Microservices: Consolidating Functionality Across Multiple Services

Automation's Negative Effects on the Common Workers

A Thesis Prospectus
In STS 4500
Presented to
The Faculty of the
School of Engineering and Applied Science
University of Virginia
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Computer Science

By
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December 3, 2022

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

In November of 1811, a group of men with covered faces and a variety of weapons marched into a textile factory and destroyed a majority of weaving frames which were used by a relatively new machine called the 'gig mill'. (Thompson, 2017) These men were former workers of the factory, but were replaced with a new machine as it allowed a weaver to produce stockings at a much faster rate. This group of men came to be known as the *Luddites*, and they would later burn down the house of the factory owner. The Luddite movement spread to many towns and other factories who also indulged in this new technology. As time went on, the Luddites grew in size and became more violent. They had assassinated factory owners in broad daylight and even raided the homes of everyday citizens for weapons and supplies. Eventually, the government started to crack down on the Luddites and create new laws that prevented destruction of machinery. Around 100 Luddites were either sent to prison, or hung publicly. There have been countless protests and riots similar to the Luddites in the past, all of them stemming from sudden surges in unemployment in a company or industry. Automation has played a major role in making people replaceable with technology. In my future STS thesis, I plan to explore the past, present, and future of automation in different industries and how they affect the employment of individual workers.

The technical project portion of my STS thesis will be based on my recent internship experience at a financial technology company. The following section describes the project I completed at my internship, which involved consolidating functionality across multiple microservices. I will then describe how I will be using different STS methodologies, Actor Network Theory and the Social Construction of Technology, to analyze key texts for the research

portion of my thesis. Lastly, I will discuss these key texts, and how they will be useful in my research.

Technical Project

During the summer of 2022, I worked as an intern at an independent subsidiary of Amount Inc. called Amount Small Business. During my internship, I was tasked with consolidating functionality across different microservices which involved third party financial reports being stored in and retrieved from their environment's database instances. Microservice architecture is a newer type of software architecture that separates unique functionality into different code bases that all run independently of each other. The more common *Monolithic* architecture runs all functionality within a single code base. Microservices allow for different services to be created in different programming languages, different frameworks, which make them more flexible. Microservices also allow for each service to be updated and deployed independently; one of the major benefits of this is that if a bug causes the application to crash, it would only affect the specific service that held the bug. It wouldn't affect the entire application or front end web application.

Amount Small Business has a platform running on microservices to take loan applications for smaller banks and return decisions for those applications. Legacy functionality in the PDF document microservice, named "PDX", generates and stores PDFs reports with useless information. The software team decided to replace this functionality with logic that only pulled PDFs from third party financial institutions such as Equifax, ThreatMatrix, and Paynet. I was tasked with imitating the PDF storage and retrieval functionality of the third party reports in

a different microservice. In order to do this, I needed to create new database tables for the PDF objects in the alternate microservice, “UDX”. Logic from PDF would be tweaked and transferred over to UDX. The main tools used to accomplish this were Orika object mappers, JOOQ database query library, and Reactive Java (JavaRx). For testing, local HTTP requests using postman were sent for debugging and ensuring functionality worked as expected, and the Mockito testing library for Java was used for unit tests. This new functionality was successfully migrated with the exception of a few small adjustments that will need to be made by my team on the front end React.js service. The main takeaways I got from this experience was learning the general process of how software engineers go about contributing code, and exposure to a multitude of technologies. Microservices, build tools, reactive programming, relational databases and mock tests were all different technologies that I needed to learn in order to complete my technical project.

STS Project

As technology has progressed, more types of jobs have become replaceable with physical automated machines and artificial intelligence. My research will revolve around making connections between different implementations of automation and how they all affected the job market. I will then look into the legal aspect of automation to see what lawmakers have done to update legislation to account for the large scale changes that this technology has been making. Should there be laws in place restricting the transition to automation? Can we form these statutes in a way that ensures both a smooth transition for workers while allowing companies to benefit from automation? These questions are important to be asking now, because it may become a relevant problem in the near future. Restricting companies from replacing employees with their

automated counterparts will help prevent a catastrophic hit to our economy from massive surges of unemployment.

In order to conduct my research in an effective manner, I will be using two different STS frameworks. The first of which is Latour's Actor Network Theory (ANT). This method involves treating all aspects of a working system as equal factors in the outcomes. I will also use the methodology of historical and philosophical literature to better understand the roles that different actors play in the network that we consider automation. Utilizing the literature mentioned in this paper will allow me to look at automation from the perspective of historical and modern technological philosophers. With ANT, I will specifically focus on the worker, the automated machine, the capitalist, and the government. It is important to differentiate the amount of influence that each of these groups have in implementing automated systems.

Next, I will be using the Social Construction of Technological Systems (SCOT) framework with historical and philosophical literature to understand why automated systems were designed in the first place. In order to propose an effective and fair solution, I need to understand the reasons behind the large-scale change to automated technologies in full. My future proposed solution requires this knowledge to ensure it will benefit not just the worker, but society as a whole.

Relevant Literature:

The first text I will be using is Cathy O'Neil's *Weapons of Math Destruction*. In this book, O'Neil touches on the many areas that automated algorithms are used in the modern world and how they can all be problematic due to the nature of the algorithm's design. Artificial intelligence has become widely used in controversial areas such as law enforcement and public school teacher evaluation. I will especially be focusing on uses of machine learning and how

misrepresentative data models will determine the actions artificial intelligence will take causing much controversy. I believe that in the beginning, legislation regarding automation will cover a large variety of uses including its effects on employment. Using arguments much like O'Neil's will help to highlight one of the areas of automation which will favor these future restrictions.

The next text to be used in my research is Karl Marx's *The Capital*. Marx goes in depth on the role that machines play in society and the capitalist system. His work highlights the major contrasts of how automation affects the average worker and what he refers to as "the capitalist". He remarks 'thus it became possible to produce the forms of the individual parts of machinery 'with a degree of ease, accuracy, and speed that no accumulated experience of the hand of the most skilled workman could give'", showing how the human cannot compete with its machine counterpart (Karl Marx, 1867, Ch. 15 Page 4). This information will help understand just how the capitalist is benefited while the worker struggles.

Another useful study I will be using is an Oxford paper which discusses estimates for which types of jobs will be at risk of replacement by computerisation in the near future. In *Future of Employment*, Frey and Osborne dive into growing technology and how they can start to spread to other fields and occupations. Some tasks in the workforce are more labor intensive and some more brain intensive than others. Using mental intensity as a main metric, Frey and Osborne look at the likelihood of over 700 different occupations being replaceable by newer technologies in the next few decades. They state "computerisation is no longer confined to routine manufacturing tasks," meaning that different types of occupations other than manufacturing are already at risk (Frey & Osborne, 2013, Page 4). This paper will give good insights into quantitative metrics of past automated replacement of workers as well as reasonable

metrics for future replacements. This information will help emphasize the importance of having legislation that helps prevent large quantities of workers being fired for the cheaper alternative.

The last source I will be using is a newer publication from the White House, *Blueprint For an AI Bill of Rights*. This outlines the protections that the federal government plans to give to US citizens from AI technology. The conceptual bill includes protections from privacy invasion, algorithmic discrimination, and unsafe systems (The White House, 2022). However, it does not specifically identify any protections for workers who can potentially be replaced by automated systems. They do touch on the necessity for human alternatives to some automated systems that people need access to should they prefer it, but this does not truly guarantee the safety of employees as many areas have no need for human alternatives. The White House's publication gives a great amount of insight into the actions that the government plans to take to ensure the safety of US citizens from newer technologies. Some of their plans are certainly necessary in the modern world, but it is missing a crucial aspect. I will be focusing on possible legislative solutions that may be added to this bill of rights in order to help remedy the issues discussed in my STS research.

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