Unraveling the Titanic Disaster: An Actor-Network Theory Perspective

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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.

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Introduction

On April 10, 1912, the RMS Titanic set sail on its maiden voyage from Southampton to New York with 2,240 passengers and crew on board (National Oceanic and Atmospheric Administration, 2024). Five days later, the Titanic collided with an iceberg. In less than three hours, the Titanic broke apart and sank to the bottom of the Atlantic Ocean, taking with it the lives of more than 1,500 passengers and crew (National Oceanic and Atmospheric Administration, 2024). In the aftermath of the disaster, people around the world sought answers, leading to multiple investigations aimed at uncovering the reasons behind the Titanic’s sinking and the failures that contributed to the immense loss of life. While many scholarly analyses attribute the disaster to a single factor, such as the Titanic's design flaws (Bassett, 1998), others consider multiple contributing factors, including weather conditions and corporate rivalries (Dieckmann, 2020). Such analyses though downplay the influence of other critical elements in the tragedy. By continuing to view the Titanic’s sinking through a narrow lens, readers overlook the complex web of human and non-human interactions that shaped the disaster. I argue that the sinking of the Titanic resulted from the complex interplay of human and non-human factors, each influencing and reinforcing one another in a chain of cause and effect. Human elements, such as Joseph Ismay, Jack Phillips, and the ship's designers, interacted with non-human factors like the iceberg and the Titanic's structural design, all contributing to the disaster. My analysis draws on actor network theory (ANT), developed by STS scholars like Michel Callon, Bruno Latour, and John Law, which examines how both human and non-human actors form networks that shape social and technological outcomes. To support my analysis, I will analyze official government documents and peer-reviewed academic publications pertaining to the disaster.

Literature Review

Despite extensive research on the Titanic's 1912 sinking, most scholars analyze individual causes rather than how multiple factors collectively contributed. Vicki Bassett examines material failures and design flaws, explaining that the ship's hull steel experienced brittle fracture due to low temperatures, high impact forces, and high sulfur content (Bassett, 1998). Additionally, iron rivets securing the hull plates failed from brittle fracture caused by the iceberg collision and freezing water (Bassett, 1998). Design flaws in the watertight compartments also allowed water to flood adjacent sections, pulling the Titanic below the waterline (Bassett, 1998). While valid, Bassett's analysis implies design was the sole cause, overlooking other contributing factors.

Caitlynn Dieckmann offers a broader analysis, arguing the shipwreck resulted not just from design flaws but also from White Star Line's competition with a rival and unusually calm conditions that hindered iceberg detection. Competing with the Cunard Line, White Star sought to appear more luxurious and faster. The Titanic was designed to complete "a faster transatlantic crossing than any Cunard Line ship" and thus sailed at full speed despite iceberg warnings (Dieckmann, 2020). This left little margin for lookouts to react. Furthermore, an optical illusion from unusual atmospheric conditions created a false horizon, concealing the iceberg and obscuring the Titanic from nearby ships that could have assisted (Dieckmann, 2020). However, Dieckmann's analysis also has limitations, as it focuses only on select factors.

In summary, existing scholarships do not fully explain the Titanic's failure. Some analyses attempt to address this but fail to consider all contributing factors. This paper aims to fill these gaps by offering a comprehensive analysis of the various factors that collectively led to the disaster.

Conceptual Framework

My analysis of the Titanic's sinking draws on actor network theory (ANT), as developed by STS scholars like Michel Callon, Bruno Latour, and John Law. This framework helps me examine how human and non-human factors interacted and influenced one another in the events leading to the disaster. Actor network theory posits that technical projects can be understood as networks of both human and non-human actors brought together by a network builder to achieve a specific goal. A network is a system of interrelated actors associated together for a common purpose. A network builder is a person or group who formed the network to accomplish a goal. An actor is a human or non-human entity that plays a role in shaping a network. A central idea in ANT is that the strength and success of the network depend on the interactions and relationships among these actors (Cressman, 2009). If a rogue actor refuses to fulfill the role assigned by the network builder, the entire network becomes fragile and unstable. This occurs because ANT treats all actors as having agency, meaning they actively influence and are influenced by other actors within the network.

Drawing on actor network theory, in the analysis that follows I examine the key human and non-human actors involved in the Titanic's sinking and how they were interconnected. First, I identify the human actors in the Titanic’s network and explain their connection to the non-human actors that led to the disaster. Then, I explore the non-human actors and explain their connection to the human actors that led to the disaster. This analysis will focus on the interplay between the human and non-human actors and how this interconnection caused a chain of events that led to the sinking of the Titanic.

Background

The Titanic, developed between 1909 and 1912, was a complex socio-technical system shaped by a variety of human and non-human actors. The network builder, White Star Line, orchestrated the construction and operation of the Titanic, bringing together various actors to create a luxurious and unsinkable ship. Human actors such as Joseph Ismay played a significant role in shaping the Titanic's objectives, emphasizing luxury and size to compete with rival companies like Cunard. The British Board of Trade established the safety regulations that influenced the ship's design and operational decisions. The ship designers were responsible for physically constructing Ismay's vision of the Titanic while ensuring compliance with the regulations set by the British Board of Trade.

The crew of the Titanic was responsible for operating the ship, ensuring passenger safety, and responding to emergencies (Library of Virginia, n.d.). Within the crew, Captain Edward Smith and his officers navigated the ship, made operational decisions, and oversaw communications. The engineers maintained the ship's engines, boilers, and other mechanical systems, ensuring smooth operation and power supply. The wireless operators handled ship-to-shore communications, including sending and receiving iceberg warnings and distress signals. Finally, lookouts were responsible for spotting hazards like icebergs, while the deck crew managed lifeboats and emergency procedures.

Non-human actors also played a crucial role in shaping the Titanic's operation and fate. The rivets and steel materials used in the ship's construction were responsible for withstanding the harsh conditions the Titanic was expected to endure. The Titanic itself served as the apparatus for executing the objectives of Joseph Ismay and the White Star Line. Within the ship, the watertight compartments were designed to prevent sinking, as intended by the ship designers, while lifeboats were critical for emergency evacuations. The Marconi wireless system, operated by the wireless crew, enabled ship-to-shore communication. External factors also influenced the ship’s fate. Weather and ocean conditions affected the lookouts’ ability to spot hazards, and ultimately, the iceberg’s collision with the Titanic was the direct cause of the disaster.

Analysis I: Human Actors

Joseph Ismay as a Human Actor

The sinking of the Titanic was caused by the complex interplay of human and non-human factors, with Joseph Ismay acting as a rogue actor within the network. Ismay was a British businessman and the chairman of the White Star Line, the company that owned the Titanic. As a passenger aboard the Titanic, he survived the disaster. In the aftermath, the British Wreck Commissioner's Inquiry investigated the cause of the sinking and sought to determine accountability. The inquiry examined the decisions made by key individuals aboard. During his testimony, Ismay was questioned about an ice warning message he received from Captain Smith. The following exchange took place between the Attorney General and Ismay (Wreck Commissioners' Court, 1912):

> Attorney-General: Now I think we understand what you mean when you say you were travelling as a passenger. Now on this day, on the 14th, did you get information from the Captain of ice reports?
>
> Ismay: The Captain handed me a Marconi message which he had received from the “Baltic” on the Sunday.
>
> Attorney-General: He handed you the actual message as it was delivered to him from the “Baltic”?
>
> Ismay: Yes.

The Marconi contained the following message:

> "Titanic": "Have had moderate, variable winds and clear, fine weather since leaving. Greek steamer 'Athenai' reports passing icebergs and large quantity of field ice today in latitude 41.51 N., longitude 49.52 W."

Further questioning clarified the circumstances surrounding Ismay's handling of the message:

> Attorney-General: And, as I understand you, you took it from him and read it?
>
> Ismay: Yes.
>
> Attorney-General: Did you attribute any importance at all to the ice report?
>
> Ismay: I did not; no special importance at all.
>
> Attorney-General: It conveyed to you at any rate that you were approaching within the region of ice, did it not?
>
> Ismay: Yes, certainly.

First, note that Ismay confirms that the captain of the Titanic handed him a telegram that contained ice warnings from other ships and he personally reads it. This establishes that Ismay had prior knowledge of ice hazards along the Titanic's path before the collision. His acknowledgment that the ship was "approaching within the region of ice" further supports this conclusion. Second, it is important to highlight that Ismay treated the message without any "special importance" or concern. So, despite being aware of the ice warnings, he did not take any apparent action to ensure the message influenced navigational decisions. Because Ismay did not reinforce the importance of ice warnings, the Titanic continued its course at high speed, despite the environmental risks posed by icebergs. Additionally, the decision to maintain speed meant the crew had less time to react when the iceberg was finally spotted. Lastly, the decision to maintain speed increased the force of impact when the Titanic struck the iceberg, amplifying the damage to the Titanic’s structure. Therefore, Joseph Ismay weakened the Titanic’s network by failing to translate critical warnings into action, which allowed non-human actors, such as the iceberg and the ship’s structural design, to exert greater influence over the system. His role in the network was not isolated but rather interconnected with other actors, ultimately contributing to the breakdown that led to the Titanic’s sinking.

Jack Phillips as a Human Actor

Another rogue actor was Jack Phillips. Phillips was an employee of the Marconi Wireless Telegraph Company and primarily handled commercial and passenger telegrams. Throughout the voyage, the Titanic received multiple ice warnings from nearby ships, including the SS Californian, a British vessel sailing in the vicinity on the night of the disaster. Cyril Evans, the wireless operator aboard the Californian, overheard the Titanic's transmissions and attempted to warn them about dangerous ice fields ahead. However, Phillips was preoccupied with transmitting passenger messages and dismissed the warning, as evidenced in the following exchange from the British Wreck Commissioner's Inquiry (Wreck Commissioners' Court, 1912):

> Solicitor-General: What did the Captain say when you said that?
>
> Evans: He said, “You had better advise the ‘Titanic’ we are stopped and surrounded by ice.”
>
> Solicitor-General: Did you call up the “Titanic”?
>
> Evans: Yes.
>
> Solicitor-General: What did you say?
>
> Evans: I said, “We are stopped and surrounded by ice.”
>
> Solicitor-General: Did you get an answer from the “Titanic”?
>
> Evans: They said, “Keep out.”

Solicitor-General: Just explain to us, will you, what that means?

Evans: Well, Sir, he was working to Cape Race at the time. Cape Race was sending messages to him, and when I started to send he could not hear what Cape Race was sending.

Solicitor-General: Does that mean that you would send louder than Cape Race to him?

Evans: Yes; and he did not want me to interfere.

Solicitor-General: That would interrupt his conversation with Cape Race?

Evans: Yes.

Solicitor-General: So that he asked you to "keep out"?

Evans: Yes.

First, note that this exchange confirms that Evans tried to warn the Titanic about the ice field, explicitly stating that his ship was "stopped and surrounded by ice." This demonstrates that the Titanic had the opportunity to receive and acknowledge the warning before the collision. Second, it is crucial to acknowledge that Phillips was focused on transmitting passenger messages to Cape Race at the time and treated Evans' message as an interruption rather than a critical alert, even going so far as to tell Evans to "keep out". The fact that Evans had to "send louder" than Cape Race to get the warning through further emphasizes that Phillips was prioritizing non-urgent communication over crucial navigational information. Because the ice warning was ignored by the operator, the Titanic continued its course at high speed, reinforcing the influence of the iceberg. Because the Titanic did not slow down or change course, the iceberg, initially just another environmental factor, became a dominant actor in the network, one that had the power to dictate the fate of the ship. As a result, the structural integrity of the ship failed more severely than expected during impact. Therefore, Phillip's decision to prioritize passenger messages over ice warnings destabilized the Titanic's actor-network by disrupting information flow, which led to a failure in human decision-making. This, in turn, amplified the agency of non-human actors such as the iceberg and the ship's materials, contributing to the catastrophic failure of the entire system.

Ship Designers as a Human Actor

Lastly, the ship designers of the Titanic were also rogue actors. They were primarily naval architects from the British shipbuilding firm Harland & Wolff. They implemented the structural features of the Titanic, mainly the watertight bulkheads and the outer shell steel plating. Specifically, the Titanic had "15 transverse watertight bulkheads, by which the ship was divided in the direction of her length into 16 separate compartments" (Wreck Commissioners' Court, 1912). The watertightness of the bulkheads extended only to certain levels of the ship, with the forward bulkheads reaching a certain height and the others only extending up to the lower decks (Wreck Commissioners' Court, 1912). The intent behind this design was to limit flooding to a single compartment in the event of a hull breach. The steel plating formed the hull of the ship, providing structural integrity and shaping the Titanic's overall form up to the top decks (Wreck Commissioners' Court, 1912). The steel plating was composed of large, riveted plates that formed the hull, providing structural integrity and shaping the Titanic's overall form. The plating consisted of large, riveted plates that were designed to withstand the stresses of transatlantic travel (Wreck Commissioners' Court, 1912). First, note that because the watertightness of the bulkheads extended only to certain levels of the ship, the bulkheads were not guaranteed to keep water within the same compartment if water levels rose above the height of the bulkheads. As a result, when the Titanic struck the iceberg, flooding exceeded the bulkheads' height, allowing water to cascade into multiple compartments and ultimately contributing to the ship’s sinking. Second, upon impact with the iceberg, the steel plating suffered a brittle fracture due to cold temperatures. As a result, the hull's integrity was compromised almost instantly upon collision, allowing rapid flooding into the ship’s compartments. Because the ship designers limited the bulkheads' height to specific levels, the rising water was not contained when the iceberg breached multiple compartments. Instead, it cascaded over the bulkhead tops, turning a localized breach into a progressive structural failure. Additionally, the designers’ choice of steel for sea operations contributed to the disaster. Upon impact with the iceberg, the steel fractured rather than bending, creating large openings that allowed rapid water to ingress. As a result, the ship designers introduced structural vulnerabilities that turned stabilizing features into failure points. Their decisions reconfigured the relationships within the network, ensuring that when the iceberg entered the system, catastrophic failure became more likely.

I have shown that Joseph Ismay, Jack Phillips, and the ship designers all took roles in the Titanic’s network that were not isolated but rather interconnected with other human and non-human actors. However, some might argue that the iceberg alone was responsible for the sinking, pointing to claims that “if this ship had hit the iceberg stern on, in all human probability she would have been here to-day [the stern being the most reinforced part of the ship]” (Gavin & Zarr, 2012). Yet it should be noted that the Titanic’s “entire passage had been made at high speed, though not at the ship's maximum, and this speed was never reduced until the collision was unavoidable” (Wreck Commissioners' Court, 1912). This means that human decisions within the network, such as maintaining high speed despite iceberg warnings, amplified the risk and reduced the ability to avoid disaster. While the iceberg itself may have been an external factor, the ship’s speed, combined with limited bulkhead height and brittle steel plating, made catastrophic failure more likely. The network's vulnerabilities were not just the result of natural forces but were actively shaped by the choices of key actors, reinforcing the idea that the disaster was not inevitable, but rather the product of interconnected decisions and material weaknesses.

Analysis II: Non-Human Actors

The Iceberg as a Non-human Actor

The sinking of the Titanic was driven by the complex interplay of non-human and human factors, including the iceberg and the ship's structural design, all of which interacted with human actors to shape the disaster. For instance, the iceberg acted as the rogue actor that directly challenged the Titanic's trajectory. The British Wreck Commissioner's Inquiry details the events leading up to the collision with the iceberg (Wreck Commissioners' Court, 1912):

> The ship appears to have run on, on the same course, until, at a little before 11.40, one of the look-outs in the crow's nest struck three blows on the gong, which was the accepted warning for something ahead, following this immediately afterwards by a telephone message to the bridge "Iceberg right ahead." Almost simultaneously with the three gong signal Mr. Murdoch, the officer of the watch, gave the order "Hard-a-starboard," and immediately telegraphed down to the engine room "Stop. Full speed astern." The helm was already "hard over," and the ship's head had fallen off about two points to port, when she collided with an iceberg well forward on her starboard side.

First, note that the lookout identifies the iceberg ahead and warns the rest of the crew of the incoming obstacle. This shows that the iceberg was in fact directly challenging the Titanic's travel path. This warning, though issued, relied on the human actors to respond effectively, but due to the high speed of the ship, the response was insufficient. Second, the ship crew attempts to steer the Titanic away from the iceberg. The crew hears orders such as "hard-a-starboard" to turn the ship to the left and “full speed astern” to reverse the ship at maximum speed. However, these commands were constrained by the Titanic’s large inertia and slow turning ability (Halpern, n.d.). The ship could not react quickly enough, demonstrating how the physical properties of the ship failed to counteract the iceberg’s influence. Third, it is important to highlight that even after attempts were made to steer the Titanic away from the iceberg, it was too late to avoid the collision and the Titanic “collided with an iceberg well forward on her starboard side”. Upon impact, the iceberg punctured the steel hull, flooding five compartments and exposing a critical design flaw. The Titanic was designed to stay afloat with up to four breached compartments, but it could not remain buoyant once water filled a fifth compartment (Eaton & Haas, 1987). While the iceberg initially appeared to be just another passive non-human factor, it ultimately reconfigured the Titanic’s network by exposing human errors and revealing technical weaknesses. The iceberg’s introduction into the system amplified the vulnerabilities of the Titanic’s network, proving that no single factor alone caused the disaster.

Structural Design as a Non-Human Actor

Additionally, the Titanic’s structural design played as a rogue actor in determining the extent of the disaster. While the ship was engineered with advanced safety features, including watertight bulkheads and a steel hull, the collision with the iceberg exposed critical design flaws. As mentioned before by the British Wreck Commissioner's Inquiry, the Titanic had multiple watertight bulkheads, divided into 16 compartments. The watertightness of the bulkheads extended only to certain levels of the ship. Additionally, following the sinking of the Titanic, the U.S. National Institute of Standards and Technology conducted metallurgical and mechanical analyses on steel and rivet samples recovered from the wreck of the Titanic. They found that “the measured fracture toughness of the steel from the hull of Titanic [was] unacceptably low for use as a structural material at ice water temperatures" and that "the low toughness was likely due to a complex combination of factors, including low Mn content, a low Mn/C ratio, a large ferrite grain size and large and coarse pearlite colonies" (Foecke, 2010). First, note that the watertightness of the bulkheads extended only to certain levels of the ship. So, the bulkheads were not guaranteed to keep water within the same compartment if water levels rose above the height of the bulkheads. Second, the references to the low fracture toughness of the steel indicate that the material properties of the Titanic's hull played a critical role in the rapid deterioration of the ship's structure upon impact. Because the steel contained a low Mn/C ratio and large ferrite grain size, it exhibited brittle fracture behavior at freezing temperatures, meaning that instead of bending or denting when striking the iceberg, the hull plates cracked. As a result, when the Titanic struck the iceberg, its brittle steel hull fractured upon impact, causing rapid flooding. As water poured in, it quickly rose above the bulkheads' height, spilling into adjacent compartments and ultimately leading to the ship's sinking. These design flaws, curated by the ship designers, disrupted the stability of the Titanic's network, where the failure of non-human actors created cascading effects that ultimately contributed to the failure of the entire network.

Conclusion

In conclusion, the sinking of the Titanic resulted from a network of interconnected human and non-human factors. Joseph Ismay's disregard for ice warnings, Jack Phillip's negligence, and the ship designers' structural choices weakened the Titanic's network by shifting influence toward non-human actors. As human decisions amplified the impact of both the iceberg and the Titanic's structural limitations, these non-human factors played an increasingly dominant role in the disaster. When viewed this way, the tragedy reveals the complex web of interactions between human choices, technological constraints, and environmental forces, demonstrating how failures emerge not from a single actor but from the interplay of multiple interconnected actors. Therefore, the importance of a systems thinking approach in professional engineering practice is crucial. Decision making must account for the interactions between human, technological, and environmental factors to prevent similar large-scale failures in the future.

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