

**Prepared Statement of Rebekah Kowalski
Vice President, Manpower Manufacturing**

**U.S. House of Representatives Committee on Science, Space, & Technology,
Subcommittee on Research and Technology**

Hearing on "Artificial Intelligence and the Future of Work"

September 24, 2019

Chairwoman Stevens, Ranking member Baird, and members of the Subcommittee -

On behalf of ManpowerGroup, thank you for the invitation to speak today on the impact of machine learning and artificial intelligence on the workforce.

ManpowerGroup is a world leader in innovative workforce solutions. Every day, we connect more than 600,000 people to meaningful work across a wide range of skills and industries. We are a \$21 billion company that operates in 80 countries with nearly 30,000 employees.

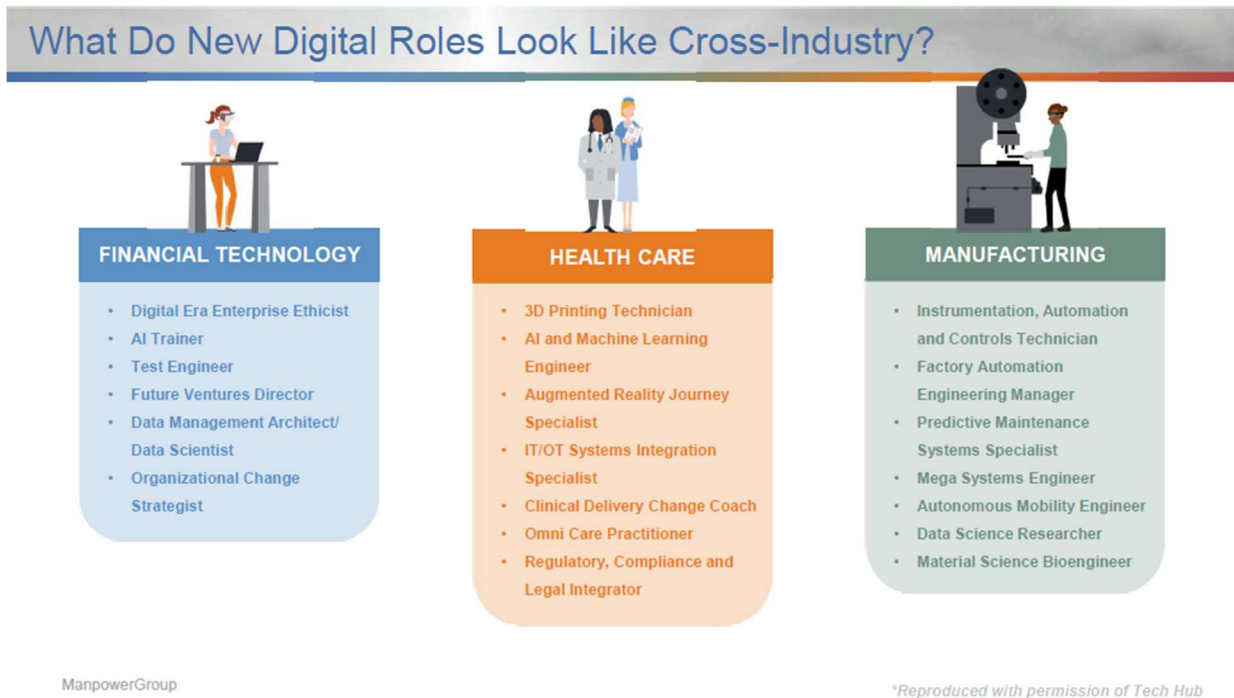
Context of the Manufacturing Labor Market

In 2017, we released a study with MxD (formerly the Digital Manufacturing Design & Innovation Institute "DMDII") on how digital technologies, including Artificial Intelligence and Machine Learning would impact manufacturing jobs. The study identified 165 roles that would either be new or evolved.¹

This evolution of roles is impacting all sectors as artificial intelligence, robotics, machine learning, and automation hasten innovation cycles creating new products and services. See **Figure 1** below for an example of the roles that are evolving or emerging as these technologies are applied to the traditional sectors of Healthcare, FinTech, and Manufacturing:

¹ <https://www.uilabs.org/innovation-platforms/manufacturing/taxonomy/> and <https://workforce-resources.manpowergroup.com/home/the-future-factory>

Figure 1: What Do New Digital Roles Look Like Cross-Industry?



New jobs and skill requirements are emerging at the same time as employers are having almost unprecedented difficulty in getting access to talent.

A hot jobs market with 107 consecutive months of job growth, 3.7% unemployment rate, and population growth that has hit an 80-year low are all key contributors. Our latest quarter of the [ManpowerGroup Employment Outlook Survey](#) shows a strong hiring intent across all sectors.² The bottom line is that today, there is <1 person for each open job, including individuals who are on the sidelines and unemployed. And with the highest quit rate since 2001, the squeeze on employers is getting tighter. The future outlook is not much brighter. In Manufacturing specifically, the sector is set to produce 3.5 million new jobs over the next decade, but 2.5 million are on pace to retire, leaving US manufacturers with a 6 million shortfall in available talent for jobs that are evolving rapidly – a double squeeze.³

[ManpowerGroup’s annual Talent Shortage Survey](#) measures the difficulty employers are having in hiring talent. In 2018, 46% of US employers reported difficulty in finding the talent they were looking for, this is compared to 14% just 8 years prior.⁴ Of the Top 10 toughest jobs to fill, 3 are particularly relevant to Manufacturing: Skilled Trades leads the list at #1; Technicians are at #7; and Production & Machine Operators are at #10.⁵ Employers say the top three reasons they have difficulty in finding talent:

² <https://manpowergroup.us/meos/public/pdf/employment-outlook-forecast.pdf>

³ <https://manpowergroup.us/meos/public/pdf/employment-outlook-forecast.pdf>

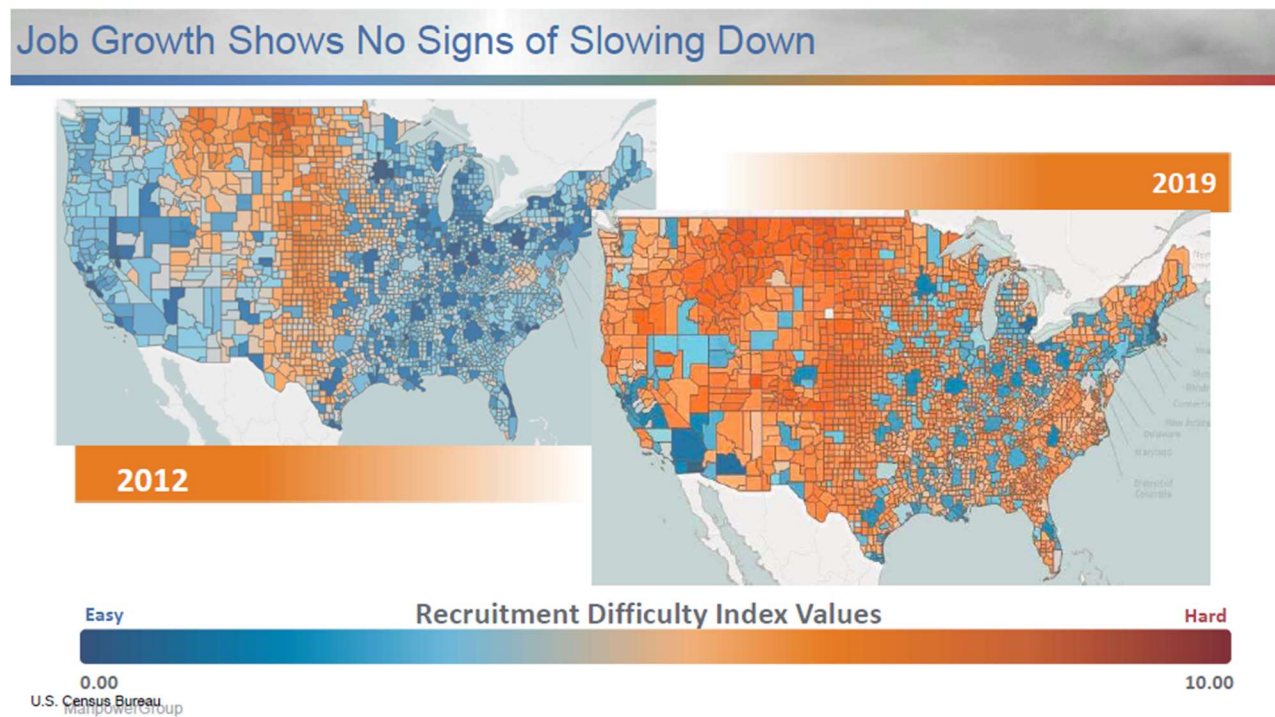
⁴ <https://go.manpowergroup.com/talent-shortage-2018#shortagebycountry>

⁵ <https://go.manpowergroup.com/talent-shortage-2018#shortagebycountry>

- 26% said lack of applicants
- 21% said lack of experience
- 14% said applicants lack required hard skills (technical competencies)⁶

ManpowerGroup’s Recruitment Difficulty Index aggregates across all sectors and roles. We believe the double squeeze of available workforce and rapid evolution of roles & skills is reflected in the difficulty we are having in recruiting individuals for our thousands of customers across the U.S. **Figure 2** shows the ‘heat map’ comparing recruiting difficulty in 2012 to 2019. As you can see, the market context for preparing the workforce for rapidly evolving roles & skills is one of scarcity. This climate will require employers to be resourceful and creative in evaluating and selecting talent. We advocate for hiring on potential (vs. ‘exact match’ of skills and experience), and then investing in upskilling and reskilling that talent to take them into the future. There is simply no ‘fresh’ resource of talent coming into the US either through an increase in population or significant populations of untapped potential. Digital technologies will certainly help close the gap, but it will also create new jobs and opportunities for which we are fundamentally unprepared.

Figure 2: Job Growth Shows No Signs of Slowing Down



⁶ <https://go.manpowergroup.com/talent-shortage-2018#shortagebycountry>

Impacts of AI and Machine Learning on Manufacturing Workforce

ManpowerGroup's perspective is that the Digital Era will rush in new jobs that require new skills. Our research shows that 90%+ of employers expect to be impacted by digitization in the next two years, 75% believe that this will require new skills in their workforce. 87% of employers plan to increase or maintain headcount as these new technologies evolve their products and services, 4% are unsure of the impact and only 9% plan to decrease their workforce.

In the Manufacturing sector, the majority of roles are in the general, entry level production workforce that consists of roles such as picker/packer, assembler, operator, and helper/laborer. Our research with DMDII shows that as US manufacturing transitions to an increasingly digital model there will be an increase in higher skilled roles such as: analyst, specialist, tester and technician. It could take 1-2 years to train the *skilled* manufacturing workforce for roles of the future, and much longer to train the unskilled population. (For additional detail on this, please review pages 49-52 of the DMDII & ManpowerGroup Report, *The Digital Workforce Succession in Manufacturing*). Individuals will move from the direct operation of tasks to using technology to facilitate those tasks, and in some cases, operating bundled technology to complete many more operations than they could if they were completing the tasks manually.

The speed at which evolved roles and skills are required is highly dependent on the speed of the uptake of technology inside of organizations. **Figure 3** shows the general progression of technological generations in the Manufacturing sector. There is no crystal ball on timing, as organizations make the decision to make capital investments in new technology based on what they believe their return on investment (ROI) will be and over what timeline it will be achieved. This ROI can be measured in terms of increased productivity (faster time to market, lowered costs, etc), an evolved product offering that opens up new consumer markets and thus drives up revenue growth, or a complete reinvention of their playing field, and many points in between. See **Figure 4** for a breakdown of what percentage of roles in manufacturing organizations are shifting, evolving and being redefined. 28% of evolving roles are on the production floor. Many organizations are on the sidelines, waiting to jump in as the price of technology drops, others are first adopters, and many more are operating legacy technologies in one plant and the newest, cutting-edge technologies at another. In general, those production facilities tied to food and pharma or a Tier 1 defense contractor, will tend to take up new technologies faster than, say, a small manufacturer who makes cutting tools and is a Tier 4 or 5 supplier. That said, a tipping point will be reached in terms of the percent of labor tied to manual and transactional tasks and the percentage of workers with the skills to operate and cooperate with the newest digital technologies. That tipping point will likely come sooner than the pace at which we are preparing our workforce.

Figure 3: Generations of Manufacturing

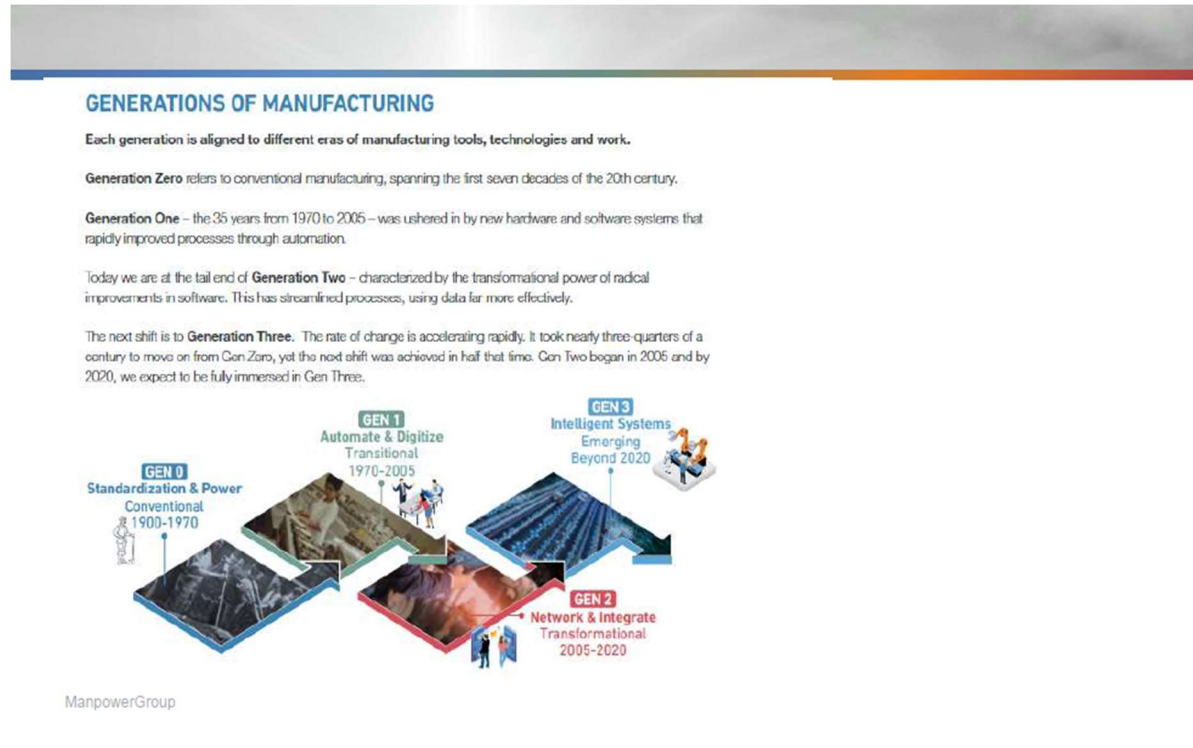
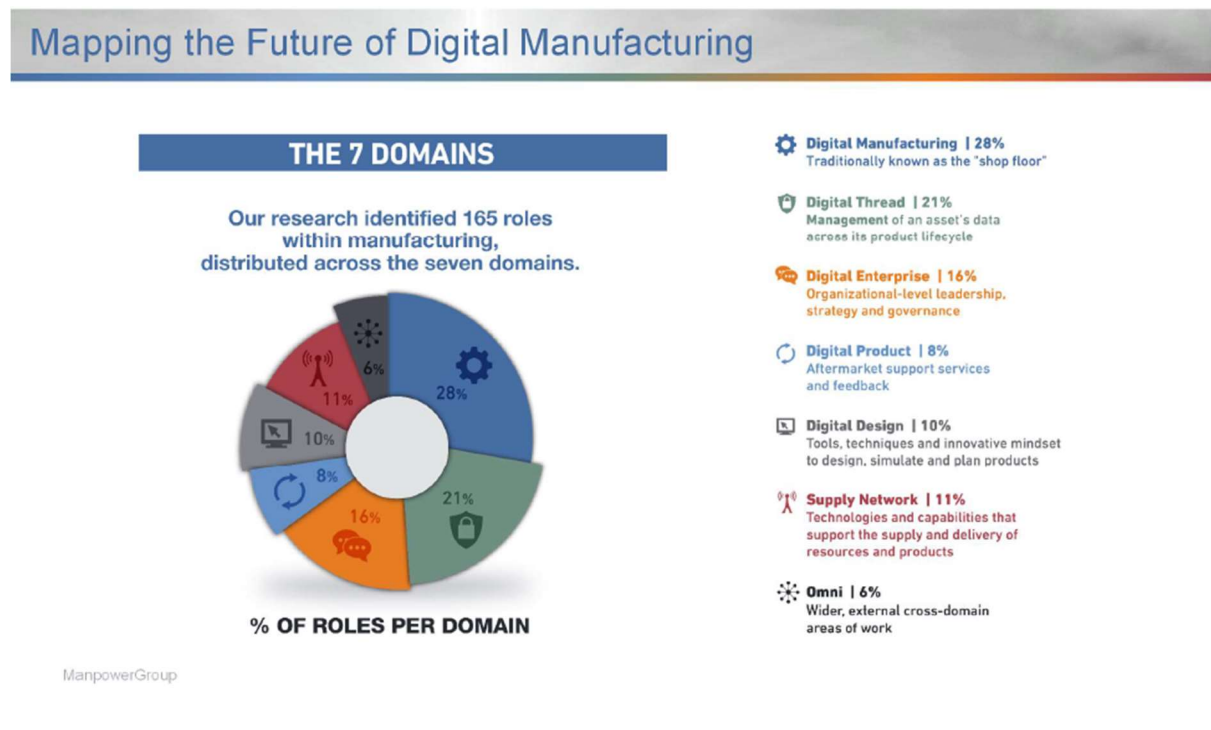


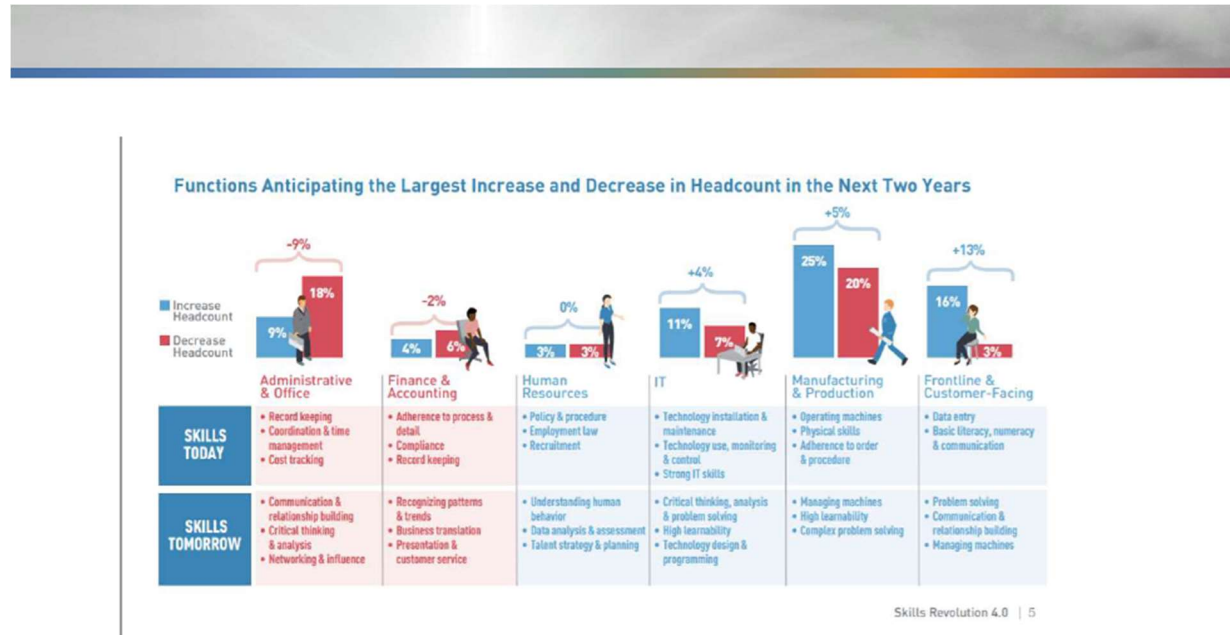
Figure 4: Mapping the Future of Digital Manufacturing



This last point out is born out in some key data. **Figure 5** shows the shift in both percentage of jobs and skills that employers are requiring as they increasingly digitize their operations, including an increased uptake in automation and AI technologies. **Figure 6** shows the increased investment that employers are making in training their employees. Much of this investment is driven by employers' understanding that the skills required to do jobs today are not the ones that will be required with tomorrow's technology. That said, based on our conversations with employers, ManpowerGroup has the following concerns:

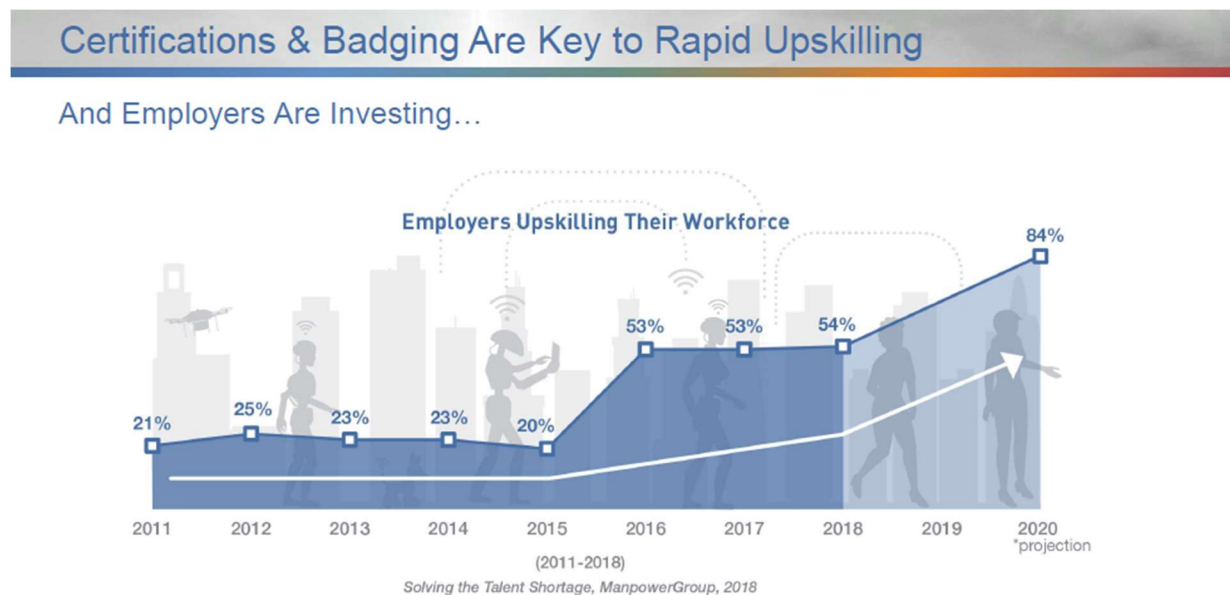
- *First:* employers are uncertain about how digitization will impact roles and skills and over what time. As mentioned earlier, 75% of employers believe that digitization will require an evolution in skills, but they are less clear on the specifics of that evolution.
- *Second:* we hear regularly from employers across the spectrum of enterprise size that their ability to invest in upskilling falls short of what is required to produce the workforce they will need over time. Put simply, they need either more money or more time. Increasingly, the lack of skilled workforce is impeding their ability to invest in new technologies. A 2017 study by MAPI showed that for 60% of manufacturers surveyed, the number one impediment to investing in technology was a rightly skilled workforce.
- *Third:* the talent shortage is impacting employers across all types of talent: the transactional, entry-level talent on the production floor today; the transitional talent that will bridge their legacy and newly digital operations; and the transformational talent that will take them forward. This means that employers are having to determine the best way to allocate precious training and development dollars, what they will do themselves, and where they will need to invest in partnerships. This pain is felt across all sizes of employers, but there is a disproportional impact on the small and mid-size employers who not only have fewer resources, but also compete with large and mega-size employers who have established brands, richer benefits, and more varied career opportunities for employees.

Figure 5: Functions Anticipating the Largest Increase and Decrease in Headcount in the Next Two Years



ManpowerGroup

Figure 6: Certifications and Badging are Key to Rapid Upskilling



ManpowerGroup

Worker displacement is a risk in jobs that are heavily routinized (picker/packer, helper/laborer, and certain assembly and operator roles). The potential for displacement in terms of size and timing is, as indicated above, variable, but it is coming. It is helpful to think of this in terms of ladders and pipelines. Today, the bottom rung of the ladder in production is represented by the heavily routinized roles that require little in the way of qualifications to perform. As digital technologies are increasingly adopted, the bottom rung of the ladder is redefined. It is crucial that those individuals currently qualified for only entry-level work get on the ladder and move up with intent. It is also crucial that talent that cannot progress to certain new roles be pipelined into other roles that are created or redefined that may not be on the production floors.

Doing this will require organizations to be resourceful in terms of what is most important in hiring talent. From ManpowerGroup’s perspective, the most important thing to measure for will be what we call Learnability, that is the ability to learn and acquire new skills and adapt to changing circumstances. This will help employers and employees weather ongoing cycles of adaptation with resilience.

New technology adoption will create many benefits for employees and employers, not limited to the following:

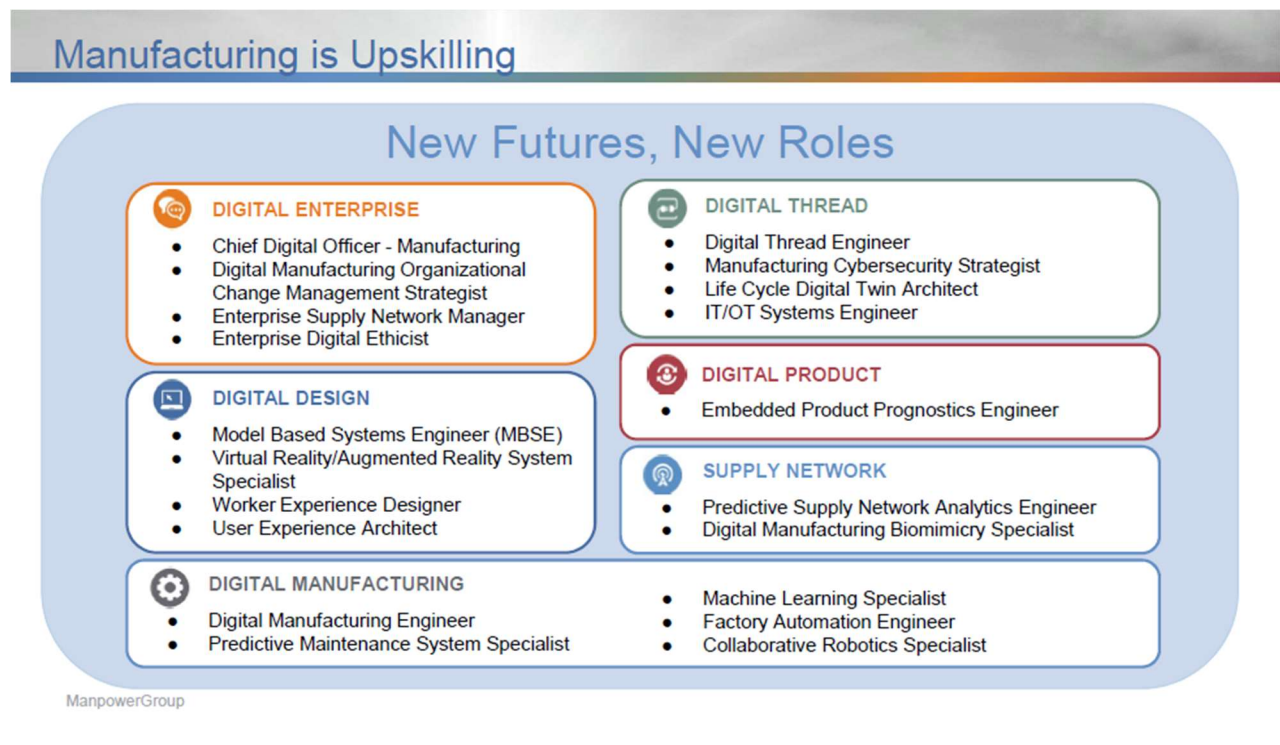
Employees	Employers
<ul style="list-style-type: none"> ● Improved worker safety through digital safeguards and predictive maintenance ● Lower ‘wear and tear’ on workforce as robots take on repetitive motion and weight bearing tasks ● Lowered barrier to workforce entry – examples: increased use of digital simulations for training and work process guidance ● Enriched career paths that take individuals from entry level production to higher paying analyst, specialist, and technician roles or pipeline into newly created roles in other parts of the organization ● More flexibility in how individuals work (at a distance, shift flexibility, etc.) 	<ul style="list-style-type: none"> ● Increased productivity ● More rapid cycles of innovation improving overall US competitiveness in global manufacturing ● Decreased waste as modeling evolves to increased use of digital twins for processes, products, services, and analytics for predicting behavior ● Technology offsets some of the worker shortage, but this is offset by the need for talent to learn new skills to operate technologies in all domains of the modern manufacturing enterprise

It is worth noting that ManpowerGroup also anticipates significant growth in the professional segment. See **Figure 7** for a representative listing of roles that we see emerging. We anticipate a continuing surge of cybersecurity related roles as “more digital” and “more data” becomes the mantra of modern manufacturing organization. The security of data moving across production floors and through the supply chain, not to mention how data is being used to drive new IP in the US or how assets that are tied to consumer safety and data are secured means an explosion in workforce tied to managing security at all levels and in all domains of

manufacturing. ManpowerGroup’s real-time analysis shows a shortage of 500,000 IT workers today.⁷

This shortage will compound very quickly as malicious attacks grow in both number and sophistication and goes beyond the IT domain into process and policy work, risk mitigation, data quality, and threat awareness. Additionally, we anticipate growth in the number of individuals who are responsible to train AI, determine strategic direction on product and process opportunities that emerge from the increased use of AI, provide guardrails and checkpoints on those strategies, and translate strategic direction into tactical execution. We also anticipate that in a more digital era, a premium will be placed on human connection, driving a surge in roles related to customer experience. These represent real opportunities for career path progression from all areas of the manufacturing organization.

Figure 7: Manufacturing is Upskilling



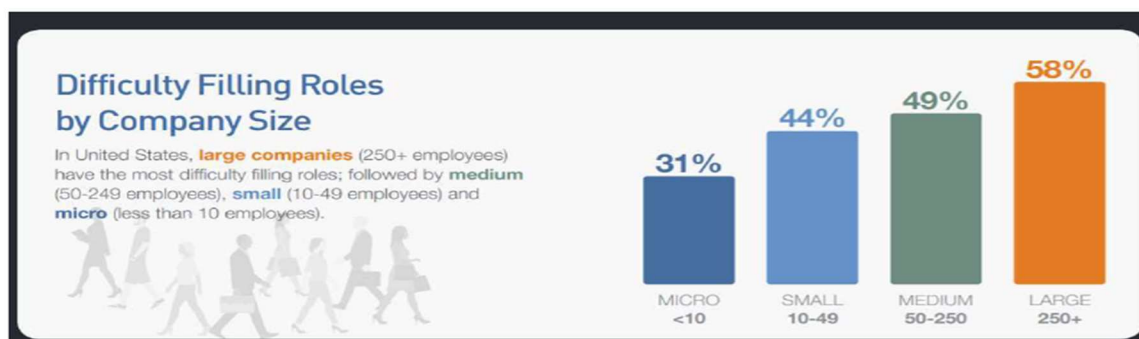
⁷ Data is ManpowerGroup Solutions proprietary analysis and the data is aggregated across multiple platforms including but not limited to ManpowerGroup's Recruitment Difficulty Index, ManpowerGroup Solutions TAPFIN [IntelliReach](#) platform, Gartner Talent Neuron and Bureau of Labor Statistics

Unique Challenges for Small and Medium-Sized Manufacturer's

Most manufacturing firms in the United States are quite small. In 2016, there were 249,962 firms in the manufacturing sector, with all but 3,837 firms considered to be small (i.e., having fewer than 500 employees). In fact, three-quarters of these firms have fewer than 20 employees.⁸ These organizations face unique challenges in the digital era, yet also have unique opportunity to benefit from it. Small and Medium-Sized Manufacturer's (SMM's) must invest in digital technologies that will help them grow and evolve their products and services that align with shifting market demand. They must invest in technology, however, any investment in tech is wasted if they aren't also investing in talent that have the skills to use it.

The double squeeze outlined earlier is also impacting SMM's. We hear regularly from SMM's that they are having difficulty in finding, hiring, training, re-training, and retaining talent. [ManpowerGroup's 2018 Talent Shortage Survey](#) reveals that small and mid-size companies have a bit of an edge. **Figure 8** shows that though micro and small companies across all sectors are having difficulty finding talent, the largest companies experience the highest level of difficulty.

Figure 8: Difficulty Filling Roles by Company Size



ManpowerGroup

- **Opportunity:** Generally, SMM's have more flexibility to take risks and be creative when tapping under-leveraged populations as there are fewer and less complex processes and systems for them to navigate in the talent acquisition and retention process. They can also be more creative in creating career, equity stake and owner pathways.
- **Challenge:** Traditional career paths are limited relative to their larger peers and in many cases are competing with larger organizations with richer benefits packages with greater leverage in pay and incentive plans and more varied career opportunities. Many SMM's have felt the sting of investing in creative recruiting and

⁸ U.S. Census Bureau, Statistics of U.S. Businesses

training programs just to see the talent siphoned off by larger corporations. Though SMM's can be nimbler and more creative, they have fewer resources to invest in talent acquisition, and learning & development and more inherent risk if the bets they have made on building talent don't pay off.

- **Distinct Challenge:** SMM's have higher risk when it comes to cybersecurity as many of them do not have the resources to invest in specialized talent. In many cases, a single individual wears many hats (for example, an engineer doing the work of engineer, IT, and safety). As the costs associated with these risks escalate, there needs to be strong consideration around what talent pool SMM's can tap into to better secure the supply network.

SMM's will need to be incredibly resourceful in how they navigate acute talent shortages and evolving roles and skills in the digital era. The good news is that their size lowers barriers to creativity and agility; however, they will need more support from public and private entities such as the MEP network to guide their short- and long-term talent strategies and market their unique career opportunities. SMM's will need to seek out ways in their communities to work with each other and their customers to create talent channels to create effective change. Shared platforms - or coopetition - that maximize their investments on talent acquisition, learning & development, employee transportation, and talent sharing will be important especially as they increasingly consider non-traditional pools of talent that can help them out of their talent crisis.

Retraining and Professional Development of Current Workforce

With less than one person available for each job opening in the U.S. today⁹ finding rightly skilled talent for the manufacturing workforce has never been more challenging. The manufacturing sector in the U.S. is estimated to produce up to 2 million new jobs over the next decade. At the same time, almost 2.7 million manufacturing workers are set to retire by 2025 (taking their knowledge and skills with them).¹⁰

Against the demographic backdrop outlined in the first section, we know new workers will not be enough to close the gap. Technological evolutions will be able to close some of the gap, but we must become far more resourceful in how we look at our current workforce and workforce re-training programs.

This is not just about worker training specific to production roles, but also the entire ecosystem of manufacturing as well as pipelining individuals into jobs where they have *adjacent skills* (as noted earlier, ManpowerGroup believes there will be growth in cyber, quality, customer service, analyst, specialist, and technician roles). There are several obstacles to ensuring mobility of talent inside of organizations:

- **Strategic workforce planning** – organizations struggle to balance the long-term and short-term of their workforce planning. It is difficult for them to predict needs more

⁹ Bureau of Labor Statistics. September 2019, <https://www.bls.gov/news.release/empsit.nr0.htm>

¹⁰ Skills Gap and Future of Work Study, Deloitte Insights and The Manufacturing Institute, 2018

than one year into the future.

- Systems and processes – talent acquisition and management systems have been fine-tuned to assumptions around abundance. Systems and processes are geared toward getting the highest possible fit and systematically weeding out talent that is not an exact match. As hiring on potential becomes increasingly important, systems need to be re-programmed and re-trained (many are increasingly AI driven) and processes need to be re-thought.
 - Our analysis showed that in September 2019 there were over 500,000 open IT jobs in the U.S. – that’s roughly the population of Minneapolis. Almost half of these jobs are for software engineers and a quarter are IT project managers. Employers are demanding more specific skills for these positions today than they did two years ago, such as expertise in Amazon Web Services rather than just Cloud. In two more years, it will be different again. This rapid evolution is having tremendous ripple effects on all industries, especially manufacturing. Therefore, processes that govern workforce eligibility need to be revisited to determine if they are unnecessarily restrictive and artificially limiting the available talent pool. Similarly, talent management systems that support the existing population need to be re-set to make talent mobility options more transparent to hiring managers.
- Evolved job descriptions – job descriptions are created and often stay stagnant, long after technology has impacted the jobs and evolved the skills required to do them. Modern HR Information Systems do not currently allow for rapid evolution of job descriptions nor is there a general culture and mindset that supports continuous evolution of skills in an organization. This is predominantly because, from a historical perspective, evolution of tasks to create outputs was seen as something that needs to be aligned with payrate increases. Today the tasks are the same, but they are done differently, which does not always require a revision in the compensation plan.
- Sufficient funding for worker training – Learning & Development organizations have been downsized and more worker training is being accomplished through partnerships and cooperative agreements. Organizations are in the tough position of determining which roles need training first and how to deliver it at speed and scale. Navigating funding options for worker training at the state and federal level is complex and the requirements from incentives for specific pools of talent, types, of training to measurements of success can be drastically different. In some instances, funding programs are aligned to outdated definitions (such as multi-year and 2,000-hour requirements on certain apprenticeships) and do not align with organizations’ willingness to experiment and take risks. The net impact is that an organization’s pilot program on worker training may be limited in its scale and benefit only a relatively small percentage of workers.

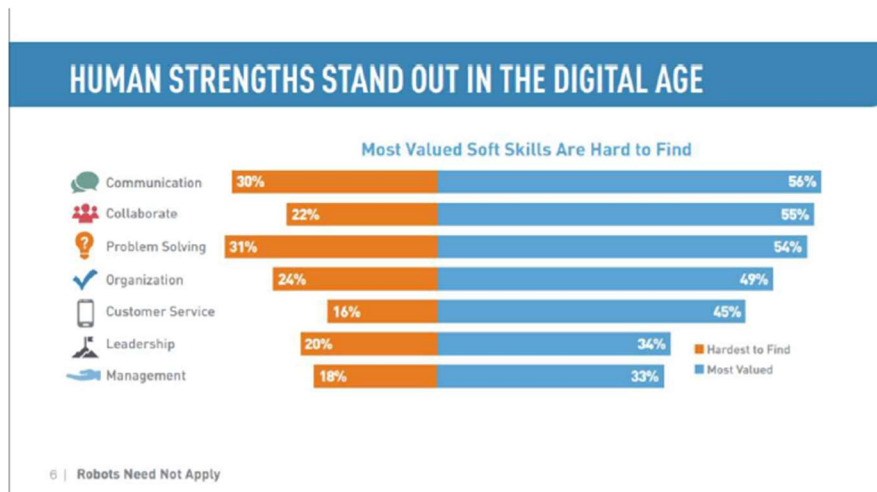
The critical blend for the workforce now and in the future is soft, technical, and digital skills as shown in **Figures 9 and 10**.

Figure 9: Most Valued Soft Skills by Function; Hardest to Find Soft Skills by Function



ManpowerGroup

Figure 10: Human Strengths Stand Out in the Digital Age



ManpowerGroup

Improved Training & Recruitment to Develop Skilled Technical Workforce

While much of the training and recruitment needs are addressed above there are additional points to consider.

An example of improved training for a skilled technical workforce can be found in our work with Veterans. Veterans share many technical and soft skills that are critical in the digital economy, but often have difficulty representing their skills in terms employers understand. This is increasingly prevalent in high tech manufacturing jobs where electro-mechanical skills are at a premium and where large numbers of military personnel are working on industrial computer systems. We looked at skills adjacencies and the concept of learnability using in-depth assessments and identified veterans who'd benefit from the Academy of Advanced Manufacturing. In partnership with Rockwell Automation, we invested in an academy to upskill and reskill veterans for higher-paying, in-demand jobs within the digital manufacturing industry. The program continues to be a win-win. We're helping service men and women earn more – the majority of academy graduates have doubled; some even tripled their previous salaries - and stay employable for the long term while helping employers address their skills gap.

In recruiting, we need to be more resourceful in working with under-leveraged populations such as formerly incarcerated, limited eligibility (no HS diploma or GED), women, individuals with physical and cognitive disabilities. It would take 243,934 people with Disabilities to connect to jobs and match their respective unemployment rate to the 3.7% national rate. There are also over 400,000 military spouses in the U.S. and only half are participating in the labor market with double the national unemployment rate.¹¹ These represent excellent talent pools to tap into and digital technologies decrease the amount of time to train, onboard and provide ongoing reinforcement.

We need to reimagine partnership between individuals, education and employers and become systems thinkers. Talent strategy has evolved from a historical high-growth, highly stable environment, where companies had time and resources to be builders of talent. Individuals joined organizations for life and stayed long enough to provide a strong return on investment.

Globalization brought shrinking margins and cost-cutting. Companies responded by labor cost reduction and just-in-time recruitment. Wages, once set by the enterprise, are now set by the market, and the bifurcation of the workforce began. Higher skilled people enjoyed pay increases, lower skilled people did not. Companies became consumers of talent and minimizers of overall labor costs.

Now, companies need to quickly adjust to what is happening in the marketplace to get a quicker return on investment and grow. Talent cycles are shorter, so people need to upskill in short bursts. Training has to impact more quickly and present a faster time to value. Even with low unemployment, wages are rising for people with in-demand skills.

To win in the digital age an effective talent strategy should have four parts: build, buy, borrow and bridge. See **Figure 11**. Build your talent pipeline by identifying future potential, driving a

¹¹ Bureau of Labor Statistics. September 2019. <https://www.bls.gov/jlt/>

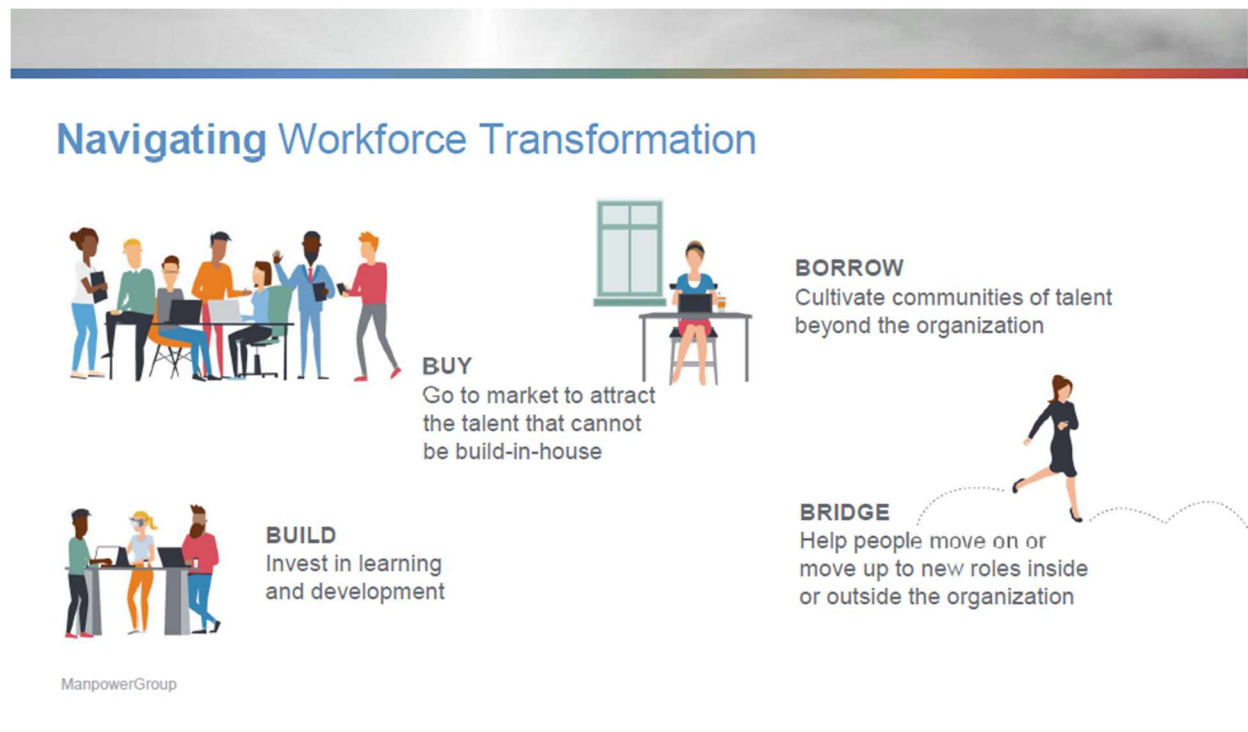
culture of learnability through the organization and providing accelerated training programs will be critical to success in the digital age.

Buy skills where necessary. Employers need to understand that candidates are consumers too; in order to attract and engage the best and brightest, HR needs to be a master marketer. We need to continue to evolve the narrative around manufacturing. The word manufacturing connotes 'dark, dirty, and dangerous.' Better messaging needs to align with words that attract talent: makers, maker spaces, innovation, high tech, etc. Manufacturing is where innovation and high tech go hand in hand.

Borrow from external talent sources. Organizations must learn to cultivate communities of workers inside and outside of the company.

Bridge people with adjacent skills from one role to another to complement existing skills. Leaders have a critical job to optimize the skills they have and find alternative pathways so those whose skills no longer fit can bridge to changing or emerging roles.

Figure 11: Navigating Workforce Transformation



Conclusion

Digitization, automation and transformation are impacting every industry, disrupting skills and creating new jobs. Manufacturing is the vanguard, with new roles appearing as fast as others become obsolete.

Manufacturers are reporting growing talent shortages as they struggle to find the right blend of technical and soft skills to fill new positions. The catalyst for the early stages of this skills shift was automation – machine strength. Now sector wide transformation has been turbocharged by the Internet of Things, the digitally connected enterprise, the relentless expansion of data and Artificial Intelligence (AI) to handle the scope of the challenge – machine thinking.

The potential for manufacturing to transform industries and drive economic growth has never been greater, thanks to the rapid advancement of new technologies. Against the backdrop of an existing skills shortage and with skills needs evolving so rapidly, we can only reach this potential with new and evolving skills for the current and future workforce. Talent is the most renewable resource on our planet: ready to learn, adapt and thrive in new environments. Employers can no longer go to market to buy new skills when they want them. We need to all become builders of talent to develop a workforce with the skills employers and individuals need to remain competitive.