Utilizing Actor Network Theory as a Lens to Analyze the New Orleans Levee System Failure During Hurricane Katrina

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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

In 1965, Hurricane Betsy hit New Orleans, Louisiana, and caused major damage to the city, leading former President Lyndon Johnson to assign the U.S Army Corps of Engineers to construct a revamped flood protection system to prevent further widespread flooding in the area (Mike Scott, 2017). However nearly 40 years later, Hurricane Katrina, a Category 4 Hurricane, made landfall near New Orleans again. Although the city was able to miss a direct hit by the hurricane, the New Orleans levee system holding back Lake Pontchartrain and Lake Borgne was overwhelmed and eventually breached due to a near 10 inch rise in water levels due to the incessant rain caused by the storm. By August 30th, the following day, the city was 80% underwater. Although an evacuation for the city was in place, an estimated 100,000 remained, anticipating no consequences from the storm's effects (Hurricane Science). The failure of the New Orleans levee system led to one of the most devastating weather related disasters in American history: an estimated 1,392 people died in New Orleans, and there was more than $160 billion in damage (The Editors of Encyclopedia Britannica, 2023). In the aftermath of the disaster, the U.S Army Corps of Engineers came out with a report claiming responsibility in the faulty engineering designs of levees; however, no other agency came out publicly with them and took blame for their role in Hurricane Katrina. By acknowledging all the actors involved in the levee system failure, a new perspective could be offered into the ethical wrongdoings of agencies and the blame could be holistically placed rather than falsely symbolizing a single entity as a "scapegoat" . In this paper I am going to use Actor Network Theory (ANT), an ethical framework which states societal problems are a network of heterogeneous elements, both animate and inanimate, to analyze all the actors, human and non-human, in the New Orleans levee system failure during Hurricane Katrina, and show how their decision making and lack of

cooperation all played a role in the development of a failed network that resulted in the disastrous outcome that took place. To do so, I will use numerous research papers regarding both the human actors, such as the government branches, engineers and agencies involved, and the non human actors, such as the natural factors that led to engineering failures, to further develop my argument of ANT as a valid lens to analyze the New Orleans levee system failure.

Literature Review

In the aftermath of Hurricane Katrina, several scholars have tried to take the details of the disaster and analyze which groups played a role in the systematic failure of the levee system, primarily placing the blame on individual groups that made mistakes leading up to the event. However, these scholars fail to account for the interrelationships between the groups they identify, and how the pressures on each group compounded on the other.

In *Overview of New Orleans Levee Failures: Lessons Learned and Their Impact on National Levee Design and Assessment*, the authors provide a thorough and highly technical breakdown of the engineering failures that led to the breakage of the levee system in place, analyzing what decisions led to the erosion of the physical structure. Specifically, they focus on the design flaw of the Hurricane Protection System (HPS) itself put in place for Katrina, stating that the engineering decisions were primarily made using a traditional component performance based approach, which addresses uncertain situations by providing general safety rules that don't apply to extreme situations (G.L. Sills, N.D.Vroman, R.E. Wahl, P.E. Schwanz 2008). Rather, the authors suggest a risk based approach to processes and documentation, which would allow for big actors with decision making power to have visibility into the vulnerabilities of the system and make it easier to identify what problems to fix in a prioritized order.

In *Hurricane Katrina as a Predictable Surprise*, Irons argues that the events that led to the damage of Hurricane Karina were predictable, and that negligence on the part of the US Corps Army of Engineers to account for the worst possible scenario resulted in the nightmare that occurred. He states that the approach used before and in the aftermath of Katrina were "surprise conducive" due to their financially and politically constrained designs, and that a "surprise avoidance" approach should be put in place instead to make more rational decisions, rather than making limited rational decisions (Lary Irons, 2005).

In both articles, the engineering approach used by the US Army Corps of Engineers was challenged, stating that an alternative decision making mindset would have led to a reduction in negligence. Specifically, the alternative approach focuses on taking into account the emergency scenario, implying that the actors responsible for the security of the levee system ignored the possibility of the worst possible outcome occurring in order to give the perception of a complete, working solution. However, these scholars fail to take into account the connection between the engineering actors and the non engineering actors, instead analyzing them separately. Throughout the rest of this paper, I will further prove the scholar's main points by connecting the actors they mention in their work and analyzing how these relationships all played a part in the failed network that caused the extensive damages of New Orleans.

Conceptual Framework

I will frame my analysis of the structural failures of the New Orleans levee system on the conceptual framework of ANT, which allows me to break down a complex problem into its numerous components. ANT is defined by Callon, the French sociology professor who came up with this framework, as something that is not reducible to either an actor or network individually;

rather a network is made up of heterogeneous elements, both animate and inanimate, that are linked to each other for a period of time (Michel Callon, 1987). Callon also came up with the concept of translation, the process of actually forming and maintaining an actor network, and says that translation can be broken down into 5 different phases: problematization, interessement, enrollment, mobilization and black-box. For problematization, the network builders, or primary actors, define a problem and find actors to solve it, defining the roles of the actors and how they'll work together in order to achieve a reasonable solution. Interessement is the attempt made by primary actors to recruit other actors and align on the primary actor's interests. In enrolment, the primary actors assign roles to other actors and the actors, in turn, accept their roles. Mobilization refers to when the primary actors secure their role in being the broker between all other actors, and are in charge of mobilizing actors for action. Finally, black-box is when the primary actors are successful in getting actors on board, making the network extremely stable in its functionality (Callon, 1987).

In order to apply ANT to the New Orleans levee system failure, I will begin by first trying to identify the primary actor that was responsible for the levee system reconstruction following the events of Hurricane Betsy. Then, I will identify the actors that the primary actor assigned within the network and analyze which phases of translation were failed by the primary actor in that case. In terms of actors, I will look into both human and non-human actors, specifically the environment upon which the levee system was built upon. By delving into the small mistakes between individual actors and the primary actor, I will use the ANT framework to explain the compounding effect that led to such a massive, systematic failure, enabling me to support my claim.

Analysis

Identifying Primary Actor

In order to deconstruct the network and identify where the actors went wrong, it's important to first identify the primary actor in the network, otherwise known as the "network builder". According to the principles of translation as mentioned above, the primary actor is responsible for choosing other actors and assigning them the appropriate roles to solve the problem at hand. As mentioned earlier in the introduction, the government assigned the U.S Army Corps of Engineers to reconstruct the New Orleans levee system in order to avoid further damage similar to that of Hurricane Betsy. To provide a little background, the U.S Army Corps of Engineers is an engineering division of the military that has both military and domestic projects. Domestically, the Corps of Engineers focus primarily on civil works projects, including the construction and maintenance of flood protection systems, hence why the levee system redesigning project fell into their hands (U.S Army Corps of Engineers).

With this background information, we can now identify two primary actors: the government and the Corps of Engineers. The government appointed the Corps of Engineers to the engineering project, thus they chose an actor and has the ability to constrain or bolster them into accomplishing their goals, thus qualifying as a network builder. The Corps of Engineers are also a primary actor since they were given the authority by the government to appoint and assign actors in order to come up with their solution, thus also making them capable of constructing a network. Equipped with the knowledge of who the primary actors are, it will now be easier to discern how they failed in the stages of translation with certain actors they interacted with and how this led to an eventual network failure.

The Non Human Actors

One of the primary reasons why the levee system failed was the engineer's incapabilities to understand the non-human actors that influenced the network they were trying to resolve. New Orleans has always been susceptible to floods due to hurricanes due to its unique geographical location. The city is centrally composed of several water bodies, surrounded by Lake Pontchartrain and Lake Borgne with the Mississippi River running in the middle of the metropolitan area. Over time as humans occupied the land in New Orleans, they decided to expand by draining the swamplands around the area, making the city even lower than it was before. These decisions have led to present day New Orleans being, on average, 6 feet below sea level. Surrounded by water bodies and being under sea level, the city of New Orleans is referred to as having the “bowl effect”, meaning that if water enters the city, it will collect adequately and make it nearly impossible to drain, making a flooding and hurricane protection system absolutely vital (Below, Dierch, Erickson, Kjos).

Although there were previous iterations of a hurricane protection system (HPS), they were inadequate in defending the city from strong hurricanes. To scope and scale a more viable solution compared to historical versions, the Corps of Engineers decided to design their system against a “standard project hurricane”, which would only occur every 200-300 years. In consultation with the Weather Bureau, they created criteria for a simulated, natural hurricane in Louisiana by compiling historical data and storm characteristics. The Corps of Engineers said this standard project hurricane model was equivalent to a “moderate” Category 3 hurricane, however, most of the statistics say otherwise, stating that the standard project hurricane was a mix of multiple category level hurricanes and their individual statistics, making it an inaccurate representation. However, the Corps of Engineers went ahead with this model and used it to develop the levees around Lake Pontchartrain, despite the faults in the metrics they used to

project a standard hurricane. In fact, numerous independent parties claimed that the system built would not protect the city against possible Category 4 or 5 hurricanes, prompting the Corps of Engineers to initiate a study into modifications. Unfortunately the results of these studies were never published, and most likely never conducted, leading to no improvements upon the system. By improperly modeling the standard hurricane, engineers failed in the problematization aspect of translation by misrepresenting the effect of a hurricane on their system. In addition, once their assumptions of the hurricane actor were questioned, engineers failed to follow up and investigate, which could have led to the proper modifications being made (Sills, Vroman., Wahl, Schwanz, 2008). Thus, engineers failed to show accountability for their interpretations of other actors, making their assumptions rigid and thus making their small mistake in modeling permanent until Hurricane Katrina hit.

In addition to underestimating the effect of the hurricane as an actor, engineers made grave mistakes in the actual design of the levees by not taking into account the variability of other actors into their decision making. In the aftermath of Hurricane Katrina, numerous independent study groups were sent to analyze and determine what exactly led to the levee system failure during the event. One of the groups, the American Society of Civil Engineers (ASCE), interestingly found out that some of the breaches were not due to overtopping, the water going over the levee's height, which was thought to be the initial reason for levee failures. In a Senate hearing, Professor Nicholson, a member of the ASCE, states that a storm surge that originated in Lake Pontchartrain was actually below levee elevation; rather the levels were well below the top height of the floodwalls. Despite this, the levees still managed to get breached, revealing a major flaw in the design of the levees that were only meant to be breached by overtopping. After further research, Professor Nicholson said that the breach could be attributed

to soil failures within the foundation of the levees, with seepage and eroding piping being evident (Nicholson, 2005). Similar to the hurricane modeling error, engineers clearly showed a lack of understanding of other natural factors when constructing, such as the soil upon which they were building. By failing to understand and scope out all of the actors at play, the Corps of Engineers failed to effectively define and solve their problem, showcasing a lack of thorough research and problematization. This consistent oversight by the Corps of Engineers regarding non-human actors displays a true lack of leadership when trying to build a network, and can explain why these small inconsiderations led to the huge failures that affected so many lives.

As mentioned, one of the biggest catalysts of the aftermath of Hurricane Katrina was the negligence of the Corps of Engineers to account for and correctly size non-human actors, such as the modeling used for hurricanes and the foundational soil upon which the levees were built. Some might argue, however, that from the point of when the Corps of Engineers started development, there were a lot of technological changes that occurred and redoing the whole construction process would take valuable time and money, resources the Corps of Engineers didn't really have. In fact, when coming up with the hurricane model, the standard Saffir-Simpson Hurricane Scale didn't even exist, making it hard to correctly categorize the different types of hurricanes. However, this viewpoint falls short because it fails to take into account the numerous warnings given to the Corps of Engineers about the network they were building. In a study conducted by the National Science Foundation (NSF) for hurricane protection systems, it was stated that a variety of factors play into the true strength of a hurricane, not just the ones used in the standard hurricane model. Additionally, the Corps of Engineers themselves stated that breaches would depend on the storm's multiple variables, such as its speed, the track the eye of the hurricane follows, and its intensity (Sills, Vroman., Wahl,

Schwanz, 2008). By acknowledging that their model was not comprehensive and being given warnings by independent third parties, the Corps of Engineers were aware of the issue at hand with the systems they had in place. Unfortunately, instead of choosing to fix the underlying issues that could cause faults in the technical system, they chose to ignore them and continue on with construction, contradicting the alternative viewpoint of technology and scientific understanding accelerating since the inception of the Corps of Engineer's project.

The Human Actors

In addition to the Corps of Engineer's lack of ability to scope non human actors, several other human actors constrained the Corps of Engineers, affecting their decision making and causing them to make oversights in order to attempt to build an effective network. The Corps of Engineers responsibility in the levee project for New Orleans was to construct, design and build the structures. After the completion of a levee construction project, the Corps of Engineers were mandated to turn over the project to a local sponsor, and after turning over a project were unable to spend further federal budget on the project. In order to be a local sponsor, groups had to sign a contract agreeing to claim responsibility for the operation, maintenance, repair and rehabilitation of the levees after the construction of the initial project, representing a full hand over of the project from the Corps of Engineers to the local sponsors. However, the local sponsors failed massively to coordinate together to create a functional system, especially when multiple authorities oversaw the joining of two different levee systems. The Corps of Engineers noted in a report that "at sections where infrastructure elements were designed and maintained by multiple authorities, and their multiple protection elements came together, the weakest (or lowest) segment or element controlled the overall performance". Additionally in a report by Raymond Seed, a scientist working on a study of the HPS, claimed that no one was in charge, and even

though the Corps of Engineers would request additional features after the initial construction, they would not be completed due to differing sponsors having different priorities (U.S. Government Publishing Office, 2005). In this way, the Corps of Engineers were unable to reach enrollment, or the ability to get all actors in alignment with a shared interest or goal, and couldn't influence actors they assigned to certain roles to fulfill their responsibilities. This adds a layer of complexity to the overall network, showing how the Corps of Engineers were restrained in their ability to get goals accomplished due to lack of cooperation from other actors, revealing a new flaw in a different stage of translation.

In addition to being undermined by local sponsors, the Corps of Engineers suffered from popular financial budget issues that got them handcuffed at several junctures of the project. Around 2001, a plan was devised by the Corps of Engineers to divert sediment from the Mississippi River back into the delta rather than the levee system, which was estimated to have cost around 2 to 3 billion dollars. If completed, this project would have possibly been able to prevent the damage observed from Hurricane Katrina, stopping some of the overflow into the city. The Corps relied upon the State of Louisiana to cover their portion of the budget required, since states provided matching grants for federal dollars which typically funded these large scale restoration projects. However, Louisiana was able to cover 15 to 25 cents to the dollar, making it nearly impossible for the Corps to raise the amount of money necessary to complete the project (Irons, 2005). The Corps abandoned the project, showcasing a failure of the government to provide the Corps with the necessary resources to complete their project. In an earlier section, the government was indicated as the main primary actor that assigned the Corps of Engineers to the project of reconstructing the New Orleans levee system. The government failed in their role as a primary actor by not enabling the Corps of Engineers, often giving them the metaphorical

short end of the stick and asking them to solve a problem with limited resources. By not giving the Corps of Engineers the necessary resources to accomplish their goal, the government failed the mobilization stage of translation, resulting in another stage of translation being corrupted and thus explaining the failed network built to solve the levee reconstruction problem.

Conclusion

Although many are quick to blame the U.S Army Corps of Engineers for the aftermath of Hurricane Katrina, the analysis done above provides evidence that the failure of the New Orleans levee system boiled down to a lack of translation into building an effective network. By utilizing ANT to analyze the actors and their roles within the network, it became evident that the Corps of Engineers failed in problematization of the non-human actors, or correctly scoping their importance to the network being constructed. Additionally, it became clear that the government failed as a primary actor in mobilizing the Corps of Engineers, and the local sponsors to which the Corps of Engineers passed responsibility didn't align their interests into the common goal of protecting the city of New Orleans, failing the enrollment stage of translation. By having three overlapping stages of translation fail, the network crumbled and failed to accomplish its goal, resulting in the disastrous effects of Hurricane Katrina. The significance of this research is that it diverts the blame of the disaster on one sole entity; rather focusing on the numerous factors that led to the outcome that happened. By using a holistic approach to view the Hurricane Katrina incident, it offers a spotlight on the reasons why certain actors failed in their roles, allowing for a

more just way to assign accountability and provide a blueprint for accident avoidance when pursuing large scale engineering projects.

Word Count: 3438

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