

**Automatic Proposal Formatting Tool**

**Analysis of Automation on the Low-Skill Workers**

A Thesis Prospectus

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By

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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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## **Introduction**

Technology has completely revolutionized how people live their lives, everything from communication to calculation has become faster and more efficient. This adoption of technology within society has gradually led to the integration of technologies into the workplace by businesses. Adoption of technology by businesses matched with an insatiable hunger for greater profits leads to the automation of industry. These automating technologies offer a way for companies to decrease costs and increase productivity (Manyika, 2017). Despite all the benefits of these technologies, this displacement of work consequently leads to the loss of jobs for working professionals (Brown, 2020). Automation is split into two types: high-skill and low-skill. Low-skill automation corresponds with tasks that are low in complexity, usually manual jobs that require routine tasks (Acemoglu & Restrepo, 2017). While high-skill automation involves tasks that are more complex and require more training and education for a human to complete.

For the proposed technical project, the research team will create an automatic proposal formatting tool for a defense company that allows compliance workers to easily format proposals correctly. Agile methodologies will be used to organize the project, which the team will then split into parts so individual teams could work on it simultaneously. The tools that will be used in the project will include: Github for version control, Python for the coding language, Jira for project management, and Zoom for communication. While putting knowledge gained from classes taken at the University of Virginia to use, the team will gain many soft skills. The team will complete a working prototype, then turn the project over to a legacy team working for the client. The final application will show great promise in reducing the time compliance workers spent changing proposal formatting, which in turn will save money for the client. Since the team

will only be able to finish a prototype which only includes a graphical user interface and title page formatting, future work will be needed to add the formatting for the body of the compliance documents.

Automation has inherent human dimensions as it is a way to reach the desired goal without human intervention. While automation affects both low-skill and high-skill workers, they are affected differently. A study from Oxford highlights the fact that low-skill workers are the hardest hit by automation, while high-skilled workers are more likely to leave the job of their own volition (Bessen, 2019). Thus, the STS project will focus on low-skill automation and how it affects the relationship between low-skill workers and the companies they work for. The STS project will also touch on how the COVID-19 pandemic has also affected automation, and by extension discuss its effects on low-skill workers as well.

### **Automatic Proposal Formatting Tool**

The aim for the technical project is to automate proposal formatting to make compliance worker's lives easier. A large defense company based in Northern Virginia, are looking for a way to automatically format compliance documents to save time. The time saved will allow for an increase in productivity in the compliance office and thus will save the company money. This problem of proposal formatting is interesting because it allows the use technology to make people's jobs easier by automating a part of it. The approach the technical team will use is simple, they will start with the prospective user's requirements and from there iteratively developed a solution to then meet those requirements. To complete the requirements, the team will use Agile methodologies which will allow them to facilitate constant communication with the client and iterative development cycles. For development, Python will be used to make a working prototype by the end of the summer internship.

The biggest requirement is to have the automatic reformatting application be intuitive as non-technical compliance workers are the prospective end-users of the product. To ensure ease of use, a bare-bones graphical user interface, GUI, will be implemented. The second main requirement is that compliance workers want to be able to specify a compliance document they want to reformat and then have the application generate another separate document that has the correct formatting. This is so that the original documents can be kept for legacy reasons. To do that, the application must digest a word document selected by the compliance worker and then a folder must be selected to have the new formatted document to be saved in.

In terms of software tools, Python and Github will be used. Python will be used because it is a simple programming language to easily create prototypes. This easy prototyping will allow the team to easily change and update the application. Something nice about Python is that it comes with a bundled GUI library, tkinter. This library was used to create a bare-bones GUI for the application. Keep in mind that the goal is to only make a working prototype, thus making the GUI visually appealing is not a top priority, rather the ease of use and functionality are. Github will be used for version control. This will allow tracking of the project and the ability to revert any changes if necessary.

The application development will be guided by Agile methodologies. This framework will help facilitate a constant cycle of requirement gathering, implementation, and user feedback. Jira, a project management software, will be used to implement this Agile development framework. The requirements that will be gathered from talking with the client will be first translated into user stories. From there, each story will be ranked by difficulty and depending on the difficulty a software engineer will take on the task and implement its solution. Once

implemented, the solution will be then tested for acceptance. If a bug is found, then the software engineer would have to repeat the cycle.

### **Analysis of Automation on the Low-Skill Workers**

The increasing gap between the classes within society has been greatly criticized throughout the years. This heated debate extends to the differences within the classes of workers. The landscape of work was changed during a disruptive period that industrialization brought in the 19<sup>th</sup> century which greatly affected the gap between the classes of workers (Ryckbosch, 2016). This disruption was brought about by the introduction of technology in the workforce. An example of this introduction of technology is water or steam-powered weavers in 19th century England, which made hand-powered weavers obsolete. This introduction of technology seemingly took away jobs, leading to a social uprising called the Luddite Rebellion (Hutchinson, 2017). Today, with the advent of technology, about 50% of jobs in America face automation, according to an Oxford University study (Avent, 2018). This automation can come into the workforce in the form of robots. It was found that for every robot added into the workforce, the employment-to-population ratio decreases by .02% (Brown, 2020), which shows that although these robots, and by extension automation, can lead to an increase in productivity, they also reduce labor demand which then takes away jobs from the workforce.

As identified by Daron Acemoglu, there are two groups of workers: low-skill and high-skill. These low-skill workers are those whose jobs utilize repetitive operations and little decision-making and abstract thinking. These low-skill jobs are easily automated and taken over by technologies, meaning they are more likely to be chosen to be automated (Acemoglu & Restrepo, 2020). Thus, this low-skill automation increases wage inequality as more low-skill workers are let go in favor of automating technologies. Other scholars have a different idea

about how automation has changed the workforce. Some believe that automation only brings good into the workforce as it only shifts the skills needed to perform a job rather than jobs just disappearing (Lazio, 2019). Even if this is the 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 COVID-19 pandemic has brought about issues that society has never faced before. During the pandemic, the job market was heavily hit, with unemployment falling to some of its lowest levels. Along with labor shortages, businesses today are looking for ways for technology to support their needs. With these labor shortages and shifts in technology, there has been a massive shift to online work, “digitizing the workplace” (Pethokoukis, 2021). This shift in the type of work has further disrupted the work market and has brought about uncertainty as job creation is slowing (Wocintechchat et al., 2020). a good example of this work shift is the meatpacking industry during COVID-19. Historically meatpacking companies have exploited immigrants and undocumented workers to fill their low-skill jobs, however with the pandemic raging that is no longer an option (Molteni, 2020). With workers getting sick and temporary shutdowns, the meatpacking industry has had to adopt automation as a necessity.

The STS frameworks that will be used are political technologies and technological determinism. Political technologies are those that are strongly aligned with “institutionalized patterns of power and authority” (Winner, 1980, p.134). In the frame of my research, the companies that hire low-skill workers serve as the power and authority in the relationship. With this framework, focus will be on how automation has changed the ‘power’ of low-skill workers concerning their employers and how automating technologies can exclude people from working, such as the historical introduction of powered weavers in England. As technology enters the workforce, the shift of skills needing to be technical and more complex could take away

someone's job as the educational requirements increase. This shift in skills is seen in a report from McKinsey where they found that by 2030 demand for workers with technological skills will increase by 55 percent, while low-skill demand will drop by 15 percent (Bughin et al., 2018). A criticism of political technologies is that not all marginalized groups can be aware of politics in technology and thus cannot identify the power shifts with a given technology (Frankenberg, 2014).

Technological determinism is the idea that society is shaped by technology (Smith, 1994). It is key to note that technological determinism does not take into account how technology is related to social determinism. Critics can also argue that technology and society evolve together, which is not the stance technological determinism makes (Smith, 1994). Focus will be put on how COVID-19 has affected the low-skill workforce by using technological determinism. To do this, how this new adoption of technology has affected this group of people will be analyzed, specifically concerning automation. The plan is to discuss a case study with the meatpacking industry and how the adoption of automation during COVID-19 has affected their low-skill workforce and how these new technologies have guided the development of the worker-company relationship. This research is important because as new technology is entering the workforce, society should take note of how it is affecting low-skill workers who may not be in the best position to help themselves.

### **Research Question and Methods**

Research questions: How does automation affect the relations between low-skill workers and the companies they work for?

To answer the research question, data from various articles and blogs will be gathered in order to better understand the change within the job market historically and currently. The

findings will then be aggregated to support a concise argument of the effects of automation and how its adoption affected low-skill workers in terms of job stability in companies. Some keywords that will be focused on are: “automation,” “low-skill workers,” “COVID-19 pandemic,” and “technological revolution.” The idea is to capture both the change in the automation landscape historically and presently and society’s reaction to it. To try to understand the historical job market, historical documents and scholarly articles will be gathered. Articles and blogs of different time periods will also be gathered to better gauge how societies felt about automation during that time period. To see how COVID-19 specifically changed the job market, special attention will be paid to current events that deal with the effects of COVID-19. The information will be organized by time period. First, how historical automation affected low-skill workers and how it affected their workplace ‘power’ will be talked. Then more modern contexts will be brought up and discussion on how COVID-19 has affected low-skilled workers and their job outlook in relation to companies will begin. Both the historical and modern contexts will help analyze how automation has affected and will affect low-skill workers and relate it back to their ‘power’ in relation to companies.

## **Conclusion**

With a sector dividing in the company, compliance workers must spend hours reformatting proposal documents. The technical deliverable will be a prototype for an automatic proposal formatting tool that will save compliance workers time and by extension will save the company money. Since this tool will take some of the responsibilities of the compliance workers, it is considered a form of workplace automation. The STS deliverable will be a research paper using political technologies and technological determinism to answer the research question: how does automation affect the relations between low-skill workers and the companies they work for?



The anticipated outcome of this research is to have society better understand how automation affects the workforce and how power shifts when new technologies are introduced. The new understanding of power shifts will allow companies to be more conscientious when deciding what technologies to adopt.

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