Prospectus

Enterprise Risk and Resilience of Container Freight Operations
(Technical Topic)

Case Study of the Miners-to-Coders Initiative in Appalachia
(STS Topic)

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.

Introduction

Keeping the economic machine of American consumption healthy and resilient relies on the robust functioning of our containerized shipping infrastructure. From all corners of the world, products ranging from steel to radioactive plutonium must go through the gates of costal ports in specialized shipment containers. With the United States being the world's biggest importer of goods, bottlenecks in container pickup and transfer are not just common, they have become the new norm (US Census Bureau, 2018). The opportunity cost of missed or delayed shipments can be severe for corporations on a tight budget and projects operating on a strictly time-sensitive protocol. Among the most severe contributions to shipment delays are downtimes resulting from maintenance on ship-to-shore cranes and the bunching of trains at intermodal ramps in- and around ports (Mongelluzzo, 2018). Efforts to mitigate these factors through the integration of various port systems into the *internet-of-things* via modernizing the communication platforms between crane operators, shipment delivery schedules, train conductors and truck drivers have been implemented this past year with varying degrees of success. While promising, these initiatives fail to consider the physical limitations of American ports and their inability to accommodate large quantities of shipments in increasingly shorter intervals of time.

A revised approach would focus on expanding the infrastructural elements found in the ports, particularly the size of the cranes, to accommodate larger ships within shorter timeframes (Finley, 2019). In addition to adding larger cranes, the ability to modularly add or build entirely new cranes on site would provide ports with autonomy from relying on foreign manufacturers (there are currently no shipping cranes manufactured in the US) and greatly decrease maintenance times on downed units. The auxiliary benefit of on-site crane manufacturing at US

ports would be the creation of jobs in parts of America where employment is usually scarce and of low quality (Rodrigue, 2017).

As part of a 65-year, $750 million investment project to create jobs in the region and optimize efficiency of transport, the Port of Virginia is considering the implementation of an in-port crane manufactory plant. To further understand the economic feasibility of this proposition, I will outline the Port of Virginia's technical motivation to bring such a project into completion and offer analysis of its place within the investment plan. It's important to keep in mind that if the Port of Virginia fails to consider the current employees affected by this implementation, the effect on the local economy will be devastating. Drawing on the STS framework of Actor-Network-Theory, I will examine the failed implementation of a miners-to-coders initiative in Appalachia to draw conclusions about short-sighted job-creating investments only resulting in further unemployment. Through this framework, we can better understand the sociotechnical considerations necessary for technical research.

Technical Problem

With an economic impact of $84 billion and generation of 530,000 jobs, any initiatives taken by the Port of Virginia have the power to drastically affect the communities in which they are implemented (VA Gov. Northam, 2019). The existence of the Port of Virginia as a government entity means that as opposed to profit, its benefit to the inhabitants of the state of Virginia is the bottom line. Thus, the most powerful variable in the consideration of implementing an in-port crane manufactory to speed maintenance of malfunctioning ship-to-shore cranes is its economic impact to the State of Virginia, its employees, and its treasury (Conversations with POV CEO John Reinhardt, 2019).

Earlier this year, the Port of Virginia made headlines when it took delivery of the world's largest ship-to-shore gantry cranes at the Virginia International Gateway in Norfolk. Manufactured entirely in China by Zhenhua Heavy Industries Co, Ltd. (ZPMC), the $44 million deal included the cost of shipping two 170 ft goliaths of engineering fully assembled across the oceans (POV 2019). Despite the Trump administration's ongoing trade-war with China, the mandatory 10% tariff has been nullified with regards to shipping cranes (Spence, 2019). The essential motivation for lifting these tariffs is that as it stands, there are no shipping crane manufactory plants in the United States. Whenever a port needs a new crane, it must arrive shipped and fully assembled from companies like Liebherr (Germany), Konecranes (Finland), or ZPMC (China) (Donnan 2019). Consequently, nontrivial maintenance work often involves technicians being flown in from these countries at a large cost to ports and state governments (Konecranes 2019). Delays caused by the inability to use cranes during maintenance periods bear heavy burdens on the timely transfer of containers from ship to trucks at these ports, potentially causing an economic loss to container-shipping customers requiring the timely delivery of their goods.

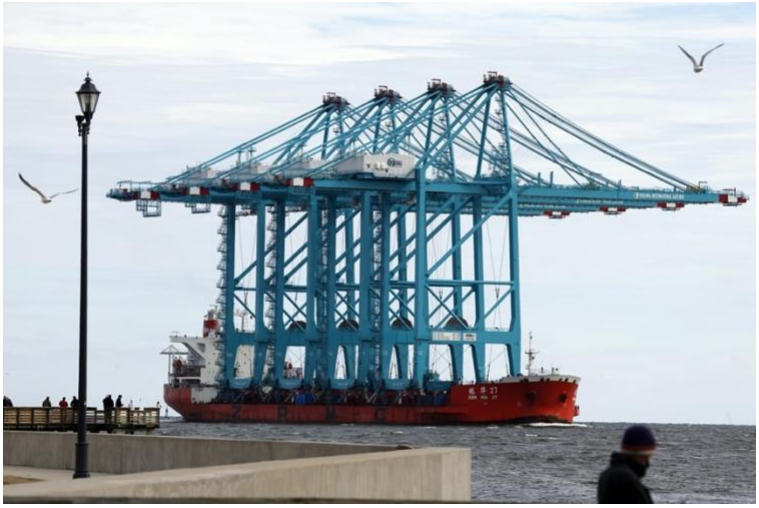

Image 1 shows the four fully manufactured cranes (ZPMC) arriving at the Virginia international Gateway in January 2019 (Getty Images).

Efforts to speed operations at ports and account for these delays have been made via updating communications between operators on land and at sea via integration of *internet-of-things* methods (Mongelluzzo, 2018). A term coined only in the past decade, internet-of-things methods seek to maximize the efficiency of technological systems via integrating various systems in user-friendly, robust and uncluttered ways (IBM 2016). Though only recently implemented, these methods have largely worked in decreasing delay times in scheduling of truck pickups and movement of containers between ships and the port via modernizing the ways in which operators use technology to perform their daily tasks (Mongelluzzo, 2018). Nonetheless, the upper-bounds to effective technologies are the physical limitations in which they operate. The problem remains that the physical process of moving containers from ship-to-shore relies on the availability of the cranes at port and the minimization of down-time relating to maintenance issues. If the Port of Virginia decides not to manufacture the cranes themselves, it will result in an economic opportunity loss to local communities and the state itself (UN, 2018).

The proposed plan to include an in-port crane manufactory plant at the Port of Virginia draws motivation from three main factors: reducing the delay time of shipment deliveries via on-site maintenance and replacement of malfunctioning crane components, providing an economic benefit to the state of Virginia via the creation of new jobs, and increasing the resilience of the port to threats relating to the variable political climate of global trade. Within the $750 million 2065 master plan, such an inclusion would take no-more than an initial investment of $60 million, while providing an economic benefit in the billion-dollar range (Conversations with POV CEO John Reinhardt, 2019). Having just broken an annual volume record of 2,850,000 containers handled in 2018, the Port of Virginia has much to lose if it falls behind with performing the infrastructural upgrades necessary to prevent bottlenecks and delays in container

transportation within its facilities. The realization of this project depends on the enthusiastic support of public officials and the outcomes of negotiations with crane manufacturing companies bidding to set up shop at the Virginia International Gateway.

STS Problem

Global climate change data suggests activities related to harvesting energy from fossil fuels are to blame for the increasing frequency of natural weather-related catastrophes across the globe (NASA, 2019). Congruently, the majority of academics, progressive politicians, and influencing personalities are quick to rally for causes in support of sustainable efforts, and even quicker to rally against polluting entities. A target of environmental activism is often the coal industry. While efficient in heat and power generation, coal emits hazardous chemicals into the atmosphere in addition to its carbon-dioxide component such as mercury and various nitrous oxides (Lyons, 2014). The grand-scale disfavor of its environmental impact has led to its decline as the leading energy source in the United States. Hence, major layoffs of coal workers have become the new norm (US EIA, 2019).

An especially hard-hit part of the coal industry is Appalachia, where over 45% of the coal mining workforce has been laid off in recent years (Appalachian Regional Commission, 2018). In 2015, the state of Kentucky invested into retraining miners to become software programmers. Referred to as the "miners to coders" initiative, its motivation stemmed from the lobbying efforts of two local software entrepreneurs that sought to make Pikeville, KN a silicon-valley type hub for technology businesses. Almost immediately, the program failed. Among other reasons, it was simply not feasible for miners, generally middle-aged and without academic education, to learn software programming to a degree where they could provide benefit to an actual corporation. While this is true, one should also look into the failure of the project planners to fully understand

the demographic they were working with. Much why of the Eastern Kentucky Concentrated Employment Program Inc.

past decade has seen a tremendous decrease in the cost of production, maintenance, and usage of solar energy. As such, the solar industry is booming; jobs are being added at twelve times the overall economic rate (National Solar Jobs Census, 2016). In contrast, the profitability of coal plants has plummeted drastically over the same time period, resulting in bankruptcies of leading private sector coal companies and mass layoffs of coal workers (US EIA, 2019). An especially hard-hit part of the coal industry is Appalachia, where over 45% of the coal mining workforce has been laid off in recent years (Appalachian Regional Commission, 2018). In many of these Appalachian towns, coal is or was the biggest private employer and the loss of a job could very well mean homelessness for laid off workers and their families. Noble efforts to not only reincorporate into the workforce but also improve the quality of life of coal miners by teaching them how to code have been tried and tested. Drawing on Actor-Network-Theory (ANT), I argue that such initiatives generally end up failing due to a mix of factors; above all being the difficulty of motivating a generally middle-aged, academically unskilled workforce to learn software programming at a level where they can compete with college-educated computer scientists (Baily, 2017), (Fish, 2019). ANT describes all human and non-human actants in a network of shared interest wherein the overhead existence of the network projects its own unique inputs into the reality of actants it oversees, granting equal agency to each node (actant) in the system while seeking to identify the processes carrying the network forward in time.

The human actants in the network of interest are the coal miners, political personalities, coal and solar energy company executives, and the families of those impacted, while the nonhuman actors include the robust advancements in today's solar energy technology and the

framework of laws and initiatives governing the treatment of soon-to-be-displaced coal miners in Appalachia. A positive step towards the prosperous future of this network would include working with the skillset of coal industry workers by retraining them for the closest equivalent job positions in solar energy. Even at current rates, which are projected to increase over the next decade, the entire coal workforce could be absorbed by the solar industry within 15 years (Pearce, 2016). If implemented correctly, the actants in the network will benefit from the economic prosperities expected to ensue.

Conclusion

The technical report governing the implementation of a crane manufactory plant at the Port of Virginia will outline the tradeoff between costs and benefits projected from implementing the project. The framework will also take into consideration the viability of choosing one bidding company over the other in terms of price, reliability, treatment of employees, equipment quality and willingness to work with the port. The STS research paper will seek to identify the processes governing the evolution of actants in the network of Appalachian coal mining while deriving conclusions from network failures throughout history.

An accurate and meaningful decomposition of requirements, feasibility, and longevity concerning the implementation of a crane manufactory plant at the Port of Virginia brings with it a chance for multi-billion-dollar economic benefits to the region of Norfolk while increasing the resilience of the port to threats brought forth by international political trends. Congruently, a successful identification of the actants and processes governing the retraining of Appalachian coal miners means healthy initiatives can be taken to guarantee employment for thousands of soon-to-be-displaced workers and income to support their families. (1831 Words)

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