

Automatic Proposal Formatting Tool: Analysis of Automation on the Low-Skill Workers

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Devaluation of Low-Skill Workers

Economics scholars Daron Acemoglu and Pascual Restrepo have predicted that automation will bring about the devaluation of labor, leading to ‘technological unemployment’ (Acemoglu & Restrepo, 2020). Businesses are always seeking to cut costs and increase productivity, so these automating technologies are continuously being adopted in the workplace (Manyika, 2017). This loss of jobs is clear in low-skill jobs that correspond with tasks that are low in complexity (Acemoglu & Restrepo, 2017). The topic of automation is important to discuss because as technology progresses and is adopted, there will be a greater inequality of power between the low-skill workers and their respective companies (Dizikes, 2020). An STS framework that applies to this inequality of power within the workforce is political technologies, where the power and authority in the relationship between low-skill workers and their companies can be analyzed. Additionally, as modern technologies have entered the workforce, society has been changed by the shifting power dynamics between low-skill laborers and corporations making the STS framework of technological determinism applicable.

Discourse Analysis for Studying Automation’s Effect on Low-Skill Workers

To explore how automation affects the relationship between low-skill workers and the companies they work for, literature from articles by notable scholars and scientific publications are aggregated into two case studies. The first case study pertains to the First and Fourth Industrial Revolutions. During the First Industrial Revolution, the widespread adoption of automation caused the Luddite rebellion in England. While the Fourth Industrial Revolution evolved society with a shift from machines to robotics. Scientific publications and scholarly articles are used to help see societal perceptions about the introduction of automation within their respective industrial revolutions. The second case study analyzes how modern automation,

specifically during COVID-19, has decreased the need for low-skill workers. To highlight the effects of COVID-19, modern and scholarly articles that address COVID-19 are used. These two case studies both support a concise argument over the effects of automation and how its adoption affects low-skill workers' job stability in companies. By using examples from industrial revolutions and the COVID-19 pandemic, society's historical and modern reactions to the change in automation in the workplace are captured. Together these examples give a historical and modern context respectively and help analyze how automation has affected and will affect low-skill workers and their 'power' in relation to companies. The research question that is answered by the end of this paper is "How does automation affect the relationships between low-skill workers and the companies they work for?" Some keywords that focus this research are: "automation," "low-skill workers," "COVID-19 pandemic," and "industrial revolution."

History of Low-Skill Workers and New Technologies

Daron Acemoglu, a prominent scholar in economics, identifies two groups of workers: low-skill and high-skill. Low-skill workers are those whose jobs utilize repetitive operations and little decision-making and abstract thinking. These repetitive operations are easily automated and taken over by technologies (Acemoglu & Restrepo, 2020). Automation is formally defined as using technology in systems to reduce human input (HeinOnline GAO Reports and Comptroller General Decisions, 1982). Low-skill jobs are most likely to be automated, leading to more low-skill workers being let go in favor of automating technologies increasing wage inequality (Acemoglu & Restrepo, 2020). Other scholars have different ideas on how the introduction of automation has affected the workforce. Some of these scholars believe that automation in the workforce only shifts the skills needed to perform a job rather than jobs just disappearing (Lazio,

2019). In that case, low-skill workers can still be locked out of jobs because they do not have a high enough skill set to manage these automating technologies.

The disparity between the power of the low-skill workers and their employers was greatly changed with the disruptive period that industrialization brought in the 19th century (Ryckbosch, 2016). This disruption was brought about by the introduction of technology in the workforce, such as water or steam-powered weavers in 19th century England. This new technology made hand-powered weavers obsolete, taking away jobs from low-skill workers. This loss of jobs and financial means lead to a social uprising called the Luddite Rebellion (Hutchinson, 2017).

Today, society is on the verge of its fourth industrial revolution with the advent of cutting-edge technologies in various areas such as artificial intelligence and robotics. In this new industrial revolution, about 50% of jobs in America face automation, according to an Oxford University study (Avent, 2018). This automation is driven by robots, for each robot added to the workforce the employment-to-population ratio decreases by .02% (Brown, 2020). This statistic shows that although automation can lead to an increase in productivity, it can also reduce labor demand which then takes away jobs from the workforce.

The COVID-19 pandemic has introduced new societal issues that it has never seen before. With labor shortages, this pandemic has accelerated the automation of jobs as companies are using technology to fill their needs (Chernoff & Warman, 2020). This adoption of automating technologies is especially seen in the meatpacking industry during COVID-19. Before the pandemic, meatpacking companies utilized immigrants to fill their low-skill jobs (Molteni, 2020). However, to safeguard workers from getting sick and keep production up during temporary shutdowns, the meatpacking industry must adopt automation in the workplace to keep up with demand.

Technological Determinism and Political Technologies

The framework of technological determinism is used to analyze the effects of automation on the power of low-skill workers in relation to their employers. Merritt Roe Smith, a major contributor to the framework, defines technological determinism as a framework that is based on the principal idea that society is shaped by technology (Smith, 1994). When technologies are introduced to society there is a “Faustian bargain,” meaning that new technologies bring benefits, but also bring some drawbacks (Harp, 2013). Smith also identifies two sub-definitions of technological determinism: hard and soft. According to Smith, hard determinism is that technology is not affected by society, while soft determinism is that society has the free will to shape technology, but technology is still the driving force. This framework dates to the Industrial Revolution, thus it directly applies to the introduction of technology during the Industrial Revolution (Smith, 1994). Technological determinism also applies to the modern Industrial Revolution as both modern and historical industrial revolutions deal with the introduction of innovative technologies into the workforce. Smith also writes that a critic of this framework would state that technology and society evolve together, rather than being led by technology (Smith, 1994). However, the focus of the research question is on low-skill workers that do not necessarily have the power or ability to combat the acceptance of automation in the workplace.

The framework of political technologies is also used to examine the research question. Landon Winner identifies political technologies as those that are strongly aligned with “institutionalized patterns of power and authority” (Winner, 1980, p.134). He goes on and states two ways artifacts have politics. First, when technologies are used to solve a problem in a community (Winner, 1980, p.123). Second, technologies can be inherently political when they are deeply intertwined with political relationships. For the research question, the latter type of

political technology is focused on. The concept of political technologies directly applies to the relationship between low-skill workers and hiring companies, with the companies that hire low-skill workers as the power and authority in the relationship. New technologies entering the workforce change the relationship between low-skill workers and their employers. Automation, when introduced into the workforce, can take over low-skill jobs, displacing workers (Brekelmans & Petropoulos, 2020). This displacement stems from automating technologies shifting the needs to perform a given job. Automating technologies either shift the skills needed to perform a job or completely take over the job (Dizikes, 2020). With the shift to more technical skills, workers could be locked out of their jobs as the educational requirements increase. Frankenberg (2014), a critic of the political technology framework, would argue that it is invalid because the power shifts that come with a given technology are not always visible to the marginalized groups whom they affect, and even if the groups are aware they may not have the tools to combat them. This critique can be disregarded to analyze the research question because the low-skill workers are directly impacted by the adoption of automation in the workplace and thus would be aware of the power shifts in relation to them and their employer.

By using these two frameworks to answer the research question, a greater understanding of the effects of automation in the workforce on the power in the relationship between low-skill workers and their employing companies will be gained. This understanding is important because as new technologies are constantly being developed, society should pay attention to how it is affecting low-skill workers who do not have the power to help themselves.

How Automation Affects Low-Skill Workers

The adoption of automating technologies by businesses has disproportionately affected and continues to affect low-skill workers. The First and Fourth Industrial Revolutions have

introduced many automating technologies into the workplace, each revolutionizing how work is done. The technological determinism theory reveals that it is the adoption of automating technologies that have led to the displacement of low-skill workers and an increase in educational requirements, all while their respective employers have increased productivity and revenue. Thus, the power of low-skill workers has been diminished compared to the power of their employers. The advent of COVID-19 has only increased the speed at which automating technologies have been adopted, leading to a continual decrease in the power of low-skill workers. With the change in how work is done, low-skill workers must retrain themselves to interact with the new automating technologies. However, low-skill workers do not necessarily have the access or resources to be able to increase their skills, further decreasing their power in relation to their employers. By framing automating technologies as a political technology and examining their role in creating this power imbalance, an equitable solution can be developed for the displacement of low-skill workers.

According to Estlund (2021), the First Industrial Revolution is the first-time society encountered the widespread use of machines that allowed for increased efficiency. Although increased efficiency helps economic growth, it also leads to the destruction of some jobs. The Luddite rebellions were fueled by the handloom weavers' fears of losing their jobs by the new powered looms taking over the weaving market (Jandrić, 2020). Research conducted by Hutchinson found that before the introduction of machinery, handloom weavers had the freedom to control their schedules and could choose their hours. He notes that most work was done at home with unpowered equipment, with the handloom weavers being paid by the amount of product they made. His research also found that, after the introduction of powered looms, the products handloom weavers made naturally depreciated as machines could produce the same

product more efficiently for less money. This depreciation led to the handloom weaver's revenue drop, anywhere between 80 to 90 percent (Hutchinson, 2017). The Luddites knew that machines were replacing their jobs, and being motivated to preserve their jobs, they destroyed the new machines (Dizikes, 2020).

The introduction of hydro-powered looms drastically changed the lives of handloom weavers during the First Industrial Revolution by taking away their freedom to choose how and when they work. This aspect of the First Industrial Revolution clearly outlines how new technologies can directly change how society conducts itself, an example of technological determinism. The mere existence of these new machines pushed businesses to use them. As these machines increased productivity and decreased costs if they were not adopted by a business, their competitors that did could and in turn would surpass the business that failed to innovate. This choice of whether to innovate or not puts the power in the hands of the businesses, rather than the workers. During the First Industrial Revolution, many textile companies chose to adopt these new automating technologies (Estlund, 2021). With little power in the matter, the Luddites resorted to drastic measures in destroying the powered looms to try to preserve their jobs. Hydro-powered looms are an inherently political technology because of their increased divide in the relationship between low-skill workers and their employers by decreasing the need for low-skill workers.

Loss of revenue is not the only effect of the introduction of new weaving machines. Johannessen, a professor from both Nord University and Kristiania University, found that new technologies in the First Industrial Revolution also influenced the geographical distribution of workers, localizing workers around centers that had the new powered looms. The hydropower

technologies introduced were difficult to move and remained in one place, meaning that workers must travel to these new technologies to perform work (Johannessen, 2019).

This localization centered workers around places that had powered looms, taking them away from their support systems at home and within their communities. This introduction of new technology redistributed the population of weavers in a manner that changed the way that weavers interacted with society. Technological determinism of the hydro-powered looms impacted the distribution of low-skill workers by centering them around manufacturing hubs. The influence of the hydro-powered loom as a political technology can be derived from the change in relationships between the weavers and their networks. Without the support of their friends and family, the workers have less power within the workplace as it was the textile businesses who chose where to invest and establish where these new powered looms would go. This new technology changed the geographic distribution of weavers, while the textile business chose where exactly the geographic hubs were. The overall impact of the hydro-powered loom on the weaver decreased their impact as individuals on society by causing a shift of power to their employers.

Similar to the First Industrial Revolution, the Fourth Industrial Revolution has led to major changes in the social structure of businesses (Johannessen, 2019). Through his research, Johannessen (2019) found the difference in the Fourth Industrial Revolution is that these workplace changes are driven by new technologies such as artificial intelligence and robotics. The adoption of these new technologies is needed to keep up productivity so that businesses can remain competitive against others in their industry (Johannessen, 2019). This idea is supported by economists Acemoglu and Restrepo, who “found that firms that quickly adopted robots became more productive... while their competitors fell behind and shed workers — with jobs

again being reduced overall” (Dizikes, 2020). An example of an increase in productivity through the use of robots is in the bricklaying industry. A human bricklayer can lay three to six hundred bricks in a working day, while Sam100, a bricklaying robot, can lay more than three thousand (Estlund, 2021). Another type of business in which robotics has improved efficiency is the automotive industry. These robots are used to help support automotive manufacturers while the United States manufacturing market has decreased (Estlund, 2021). Estlund found that between 2000 and 2015, the manufacturing labor force decreased by 20 percent, while the automotive industry’s output increased by 5 percent. The fact that technology is driving this change in the labor force is unprecedented and points to the need for action to support these displaced workers.

As seen by Sam100 and automotive robots, technological determinism is driven by artificial intelligence and robotics in the Fourth Industrial Revolution rather than the mechanical machines in the First Industrial Revolution. Like the position of the Luddites, today's low-skill workers’ jobs are being threatened by the adoption of new technologies. Similar to the First Industrial Revolution, the power is in the hands of the businesses to choose whether to adopt these new technologies. In turn, the introduction of new technologies in the form of robotics and artificial intelligence are inherently political because they both changed the power dynamic in the relationship between the low-skill workers and their employers by giving more power to the employers. The example of the bricklaying company highlights the benefits to productivity that using a robot may yield. Because of the significant output of the bricklaying robot, the bricklaying company plans to be completely human-free by 2050 (Estland, 2021). This choice by the business directly impacts bricklaying workers, where many will have to be laid off to accomplish the goals of the business. In the case of the Sam100 robot, technological determinism negatively affected low-skill workers by laying off workers.

Besides the increase in productivity from new robots, it is easy for businesses to adopt them because they are machines and do not require all of the support a human worker needs (Estlund, 2021). Robots do not require sick days, or breaks, and most importantly do not require a salary while they increase productivity. These new technologies lead to the adoption of new ways of working as automating technologies take over jobs performed by low-skill workers. Low-skill workers now work in the fear of the possibility of losing their jobs to technology (Johannessen, 2019). Johannessen (2019) notes that this fear only strengthened with the economic crisis of 2008. Thus, these workers must be flexible and willing to change with the flow of the market. He reasoned that this leads to an increased tendency to change jobs with a focus on stable short-term, temporary jobs rather than longer-term jobs.

The lack of commitment from low-skill workers to their employer becomes integrated into how the employer controls their employees. The framework of political technologies reveals that employers care more about their costs rather than keeping low-skill workers employed. As employers focus on their main streams of revenue, the low-skill workers will be replaced by automated technology or outright let go will be (Johannessen, 2019). These technologies that cause this lack of commitment are inherently political as they directly fuel the lack of commitment by low-skill workers. The possibility of being replaced or let go leads to the low-skill workers seeking to maintain their self-interest rather than that of their employers (Johannessen, 2019). This shift to shorter-term jobs decreases the time for low-skill workers to form meaningful relationships with their co-workers. The lack of meaningful relationships rips away the chance for deep connections such as trust and commitment from low-skilled workers to their respective employers. Thus, these new political technologies have affected how power is distributed within the business hierarchy in favor of the employers.

Automation does have the possibility of creating new jobs. However, Dizikes (2020) found that the overall displacement to the creation of jobs has been increasing. He found that between 1946 and 1987, 17 percent of jobs were displaced, while 19 percent were made. But, between 1987 and 2016, those numbers shifted to 16 and 10 percent respectively (Dizikes, 2020). This imbalance in jobs has led to a flattening of job creation as more automating technologies are adopted. Supporting this claim, the Government Accountability Office (2019), GAO, found that many firms that adopted automating technologies required fewer workers in low-skilled jobs to reach their output goals. The companies then went on to either redistribute their workers or reduce their employment (HeinOnline GAO Reports and Comptroller General Decisions, 2019). The GAO (2019) found that as of 2016, specific groups, such as those that do not hold a college degree and Hispanic workers, tend to hold low-skill jobs that can be readily taken over by automation. Thus, if automation is adopted, these groups will be affected disproportionately. The presence of automation in the workplace also shifts the skills needed to work these jobs, however education needed to require these skills is not available to all parts of the world equally (Council for Technological Advancement, 1955).

The effects of technological determinism from automation are the flattening of the job curve, meaning that there are more workers than there are jobs. This inherently shifts the authority and power to the businesses in the business-employee relationship. The business always has the option to move on to a new employee, but an employee cannot find a job as easily because of scarcity. Technological determinism negatively affects the low-skill worker as they are forced to adapt to the standards set by the employer. If these businesses decide to adopt automating technology, then workers either lose their jobs or are required to retrain themselves to better interact with the new technologies in the workplace. The inherent political relationship

between workers and employers is a delicate balancing act and the introduction of automating technologies exacerbates the power imbalance in favor of the employer.

In Ryan Avent's book "The Wealth of Humans: Work Power, and Status in the Twenty-first Century" he finds that 50% of the workplaces will be automated within the next 20 years (Johannessen, 2019). However, the COVID-19 pandemic has drastically changed the speed at which automation has been adopted and the labor force. The trend of adopting new technologies to increase the productivity of businesses is not unique to the pandemic as seen in the First Industrial Revolution as discussed previously. However, because of the lack of physical interaction between workers, the integration of new technologies has accelerated (Kudyba, 2020). Kudyba, a professor at the New Jersey Institute of Technology, writes that the COVID - 19 pandemic has disrupted how businesses have historically conducted work as restrictions were put on human contact to prevent the spread of the COVID-19 virus. He found that with these restrictions, businesses adopted automating technologies to maintain their daily operations. A McKinsey study found that in July of 2020, two-thirds of a survey of 800 business executives have significantly increased their investment in automating technologies (Lund et al., 2021).

The increased adoption of automated technologies has only sped up the power shift within the business-employee relations in the favor of the businesses. The technological determinism of the adoption of automating technologies during the COVID-19 pandemic has affected society two-fold. First, businesses aim to be profitable during quarantine. It is favorable for businesses to implement more efficient spending in automating technologies that reduce costs. Second, due to the COVID-19 pandemic, low-skilled workers faced a job shortage due to businesses closing which in turn led to an oversupply of workers, diminishing the individual worker's power in the workplace. For businesses to keep up with customer demand, automating

technology was adopted to fill the void that widespread unemployment left. The increased adoption of automating technology has led to these technologies being the norm within society. With the significant investment into automating technology business executives highlight their intention to use automating technologies more prevalently in the workplace. With this investment, it is highly unlikely that automation will decrease in the future, strengthening the business' position in the business-employee relationship as they are the ones that have increased power over their counterparts.

Research from Estlund (2021) shows that the COVID-19 pandemic brought about the largest increase in unemployment in United States history, which led to a spike in the adoption of automating technologies. During the height of the pandemic, Microsoft's CEO stated that "[w]e've seen two years' worth of digital transformation in two months" (Estlund, 2021). Workers must now learn to interact efficiently with these new automated technologies to either effectively complete their jobs or find a new one as their adoption is accelerating (Kudyba, 2020). Economists believe that the adoption of automated technologies is the driving force in the increasing wage gap as high-skill workers' salaries increase and as low-skill workers' salaries stagnate (Estlund, 2021). It is recommended that displaced workers retrain themselves by gaining new skills whether that is by enrolling in a degree-seeking program or entering a certification course (Humberd et al., 2018). Lazio (2019), a management consultant, found that although it is known that low-skill workers must retrain themselves to stay relevant in the job market, not all of them are whether that is due to a lack of availability of skills courses or the resources to obtain them. This lack of retraining is seen in the 2.4 million unfilled STEM jobs (Lazio, 2019).

The gap in the wage between low and high-skill workers means that low-skill workers do not have ample resources to go out and retrain themselves. Technological determinism resulting from the increasing wage gap and need for skills-courses lights the low-skill worker's need for external help to get them to jobs to support themselves. Third parties must come in and support them. A historical example is seen in the Great Depression. During the recession that came with the Great Depression, the United States government had to step in with the New Deal to properly support laid-off workers (Estlund, 2021). The support was provided by domestic programs that lead to movements bringing new employee rights, and revised labor laws (Estlund, 2021). Today low-skill workers need governments to step in to provide support for these displaced workers. This outside help will level out the power imbalance from the political technology of automating technologies. The fact that low-skill workers need help from an external source highlights the lack of power they have to influence decisions made by their employers.

A limitation of this study is that it is difficult to isolate specific technologies, such as automation, and see how they individually affect employment as many related factors affect the labor market (Council for Technological Advancement, 1955). There is also no comprehensive data set that outlines the specific adoption and effects of automation in the workplace which inhibits agencies to track the change in employment levels through a changing workplace (HeinOnline GAO Reports and Comptroller General Decisions, 2019). Thus, to continue this study, data must be collected on historic and present employment levels to better analyze the change that automation has in the workplace. Another limitation of this study is that the full impact of the COVID-19 pandemic is not known. The short-term effects of the COVID-19 pandemic are apparent, with significant unemployment and a shift to virtual work. As the world is still dealing with the COVID -19 pandemic, the long-term effects on employment are

uncertain. It is predicted by McKinsey that remote work will likely continue after the conclusion of the COVID-19 pandemic (Lund et al., 2021). However, this pandemic has drastically changed how society lives its life, and thus there can be no certainty of long-term effects on employment.

Next Steps in Supporting Low-Skill Workers

The adoption of automation has had detrimental effects on the power of low-skill workers in the relationship between them and their employers. Hydro-powered looms and robotics changed how work is conducted. The choice of whether a business adopts these automating technologies is purely in their hands, with no input from low-skill workers. This inherently puts the power in the hands of the businesses in relation to their low-skill employees. With new technologies being invented every day that threaten the displacement of low-skill workers, government agencies and businesses need to ensure that low-skill workers are supported in the evolving workplace as their power decreases. Whether this support comes from funding for education for the disproportionately affected groups or support for adequate income to close the wage gap, something must be done to ensure that these workers can support themselves.

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