Microsoft

Thoughts on global workforce transformation in the Industry 4.0 era

Featuring insights by Çağlayan Arkan,
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Executive Summary

Technology has been an agent for change. We saw that when the notion of 'systems of record' came to life with MRP and ERP decades ago. Similarly, we witnessed how mobility, cloud, and social triggered the creation of 'systems of engagement,' where data moved to mobile devices and to 'on-the-person.' That period also saw the emergence and impact of unstructured data on processes and decision making.

We are now observing how IT and OT domains are converging, as traditional 'walls' are being removed, enabling end-to-end business processes across engineering, manufacturing, logistics, marketing, sales, and service.

Today, we are at that historical crossroads again where IoT, machine learning, artificial intelligence, smart robots, and mixed reality are driving the creation of 'systems of intelligence.' These are the new digital feedback loops that will completely change how manufacturing is done and how enterprises make decisions, innovate, compete, engage customers, and run their businesses. Technology is inside all 'things.' Connectivity has become pervasive. Data volumes continue to rise exponentially. Yet, with virtually unlimited compute power and incredibly rich data platforms, we are now able to gain unprecedented insights related to all aspects of our businesses.

I would like to note that today's disruptive forces are not limited to technology: One of the most critical disruptions in manufacturing is happening around the global workforce. This is a top-of-mind, high-priority topic at Microsoft as we look to empower our customers and partners to deal with challenges of the present and the future.

I would like to share a few thoughts on how the global workforce will be impacted by ongoing trends, as well as ideas around how three core groups—manufacturers, employees, and the industry at large (IT companies, large enterprises, education institutions, policy makers, government, etc.)—can prepare for this massive transformation.
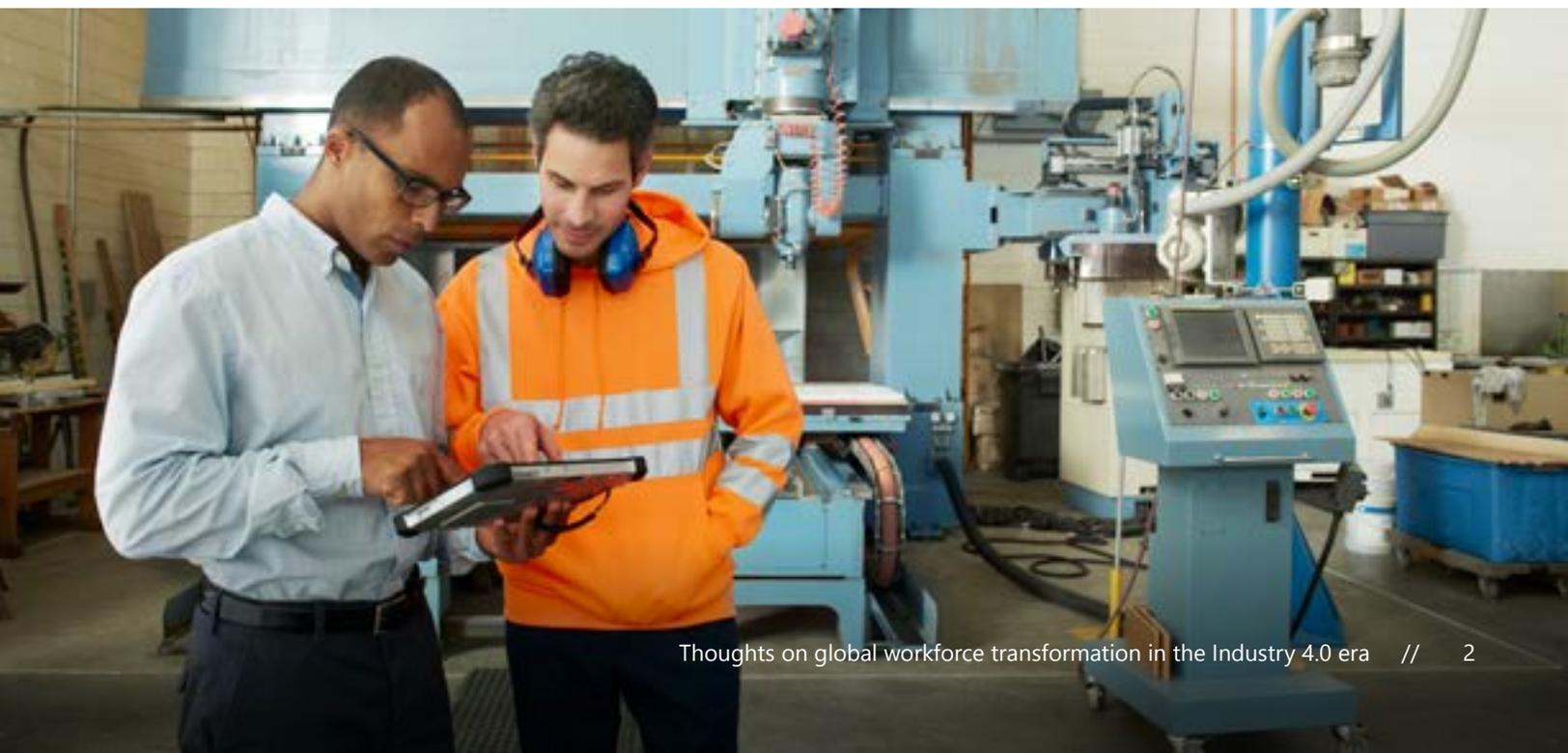
The manufacturer's dilemma

There is a growing talent gap and manufacturers are worried. There is a major risk with knowledge and experience going away with the retiring employee base. According to a Census report, by 2029, the majority of baby boomers will be aged 65 and above, accounting for 20 percent of the population of the United States. This translates into a significant drop in terms of the numbers of active workers in our economy, particularly in manufacturing industries.[1]

The younger generation still perceives manufacturing as 'blue collar' work and not something they want to do.[2] In addition, while the pace of advanced technologies being introduced on the plant floor has been growing at a rapid pace, many workers do not have the skills or proper training to keep up. It is estimated that the skills gap is expected to result in two million manufacturing jobs going unfilled, according to First Research.[3]

Manufacturers have a great need to lure in tech-savvy talent—or upskill/reskill existing forces— to harness new and disruptive manufacturing technologies. Companies should be looking for a new generation of employees that possess the hybrid skills and comfort with innovation to adopt these technologies and those not yet invented.

The manufacturer's opportunity

In this new era, we know that every industry and every business must reinvent itself and leverage the power of digital to innovate, accelerate, optimize, and become more agile and efficient. We at Microsoft believe that all enterprises will become software companies as technology will inform our business process, our business model, and our customer and employee engagement. This is a "be the predator or the prey" type of environment, whereby you either change and disrupt, or become obsolete as your competition disrupts your business. Manufacturers need to start immediately—take action today, experiment, fail fast, and keep repeating, learning, and changing. In my last blog, I shared the seven key imperatives that business leaders need to consider as they grow, adapt, and evolve to meet the new business opportunities of tomorrow by thinking and operating like a digital company.

It's clear that organizations that gain these digital competencies and capabilities will be quick to adapt to market changes, even drive them, and be a catalyst for new products, services, and experiences. The rewards are clear: organizations that take these steps to embrace digital transformation generate an average of $100 million more operating income each year than those who lag behind, according to a new Keystone Strategy study.[4]

Manufacturers today have the opportunity to invest in new technology such as 3D printing (or additive manufacturing) and intelligent robots, as well as enable completely new digital manufacturing automation and execution capabilities to further rationalize and improve overall processes and production.
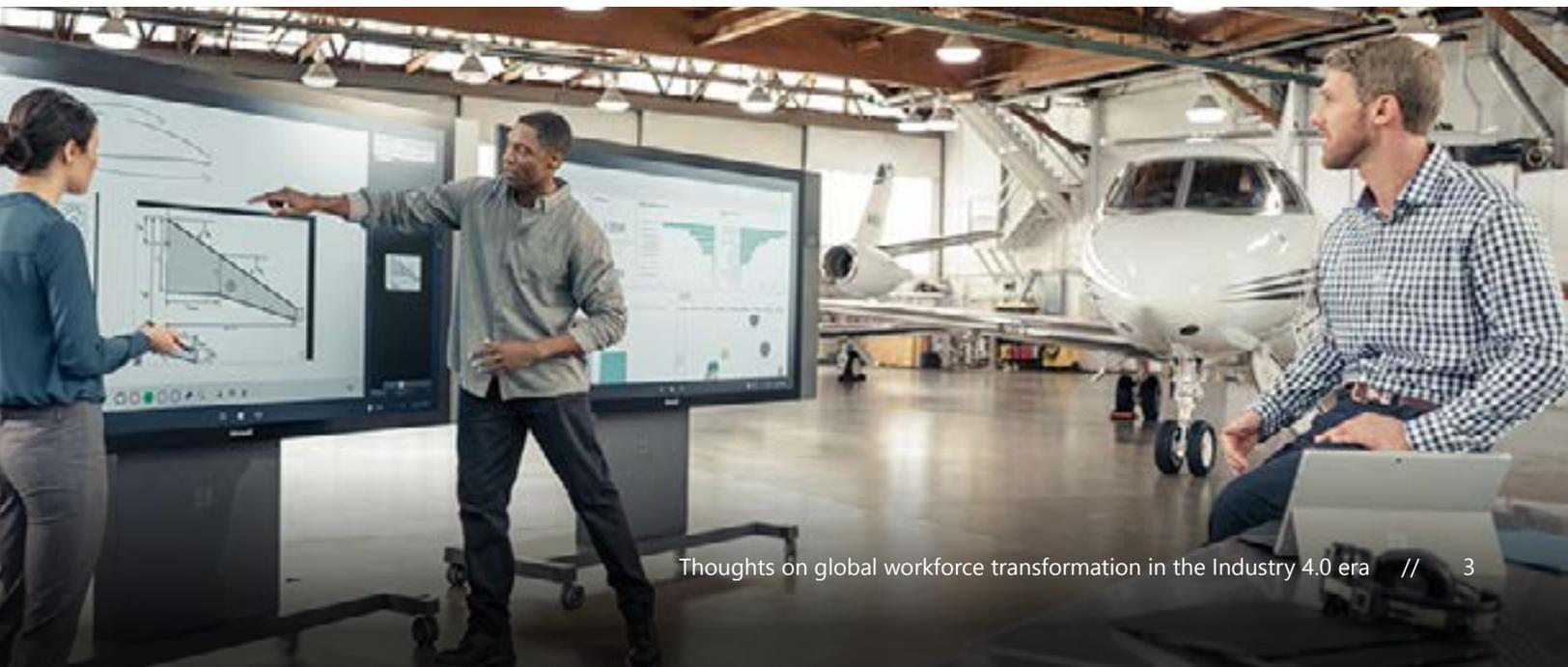
With the new level of automation, manufacturing will move from a mass-production paradigm to a mass-customization paradigm that I like to call "one size fits one." This interesting chart from McKinsey & Co. analyzed the detailed work activities for more than 800 occupations to assess the technical potential for automation. In manufacturing specifically, the findings show that workers performing predictable physical work activities comprise 29 percent of total work in manufacturing, of which 89 percent has the potential to be automated.[5]
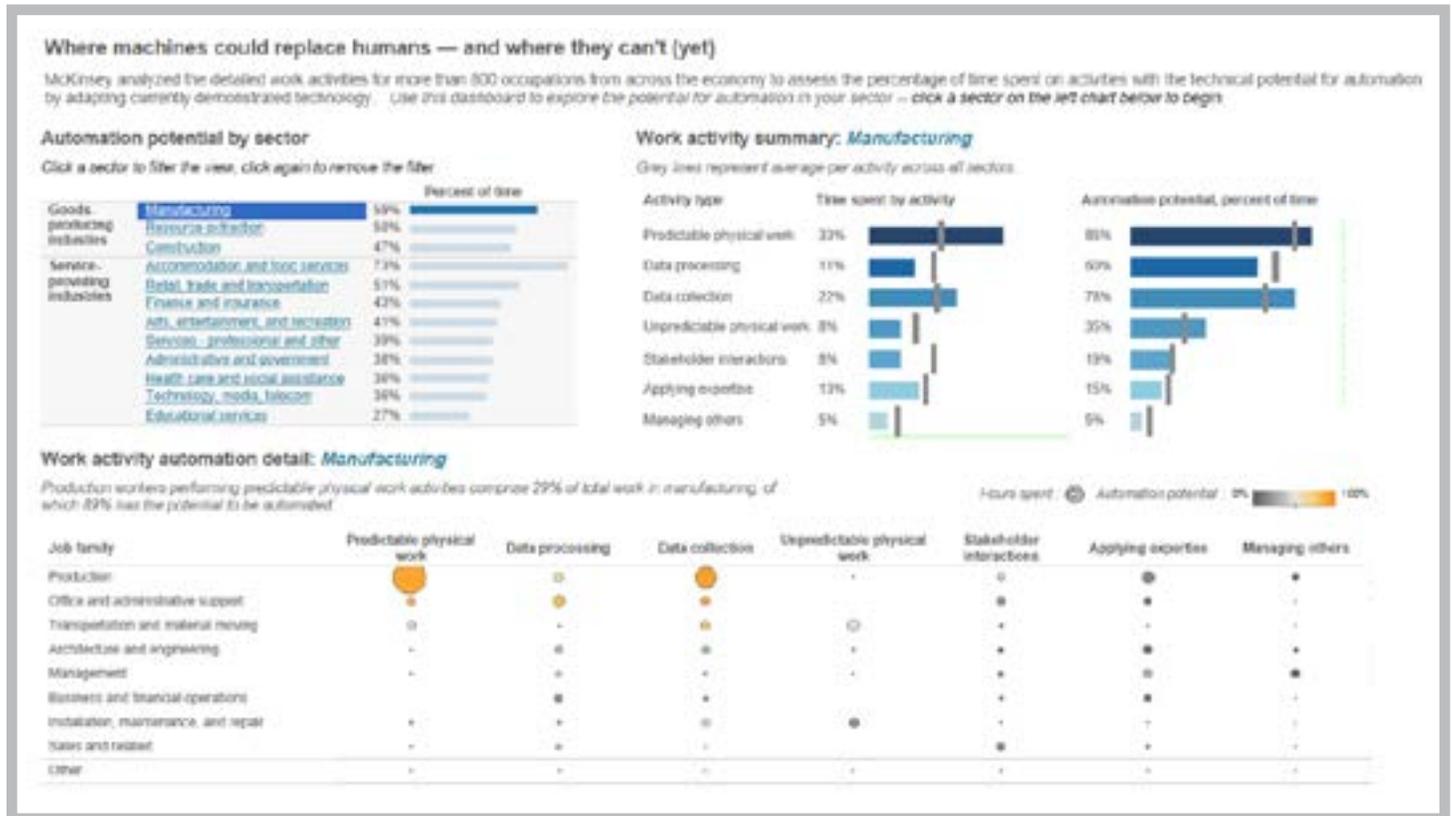
According to PricewaterhouseCoopers, the number of industrial robots is expected to rise from 1.8 million in 2016 to 2.6 million in 2019, which will also have a significant impact on a number of industries.[6] Robots are now capable of more physically taxing work, with the ability to handle and move tons of weight, as they are also likely to take over repetitive, complicated, or sensitive tasks. As these increased levels of automation and intelligence take hold in the manufacturing environment, we know that jobs will be replaced.

On the other hand, new technology and the new levels of automation may help with the talent gap problem as it relates to the aging workforce. According to the U.S. Bureau of Labor Statistics, a larger share of people 65 and older is staying in or returning to work as the labor force participation rate for older workers has been on the rise since the late 1990s.[7] The European Commission also estimates the number of people in the UK aged 55 to 64 will increase by 24 million between 2005 and 2030.[8]

For our aging workers, it's not hard to imagine that we can help keep them in the workforce longer with the affordability and efficiency of robots. Add the fact that communication, collaboration, and messaging technologies are now accessible by everyone, as well as easy and intuitive to use for all ages and workgroups. Using technologies like Skype, Skype Translator, and Microsoft HoloLens, experienced workers can be available to anyone around the global enterprise, offering verbal, even visual help. These kinds of innovations can help us keep our older workers on the job longer by leveraging their intelligence, knowledge, expertise, and experience through less physically demanding—yet vital—roles. These tools can also enable workers to perform complicated tasks, such as maintenance on aircraft engines, in a reliable and compliant way, with remote aid from experienced employees.

As technology advancements trigger increased levels of automation, chances are advanced economies will do less outsourcing and offshoring, even potentially bringing jobs back into their own countries, as cheap labor will no longer be an important factor in terms of cost of manufacturing. It is also realistic to think—to further support that hypothesis—that political stability, predictable energy supply, and reliable cyber-security infrastructure will become extremely critical factors in determining the geographies for manufacturing production.

We are already starting to see a trend in that direction, for example 'insourcing' manufacturing back to advanced, mature economies. According to Harry Moser, the founder of the Reshoring Initiative, an estimated 50,000 jobs were returned to the American manufacturing industry from 2010 to 2013 based on a cost-benefit analysis of domestic versus offshore production. Moser states that if this trend continues, a potential six million jobs could return to America.[9]

The employee's dilemma

On the flipside of the talent gap, the workforce is very worried about unemployment. In the United States, workers remain concerned that jobs could shift to other countries, as they have over the last few decades. Manufacturing is a sector that tends to lead in terms of outsourcing jobs; more than 50 percent of manufacturing companies outsourced jobs in 2015.[10]

Workers also worry about how they will access and afford the training they need to have the right skills to match today's rapidly evolving technology job roles. Many may need to be reskilled several cycles throughout the course of their careers. Often graduates find that their education did not properly prepare them for the skills needed for fast-changing industries such as manufacturing.

In addition, the workforce profile is changing rapidly and looks different than a few generations ago. Long gone is the era of staying in the same job for the span of your career. Today's millennials are used to working multiple jobs, even while at school. They are driving Uber cars, they are babysitting, waiting tables, exploring internships in the summer, and doing volunteer work.

The world is constantly changing and millennials are coming to the workforce with a very different set of expectations than previous generations. According to MIT research, for employees across age groups from 22 to 60, the vast majority want to work for digitally-enabled organizations.[11]

The employee's opportunity

There has never been a more exciting time to be part of the future of the manufacturing workforce, as the workplace has evolved to a highly technologically advanced environment. Employees need to understand what the new professions are and seek out those roles through things like continuing or advanced education.

Employees have the opportunity to focus their contributions more around digital, intelligence and technology focused types of roles. It is almost a sure bet that those who acquire these new skills will be gainfully employed. After all, we already established that every enterprise will become enterprise software companies and that means the world will need more software and more developers to write them—many, many more.

Large enterprises are also moving toward recognizing and respecting the millennial's preference for work-life balance. Markets are moving to more flexible work arrangements, such as job-sharing programs and work-from-home opportunities.
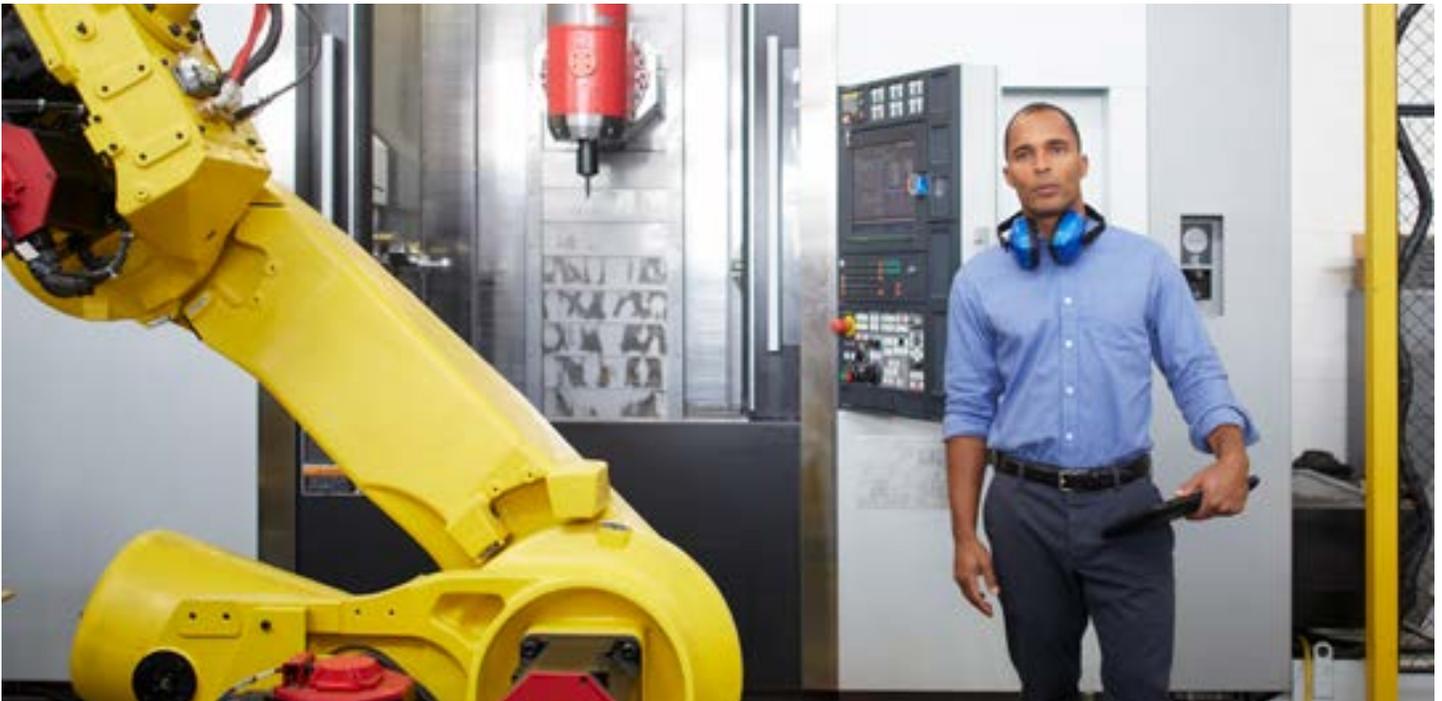
The industry's dilemma

As we've discussed, while technology advancements can help to create different types of jobs, when it comes to the new professions, automation has the potential to take away more jobs than it will create. According to McKinsey & Co., by 2025, digitization is expected to contribute $2 trillion to US GDP—and displace up to 12 million middle-skill workers.[12]

This is a warning that while Industry 4.0 brings many benefits, it also foreshadows the beginning of a major socio-economic structural change in our new world of work. From the industry's perspective, the dilemma is around how to keep everyone, even high-skilled workers, employed, as well as how to deal with the social and social security implications.

According to a documentary aired on Erstes Deutsches Fernsehen, a study by Deutsche Bank finds that, for the first time, more jobs will be destroyed through the use of new technologies than created. Specifically, the head economist at ING-DiBa, Carsten Brzeski, concluded that in Germany alone, 18 million jobs—even in highly qualified professions—are potentially threatened by automation and digitalization.[13]

However, while reducing the number of actual workers, the new levels of automation for advanced economies will actually create more productivity and growth. Those economies that embrace advanced manufacturing and automation will become more prosperous, even though they will have fewer human jobs. This is because technology and automation can help industries and businesses lower costs and increase efficiency, according to PricewaterhouseCoopers.

For example, robotics can help businesses make better use of their existing capital stock and increase margins. This in turn could create further demand for traditional forms of investment, such as warehouses and machinery. The price of goods and services could also drop—or increase more slowly—if businesses pass on these productivity gains to consumers through lower prices, which they should do so long as markets are competitive.[14]

Some countries such as Germany are also considering using this new automation-enabled wealth to offer subsidies to provide their citizens with basic unemployment insurance and an unconditional basic monthly income, regardless of employment status.[15] But not all countries are ready to make this transition. Earlier this year, three-quarters of the population of Switzerland voted against introducing an unconditional basic income.[16]

What political and business leaders need to know is that the world of work is changing and the industry must keep up. Robots and systems of automation are re-defining the workplace as we know it. As such, we are facing an overhaul in terms of the way social security, unemployment, and other subsidies are planned, managed, and executed.

As we look beyond technology and automation as they relate to the basic preparation of our workforce, today's schools and vocational education institutions are simply not keeping up with the demands of the new digital enterprise. We need different types of education and training programs. It's not just governments and educational institutes; only a small number of forward-thinking enterprise companies are doing enough to help skill the next generation.

The industry's opportunity

As we look to the opportunity ahead, we must reflect back that this kind of massive disruption on the workforce has happened before. If we go back to 1870, almost 50 percent of the US population was employed in agriculture; as of 2008, less than two percent of the population was directly employed.[17]

What happened was that the industry adapted and evolved. As the economy moved from agriculture to industrial, new jobs were developed; new skill-sets were identified; new professions were created; and new opportunities were identified for innovation, growth, and prosperity.

With evolving industries and changing technologies, it's clear that there is great opportunity for leaders in our industry to drive that same kind of workforce evolution today to continue to advance the future of our economies and industries. The question becomes: Are we able to support these new professions and new expectations with our existing training, education, and government systems?

To support our new millennial workforce, as well as our current workforce that needs to remain relevant, we will need to rethink high schools, colleges, vocational education, industry training, and on-the-job readiness activities to ensure the next generation is ready for the future of work with more specialized skills like software development, data, and analytics.

Broadening the pipeline of diverse talent flowing into the industry is critical to the future of our workforce. To get students on the path of Science, Technology, Education and Math (STEM) programs, these education investments need to start early, beginning with elementary school. Microsoft is an example of a company working to expand the pipeline for the next generation of technology leaders, including programs such as our YouthSpark global initiative that has created new opportunities for more than 227 million young people in 100 countries, and our DigiGirlz program that has reached more than 26,000 young girls around the world with technology career education.

We also need to plan for the new roles that need to be filled. I believe these roles should be particularly focused around software development and data analytics, including professionals such as data scientists and chief digital officers (CDOs. I read a recent Frost & Sullivan report that highlights the growing role of CDOs, saying that they will be instrumental in enabling digital enterprises to move from product-centric businesses to service-centric models with data and digital at the center. These roles will also help to 'digitalize' business processes that go from the supply chain, to manufacturing, to innovation, to engineering and design, to the development and deployment of smarter products, and beyond.[18]

Where do we go from here?

As we can see, the nature of how we work—and the workplace itself—is undergoing a dramatic transformation. I agree with Barret Kupelian, senior economist at PricewaterhouseCoopers, when he says: "Technological breakthroughs are a disrupting force for businesses and workers. But for those businesses that can adapt fastest to new technologies, and for workers with characteristics that machines don't currently have—such as creativity and empathy—improvements in technology could deliver substantial gains."[19]

As we have already established that every enterprise will become a software company and will need to adopt 'digital' to avoid becoming obsolete, there is a ton of new software to be developed and virtually unlimited data to be reasoned over.

The call to action from Microsoft to technology companies, enterprise customers, education institutions, policy makers, industry leaders, and political decision makers is to work collaboratively and take steps quickly to re-skill the workforce and transform the education system to ensure we have the right roles in place to take us to the next industrial revolution and beyond.

The future of manufacturing is in the hands of our current leaders. And the opportunity is now to reinvent the workplace and the workforce of tomorrow.

Additional Resources

- Çağlayan Arkan's blog

- Digital transformation: Seven steps to success

- Microsoft HoloLens

- Skype

- Skype Translator

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[1] The Baby Boom Cohort in the United States: 2012 to 2060, Sandra L. Colby and Jennifer M. Ortman, May 2014

[2] ThomasNet's annual Industry Market Barometer® survey of North American manufacturers, November 2014

[3] Manufacturing Sector Industry Profile. First Research, January 2016

[4] Keystone Strategy interviews Oct 2015 – Mar 2016. Based on interviews with 340+ leading enterprises comparing data platform maturity with business performance, controlling for company size and industry. Incremental operating income of $100M is based on median company revenue of $3.4B.

[5] "Where machines could replace humans—and where they can't (yet)," McKinsey & Co. July 2016

[6, 14, 19] Rise of the robots – good news or bad for business and society? PricewaterhouseCoopers, October 2016

[7] Older Workers. U.S. Bureau of Labor Statistics, July 2008

[8] Europe's changing population structure and its impact on relations between the generations, European Commission, March 2005

[9] Manufacturing. Economic Development Journal, Harry Moser, Reshoring Initiative, September 2016

[10] Job Overseas Outsourcing Statistics, Statistic Brain, October 2015

[11] Strategy, Not Technology, Drives Digital Transformation, 2015 Digital Business Global Executive Study and Research, MIT Sloan Management Review, July 2015

[12] Infographic: The Accelerating Digitization of the US Economy. McKinsey & Co., February 2016

[13, 16] "Shift in perspective: The robots take over," Erstes Deutsches Fernsehen, October 2016

[15] A workshop on the Universal Basic Income in Berlin, October 2016

[17] "Latest U.S. Agricultural Trade Data." USDA Economic Research Service. Ed. Stephen MacDonald. USDA, 4 Sept. 2013. Web. 28 Sept. 2013. "Employment by major industry sector". Bls.gov. 2013-12-19. Retrieved 2014-04-01. "Extension". Csrees.usda.gov. 2014-03-28. Retrieved 2014-04-01

[18] Manufacturing Leadership, Manufacturing Trends to Watch in 2016, Frost & Sullivan, David Brousell, September 2016