Forecasting Breakthroughs: Identifying Future Leaders in the Semiconductor Industry

Resigning From Uber: An Actor-Network Perspective on Algorithmic Management

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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

Technological disruption is a phenomenon driven by rapid advancements in technology; examples include cell phones, 3D printing, artificial intelligence, and algorithmic bosses. Technological disruption refers to the process by which new technologies and innovations significantly alter the market, existing industries, and societal structures. This research will delve into technological disruptions using one example of algorithmic bosses and focus on the unpredictability of such disruptions. The central question addressed in this research will be the impact of algorithmic bosses on society, focusing on the sociotechnical factors (STS) driving these technological changes and their broader impact. Understanding technological disruption is important and timely in today's rapid pace of innovation. This research is essential for various stakeholders, including policymakers, businesses, and individuals, because it directly affects job markets, economic stability, and society.

The various sociotechnical factors that drive technological disruption will be the research focus. The first and most apparent STS factor is the technological advancement itself. Research in new emerging fields such as artificial intelligence, machine learning, biotechnology, and renewable energy are all key drivers of disruption. These advances enable the development of new products, services, and industries. Consumer preferences and society are vital because the growing demand for specific products or needs can also drive disruptions. Government policies can also further or hinder technological disruption. Regulations may encourage innovation by providing incentives and investments or can put up barriers to discourage innovation.

Algorithmic bosses are an example of technological disruption, made popular by the ride-share app Uber. This business model refers to automated systems and algorithms that oversee people and make managerial decisions. The causes and effects of algorithmic bosses can be

evaluated within the sociotechnical framework of Actor-network theory (ANT). The STS implications of algorithmic bosses include effects on employment, fairness, privacy, and ethics. Algorithmic bosses have the potential to reshape job markets, leading to fewer traditional managerial positions in some instances while creating new opportunities for engineering in others. Using algorithms to make hiring, promotion, and performance evaluation decisions raises ethical questions about transparency, accountability, and the potential for algorithmic bias.

This research will explore the sociotechnical issue of technological disruption, focusing on the specific case study of algorithmic bosses. Looking at the driving sociotechnical factors is necessary to understand the challenges and opportunities presented by disruptive technologies.

Technical Topic: Predicting Technological Disruption in the Semiconductor Industry

The problem that will be addressed in the technical analysis is the unpredictability of disruptive technologies. The uncertainty of successful technologies leads private entities and the government to invest in potentially unsuccessful or non-breakthrough technologies and companies. Predicting technological disruption is essential for investors and individual companies to better prepare for disruptive innovations that will affect their businesses. Another critical reason to predict technological disruption is to form appropriate measures of policy and regulation before rapidly developing technology disrupts society. The questions to be explored include when the technological breakthrough will occur, and which technologies can potentially disrupt the market and society.

To narrow the scope of this problem, the research focus will be primarily on the semiconductor industry. The semiconductor industry has historical and recent examples of successful innovations and failures. One of the first steps of this project is data collection on

semiconductor companies focusing on early growth and funding rounds. Analysis will be done to identify important metrics that set successful companies, like unicorn startups, apart from companies that failed. Potential metrics for exploration are the amount of investment received at each funding round, who the investors are, the time between funding rounds, how saturated the specific market is, and other metrics to evaluate the successfulness of the business that previous research may point to. Unicorn companies will be defined as startups that reach a valuation of a billion dollars. Data will also be collected on academic publications that potentially led to technological innovation. The next step of this research will be to analyze the data to identify patterns that led to the technological breakthrough. This analysis will help the team to then build a model to predict future disruptions. Potential data sources that will be used for analysis are Pitchbook, Crunchbase, and the SEC filings database. Pitchbook and Crunchbase contain databases with useful company information such as funding round specifics and investors. Databases with SEC filings are available online, containing information on the public companies.

Sociotechnical Topic: Evaluating the Impact of Algorithmic Bosses

The rise of the algorithmic boss business model has the potential to impact the market, employees, consumers, and society. Algorithmic bosses blur the line between employee and customer, potentially producing negative consequences such as lack of responsibility, breaches of privacy, and ethical uncertainties. A known concern is that algorithms can reflect the biases in their training data, leading to discrimination. This raises questions about fairness and equality in decision-making towards employees. Additionally, the collection and analysis of employee data by algorithmic bosses raises privacy concerns. Using algorithms to make hiring, promotion, and performance evaluation decisions raises ethical questions about transparency, accountability, and

the potential for algorithmic bias. Researching algorithmic bosses will be a specific case study illustrating the broader sociotechnical impact of disruptive technologies.

STS Framework: Actor-Network Theory

Actor-network theory (ANT) will be used to frame the analysis of algorithmic bosses. ANT is a sociological approach that can be used to understand the complex interactions and relationships between human and non-human entities in social and technological contexts (Nickerson, 2023). ANT challenges other sociological frameworks and perspectives by emphasizing the importance of both human and non-human actors in shaping society. ANT argues that social forces do not exist as real, separate entities that cause social events. The framework says we should study and describe what is happening in the real world before discussing big ideas like social forces, which should be seen as theories instead of concrete things (Latour, 2005).

The first key tenant of ANT is the actors, which include human and non-human entities such as objects, technologies, institutions, and ideas. Each actor has equal agency in shaping social interactions and outcomes. The second key tenant of ANT is the networks, which link the actors together through various relationships and connections. These networks emerge through the interactions and associations among actors.

The concepts of translation and symmetry are central to ANT. The translation process allows a network to become one stable entity; it involves aligning the interests and goals of actors to form one stable network. The symmetry principle states that all human and non-human actors have equal agency and importance in shaping social outcomes. ANT is particularly suitable for analyzing the sociotechnical issues related to algorithmic bosses because treating

human actors as equal to non-human algorithms will be crucial. The algorithm takes the role of a human boss, so for this analysis, it is essential to treat them equally and as having equal potential to affect social change.

Thesis Plan

To explore the sociotechnical issue of algorithmic bosses, I will explore research and news articles to understand the perspectives of different actors in the overall network. I will explore the existing research on public perception of algorithmic decisions, their impact on employees, and economic and legal implications. It may be helpful to use Uber as a case study, dive into that specific network, and extend those findings to companies with similar business models, such as Lyft and the food delivery services Doordash, Grubhub, and Uber Eats.
Key questions I intend to explore are how companies with algorithmic bosses benefit from that business model. What does the C-suite of the companies themselves have to say? Are they cutting costs by eliminating the middle managers? What challenges have they faced by relying on a network of independent contractors and users to keep their business running? Other key questions I intend to research relate to the employees or "independent contractors," as Uber defines. Do the employees feel like they are treated fairly by their algorithmic bosses? What are the benefits of this more flexible business model? How have algorithmic bosses promoted a "side-hustle" culture? Another critical segment I intend to explore is the consumer. How important of a role does the consumer play in the network of algorithmic bosses? Do consumers have a different view on these kinds of business models? Have they significantly changed consumer day-to-day life? The final perspective for exploration is the governmental and policy

side. Is there adequate policy regulating algorithmic bosses? What threats do they pose that the government should be concerned about?

There are many existing news and research articles exploring these key perspectives. One source will be used to explore how users perceive algorithms in place of humans; the article is on the perception of fairness of algorithmic versus group-made decisions (Lee & Baykal, 2017). Multiple research articles explore the impact of algorithmic management on human workers (Lee et al., 2015). Another research article explores the economic and legal challenges related to artificial intelligence in the workplace (Adams-Prassl, 2019). In addition to these research articles, looking at news articles and opinion pieces with accounts of people's personal experiences with algorithmic bosses will be beneficial.

Conclusion

The research conducted in this project can improve the problem of unpredictable technological disruptions. Improving the predictability of technological disruption can improve investor profitability, ensure the most promising areas are well funded, and quicken the timeline for adequate regulation. Further, the research for this project can help tackle problems related explicitly to algorithmic bosses, such as transparency, fairness, privacy, and accountability, by helping to pinpoint which actors are most responsible for these issues, which actors are most affected, and what can be done moving forward. The research on predicting technological disruption and the topic of algorithmic bosses can then be extended to understand the sociotechnical problem of technological disruptions more generally.

Potential findings from the evaluation of technological disruption are that the technologies are unregulated and lead to unfairness or danger. These problems could impact the

consumers, the employees, or businesses being put in unprecedented, unregulated circumstances. The implications could also negatively disrupt the job market, the economy, and society. Once these problems are addressed, appropriate measures can be taken to solve them through policy, regulation, and changing societal perspectives.

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