An analysis of the February 3rd , 2023 Train derailment in East Palestine, Ohio and its ethical ramifications

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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

Every day, thousands of dollars in goods are transported around the United States. Railroads play a major role in the transportation of consumer goods as well as the development of the United States as a nation. Not only do they transport goods, they also transport raw materials such as coal and production grade chemicals. On February 3, 2023, there was a train derailment in East Palestine, Ohio that has been the subject of much discussion and is starting to be accepted as a freak accident in the mainstream media (Goodman, 2023). With more analysis of the derailment, the validity of the accident claim is being thrown into question due to engineering operations irregularities found by investigators (Premack, 2023). In this paper, I will prove this was no mere accident and investigate how the train operator, Norfolk Southern, is morally culpable for the derailment and leak of over 100,000 gallons of vinyl chloride. Should we allow this to be accepted as an accident, we will miss the opportunity and benefit to society offered by assessing the moral and ethical responsibilities that corporations hold to the public.

To accomplish this goal, I will be reviewing multiple official documents such as the NTSB preliminary report as well as train and chemical safety papers in order to show Norfolk Sothern's lack of ethical business practices combined with an extreme focus on profit caused the derailment and therefore cements their moral responsibility for the accident. Looking at all the evidence through the lens of Actor-Network-Theory will provide an adequate framework for the paper. Actor-Network Theory (ANT) is a sociological framework that aims to understand how human and non-human actors influence each other and interact to create social networks. The multi-party nature of the incident as well as the overall business lends itself to the use of ANT in a beneficial way. I will be reviewing multiple released documents and read into their methods of business as well as their handling of the derailment itself. Doing so will prove that Norfolk

Southern is responsible for the derailment as well as morally responsible for the aftermath of the derailment.

Literature Review

There have been multiple peer reviewed articles relating to the Ohio train derailment, a few on the specific accident itself and many on train safety overall. This lack of ethical behavior by Norfolk Southern will be shown through the review of these documents and later supported by other evidence.

As an overall train derailment resource, *Quantitative Analysis of Changes in Freight Train Derailment Causes and Rates* (Wang, 2020) provides an assessment of freight train derailments from a statistical perspective. This report has analyzed train derailments by comparing their causes and outcomes to highway traffic accidents, providing a useful reference point for the reader. A main distinction that the paper introduces is the difference in causes, as highway accidents are often caused by driver error while train accidents are most often mechanical failures. As found by investigators in the Ohio accident specifically, mechanical failure was likely a direct cause of the accident, supporting this papers finding on the subject. Using accident-related variables, quantization of changes in derailment rates over a period, and models based on previous derailment research the paper outlines new derailment estimates to be used for risk analysis.

One thing that the paper neglects to address is the socio-economic status of the land and communities surrounding their tracks. I propose that corporations understand that communities with lower economic power pose a minimal legal threat to them, therefore reducing the repercussions the company could face. From environmental research, we know that poorer

communities suffer from increased environmental pollution (Hajat, 2015), contributed to by unsafe business practices. I think due to this reasoning, an analysis of derailment cause, location and outcome through a socio-economic lens would lend itself greatly to understanding train accidents and become an invaluable tool to investigators.

While the Quantitative report provides an examination of causes relative to other accidents, *Freight-train derailment rates for railroad safety and risk analysis* (Lui, 2017) supplies an analysis of freight train derailments and safety in regards to mechanical aspects. This report analyzed the affects that roadway design has upon the train as well as giving reasons to increase the safety of the trains at hand. Ironically, one of the reasons cited in the paper is the risk of train derailments leaking Toxic Inhalation Hazards (TIH), which is exactly what was seen in the Ohio derailment. Using matrix data, the paper found that FRA track classification, method of operation, and traffic density all had significant effect upon derailment rates.

One thing that the paper neglects to address is the company ownership and maintenance schedule of the tracks at hand. This leaves the possibility of maintenance schedules being the largest factor in terms of train accidents and derailments and should be investigated further. The chance that the vast majority of train derailments can be attributed to failures in railroad equipment upkeep is something that I believe to be a serious possibility and a source of major uncertainty in this data. There is also no weight placed on the outcome of the derailment, despite the varied effects that the derailment can have upon the surrounding area. I propose some form of derailment ranking system that would allow the damage of the derailment to be accurately and fairly quantified. The affects that the derailments have are an important factor in analyzing where the greatest issues are in railroad safety and would be an invaluable tool to make safety decisions.

Together, the *quantitative analysis report* (Wang, 2020) and the derailment rate paper (Lui, 2017) work well together in providing empirical evidence relating to the specific accident and train derailments overall. While they do provide quantitative evidence, neither document makes an effort to morally evaluate train derailments and the risks posed by the materials they carry. Despite this, both documents will greatly help this paper as they provide a baseline of train safety and official accident details.

Actor Network Theory

In order to effectively show Norfolk Sothern's culpability in the derailment as well as demonstrate corporate ethical responsibility, a framework is necessary. Science, technology, and society (STS) provides an adequate framework in the Actor-Network Theory (ANT) framework. ANT makes isolation of single elements in a broad network much more approachable and thus makes the separate elements simpler to judge.

ANT, as a framework, allows for the building and later deconstruction of large sociotechnical arrays for the purposes of analysis (Cressman, 2009). ANT does this through boiling down a network to its most basic units, human and non-human actors, that can be isolated and their individual relationships determined. While often times these units can be broken down further into their own networks, the overarching connections the actor makes allow these lower level relations to be treated as a cohesive unit. These relations between non-human and human actors form a heterogenous network that can then be analyzed.

Power in the heterogenous network is determined by the strength of the relations between the actors (Cressman, 2009). While separate actors my possess great power, they cannot solely form the network and must rely upon the heterogenous system. While the common method of

ANT uses simplified network units to bridge their gaps and form their relationships, the true progression and developing of the network comes from Callon's concept: the sociology of translation (Callon, 1986). Callon defines translation as the process where actor-networks are formed around a primary actor. In the 1986 paper, Callon outlines four distinct "moments of translation", problematization, interessement, enrolment, and mobilization (Callon, 1986). Problematization is the stage where a primary actor is clearly outlined, the problem the network faces is defined, the required actors are identified, and the primary actor identifies how they must adjust themselves to become an "obligatory passage point" (OPP) for the other actors to utilize in the achievement of the final goal. Interessment is the phase where the primary actor attempts to recruit other actors within the network by attracting them from other networks into sharing the primary actors view. In enrolment, the primary actors have successfully recruited actors from other networks, and roles are allocated to these actors and they preform their assigned role within the network. The last phase, mobilization, is where the primary actor takes up the role of speaking for and representing the other actors within the network, and the unit acts as a cohesive network.

Another element of the ANT theory is its possible failure due to network fragmentation. Should one of the actors refuse or be unable to preform the assigned role from the primary actor, the whole network can fail (Callon, 1986). This defined characteristic of network failure is extremely important to the analysis the Ohio train derailment, as it will allow for the identification of the reasons for the failure. This, as well as the network translation process will allow for the total analysis of the Norfolk Southern derailment network.

A**nalysis**

Norfolk Southern Network

In order to fully grasp and analyze the accident, the network that led to it must be understood. The human and non-human actors of the Norfolk Southern derailment system must be defined, and their relationships clearly identified. The most important human/organizational actors are the (i) *company management* (board of directors, company executives) who determine the direction of the company (Southern, Corporate Profile, n.d.); (ii) *workers* (engineers, conductors, etc.) who are responsible for the day to day operations of the railroad (Southern, Corporate Profile, n.d.); (iii) *railroad customers* (businesses, private individuals) who hire Norfolk Southern for shipping (Southern, Corporate Profile, n.d.): (iv) *the government* (NTSB, EPA, etc.) that regulates the railroad industry (DoT, 2023); and lastly (v) *the general public* whom the Norfolk Southern trains operate around. The essential non-human actors to this incident are the (vi) *railroad equipment* (trains, rails, etc.) that Norfolk Southern directly uses to operate its business, and (vii) *freight* (consumer items, chemicals) that is directly transported by Norfolk Southern on their rail lines.

Knowing the principles of translation (Callon, 1986), the relationships between actors must be established to fully understand the network. These relationships are almost always double sided, where both parties have the ability to affect one another. The business model of the Norfolk Southern company provides the most information on these relationships (Stagl, 2022), while also providing needed insight into the strength of these relationships.

The form of these relationships are shown in Figure 1, where all the connections are the ideal associations between the ANT actors. Norfolk Southern Management (NS) acts as the primary actor, organizing and working with the other actors with the final goal of railroad transport to turn a profit. They do so through complying with government regulations applied by the government (G); hiring and employing workers (W) to operate the trains, and acquiring customers (C) whose goods they can transport. Each of these actors have their own goals and relationships that they must also fulfill. The workers (W), being people, must work to live and operate railroad equipment (RE) at the direction of NS management. The customers (C), who own the freight (F), contract NS to ship it using the rail equipment (RE) operated by the workers. The government (G) regulates Norfolk Southern with the purpose of protecting the public (P) from any accidents that may occur.

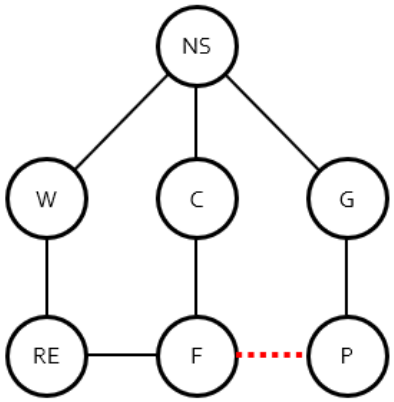

Figure 1: Norfolk Southern ANT network

Under these optimal relationships, the customer receives the freight service for a good price, the workers get paid fairly, the executives make money, and the government must do very little work to protect the general public from hazards. The railroad would self-regulate in order to maintain business, not compromising any aspect of an ethical business during operations. This is not what we have seen from Norfolk Southern in this incident: we have seen the failure of the system as a whole in this specific case. In this case, there is evidence that system actors skirted or did not preform their designated duties, leading to the failure. This failure led to the freight affecting the general public, represented in the figure by a dotted red line.

Misguided Accountability

With the network arranged and the inter-actor relationships established, the failure of the network can be analyzed. I argue that the derailment comes down to greatly misguided accountability on the part of the NS executives. Despite their existing relationships within the system between them and the government as well as the consumer, they allowed the goal of high profits to compromise these. From recent NS business decisions, it can be proven that NS was prioritizing business profit at the expense of the network.

Firstly, in past years NS has started stock buyback programs, some as recently as March 2022 (Southern, 2022). This recent buyback was for up to $10 billion dollars to be executed through many purchase methods, which bought back 14.6% of all Norfolk Southern shares (Curry, 2023). Stock buybacks are done to make the business more attractive to investors through consolidated control, increased stock price, but most importantly stock buybacks can be used to conceal share compensation to company executives (Curry, 2023). The $10 billion in buybacks act an indicator of the NS executives priorities, showing that the NS executives valued profits and personal gain over the company. I would posit that both the prospects of increased stock price as well as the compensation because of stock buybacks caused the NS executives to neglect the rest of their network.

Another form of evidence that Norfolk Southern was prioritizing their own profits over the strength of the network comes in the form of changing their workers behavior. The Railroad Union has reported that Norfolk Southern pulled key maintenance positions from the regions of the accident (Premack, 2023). These positions specialized in maintaining safety devices like the hot-box detectors that played a role in this derailment. A hot box detector is a type of defect detector that scans the train as it passes overhead. Hot box detectors specifically use infrared

imagers to detect and transmit the temperature of the wheel journal bearings. Devices like hot-box detectors have been proven to minimize train accidents (Premack, 2023) and yet Norfolk Southern allowed their upkeep to be ignored, to the detriment of the network. The lack of service on these units may have contributed to the derailment, as there are multiple examples of video footage where a wheel bearing is visibly failing, yet the train did not slow down (Elamroussi, 2023). This drastic decrease in scheduled and normal maintenance to cut costs further cements the argument that the NS executives valued their profits over the success of the network. There is evidence that the hot box detector recognized the overheating wheel bearing, but currently no indication if the defect signal made it to the train (Premack, 2023). This trade of profits for overall safety is unethical in principle and wrong in practice, and has affected the network as a whole.

Poor Oversight

With it being shown that the network was negatively impacted by the profit driven executive team, I would also like to make the case that the actions taken by Norfolk Southern leadership were unethical. This is clearly displayed in how the derailment and the chemical leaks were handled (Elamroussi, 2023). The most important elements that demonstrate the unethical actions are their disposal method of the chemicals and their compensation offered. After the accident, it was determined that over 100,000 gallons of liquid vinyl chloride was at risk of becoming an explosion risk. The decision was made to drain the tanker cars into ditches, and then burn off the vinyl chloride. Firstly, this introduced vinyl chloride into the environment around the train cars where it percolated into the surrounding water (Elamroussi, 2023). Secondly, burning of vinyl chloride produces an array of toxic chemicals (Bishop, 2023), which includes compounds like phosgene gas and hydrogen chloride. These are both extremely toxic

chemicals, the results of which are being seen in the surrounding community, showing extreme irresponsibility of NS leadership. The ecosystems in the surrounding streams have been decimated (Bishop, 2023), not to mention the health affects seen by the local community (Goodman, 2023). These health impacts are not only limited to East Palestine, there have been chemical signals picked up in parts of Pennsylvania (Findell, 2023), leading to concern over the size of this leak. Considering the noticed short term impact, the decision to purposely release and burn the chemicals was the least ethical decision available. They knowingly exposed the surrounding communities and ecosystems to deadly chemicals for the sake of better profits, showing a distinct lack of ethical responsibility.

While the purposeful release of deadly chemicals likely shows the irresponsibility of the NS leadership, not everyone sees it that way. The argument can be made that the chemicals had to be purposely drained and burnt off to prevent an explosion. While these chemicals are highly reactive, measures could have been taken to prevent pressure build up within the train vessels. This would have given responders time to pump the chemicals onto cleanup tankers rather than expose the community to the chemicals. Looking to the timeline of the accident, an ulterior motive of NS arises. With the accident occurring on February 3rd and the chemical burn off on February 6th, NS had cleared the accident and was running trains again by February 10th (Rail traffic resumes, cleanup continues in East Palestine, 2023). From ariel photos, we can see that NS simply dragged the damaged tanker cars to the side of the tracks and left them, rather than cleaning up the mess that they made (Elamroussi, 2023). This extremely rushed return to operation from NS shows that their burn off of the chemicals was simply the quickest option, not the ethically right or professionally safe option which further proves their moral corruption.

ANT Analysis

The degradation and failure of the Norfolk Southern is extremely interesting, as its failure is not the result of any of the hired actors, but of the primary actor Norfolk Southern itself. All of the other actors preformed their role and what was expected of them by Norfolk Southern in support of the network. I would propose a new method of network degradation: Network Primary Focus Erosion. In this form of degradation, the primary actor looses sight or alters their goal without informing the network of the change, and therefore the network is inadequate for the new direction. In this example, the goal of Norfolk Southern pivoted from producing a profit by safely transporting goods to solely procuring a profit with trains. The quality of the transport provided and level of safety required by the government and expected by the customer was forfeited without their knowledge. I propose should a primary actor change their focus or goal, they must inform the network and either modify or rebuild said network in order to achieve their new goal.

Conclusion

Based on the evidence, we can conclude that Norfolk Southern's overall business practices are unethical and jeopardized their network for profit. Their lack of routine maintenance for essential safety items to cut costs as well as excessive expenditures on stock buybacks show the executives extreme profit motive. The hot box detectors are vital pieces of accident prevention equipment, and stock buybacks serve no purpose other than corporate wealth inflation. Regarding details of the specific accident, they improperly handled the material clean up which lead to the jeopardization of the future of the local land. The exposure of multiple ecosystems and thousands of people through just the leak is magnified by their decision to burn the chemicals. Even after this misstep, they offered a measly sum one million dollars as

compensation, inconsequential to the $4 billion they spent on stock buybacks in 2022 alone (Albrecht, 2023). The neglect of safety equipment maintenance, excessive corporate greed, and their lack of remorse for a catastrophic and preventable derailment have contributed to the network deterioration as well as exhibiting the unethical behavior of the Norfolk Southern corporation. This specific case, while concentrated on a singular train derailment, does an exceptional job at showing how corporate greed has negatively affected a multitude of communities. From this we can learn that we must treat all high impact disasters with the upmost care and treat their perpetrators with the greatest scrutiny to protect our communities.

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