

GSP Background Briefing
AI and Automation

The promise of AI

AI related technologies are currently being employed to help solve global challenges from climate change to improving patient outcomes in the medical field. The estimated global value of AI is considerable. Some sources estimate that AI will potentially contribute \$15 trillion to the global economy by 2030, with North America realizing a 14.5% impact upon total GDP from AI during that time frame (\$3.7 trillion).¹ AI also promises the value of greater productivity, with potential dividends being passed on to the consumer, the workforce (through the creation of additional jobs) – and humanity, by freeing workers from performing some automatable tasks to focus on valuable priorities. As a number of publications have demonstrated, AI has the potential to change human lives and the nature of work itself.²

...and the challenges

Challenges accompany the promise of AI and automation. The enduring theme among recent studies is that technologies related to automation will result in a significant shift in the occupational landscape as well as the changing nature of work in and of itself³ – not in a world of massive job loss. In the majority of cases across multiple scenarios and timelines, AI and automation are shown to result in net job gains.

That said, people in this new occupational landscape will require reskilling. By 2022, the World Economic Forum notes that 54% of 15 million employees represented by companies in a recent survey will require significant reskilling and upskilling as a result of new technologies, including AI, being introduced into the workplace.⁴ McKinsey Global Institute notes that 51% of activities present in today's economy could be replaced by automation; these activities cut across industries and occupation. According to McKinsey, "while very few occupations – less than 5 percent – are candidates for full automation...almost every occupation has partial automation potential, as a proportion of its activities could be automated."⁵

¹ PwC. *Sizing the Prize*. PwC. 2017. Pg. 1 <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>.

² Deloitte. *Reconstructing Jobs*. Pg. 7. Deloitte Touche Tohmatsu, 2018. https://www2.deloitte.com/content/dam/insights/us/articles/AU308_Reconstructing-jobs/DI_Reconstructing-jobs.pdf

³ Ibid.

⁴ World Economic Forum (September 17, 2018), *The Future of Jobs Report 2018*. World Economic Forum, Pg. 13 http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

⁵ Jacques Bughin, Michael Chui, Martin Dewhurst, Katy George, James Manyika, Mehdi

Does the current workforce possess the skills needed to participate in this new jobs landscape? How might current training and re-skilling priorities amongst the private sector stand to benefit workers unequally – with those whose jobs are most at risk standing to benefit the least from re-training?⁶

The need for branding

Greater Seattle and Washington state is home to one of the foremost AI ecosystems in the US. According to an article published in Crosscut, around 6,400 people work in the state's AI industry.⁷ The Seattle area accounts for 5.9% of AI job postings in the US – the sixth largest number of US job postings, behind New York City, San Francisco, San Jose, Washington DC, and Boston.⁸ World-renowned institutions are building a robust AI talent pipeline, such as the University of Washington's Computer Science & Engineering program (and related programs in the Information School and eScience Institute).

The region's AI power is not un-noticed by industry. Amazon, Microsoft and Expedia are all making multi-billion dollar investments in AI-related technologies,⁹ as well as

global companies including Google, Apple, Facebook, Baidu, Tencent, Alibaba and ARM.

Miremadi, and Paul Willmott. *Driving Impact at Scale from Automation and AI*. Pg. 7. McKinsey & Company, February 2019.

⁶ World Economic Forum (September 17, 2018), *The Future of Jobs Report 2018*. World Economic Forum, Pg. 13 http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf.

⁷ Stang, John. "Could Washington state be the next AI frontier?" Crosscut. December 21, 2018. <https://crosscut.com/2018/12/could-washington-state-be-next-ai-frontier>

⁸ Ibid.

⁹ Reference the following:

- Levy, Steven. "Inside Amazon's Artificial Intelligence Flywheel." Wired. February 1, 2018. <https://www.wired.com/story/amazon-artificial-intelligence-flywheel>.
- Needleman, Sarah E. "Microsoft to Invest \$1 Billion in Artificial-Intelligence Startup." Wall Street Journal. July 22, 2019. <https://www.wsj.com/articles/microsoft-to-invest-1-billion-in-artificial-intelligence-startup-11563813648>
- Expedia Group. "Expedia Group and AI Singapore Ink Collaboration Under 100 Experiments Programme to Develop AI Solution to Transform the Online Search Experience for Asian Travelers." September 9, 2019. <https://media.expediagroup.com/2019-09-09-Expedia-Group-and-AI-Singapore-Ink-Collaboration-Under-100-Experiments-Programme-to-Develop-AI-Solution-to-Transform-the-Online-Search-Experience-for-Asian-Travellers>
- Wallis, Gregg. "Expedia's Okerstrom: AI is the next big thing in travel." Hotel Business. January 15, 2019. <https://www.hotelbusiness.com/expedias-okerstrom-ai-is-the-next-big-thing-in-travel/>

However, Greater Seattle is not attracting investment and recognition that is commensurate with its assets. A recent ranking performed by fDi markets of the most attractive 25 global cities for AI and robotics investment did not feature Seattle.¹⁰ The State of Washington ranked fifth out of US states for AI investment, as measured by dollar value, posting three deals and \$9 million invested (by comparison, California ranked #1, posting 53 deals and \$1,917 million invested).¹¹

RESEARCH HIGHLIGHTS

The promise of AI

AI related technologies and automation offer the promise of faster services, improved quality, productivity and savings. AI also has the potential to address “moonshot” challenges from climate change to health. Researchers at Geisinger have developed an algorithm that could reduce diagnostic times for intracranial hemorrhaging by up to 96 percent. Meanwhile, researchers at George Washington University are using machine learning to more accurately weight the climate models used by the Intergovernmental Panel on Climate Change.¹²

When sizing these applications, the global value of AI is considerable. Some sources estimate that AI will potentially contribute \$15 trillion to the global economy by 2030, with North America realizing a 14.5% impact upon total GDP from AI during that time frame (\$3.7 trillion).¹³ AI and automation also have the potential to reverse a decline in labor productivity growth from an average 0.5% in 2010-2014 to 2% in U.S. and major European economies over the next decade, with over 60% of that increase due to “digital opportunities.”¹⁴ Other sources estimate that AI and automating technology

¹⁰ Cathy Mullan. “Singapore leads AI destinations ranking.” fDi Intelligence, December 4, 2018. <https://www.fdiintelligence.com/Sectors/Software-IT-Services/Singapore-leads-AI-destinations-ranking>

¹¹ Su, Jeb. “Venture Capital Funding For Artificial Intelligence Startups Hit Record high in 2018.” Forbes, February 12, 2019. <https://www.forbes.com/sites/jeanbaptiste/2019/02/12/venture-capital-funding-for-artificial-intelligence-startups-hit-record-high-in-2018/#49eb04e241f7>

¹² James Manyika and Kevin Sneader. “AI, automation, and the future of work: Ten things to solve for.” McKinsey Global Institute, June 2018. Pg. 2. https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Future%20of%20Organizations/AI%20automation%20and%20the%20future%20of%20work%20Ten%20things%20to%20solve%20for/MGI-Briefing-Note-AI-automation-and-the-future-of-work_June2018.ashx

¹³ “Sizing the Prize.” PwC, 2017. Pg. 1 <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>.

¹⁴ James Manyika and Kevin Sneader. “AI, automation, and the future of work: Ten things to solve for.” McKinsey Global Institute, June 2018. Pg. 3. https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Future%20of%20Organizations/AI%20automation%20and%20the%20future%20of%20work%20Ten%20things%20to%20solve%20for/MGI-Briefing-Note-AI-automation-and-the-future-of-work_June2018.ashx

could lead to an average labor productivity increase across sectors of about 30% compared to 2015.¹⁵

Added productivity could have the potential to transform jobs as we know them by freeing employees to focus on “higher value” work¹⁶. Added productivity could also result in creating new jobs and transforming lives. Cost savings could be shared with the consumer or re-invested into the product/service, potentially resulting in a superior experience, such as increased inclusivity. On this front Deloitte provides a useful future case scenario of a public transportation service employing AI to realize time/cost savings, that then transfers those savings into extending services to rural or underserved areas, creating a more inclusive transportation system.

Assessing the potential impact of AI and automation on jobs

Based on the 11 reports that GSP examined, there is a growing body of work in recent years that recognizes that while AI and automation is likely to result in net jobs gain in the global workforce, the distribution of jobs across occupations and occupations themselves will undergo substantial change.¹⁷ Identifying the occupations that are most at risk of automation and the demographic profile of the workforce currently associated with those jobs would be critical in terms of understanding who stands to gain – and lose – the most from these new technologies.

People in this new occupational landscape will require reskilling. By 2022, the World Economic Forum notes that 54% of 15 million employees represented in a recent survey will require significant reskilling and upskilling as a result of new technologies, including AI, being introduced into the workplace. McKinsey Global Institute notes that 51% of activities present in today’s economy could be replaced by automation; these activities cut across industries and occupation. According to McKinsey, “while very few occupations – less than 5 percent – are candidates for full automation...almost every occupation has partial automation potential, as a proportion of its activities could be automated.”¹⁸

¹⁵ World Economic Forum (September 17, 2018), *The Future of Jobs Report 2018*. World Economic Forum, Pg. 11 http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

¹⁶ Michael Chui, James Manyika, and Mehdi Miremadi. “Four fundamentals of workplace automation.” McKinsey & Company, November 2015. Pg. 5. <https://roubler.com/au/wp-content/uploads/sites/9/2016/11/Four-fundamentals-of-workplace-automation.pdf>

¹⁷ Deloitte. “Reconstructing Jobs.” Pg. 7. Deloitte Touche Tohmatsu, 2018. https://www2.deloitte.com/content/dam/insights/us/articles/AU308_Reconstructing-jobs/DI_Reconstructing-jobs.pdf

¹⁸ Jacques Bughin, Michael Chui, Martin Dewhurst, Katy George, James Manyika, Mehdi Miremadi, and Paul Willmott. “Driving Impact at Scale from Automation and AI.” Pg. 7. McKinsey & Company, February 2019.

Highlights of key findings from 11 reports examined:

- [The future of work in America \(McKinsey, July 2019\)](#)¹⁹
McKinsey analyzed over 3,000 countries and 315 cities in the US to forecast potential changes to the US workforce from 2017 – 2030, based on a midpoint adoption scenario of automation related technologies. Note that not all technologies related to automation include AI; automation can come from other technologies as well.²⁰
- Implications for greater Seattle²¹
 - Potential net job growth in midpoint adoption scenario:
 - King County: Greater than 15%
 - Pierce County: 10 – 15%
 - Snohomish County: Greater than 15%
 - State of Washington: 14% net job growth, highest in the U.S.
 - Impact on occupations among “urban core” economies (which includes greater Seattle):
 - Job increases (in order of size of increase): Health Professionals, STEM professionals, Health Aides, Technicians and Wellness, Creatives and Arts Management, Business/Legal Professionals
 - Job decreases (in order of size of decrease): Office Support, Food Services, Production Work, Community Service, Mechanical Installation and Repair
- Overall findings
 - Job displacement ranges from 18% - 33% in U.S. counties
 - 90% of US counties post a potential displacement rate of 22 – 27%
 - 25 large cities, high growth hubs and peripheries led post-recession job recovery (greater Seattle is identified as a high growth hub)

¹⁹ Susan Lund, James Manyika, Liz Hilton Segel, Andre Dua, Bryan Hancock, Scott Rutherford, and Brent Macon. *The future of work in America*. McKinsey & Company, July 2019. <https://www.mckinsey.com/~/media/McKinsey/Featured%20Insights/Future%20of%20Organizations/The%20future%20of%20work%20in%20America%20People%20and%20places%20today%20and%20tomorrow/The-Future-of-Work-in-America-Full-Report.ashx> and

<https://www.mckinsey.com/featured-insights/future-of-work/americas-future-of-work>

²⁰ OECD (2019), *OECD Skills Outlook 2019*. OECD Publishing, Paris, pg. 48. <https://www.oecd-ilibrary.org/sites/df80bc12-en/index.html?itemId=/content/publication/df80bc12-en&mimeType=text/html>

²¹ *America’s future of work*. McKinsey & Company. <https://www.mckinsey.com/featured-insights/future-of-work/americas-future-of-work>

- These same areas could capture 60% of all US job growth estimated to occur from 2017 – 2030, although they only account for 30% of the U.S. population.
- There is the potential for automation to deepen existing inequities:
 - Those with only a high school degree or less are four times as likely to hold a highly automated role.
 - Many occupations with the highest potential for displacement have skewed demographic characteristics. Example provided by McKinsey: food preparation workers face a 28% risk of automation. This occupation holds a high concentration of Hispanic and African American workers, with the majority of workers holding a high school degree or less.
 - According to McKinsey's analysis, Hispanics stand out as the ethnic group with the highest potential displacement rate.
- The Future of Jobs Report (World Economic Forum, 2018)

Launched in 2016, the goal of the WEF's Future of Jobs report is to better understand the impact of the Fourth Industrial Revolution on work and jobs. The 2018 report was created with the goal of providing a five-year outlook on how new technologies, including those related to AI, will "create and disrupt jobs in favor of improving the quality and productivity of the existing workforce."
- Methodology:
 - Survey of mainly Chief HR Officers across 12 industries, representing over 15 million employees in 20 developed and emerging economies. Results reflect 313 unique responses.
- 2022 jobs landscape (based on survey results):
 - About half of today's current jobs amongst those surveyed will remain somewhat stable (around 48% of jobs)
 - Nearly 50% of all companies surveyed expect that automation will lead to a reduction of the full-time workforce
 - New roles in "emerging professions" set to increase share of employment from 16% to 27%
 - Employment in share of declining roles set to decrease from 31% to 21%
 - Thus, job loss that is the result of declining roles will be fully offset by job creation and the emergence of new professions
 - Extrapolating these trends for the global, non-agricultural workforce employed by large firms:
 - 75 million jobs may be displaced by the above trends
 - 133 million additional new roles may emerge at the same time
- 2022 occupational landscape:

- Occupations set to experience increasing demand: existing occupations such as Data Analysts and Scientists, Software and Applications Developers, Ecommerce and Social Media Specialists; roles that leverage distinctively ‘human’ skills: Customer Service Workers, Sales and Marketing Professionals, Training and Development, and Organizational Development Specialists
- Wholly new occupations set to experience demand: wholly new specialist roles related to leveraging latest emerging technologies; AI & Machine Learning Specialists, Big Data Specialists, Process Automation Experts, Information Security Analysts, etc.
- Increasingly redundant roles: routine-based, middle skilled white collar roles. Examples: data entry clerks, accounting & payroll clerks, secretaries, auditors, bank tellers, cashiers
- 2022 skills landscape:
 - Machines and algorithms are set to increase their contribution to specific tasks by 57% by 2022. Major shifts in skills are predicted to be needed to take advantage of this productivity
 - Skill stability (proportion of core skills needed to perform a job that will remain stable): around 58%
 - Skill shift needed: 42% (average)
 - Re-skilling needs:
 - 54% of all employees will require re-and upskilling
 - Re-skilling priorities:
 - 54% and 53% companies target employees in key roles that will be using new technologies
 - 41% employers focus re-skilling on high-performing employees
 - Just 33% prioritize at-risk employees
 - Those at greatest risk of redundancy are the least likely to receive re-training assistance from within their company
- AI, Automation and the future of work: Ten things to solve for (McKinsey, June 2018)²²
 McKinsey provided a forecast of the potential impact of automation and AI on the global workforce, based on a midpoint adoption scenario from 2017 – 2030. McKinsey’s methodology drew from an analysis of over 2,000 work activities across over 800 occupations. Key findings:
 - Jobs changed rather than jobs lost or gained
 - A midpoint adoption scenario by 2030 will result in *changes* to the occupational composition of the global workforce, rather than jobs gained or lost.

²² James Manyika and Kevin Snedder. “AI, automation, and the future of work: Ten things to solve for.” McKinsey Global Institute, June 2018

- Around 15% of the global workforce, or 400 million workers could be displaced by automation by 2030.
- Demand for new jobs could result in an additional 555 million to 890 million jobs added to the global economy, more than off-setting the number of jobs lost. Note that these new jobs are not all related to the introduction of new technologies such as AI.
- New occupations will emerge during this time period and may account for as much as 10% of jobs created by 2030.
- Workforce transitions
 - Around 3 percent of the global workforce will need to change occupational categories by 2030.
 - Growing occupations: those with activities that are difficult to automate and those interacting with an unpredictable environment. Skills projected to be in demand: advanced technology (such as programming), social, emotional, and higher cognitive skills (creativity, critical thinking, etc.) will grow in demand.
 - Declining occupations: occupations comprised of physical activities, or in data processing and collection. Skills projected to decline in demand: physical and manual skills. It is noted that these will remain the single largest category of workforce skills in 2030 in many countries.
- Challenges to workforce transitions
 - Across OECD, spending on workforce education has witnessed a decline in the last two decades.
 - Potential for increased inequity: high-wage jobs are forecast to grow while many current middle-wage jobs are comprised of highly automatable activities and may be threatened by automation. A large number of jobs forecast to be created (teachers, nursing aides) generally report lower wages. Automation could exacerbate wage polarization.
- The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis (OECD Publishing 2016)²³
- Past studies aimed at estimating the potential impact of automation on jobs and occupations:
 - These past studies have generally based predictions on assumption that entire occupations are to be displaced, rather than discrete tasks; a significant study of this nature estimates that 47% of US jobs are automatable (for example, see *The Future of Employment: How Susceptible Are Jobs to Computerisation?* By Frey and Osborne, 2013)

²³ Melanie Arntz, Terry Gregory, Ulrich Zierahn. *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis*. OECD Publishing, June 16, 2016.

- New study aims to correct this feature of past studies. Methodology:
 - o Uses task-based approach
 - o Programme for the International Assessment of Adult Competencies (PIAAC) database that surveys task structures across OECD countries
 - o Re-estimates share of jobs at risk of automation for 21 OECD countries: only 9% jobs are automatable on average across OECD countries²⁴
 - o Use individual survey data to obtain a more comprehensive list of tasks within occupations
 - o Matched “automatability indicator” used by Frey and Osborne (2013) to U.S. data based on occupation codes
- Findings:
 - o Reflects technological capabilities rather than actual utilization of technologies
 - o Automatability decreases with higher education attainment
 - o 9% all US jobs are automatable
 - o Automatability has inverse correlation with educational attainment and income level of workers
 - o Approach only considers existing jobs, does not take into account the new jobs that new technology will create
 - o Factors influencing adoption of technology:
 - Shortage of qualified personnel
 - Cost of new technology
 - Ethnical/legal obstacles²⁵
- Potential impacts of automation:
 - o New technology boosts company productivity->lower prices->increased demand->creates new jobs
 - o Demand for new labor in jobs related to automation/ICT
 - o Computerization generated 11.6 million jobs net in 27 EU countries from 1999-2010 (Gregory et al. (2015))
- Conclusions:
 - o Large shifts in employment between industries and occupations, but large -scale unemployment due to automation is unlikely

ADDITIONAL RESOURCES

- OECD. *OECD Skills Outlook 2019*. May 9, 2019. OECD Publishing.
<https://www.oecd.org/skills/oecd-skills-outlook-2019-df80bc12-en.htm>

²⁴ Ibid, pg. 8

- McKinsey. *Driving Impact at Scale from Automation and AI*. February 2019. McKinsey.
<https://www.mckinsey.com/~media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Driving%20impact%20at%20scale%20from%20automation%20and%20AI/Driving-impact-at-scale-from-automation-and-AI.ashx>
- Jacques Bughin, Eric Hazan, Susan Lund, Peter Dahlström, Anna Wiesinger, and Amresh Subramaniam. *Skill shift: Automation and the future of the workforce*. May 2018. McKinsey.
<https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Future%20of%20Organizations/Skill%20shift%20Automation%20and%20the%20future%20of%20the%20workforce/MGI-Skill-Shift-Automation-and-future-of-the-workforce-May-2018.ashx>
- Jacques Bughin. "Why AI Isn't the Death of Jobs." May 24, 2018. MITSloan Management Review.
- Carl Benedict Frey, Michael A. Osborne. *The future of employment: How susceptible are jobs to computerization?* September 1, 2013. Oxford Martin Programme on Technology and Employment.
<https://www.oxfordmartin.ox.ac.uk/downloads/academic/future-of-employment.pdf>