

# **The Impact of Automation and Artificial Intelligence on Society and Policy**


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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Automation is the application of machines used to perform various production processes that were once carried out by humans without human intervention. The pace of automation today is unprecedented and it has the boundless power to transform the way our industries, workforce, and economies operate. The benefits of automation include increased speed and efficiency, improved quality of products, a safer work environment for workers, and increased profitability. While there are significant positives that will come from automation, there are clear negatives that cannot go unaddressed. Since the progression of automation and artificial intelligence (AI) in the workforce will render many traditional tasks obsolete, mass job displacement is a key consequence of this technological transformation.

My STS research and technical research are tightly coupled as they both relate to automating a process in order to increase efficiency, productivity, and profitability. For the STS research portion of the project, this paper presents a future study of further implications automation and AI will have on our society over the next several decades. More specifically, the Social Construction of Technology (SCOT) model (Bijker, Bonig, & Oost 1984) is used as a framework to address the intersectionality of key social groups that are affected by automation and AI: workers, businesses, and government. The study focuses on common misconceptions surrounding automation, potential impacts on these various social groups, and provides a framework for guiding future policy decisions that will make the adoption of new technology more effective and just for all groups involved.

The better prepared and informed our businesses, workers, and government are as society advances into this next stage of industrialization, the more seamless this transition can be. With adequate foresight and planning, workers will be able to retrain and transition to newly evolving jobs rather than lose them. Given the significant reach of automation and AI across society, it is

critical that those involved in the research, development, implementation, and regulation of it develop a strategic transition plan that takes into account impacts to all stakeholder groups.

## **AUTOMATION AND AI'S IMPACT ON SOCIETY AND POLICY**

This STS study research addresses concerns, misconceptions, impacts on social groups, and government policy associated with increased use of automation and artificial intelligence (AI). While societies have undergone different stages of industrialization at different rates throughout history, the natural technological advancement of the next wave of automation will drastically change how businesses and organizations function at an unprecedented rate.

There is an increasing collective sentiment of apprehension about the future as automation directly and indirectly relates to job displacement, as some rate of adoption is inevitable if it makes companies more profitable. The COVID-19 pandemic has helped people more broadly accept its implementation by making things safer for workers and consumers. Using different forms of safety precautions in order to accommodate to local safety guidelines of COVID-19, such as contactless transactions, robotic cleaners, and working remotely, have widely accelerated automation and AI's rate of adoption. Businesses were able to adjust to new lockdown measures and social-distancing guidelines in order to preserve the ability to deliver their products and/or services in a safe way and a lot of takeaways made from adopting these measures are likely to stay. Throughout the pandemic, industries have been adapting to these new ways of life through increased implementation of automation, which shows further implications of how automation will affect the workplace in the future.

While COVID-19 has accelerated the impact automation and AI will have on our workforce, people are more willing to accept it than they were pre-pandemic because it has helped businesses keep their employees and customers more safe (Corkery & Gelles, 2020, para.

6). However, labor and robotics experts suggest that “social-distancing directives” will drive different industries to accelerate automation in some form post-pandemic as well. Richard Pak, a professor at Clemson University, explains that, “people become more expensive as companies’ revenues decline” (Corkery & Gelles, 2020, para. 14). While some industry leaders claim that introducing robots and leaning on automation will aid essential workers and decrease their heightened workload during the pandemic, companies may no longer have a need for the same workers post-pandemic if the automation truly is here to stay. McKinsey & Company reports that many executives agree that since the start of COVID-19, the rate of adoption of digitization and automation of technologies has rapidly increased (Cheng, et al., 2020). Nearly half of the 800 executives surveyed by McKinsey reported increasing their adoption of automation, and roughly 20 percent have significantly increased its use in their organization.

The prospect of automation and AI has initially alarmed many workers and technology experts in fear that advancements would cause devastating levels of job loss. However, the understanding of where the next industrial revolution is heading is now much more complex and ambiguous as there are benefits and unknown opportunities to be provided as well. This analysis will address these misconceptions on the subject of automation and AI by assessing the current and future trends that will affect both people and communities that are significantly impacted. It will also provide a thorough overview of suggested federal, state, and local policy actions to be made in order to minimize the negative effects of this next wave of industrialization.

## **BREAKDOWN OF SIGNIFICANTLY IMPACTED GROUPS**

The workplace as we know it is permanently changing across all industries. Artificial Intelligence, automation, and robotics are becoming more prevalent in an effort to transform the efficiency of manufacturing, services, and informative decision making. Many jobs will become

obsolete, many more will be created, and almost all current jobs will transform in some capacity. AI is one of the most polarizing topics in the technical world as it has the potential to learn theoretically infinite amounts of information at an unprecedented pace. If an idealistic version of AI is achieved, being one that can learn on its own by interpreting outside data and making informed decisions with full autonomy, it could fundamentally change the world economy, as it is smarter than the average human and can work and make decisions much faster. With its theoretically limitless ceiling of intellectual capability, only creative and non-automatable maintenance jobs may remain after that point. It is understandable that misconceptions arise from such a potentially powerful technology that is still in its infancy. One of the most common concerns focuses on the job displacement. However, technological change has historically initially reduced, but then boosted employment, by creating new jobs and industries aligned with new technology.

In order to successfully navigate and prepare for these rapid changes of adoption across all industries, especially while exacerbated by the pandemic, a Social Construction of Technology

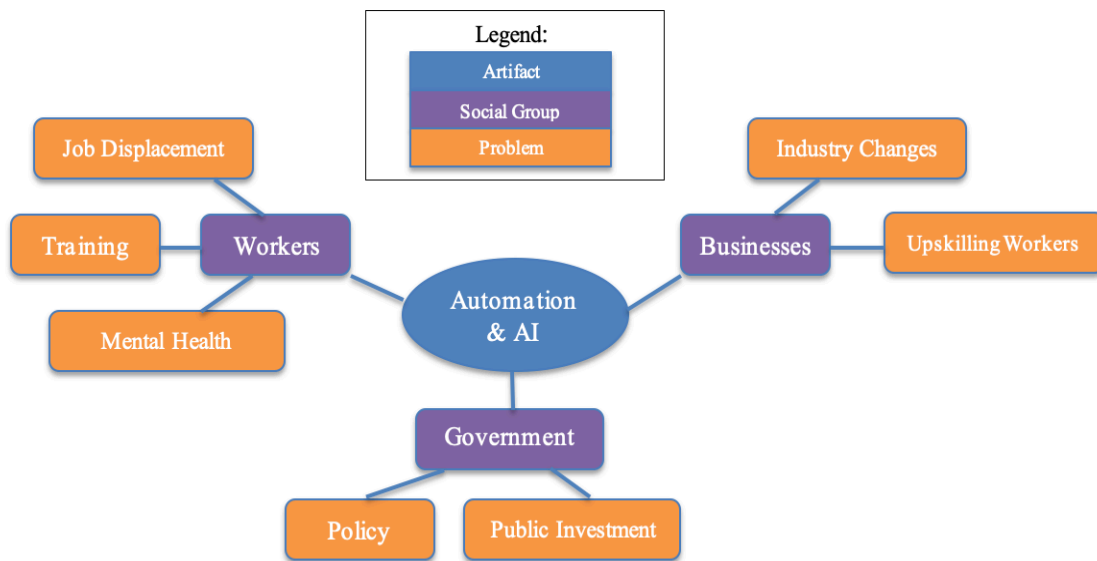


Figure 3: SCOT Model for Automation and AI. The graphic shows the relevant social groups impacted as well as problems to be addressed in order to better prepare for the adoption of new technologies. (Adapted by Ben Stein from Bijker, Bonig, & Oost 1984).

model (SCOT) must be developed (Bijker, Bonig, & Oost 1984). This approach was initially developed by Dutch Professor, Wiebe E. Bijker, in 1984. The SCOT model is based on the concept of interpretive flexibility, which proposes that the products of technological endeavors are significantly impacted by interacting with various social groups and factors. The model in Figure 3 shows the problems that various social groups face as our economy continues down the path of adoption towards automation and AI. Peoples' sentiment towards the acceptance and adoption of automation and AI in some form shows how the development of technology through its innovation, rate of adoption, and design process will be influenced based on how it affects different social groups.

## **EFFECTS ON WORKERS**

Before generalizing job displacement as a direct symptom of increased adoption of automation and AI, it is important to assess its interplay with human labor in order to understand the interaction of machines and workers. The Metropolitan Policy Program at the Brookings Institution, a Washington D.C.-based research group, lays out six general tendencies of how automation will impact workers (Muro et al., 2019, p. 14):

- **Automation substitutes for labor.** Machines that can perform tasks currently done by humans will be done with a higher level of precision, speed, and for less cost.
- **Machines substitute for tasks, not jobs.** Since a job is a collection of tasks, machines will only be able to handle specific tasks performed and not an entire human job in an organization, even under the most advanced projected scenarios of technological advancement.
- **Automation also complements labor.** The tasks that are left for humans to perform will increase in value as a result.

- **Automation can create jobs by increasing demand.** Some sectors may actually increase employment as the machine substitution of labor can lower costs as well as improve the quality of the product.
- **Augmenting capital and labor leads to innovation.** Humans have more time to create new products and roles if repetitive, time-consuming tasks can be performed by machines.
- **“Technological possibility” does not equal “technological reality”.** McKinsey & Company estimates that just 18% of the United States’ “digital potential” will be reached. We are projected to fall short due to factors such as “technical feasibility, deployment challenges, regulatory and social barriers, and institutional factors, among others” (Muro et al., 2019, p. 15)

With that being said, there are clear challenges workers will face that must be addressed. The fear of job displacement is as valid as it is common. Manyika and Sneider of McKinsey & Company (2018) predict that around 15 percent of the global workforce, or 400 million people, could be displaced between 2016 and 2030 as a result of their current roles being automated. They note that this figure could be up to 30 percent of people under their fastest adoption scenario. On the other hand, various cycles of innovation throughout history have led to job creation as well.

The research firm Forrester estimates that 331,500 net jobs will be added to the workforce in the United States next year (Press, 2019). However, while we do know that new jobs and tasks will emerge as technology advances, we are unsure how many will be created and where because the demand for certain roles will change due to evolving task demands. History provides context to this claim. From the 1980s to the 2000s, half of employment growth emerged from

occupations that did not exist previously (Muro et al., p. 20). However, as automation progresses into the new AI era, the same authors predict that automation will likely continue to have a “muted net impact” on total employment due to various limitations of machines. While some jobs are lost as less human labor is required, as innovation progresses, higher paid workers are affected more frequently, but lower paid workers will suffer more deeply and experience longer periods of unemployment (Bessen & Kossuth, 2019). Welfare programs such as unemployment insurance are framed as a way to cover these losses, however, HBR’s data confirms this lost income is not nearly covered. These spells of unemployment affect both peoples’ financial stability and overall wellbeing.

Even if the roles of many workers will only be partially automated and not entirely displaced, their mental health will likely be affected as well despite keeping their job to the nature of how their role changes. The low-to-medium-income employees’ roles are most highly affected in that the majority of their tasks that are clearly defined and repetitive will become automated will take on a more overseeing role with varying periods of activity intertwined (Hewitt, 2017). This will interestingly result in work that is more tedious, yet mentally fatiguing, as Hewitt explains. It is true that models in cognitive psychology, neuroscience, and economics indicate that mental and physical effort is draining. However, in 2017, researchers monitored the effect of effort and boredom on subject’s brains using electroencephalography (EEG). Their study suggested that subjects who performed more boring tasks repetitively actually experienced more fatigue in the long run and those who exerted more effort in their tasks given through the course of the study (Hewitt, 2017). Boredom has been linked to significant health problems, such as cardiovascular disease, increased anxiety and depression, and increased use of recreational drugs in some populations. Due to these findings, we should further evaluate accelerated automation’s effects



on peoples' wellbeing and performance in order to altruistically develop a more informed and benevolent implementation framework that favors taking measures to avoid tedious roles becoming the norm.

## **EFFECTS ON BUSINESSES**

Businesses are currently making the role of automation and AI a priority in order to remain competitive and significantly cut their operational costs. More specifically, automation broadly describes the process of performing a repeatable task by a machine, and AI is used to analyze data, improve customer service, automate production, predict performance, prevent outages, etc. While all industries will be transformed as technology advances, some will be more severely affected than others. The potential for implementing automation is highest in industries such as manufacturing, agriculture, mining, and large service sectors such as retail and food preparation (Muro et al., 2019, p. 35). The jobs that are most severely in decline are lower to middle-wage jobs which involve more repeatable tasks, making them more susceptible to adopting automation. Examples of these jobs include factory workers, office staff, and various information technology (IT) roles (Muro et al., 2019, p. 24).

Another challenge that organizations will face at an increasing rate as the landscape of the workplace transforms due to technological innovation is the need for retraining and upskilling their workforce. Upskilling is defined as “the process of teaching employees new skills that will aid them in their work” (“what is upskilling...”, n.d.). In order to have the staff with the necessary skills required to use new technologies, completely automating certain tasks and retraining existing employees must occur in order to remain profitable and competitive. World Economic Forum founder and executive chairman Klaus Schwab (2018) emphasizes the significance of being proactive in this process:

“It is critical that business take an active role in supporting their existing workforces through reskilling and upskilling, that individuals take a proactive approach to their own lifelong learning, and that governments create an enabling environment to facilitate this workforce transformation. This is the key challenge of our time” (Chowdhry, 2018, para. 7)

The World Economic Forum’s Future of Jobs Report in 2018 projected machines to perform over half of current human work tasks by 2025 as opposed to the 71% being performed by humans at the time of the report (Chowdhry, 2018, para. 3). The report also determined that 54% of employees that are a part of larger organizations would need to upskill in order to adequately adopt this growth potential. The responsibility in retraining and upskilling employees heavily lies on organizations and is intersectional with their workers and governments as well.

### **EFFECTS ON GOVERNMENT POLICY**

The advancement of automation and AI will certainly impact the way government aids, regulates, and interacts with entities which use this technology. The Metropolitan Policy Program at Brookings outlines five key steps to be made on a federal, state, and local level in order to facilitate an “automation-resilient” employment strategy. These initiatives will support the broad implementation of novel technologies that drive innovation, increase productivity, and ultimately foster future job creation. Figure 4 shows the progression of these steps:

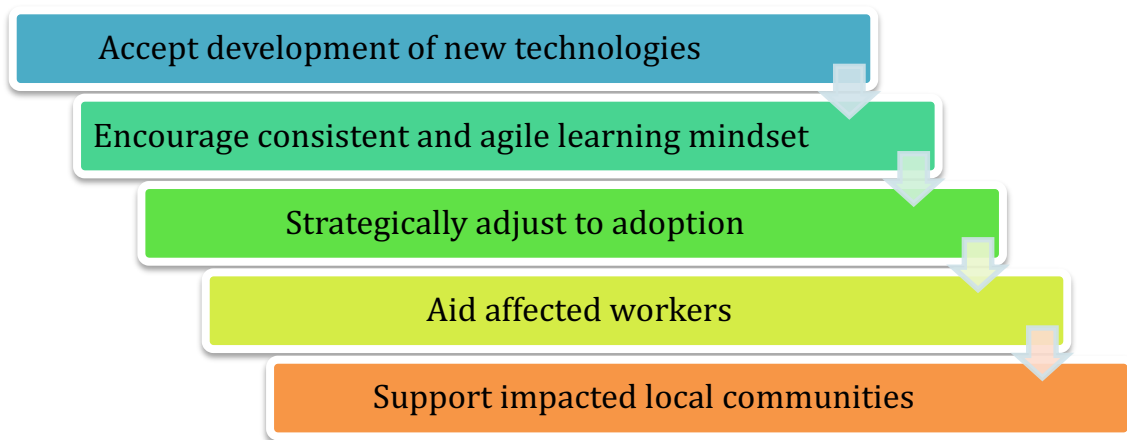


Figure 4: Progression of policy implementations for mitigation of negative impacts on workers as a result of automation. (Adapted by Ben Stein (2020) from Muro, Maxim, & Whiton 2019)

The purpose of the first step in embracing the development of transformative technologies is to catalyze growth by prioritizing tech-lead productivity gains. Productivity growth will unquestionably increase the workers' average output, allowing companies to reduce their prices and increase their market share. This allows for an increased salary paid to workers and a higher standard overall. In order to achieve this, the federal government must increase R&D funding on automation and AI in order to ensure America's competitiveness in the technology sector as well as effective and humane development (Muro et al., 2019, p. 50). The second step in promoting constant learning can be achieved through investments in upskilling workers, expanding accelerated learning and certification training programs as well as making it more financially obtainable, and adapting education to align with technological innovation. The third step addresses the need to reform the United States' lagging adjustment system. This can be achieved on a federal, state, and local level through implementing a "Universal Adjustment Benefit" in the form of periodical stimulus checks given to aid displaced workers. Hiring efforts can be maximized through subsidized employment programs as well (Muro et al., 2019, p. 56). The fourth step focuses on providing relief to struggling low-income workers, particularly those in the service industry, through reforming and expanding income support systems as well as lowering the volatility of wages for low-paying jobs. These jobs commonly lack sufficient access to basic benefits such as retirement, paid leave, and health insurance (Muro et al., 2019, p. 62). The final step is to alleviate the burden placed on local communities and help provide a sustainable foundation for implementing new technology. Local labor markets vary considerably, depending on how much automation affects them, and directly shapes the average

work standards for communities. This instability can be mitigated through programs which brace vulnerable regional economies and expand their ability to adjust to new innovations. The government can help firms become more resilient to automation by providing frameworks for adoption.

One of the most unique candidates of the 2020 United States Presidential election was Andrew Yang. Yang was one of the first mainstream proponents of providing monthly stimulus checks, even before the pandemic existed, to American citizens in order to ease the financial hardships of those hit hard by the next wave of automation. His platform incorporated a Universal Basic Income system and emphasized that we should focus on the next wave of automation due to its unprecedented projected rate of job displacement (“Andrew Yang Warns...”, 2019). He foresees the issues that the next wave of automation and AI poses on many Americans and why politicians need to take technological progress more seriously, especially when considering how COVID-19 has accelerated job automation in order to accommodate social-distancing directives.

## **SUMMARY OF RESEARCH AND ANALYSIS OF FURTHER IMPACTS**

By addressing the impact of AI, automation, and robotics on society, and how our historical perceptions and misconceptions will contextualize and further affect its implementation. By incorporating the SCOT theory to identify the most impacted social groups, government policies can be proactively created to mitigate negative consequences on our workforce as a result of adopting new technologies. With a potential recession expected to follow this pandemic, companies will likely no longer have a need or want to employ many reassigned workers. The similar trends in industries currently being affected by automation are now accelerated through the pandemic with new remote and automated approaches being applied

to the workplace in order to make them safer. As a result of this accelerated rate of adoption, these social groups will be impacted at an increased rate as well. In addition to assessing the various impacts on social groups, highly impacted industries such as retail, tech, and transportation, must assess various cases to contextualize how different social groups are impacted demographically by this technology as well.

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