI, and automation has also raised fears among some about jobs being displaced. To be sure, many jobs have replaced humans with machines, including automotive manufacturing, retail and other industries.

Gone soon will be the jobs in which one “only needs to fog the mirror” to qualify, Sigelman said. Companies can no longer add people to increase productivity. Those increases come as a result of automation and technology, not by adding people.

In these instances, robots, AI, and automation will be the choice when technology can fulfill a role more efficiently and at a lower cost than a human.



*John Santagate,
IDC*



New AI can scan things like x-rays to find anomalies, but human doctors will still be needed to make the final decision.

Such is increasingly the case [in logistics, manufacturing applications](#), and some [medical disciplines](#). Technology can easily perform repetitive tasks with repetitive outcomes without getting bored, and do ergonomically challenging work much faster and more efficiently than a human. AI is also learning how to examine and interpret images, as well as find key elements and words in papers, research studies, financial reports, and other complex text.

CMU's Holm said the machine doesn't replace the expert, but instead augments their capabilities. "For example, when we use computers to find flaws, it's very much like when we use computers to read radiographs, X-rays, and CAT scans in medical imaging. The idea is that the computer does the first look to find the areas of interest, but we're in no way replacing the expert who looks at that flaw and says, 'No, it's nothing to worry about,' or, 'Oh yeah, that's what happens when the oil gets old, and it's problematic.' "

Because the machine is saving time and effort, this lets scientists and engineers have more time to focus on research, Holm added. "The first thing a graduate student wants to do is stop having to outline segmentation drawings, which can take multiple hours and cause a lot of angst; they vow when they graduate, they're never going to do that again and it's going to be some other graduate student's problem. The computer doesn't have that; the computer might do it forever without getting bored because there's no boredom in a computer."

"Technology is not taking jobs, it is taking tasks," IDC's Santagate said. "Often, these tasks fall under the categories of dull, dirty or dangerous. For example,

in the business of order fulfillment, robots are being used to take on the movement component of the process, which is allowing people in the process to spend less time traveling from point to point and more time conducting value adding efforts.”

Indeed, in our [earlier report on logistics](#), RK Logistics Group turned to robots to handle much of the material transportation within its warehouse. In the first six months, the robots the robots have made 4,500 deliveries over about 1,000 kilometers – distance humans no longer needed to traverse.

Robots from Fetch and other materials handling robot companies are instrumental in today’s e-commerce supply chain. While some of these robots simply move from point A to B and back, increasingly these and other robots are undertaking more complex tasks made possible with the incorporation of artificial intelligence.

“AI can be a powerful human complement to solving challenges in which an organization lacks the human capital to succeed,” said Heidi Abelli, senior vice president, content product management at Skillsoft. “AI lends itself to solving efficient automation of a wide range of human and machine interactions, and it is very effectively leveraged in situations where a worker might perform repetitive tasks, but where there is variability in the outcomes. AI systems can also automatically enhance their outcomes [through machine learning] without human intervention for continuous improvement.”

Ahmar Abbas, vice president of global services for DISYS, said some jobs will indeed disappear, but “those who are tasked with working with automation once processes are deployed are not only better able to perform their jobs, but are also poised for career advancement.”

For example, AI can detect fraud and compliance issues more quickly than humans, and also provide predictive capabilities to stop fraud or notify a human about a compliance issue so it can be addressed quickly. Such a capability enables humans to focus on more important tasks, Abbas said.

SKILLS TRAINING A JOINT RESPONSIBILITY

Most experts agree that filling the skills gap is a joint responsibility of private enterprise, the education system, the government, and the workers themselves.

Traditional education does not provide enough of the skills people will find necessary for their next jobs, said Garry Mathiason, founder and co-chair of the robotics practice at the law firm of Littler Mendelson. “Non-traditional job



training is an important way of addressing the impact of displacement caused by AI and robotics.”

As displacement continues for low-skilled workers, skills education should be a lifelong process that brings together government, business, and educators, Mathiason said.

Littler Mendelson did this a year ago, developing the Littler Workplace Policy Institute, a resource for the employer community to engage in legislative and regulatory developments that impact their workplace and business strategies. The institute harnesses the deep subject-matter knowledge of Littler to ensure that policymakers in Washington, D.C., and around the country hear the voice of employers. The group is engaged with Congress, the executive branch and the courts on the most critical employment, labor and benefits issues of the day, including the requirements of the Affordable Care Act (ACA), the Fair Labor Standards Act (FLSA), the National Labor Relations Act, Title VII and ever-changing implementing regulations, helping employers meet workplace skills and other challenges.

ONLINE TRAINING PROGRAMS

Workers that need additional skills training can look to online programs, such as those offered by Coursera.

The company offers interactive coursework and lecture videos, has worked with about 11 million students and offers many free programs. Students can purchase “verified certificates” for single classes, or earn mini-degrees in



entrepreneurship or cloud computing. Coursera has many notable sponsors, including Stanford, Harvard, Northwestern, Yale, IBM, and Google.

Companies can provide their own training for employees to give them access through digital technologies, methodologies, and competencies.

Mindtree, for example, has had 90% of its employees complete more than 80,000 courses on its self-developed Yorbit platform. Yorbit has more than 1,000 courses covering more than 500 skills. The courses train employees for digital technologies such as machine learning, big data, mobile, cloud and newer engineering methods such as DevOps, agile and design thinking.

Employees can pick the self-paced, on-demand learning courses based on their own interests. The Yorbit platform also enables users to create their own learning paths, collaborate with their peers, connect with mentors and experts, as well as to bundle courses to meet specific learning needs.

Additionally, the government has a number of programs for displaced workers, including the Universal Displaced Worker Program and displaced worker education grants.

EFFORTS REQUIRED BY ALL TO ADDRESS THE SKILLS GAP

The combination of more students entering STEM disciplines, efforts from government, private enterprise, public institutions and workers themselves will help address the skills gap, which is not expected to wane any time soon.

These efforts, plus the increased use of automation, robotics, and AI efforts to fill labor shortages, should continue in order to bridge the gap, most experts said.

KUKA OFFERS COLLEGE TO LEARN, EXPAND STEM SKILLS

At KUKA, the type of skills needed for the robotics company and its business partners weren't being met by people graduating from traditional colleges, or obtained by workers retraining for tech-related jobs.

So the company created KUKA College, a training facility with 25 locations worldwide where "students" learn about robotics and receive hands-on training. The program offers each participant a custom-tailored concept, allowing them maximum success – as a robot operator, robot maintenance technician, robot programmer, or robotic cell planner.

"As an employer, we need a wide range of skills," said Simon Whitton, regional division manager for North

America for KUKA. "We try to take some time in the education of our people. We can educate people about robots and how they work." But workers also need to understand cultures of the businesses in which they work. For example, KUKA commercial sales engineers need to understand what a customer wants a robot to do, Whitton said. "We need people who look at inventive ways to apply solutions."

KUKA College attendees can benefit from:

- Courses with a sound methodical and didactical structure'
- Practical knowledge for everyday use;
- Robot cells developed specially for KUKA College;
- Current robot technologies;
- Modern training facilities;
- Globally certified training standards.

The training is designed for machine operators and installers, service technicians and maintainers, machine programmers and commissioners, planners, executives, and others.

KUKA College offers up-to-date presentation techniques, PCs with simulation software, and robotic machines with diverse control systems and applications.

The college's slogan is: Theory as much as necessary, practice as much as possible.



Credit: KUKA