



HUMAN-CENTERED ARTIFICIAL INTELLIGENCE AND WORKFORCE DISPLACEMENT

Artificial intelligence (AI) has the potential to drive humanity towards a better future for all. But it also comes with risks and challenges. At its best, AI will boost global economic prosperity, stimulate job growth through innovation, and augment human productivity in the workplace. But it also has the potential to displace entire industries, increase economic disparity, and amplify education and skills gaps in the workforce. Harnessing the positive potential while mitigating the negative requires purposeful human-centered design:

Only once we have thought hard about what sort of future we want, will we be able to begin steering a course toward a desirable future. If we don't know what we want, we're unlikely to get it.¹

This case highlights concerns about workforce displacement caused by automation, a subset of AI, to illustrate the importance of human-centered design and deployment.

WILL ROBOTS REPLACE HUMANS?

Robots replacing humans is more than a compelling movie plot; for an increasing percentage of workers it's a significant worry. In fact, a 2018 international study found that 37 percent of workers are worried about losing their jobs to automation.² In a widely referenced 2018 study, McKinsey Global Institute (MGI) claimed AI will create a net \$13 trillion of global economic

¹ Max Tegmark, *Life 3.0: Being Human in the Age of Artificial Intelligence*, Alfred A. Knopf, 2017.

² "Will Robots Really Steal Our Jobs? An International Analysis of the Potential Long Term Impact of Automation," PwC, 2018 https://www.pwc.com/hu/hu/kiadvanyok/assets/pdf/impact_of_automation_on_jobs.pdf (February 16, 2020).

Thomas Higginbotham, Zoe Weinberg, Wendy De La Rosa, Professor Jennifer Aaker and Professor Fei Fei Li prepared this case as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

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value by 2030, \$9 trillion from automation alone.³ The transportation, manufacturing, and construction sectors will see the greatest potential for automation but even the public sector and education will be affected. Every country—industrial economies and service economies, in particular—will benefit from automation and AI.⁴ However, the adoption of AI comes with substantial economic and social costs, perhaps the most salient of which is the disruption of the workforce:

- **McKinsey Global Institute (2018):** “60 percent of occupations have at least 30 percent of activities that theoretically could be automated by adopting and integrating technologies that exist today.”⁵
- **PricewaterhouseCoopers (PwC) (2018):** Industrial countries have up to 40 percent of jobs with “potential high risk of automation.” Service economies are slightly lower but still greater than 20 percent of jobs by 2030 will have a high risk of automation.⁶
- **Oxford University (2013):** “According to our estimates, about 47 percent of total US employment is at risk.”⁷

Beyond displacing workers, AI and automation are changing the very nature of work. By 2030, the workplace hourly demand for technological skills will increase 55 percent, while demand for social-emotional skills will increase 24 percent.⁸ Evidence suggests there is a 30 percent or higher mismatch between skills the workforce has and the skills employers already need—and automation will likely exacerbate this mismatch because of the shifting demand for higher skills.⁹

Another unresolved question is whether the adoption of AI will serve to increase or decrease economic disparity. Many studies agree that the burden of worker displacement will fall disproportionately on low-skilled workers while high-skilled workers will reap much of the economic benefits. Furthermore, the demand for high-skilled workers will likely increase this group’s wages relative to lower-skilled workers.¹⁰

³ The \$13 trillion figure also includes \$7 trillion of benefit from innovation in goods and services plus economic costs associated with the technology. See “Notes from the Frontier: Modelling the Impact of AI on the world Economy,” McKinsey Global Institute, September 2018, <https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy> (February 22, 2020).

⁴ “Will Robots Really Steal Our Jobs?” op. cit.

⁵ Ibid.

⁶ Ibid.

⁷ Carl Benedikt Frey and Michael A. Osborne, “The Future of Employment: How Susceptible are Jobs to Computerisation?” *Technological Forecasting and Social Change*, September 17, 2013, https://www.researchgate.net/publication/271523899_The_Future_of_Employment_How_Susceptible_Are_Jobs_to_Computerisation (February 22, 2020).

⁸ Jacques Bughin, Eric Hazan, Susan Lund, Peter Dahlström, Anna Wiesinger, and Amresh Subramaniam, “Skill Shift: Automation and the Future of the Workforce,” McKinsey Global Institute, May 2018, <https://www.mckinsey.com/featured-insights/future-of-work/skill-shift-automation-and-the-future-of-the-workforce> (February 22, 2020).

⁹ Ibid.

¹⁰ Ibid.

While these studies generally predict that AI will create more jobs than it will displace, there will nonetheless be meaningful consequences for individual workers. And while automation may give rise to new wealth, it simultaneously has the potential to exacerbate economic inequality. Human-centered AI practices encourage technologists to design AI systems with these tensions and difficult realities in mind, in order to help realize a better future for all of humanity.

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Workforce displacement from automation illustrates that *how* and *why* we adopt AI matters just as much as the *what*—a technology with a \$13 trillion net positive economic benefit jeopardizes the jobs of more than a third of workers. Artificial intelligence should be human-centered from design to deployment. For Stanford’s Institute for Human-Centered Artificial Intelligence (HAI), this approach means:

1. AI technology should be inspired by human intelligence;
2. Development of AI must be guided by its human impact; and
3. Applications of AI should enhance and augment human capability, not replace humans.

Artificial intelligence can replace jobs through automation but it can also teach, train, and help humans to improve their work capacity. Human impact should inform the design and deployment of AI in the workplace—that is the essence of human-centered design.

In a similar effort, the design firm IDEO wants to rebrand artificial intelligence as *augmented* intelligence with these core beliefs:

1. Data science is a discipline of human-centered design.
2. Privacy and ethics are foundational to developing human-centered AI solutions.
3. Augmented intelligence elevates human capabilities and experiences.
4. Augmented intelligence is based on data that is collected, interpreted, and made meaningful by humans.

Artificial intelligence, like many technologies before it, comes with both promises and perils for humanity. Deliberate, purposeful human-centered design will help us realize the benefits and mitigate the dangers. AI in the workplace must be developed and deployed in partnership with workers to include helping develop new skillsets, training to work alongside AI, and, if necessary, finding meaningful work elsewhere. AI can help with these tasks but business leaders must be intentional about the human side of this technology. Complementing and augmenting humans rather than replacing them is a critical priority for human-centered AI in the workplace.

ADDITIONAL MATERIALS AND RESOURCES:

Read:

- Max Tegmark, [Life 3.0: Being Human in the Age of Artificial Intelligence](#) (2017)
- Paul R. Daugherty and H. James Wilson, [Human + Machine: Reimagining Work in the Age of AI](#) (2018)
- The New York Times, [How to Make A.I. That’s Good for People](#) (2018)
- Wired, [Fei-Fei Li Wants AI to Care More About Humans](#) (2019)