

**Thesis Project Portfolio**

**Mitigating Incivility on Social Media Platforms: A Proposed Framework for Online Discussions**

(Technical Report)

**In an Ocean of Light: American Reactions to the Trinity Test and the Bombings of Hiroshima and Nagasaki**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science  
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree  
Bachelor of Science, School of Engineering

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Department of Computer Science

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## **Sociotechnical Synthesis**

The focus of my capstone was on developing a social media framework for mitigating online incivility, whereas the focus of my STS research was on explaining the public reception of the atomic bomb. The two works are rather dissimilar; however, they do share a concern for how individuals' perception of a given technology affects how they interact with it. In my capstone, this concern surfaced late in the project when I realized that how users perceived my framework would impact the success of any social media platforms developed using my methodologies. Due to time constraints, I was unable to fully explore this issue, which is why I took it up in my STS research via a study of a controversial piece of technology: the atomic bomb.

To give some more background, the focus of my capstone was the development of a framework consisting of three major components: (1) a user reporting system, (2) an incivility detection module, and (3) a democratic distributed moderator hierarchy. The purpose of the reporting system was to identify and fine uncivil parties to dissuade such individuals from disrespectful behavior. The incivility detection module I included in my design to avoid the formation of echo chambers and biased moderator selection. The last element of my design was aimed at democratizing the role of moderatorships as well as restricting their power. At the time, I thought that each of these elements had the potential to greatly mitigate online incivility; however, perhaps a bit too late, I realized that public perception towards my framework would be crucial to its adoption. After all, most users I realized would probably be uncomfortable with the idea of fining disrespectful online behavior. They would have to be convinced of the idea.

While I was unable to explore this part of my project further in my report, I did get a chance to revisit it in my STS work. There I focused on analyzing the American public's response to the atomic strikes conducted on Hiroshima and Nagasaki in 1945. Since the goal of

my research was to deepen my understanding of public responses to technology, I ended up using Martijntje Smits' monster theory to frame my analysis so that I could study the ways in which individuals' reactions to a given technology are shaped by their expectations of what that technology should be like given the cultural categories it seems to inhabit. In applying this mode of analysis, I came to the conclusion that the polarized response to the atomic bomb was, in part, due to the technology's unique fusion of the cultural categories of "culture" and "nature."

Through this conclusion, I was able to finally see the core issue with my design: a violation of the concepts of authoritarianism and democracy. To elaborate, the structures employed in my design function towards promoting free speech and democracy. At the same time, though, these heavy policing and fining mechanisms lend a rather authoritarian or controlling feeling to the framework, one which stands in opposition to the design's intended purpose of facilitating civil discourse. The framework then is in tension with itself, just like the atomic bomb with its mixing of "culture" and "nature." Now, this observation by itself is not a solution to this design problem; however, I think it will in time lead to one since I now know what is problematic about my framework. I would have never discovered this though if I had not done my STS work in tandem with my technical work, nor would I have taken up the STS work that I did if my capstone had not exposed to me the significance of public perception. Hence, it was extremely valuable for me to work on these two projects side by side.

Word Count: 624 words

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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

Briana Morrison, Department of Computer Science

## **ABSTRACT**

Existing social media platforms are rife with incivility, especially in discussions about politics. To rectify this issue, I propose a social media framework for mitigating online incivility. The anticipated results for an actual implementation of this framework include an increase in the productivity and civility of political discussions, as well as improved user satisfaction and participation. Further work to ensure the viability of this proposal includes testing to verify the efficacy of the framework in reducing incivility. In addition, scalability and marketability issues must be addressed to ensure commercial feasibility.

## **1. INTRODUCTION**

In the 21st century, public discourse is increasingly happening online through social media platforms like Facebook, Twitter, and Instagram. Roughly 82% of Americans now use social media, and according to the Pew Research Center, online “political debate [is] a regular fact of digital life for many” Americans [1, 2]. Yet these discussions are often far from productive and tend to devolve into personal attacks [2, 3]. This is problematic as incivilities have a corrosive effect on public

discourse and people’s perception of those with differing political viewpoints. In 2016 alone, “64% [of users reported that] their online encounters with people on the opposite side of the political spectrum [left] them feeling as if they [had] even less in common than they [had previously] thought” [2]. Of course, some amount of disagreement and polarization is inevitable. Still, the widespread presence of incivility online is concerning as it poses a danger to the efficacy of public discourse as a means of social change. After all, when people are not willing to engage with one another civilly, all discourse collapses into polarization and partisan politics [4]. Polarization, in turn, undermines the fundamental principles on which democracy rests; for as Svoboda (2019) notes: polarization “undercut[s] the public’s ability to curb illiberal inclinations of elected politicians [and] thus presents aspiring authoritarians with a structural opportunity: They can undermine democracy and get away with it” [5]. One need look no further than the recent events of January 6th to see the truth of his words. If civility cannot be cultivated in public discourse, polarization and ruin will follow; and given the significant role that social media now plays in supporting such discourse, improving

online civility is crucial for the endurance of American democracy.

## 2. RELATED WORKS

Currently, many social media companies have frameworks in place for dealing with online incivility. Facebook (2022), for instance, utilizes a combination of AI tools and human reviewers to identify and remove content that fails to “respect the dignity of others” [6, 7]. There are two major drawbacks to this strategy. First, the use of human reviewers (over 15,000 for Facebook [8]) places a significant administrative burden on the company, one that smaller platforms may not be able to support. Second, the framework ultimately places the power of moderating discussions in the hands of Facebook rather than discussion participants. From a practical standpoint, this is undesirable, as it hampers real-time moderation. It is also undesirable from an ideological standpoint since arguably, the people participating in a discussion should have a say in how that discussion is framed.

Reddit, too, suffers from this problem. In its framework, civility is enforced via moderators, users who own a Reddit community or have been delegated a moderatorship by a community owner [9, 10, 11, 12]. Although this setup does allow for

some community participation, the fact that moderators must either be community owners or selected by them severely limits the amount of influence normal users can exercise in shaping the discussions of which they are a part. This method of moderator selection leads to a further problem; for if normal users cannot directly impact the way in which civility is enforced in their communities, then they are vulnerable to abuses of moderator power. The best illustration of this danger is the July 2015 blackout where moderators engaged in a sitewide boycott in response to the resignation of Ellen Pao [13]. In this scenario, administrators were unable to help user groups that did not wish to participate in the boycott until after the fact.

The social media platform with perhaps the best method of mitigating incivility is LinkedIn.

Although it has no formal structures in place for dealing with this issue, it implicitly counteracts uncivil behavior by instituting reputational costs for people’s actions. In 2019, David Roth, LinkedIn’s editor-in-chief, noted that a post to LinkedIn “is something that your boss [can see], your future boss... It’s as close to your permanent record as you can get” [14]. Because of this powerful deterrent, LinkedIn has less trouble with incivility

than platforms like Facebook and Reddit. The only problem with this type of implicit framework is that it cannot be easily imported into other contexts.

### **3. PROJECT DESIGN**

My design differs from the above frameworks in that it attempts to provide an effective means of reducing incivility while 1) easing the administrative burden placed on companies, 2) including users in the moderation process, and 3) providing civility enforcement mechanisms that do not assume a particular context. To this end, my framework utilizes a decentralized moderator system like Reddit's in order to avoid the pitfalls of Facebook's design. I improve on Reddit's scheme, though, by using a form of democratic distributed moderation (DDM) to increase user participation, prevent abuses of power, and enhance the framework's efficacy in reducing online incivility. I also attempt to mimic the structures of accountability on LinkedIn by instituting a system of fines for uncivil behavior. I consider this part of my design first after briefly listing the principles which underlie my design. I end by outlining my system's moderation scheme.

### **3.1 DESIGNING FOR ACCOUNTABILITY**

Regarding the civility mechanisms on LinkedIn, David Roth's comment on the site's reputational costs for uncivil behavior points to one core element of these structures: LinkedIn's approach to dissociative anonymity. Dissociative anonymity refers to the degree to which individuals perceive their online personas as separate from their real identities [15]. On LinkedIn, there is very little of this type of anonymity. After all, how could reputational costs serve as an effective counterbalance to incivility on LinkedIn if people did not see the reputation of their online persona as contiguous with their own? This suggestion, of course, is only tentative. Still, there does seem to be a link between dissociative anonymity and incivility in online discussions [15, 16, 17]. If this is the case, the best way to make platforms more civil is to prevent users from compartmentalizing their online selves and separating them off from their real identities. To address this gap between the online and real self, actions by the former must have consequences for the latter. I take this insight as the first principle of my framework.



### **3.2 DESIGNING FOR DDM**

I mentioned that taking a distributed approach to moderation could help reduce administrative burdens and that implementing this approach democratically could potentially decrease acts of power misuse by platform moderators. Another possible benefit of this form of moderation is its ability to facilitate a greater degree of user participation. To wit, participation is essential in building a sense of community, and when each user feels as if they belong to a group and have a stake in preserving that group, the likelihood of them engaging uncivilly with each other might decrease [18]. For these reasons, I take as my second principle the idea that DDM is vital to a platform's civility levels.

### **3.3 PROJECT ASSUMPTIONS**

My proposal is meant only to outline the basic structure of my framework. To this end, I make a number of simplifying assumptions:

- 1) Users are grouped together into topic-based communities like Reddit.
- 2) Communities may consist of a number of sub-communities.
- 3) Each sub-community may consist of several discussion threads.

- 4) No more than thirty individuals interact on a discussion thread at once.
- 5) Users of the platform have a credit card.
- 6) The use of vituperative language is a good indicator of uncivil discussion.

### **3.4 IMPLEMENTING ACCOUNTABILITY**

I implement accountability through a registration system, a report system, and an incivility detection system. I consider each of these in turn.

#### **3.4.1 USER REGISTRATION**

The framework establishes user accountability using a system of fines. To this end, users must, during the registration process, provide their credit card information. Once provided, this information would be validated using a credit card interface such as Authorize.net API [19]. If valid, the information would then be encrypted and filed away on the system. This module is crucial for the operation of the next two system components.

#### **3.4.2 USER REPORTING**

This element of the framework would allow platform users to formally report uncivil actors to system administrators. Importantly, the report would have to identify a number of specific

comments made by the offending party in order for administrators to ascertain whether uncivil behavior did occur. If the report is valid, the administrators will fine the offending party for violating the platform's civil discourse user agreement. If the report is clearly groundless or malicious in intent, then the reporting party will be fined instead. This feature should both discourage uncivil behavior and promote honest reporting on the platform.

### **3.4.3 INCIVILITY DETECTION**

Of course, formal reporting alone is limited. Administrators cannot respond to every report as soon as it is sent. To address this issue, the system will employ a sentiment analysis (SA) module to identify cases of incivility. SA is a form of natural language processing that involves assigning textual data either a positive or a negative rating [20]. In the context of social media, SA would entail rating user comments based on some established criteria of what a civil comment looks like. For the purposes of this proposal, I make the simplifying assumption that vituperative is a good indicator of blatant incivility. Several SA models based on this assumption have achieved high degrees of accuracy, so the assumption is not an impractical

one to make. For example, Daxenberger and his colleagues (2018) achieved an overall accuracy rating of 75% with their module [21]. Habernal and his colleagues (2018) achieved accuracy ratings between 78% and 81% [22]. The purpose of my SA module would be threefold: Firstly, it would flag and fine users with a high number of negatively rated comments. Secondly, the aggregated ratings produced by the module would be used to produce civility scores (CSR) for each community on the platform. Thirdly, the module would run against active threads, generating a present CSR (PCSR) to gauge current civility levels.

### **3.5 IMPLEMENTING MODERATION**

I now consider how DDM will be implemented in my framework. I assume two main types of users: 1) discussion participants and 2) moderators. First, I outline the ways in which discussion participants can interact in a thread. Next, I outline the ways in which moderators can interact in a thread. Lastly, I outline how moderators are to be selected.

### 3.5.1 DISCUSSION PARTICIPANT

#### ABILITIES

All first-time platform users will be classed as discussion participants and have access to the following capabilities:

- 1) Commenting: Ability to comment on threads
- 2) Flagging: Ability to flag comments deemed inappropriate
- 3) Election: Ability to put forth a motion to elect a moderator
- 4) Impeachment: Ability to de-elect a moderator
- 5) Approval: Ability to approve a type II power
- 6) Voting: Ability to vote for any motion
- 7) Reporting: Ability to report other users

### 3.5.2 MODERATOR ABILITIES

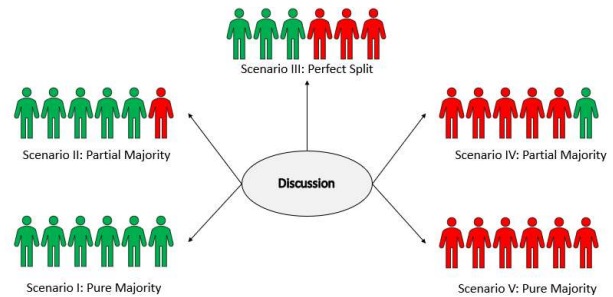
A user upon being elected as a moderator will gain access to two types of unique functionalities: Type I (T1) powers may be used by moderators at their discretion. Type II (T2) powers require the approval of other users for their enactment:

- 1) Comment Obfuscation (T1): Ability to obfuscate flagged comments
- 2) Priority Reporting (T1): Ability to file reports with a higher priority than usual

- 3) Discussion Suspension (Type2): Ability to temporarily suspend discussion if a quarter of users approve
- 4) Temporary Ban (T2): Ability to temporarily ban a user if half of users approve

### 3.5.3 MODERATOR SELECTION

The number of civil and uncivil participants may form a pure majority, a partial majority, or a perfect split as shown below. Green actors depict civil users; red actors depict uncivil users. Importantly, green and red actors are not fixed within a given discussion since an individual's level of civility may improve or worsen.



*Figure 1: A Snapshot of a Discussion*

The moderation selection process deals with the above five scenarios through a combination of democratic and external moderation. Initially, all discussions begin without a moderator. However, if

communication breaks down, users may move to appoint a moderator so long as a third of them agree that moderation is required. Once the motion is approved, a moderator is selected from the participants by vote. A nominee with a simple majority is appointed moderator; otherwise, no moderator is chosen. This method of moderator selection covers Scenario I and Scenario II since in these cases, the likelihood of a *civil* moderator being chosen is high. For Scenario III discussions, this method is problematic since if red and green actors each choose a candidate from their group, no moderator will be elected. To rectify this issue, all moderator elections that result in a perfect split will automatically trigger a request for an external moderator. This request will be filed to random members of communities with high CSRs, ensuring that a civil moderator is elected. A similar selection process occurs with Scenario III, IV, and V groups. The main difference though is that these groups are handled by the incivility detection system mentioned previously. The system will flag groups with declining PCSRs, and if the score dips below a certain threshold, a request for external moderation will be generated. This process should allow for the election of civil moderators.

#### **4 ANTICIPATED RESULTS**

This framework is likely to have a positive impact on online civility and user satisfaction. The system's use of fines should serve as an effective deterrent for uncivil behavior. Furthermore, the framework's use of DDM should decrease the administrative burdens associated with policing the platform. Thus, this framework has the potential to improve the civility and quality of online discussions.

#### **5 CONCLUSION**

Civil discussion is vital to the health of democratic societies and given the increased polarization of public discourse on social media, there is a sore need for a way to promote civility and diminish uncivil behavior. The proposed framework fulfills this need by providing a way of ensuring user and moderator accountability, thereby creating an environment in which civility can flourish.

#### **6 FUTURE WORK**

Further work remains to be done for this approach to counteracting incivility to be completely viable. First, a prototype of the framework should be developed and tested to verify that it has the intended effect on platform discourse. Second,

issues of scalability must be addressed, meaning that additional research must be conducted to determine the best structure for the moderator hierarchy and how to implement platform processes to handle user reports. Third, a marketing strategy should be developed to help convince users and companies to adopt the framework. Public perception will be a key factor in determining the framework's commercial viability.

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Advisor

Benjamin Laugelli, Department of Engineering and Society



“It was like being at the bottom of an ocean of light. We were bathed in it from all directions. The light withdrew into the bomb as if the bomb sucked it up. Then it turned purple and blue and went up and up and up. We were still talking in whispers when the cloud reached the level where it was struck by the rising sunlight so it cleared out the natural clouds. We saw a cloud that was dark and red at the bottom and daylight at the top. Then suddenly the sound reached us. It was very sharp and rumbled and all the mountains were rumbling with it.”

– Joan Hinton

## **Introduction:**

On July 16, 1945, the desert of Jornada del Muerto was flooded by what one onlooker described as an “ocean of light” (Atomic Heritage Foundation [AHF], 2022). A month later, residents of Hiroshima beheld that same light over the center of their beloved city as the world’s first atomic bomb reduced it to rubble. President Truman informed the American public about the strike sixteen hours later; and what a few days ago had been known only to the scientists of the Manhattan Project became, in the span of a few minutes, common knowledge (Air Force Nuclear Weapons Center, n.d.). The public’s response was varied. Most supported the government’s decision, reacting to the bomb with fascination, pride, and awe. Others were horrified and responded with fear and outrage. Most scholarly analyses of public opinion during this time attribute this response to a wide variety of sociocultural and political factors, including the government’s handling of the event, anti-Japanese sentiment, and relief over the end of World War II (Yavenditti, 1974; Hein & Selden, 1997; Boyer 1994). Such analyses though ignore the ways in which the bomb’s unique characteristics impacted how Americans perceived and responded to it. Analyzing the atomic bomb’s reception from this viewpoint offers a unique perspective regarding the public’s reaction to the advent of the atomic era, one which may deepen scholarly understanding of the topic by exploring it from a dimension hitherto neglected. In what follows, I attempt to do exactly this by showing how the bomb’s unnatural fusion of the categories of “culture” and “nature” helped shape the public’s perception of this destructive technology, evoking awe in some and fear in others. My analysis draws on Martijntje Smits’ monster theory, which attributes public polarization around emerging technologies to their melding of mutually exclusive cultural categories. To support my conclusions, I draw on several

documents from the time, including newspaper articles, political speeches, and reports from the Manhattan Project.

### **Literature Review:**

Despite the vast body of research on the atomic strikes of 1945, few scholars have explained how the bomb's unique qualities helped shape public opinion of nuclear weapons, focusing instead on the roles played by various political and cultural actors. For example, historians Laura Hein and Mark Selden attribute the public's predominantly positive response to the government's presentation of the atomic bomb as "the ultimate symbol of victory" in a just war against the axis powers. They credit President Truman's 1945 address to the American people and Secretary of War Henry Stimson's "The Decision to Use the Atomic Bomb" for the initial formation and introduction of this view into American society. Hein and Selden also point to the government's deliberate suppression of "most images of the bombs' destruction [and] its most terrifying effect" radiation as further explanations for the public's general acceptance of the strikes (Hein & Selden, 1997). While this interpretation of events has its merits, it ultimately portrays the government and the various methods it employed to stave off criticism as the key causes behind public perceptions of the atom bomb. In doing this, Hein and Selden's analysis obscures the way in which people's recognition and evaluation of the bomb and its unique qualities influenced their end response to it.

In this regard, Paul Boyer is much more successful. He explains the American public's reaction to the atomic bomb in reference to the technology's immense power. The vast majority of Americans he argues reacted to this trait and its promise of global annihilation with confusion and fear. For Boyer then, the bomb's apparently positive reception is only a superficial feature of public opinion. It is a product of "relief over the war's end and the emotional high brought on by

Japan's surrender" and easily obscures the "fundamental psychological realities [of fear and dread] underlying the broader intellectual and cultural responses of [the] period" (Boyer, 1994). Boyer's reading of events offers a unique perspective on the public's reaction to the bomb as it portrays the cultural developments of the period as offshoots of Americans' efforts to come to grips with the paralyzing fear engendered by the bomb. Yet this is also a shortcoming of his analysis; for by reducing all cultural trends to fear, Boyer ultimately fails to provide a symmetric explanation of fear and fascination. Thus, his analysis discounts the many genuine expressions of awe and wonderment which occurred during this period in response to the bomb.

To summarize, current scholarship concerning the reception of the atomic bomb fails to adequately explain how the bomb's unique characteristics helped define the public's response to it. Although a few analyses do attempt to address this issue, they do not provide a symmetrical explanation of fear and fascination. My goal in this paper is to remedy these gaps in knowledge and to provide an explanation of the bomb's reception which focuses on its unique properties and the emotional responses engendered by those properties without privileging fear over fascination.

### **Conceptual Framework:**

My analysis draws upon Martijntje Smits' monster theory, which allows me to explain the American public's response to the bombings of Hiroshima and Nagasaki in terms of the atomic bomb's unique properties. Based on the work of anthropologist Mary Douglas, monster theory maintains that public polarization towards an emerging technology arises when the technology fuses two mutually exclusive cultural categories (e.g. nature and culture, human and machine, life and death). When this occurs, Smits argues that the technology is perceived as a violation of the symbolic order which society uses to organize and interpret its experience of the world. As a result, the technology becomes an ambiguous entity, one that does not fit neatly into

the cultural order and is therefore considered “unnatural.” In trying to understand the technology’s place in society, some respond to this unnatural fusion of categories with fear and a desire to eliminate the technology to restore cultural normalcy. Such individuals have what Smits calls a “monster exorcist” perspective. The “exorcists” are opposed by those who respond to the technology’s ambiguity with fascination and regard it as a “miracle” rather than a “monster.” This group represents what Smits calls the “monster embracing” perspective. According to Smits, the different responses of these two groups towards the ambiguity of certain technologies is what generates public polarization (Smits, 2006).

In what follows, I will use Smits’ monster theory to explain the public’s response to the atomic bomb in terms of the technology’s perceived violation of the categories of “nature” and “culture.” By the term “nature,” I understand any phenomena, elements, or organisms recognized to be a part of the natural world. By the term “culture,” I understand any human-created entity whether it be a practice, an institution, an artifact, or some other modification of the natural world. My analysis will focus on the monster embracing and exorcist perspectives, explaining how these two perspectives arose from different responses to the bomb’s meshing of cultural categories.

### **Analysis I: The Monster Embracer Perspective**

In the wake of the bombings of Hiroshima and Nagasaki, some responded to the atomic bomb with a “monster embracer” attitude, reacting to the technology’s fusion of “nature” and “culture” with awe and fascination. This perspective is best exemplified by William Laurence, a *New York Times* reporter who was present for the Trinity Test and the bombing of Nagasaki. In his article on the former, Laurence perfectly illustrates the monster embracing perspective and its emphasis on the miraculous character of the monster:

“At that great moment in history, ranking with the moment... when man first put fire to work for him and started on his march to civilization, the vast energy locked within the hearts of the atoms of matter was released for the first time in a burst of flame such as had never before been seen on this planet, illuminating earth and sky for a brief span that seemed eternal with the light of many super-suns” (Laurence, 1945).

Laurence begins by likening the bomb to the discovery and control of fire by early humans. In doing this, he frames the weapon as a more evolved version of this control over nature. The comparison then highlights the bomb’s technological status; but at the end of the passage, Laurence pushes back against this characterization, describing the bomb’s light as “the light of many super-suns.” This choice of wording draws a direct link between the bomb and the sun, a constructed entity and a natural one. It thus places the bomb in the category of nature. At the same time, it also frames the device as alien since its light is not the light of *a sun* but of “many super-suns.” Thus, Laurence is subconsciously placing the bomb in its own transcendent category, one which combines aspects of both “culture” and “nature.”

He does not explicitly connect this fusion of categories to a feeling of awe or fascination though. Rather, he establishes a link between the bomb and the destiny of man. His initial comparison of the bomb to early humans’ discovery and mastery over fire presents the Trinity Test as a logical outgrowth of human progress, of the long “march to civilization.” Under this view, the bomb, with its mixing of categories, becomes a symbol of human progress and achievement. Its miraculous properties, namely its destructive power and manufacturability, become the miraculous properties of the human intellect. Similarly, its promise of global annihilation is transfigured into a promise of progress, of a more civilized tomorrow. Hence, Laurence’s reaction to the bomb’s ambiguous nature is based in a sort of awe-inspired reverence

and pride for the bomb, which transforms the technology from a monster to a saint. Laurence then exemplifies the “monster embracing” perspective with its positive treatment of technological ambiguity as a “miracle.”

Laurence though is not the only monster embracer to react to the bomb’s fusion of “culture” and “nature” like this. In his address to the American public, President Truman also emphasizes the bomb’s miraculous fusion of categories. “Sixteen hours ago,” Truman relates, “an American airplane dropped one bomb on Hiroshima and destroyed its usefulness to the enemy... It is an atomic bomb. It is a harnessing of the basic power of the universe. The force from which the sun draws its power has been loosed against those who brought war to the Far East” (Truman, 1945). The first sentence of this passage characterizes the bomb as a cultural artifact, an explosive engineered by scientists and dropped by military personnel. It places the bomb in the culture category; however, Truman immediately challenges this idea, noting how the bomb and the sun draw on the same “basic power of the universe.” This link between the bomb, an artifact of culture, and the sun, a natural entity, highlights the device’s sheer power: It is not a conventional weapon, for it is capable of loosing, on earth, the cosmic forces which animate the heavens. As a result, its destructive potential is not quantifiable in conventional terms. It is more like a solar flare than a bundle of TNT. In other words, it is more suitably classed in the “nature” rather than the “culture” category. Implicit then in the above quotation is the idea of the bomb being a fusion of technology and nature.

This is significant because while the above passage does not by itself portray the bomb as a miracle, the end of the address does. There Truman states that “The fact that [America] can release atomic energy ushers in a new era in man’s understanding of nature’s forces. Atomic energy may in the future supplement the power that now comes from coal, oil, and falling water”

(Truman, 1945). Although Truman does not explicitly appeal to the bomb's fusion of categories here, its presence in the previous passage suggests that Truman was aware, at least subconsciously, of the bomb's fusion of cultural types. The phrase "atomic energy" then should be read in light of this unique cultural fusion. Similarly, Truman's hopeful expression of the bomb's peacetime applications and its significance to science should all be interpreted relative to the device's violation of categorical norms. When viewed in this way, the above passage illustrates a monster embracing perspective since it takes the source of the bomb's monstrousness – its ability to harness the cosmic power of the sun for the ends of human beings – and uses it to construct a hopeful vision for the future in which the bomb is transfigured from an engine of destruction into a tool for everyday life, from a symbol of humankind's hubris to a symbol of its steady advancement towards a greater "understanding of nature's forces." While perhaps less exuberant than Laurence then, Truman illustrates the monster embracer attitude with its hopeful outlook regarding socially ambiguous technologies.

There are other ways though of explaining Truman's characterization of the bomb. So far, I have argued that his treatment of the weapon demonstrates a monster embracing view; however, for Hein and Selden, Truman's address to the American public says nothing about the President's personal view of the bomb because the address is essentially a piece of propaganda, "designed to stave off criticism" for the bombing of Hiroshima (Hein & Selden, 1997). Under this view, it becomes difficult to disentangle rhetoric from genuine belief. For example, when Truman characterizes the bomb as a harbinger of "a new era in man's understanding," it could be that he genuinely believes this; or the phrase may be rhetorical and intended simply to foster a favorable view of the bomb. Similarly, when Truman likens the bombing of Hiroshima to the loosing of the sun against the east, it could be the case that the analogy is not rooted at all in the



bomb's fusion of culture and nature. Rather, by portraying the bomb as a sort of natural disaster, a terrible event which no one is responsible for, Truman might be trying to create a disconnect between the American public and the destruction of Hiroshima, in an effort to minimize people's feelings of responsibility over the matter and thus any feelings of remorse.

All of this is rather problematic for the monster theory interpretation of events. At best, the objection problematizes Truman's status as a monster embracer. At worst, it completely severs his address from the cultural fusion which I believe underlies all his claims. The worst part of all is that the objection can be generalized. During the aftermath of World War II, most of those who expressed a monster embracer perspective were government officials or associated with the government. In other words, they were complicit in the Truman Administration's propaganda campaign. Laurence himself is a fine example as he helped officials cover up the effects of radiation during the post-war period (Broad, 2021). If this is all true, then the very endeavor of using monster theory to analyze public discourse around the bomb seems to be pointless. After all, one of the main advantage of monster theory, compared to other frameworks, lies in the symmetrical explanation it gives to monster embracers and exorcists, yet in light of this objection, it seems like there are no genuine exorcists.

Fortunately, before the reception of the bomb became an issue, many scientists and military personnel from the Manhattan Project expressed genuine monster embracer perspectives of the weapon. For instance, in his report on the Trinity Test, Brigadier General Thomas Farrell describes the bomb's detonation as follows:

“No man-made phenomenon of such tremendous power had ever occurred before. The lighting effects beggared description. The whole country was lighted by a searing light with the intensity many times that of the midday sun. It was golden, purple, violet, gray,

and blue. It lighted every peak, crevasse and ridge of the nearby mountain range with a clarity and beauty that cannot be described but must be seen to be imagined. It was that beauty the great poets dream about but describe most poorly and inadequately” (Groves, 1945).

Farrell’s use of the phrase “man-made” in the opening line of this passage highlights the technological nature of the bomb. It is an artificial creation. However, Farrell immediately problematizes this simplistic view of the weapon by referring to it as a “phenomenon,” which evokes a connection to natural events like storms and earthquakes. He expands on this connection in the next couple of lines, comparing the light of the weapon to that of the sun. This moves the bomb into the nature category. Underlying this movement is the implicit admission that the radiance of the bomb is something that cannot be described in terms of the culture category. The dim glow of a lightbulb cannot compare to the all-consuming brilliance of a split atom. Hence, the analogy dissociates the bomb from the culture category and connects it more to the nature category.

It also suggests that the bomb is really not a natural entity either; for it shines with an “intensity many times that of the midday sun.” Here at last the tension inherent in the bomb is revealed. It is a cultural artifact that wields the “tremendous power” of nature. It is a “man-made” device that surpasses the limits of human technology, and a natural force greater than “that of the midday sun.” The bomb does not fit squarely in the nature or culture category. It is a unique form of being, and Farrell reacts to this uniqueness with awe. He describes the effects of the bomb on the landscape as beautiful, claiming “It was [the beauty] the great poets [all dreamt] about but describe most poorly and inadequately.” As this perception of beauty is ultimately rooted in the bomb’s unique properties, i.e., its artificial brilliance, Farrell can be viewed as

reacting to the bomb's fusion of categories. The result is that he sees the bomb, not as an engine of annihilation, but as an object of beauty. Farrell then qualifies as a monster embracer.

Hein and Selden's interpretation cannot explain Farrell's response as it is genuine and not part of some propaganda campaign. The objection then, at least in its extended form, is untenable. In the cases of Lawrence and Truman though, things are less clear-cut. Farrell's account makes it plausible for both to be genuine monster embracers, but at the same time, Hein and Selden are likely correct about them having ulterior motives for framing the bomb in a positive light. Still, one cannot deny that the language Lawrence and Truman use makes explicit reference to the bomb's meshing of categories. Perhaps they are not genuine monster embracers; but their rhetoric suggests that they were, at the very least, sensitive to the bomb's fusion of categories and concerned about how the public would react to this fusion. If one refuses to take an embracer perspective here, this detail drifts out of focus. Hence, for the purposes of analysis, there is nothing inherently problematic in treating Lawrence and Truman as what their writings frame them as, i.e., as monster embracers. At worst, doing so brings into focus the view of the bomb that underlies their rhetoric. At best, it also explains the awe and fascination they seem to express towards the bomb's ambiguous nature.

## **Analysis II: The Monster Exorcist Perspective**

Not all members of the public responded with a monster embracing perspective. Some reacted with an exorcist viewpoint, expressing fear and horror at the bomb's fusing of culture and nature. For example, the philosopher Lewis Mumford in his article "Gentlemen: You are Mad!" expresses an exorcist position when he laments how those in power "have a comet by the tail [and seek] to prove their sanity by treating it as if it were a child's skyrocket... they have decided to play a little further with this cosmic force... the madmen do not want us to know that

this power is too absolute, too godlike, to be placed in any human hands: for the madmen dandle the infernal machine jauntily in their laps” (Mumford, 1946). Throughout this passage, Mumford emphasizes the unnatural character of the bomb by alternating between metaphors which paint the bomb as a product of human artifice and ones which depict it as a part of nature. To illustrate, Mumford initially portrays the bomb as a “comet” and then later describes it as a “cosmic force.” These phrases highlight the weapon’s wild, untamable nature and implicitly cache out its destructive power in terms of natural disasters like falling comets. Thus, for Mumford, the bomb appears to be, in a way, natural; yet it is also artificial.

This can be seen in how he likens the device to a “skyrocket.” Although this phrase does other rhetorical work for Mumford, its presence evokes the bomb’s cultural aspects as a man-made weapon wrought by human hands for human ends. This connection is rendered explicit in the final line of the quotation when he calls the bomb an “infernal machine,” highlighting its technological status. Mumford then can be seen as reacting to the bomb’s fusion of nature and culture, hence the reason why he oscillates between mechanical and natural descriptions of the bomb. However, unlike Laurence and Truman, Mumford reacts to this combination of categories with horror and outrage, calling the weapon “infernal.” For him, the bomb is too great a power “to be placed in any human hands.” It violates the natural order of things by providing a technological means of harnessing the “cosmic” forces which are nature’s sole prerogative. This violation occurs because the bomb is ambiguous: Its power does not belong to the realm of human technology because the energy it harnesses lies solely in the category of nature. Thus, Mumford’s negative characterization of the weapon as “infernal” ultimately stems from the bomb’s ambiguity, its simultaneous existence in the categories of nature and culture. This makes Mumford a monster exorcist.

Another example of the exorcist perspective comes from Isidor I. Rabi, a scientist who worked on the Manhattan Project. In his account of the Trinity Test, Rabi writes that the glow of the bomb seemed “to last forever. You would wish it would stop; altogether [though] it lasted about two seconds. Finally it was over, diminishing, and we looked toward the place where the bomb had been; there was an enormous ball of fire... it went up into the air, in yellow flashes and into scarlet and green. It looked menacing... A new thing had just been born; a new control; a new understanding of man, which man had acquired over nature” (AHF, 2022). Throughout this recounting of the Trinity Test, Rabi emphasizes the disquieting nature of the experience, saying how he wished it “would stop” and how the detonation “looked menacing.” At the beginning of the passage, this fear is directed primarily at the bomb’s detonation, but the final sentence redirects this unease to what the bomb represents: “a new understanding of man, which man had acquired over nature.” This line frames the bomb as a technological artifact, a means of channeling the powers of nature; yet when viewed alongside the sense of unease which pervades this passage, the line also suggests that the power utilized by the bomb is one that should not be in human hands, i.e., it is a power that belongs to nature alone. The idea is similar to the one expressed by Mumford because at its core, the tension here ultimately derives from the same source. The bomb is monstrous for Rabi because it combines the technological control essential to the category of “culture” with the annihilating power of the atom, a force hitherto untouched by humankind and thus belonging to the category of “nature.” Rabi’s discomfort with his creation then stems from its fusion of categories. Because his reaction to this fusion is negative, Rabi is a monster exorcist.

## **Conclusion:**

In conclusion, the American people's response to the atomic bomb was polarized due, in part, to the bomb's mixture of "nature" and "culture." Among monster embracers, this fusion was viewed as something miraculous, awe-inspiring, and beautiful. However, for monster exorcists like Mumford and Rabi, the bomb's meshing of categories evoked fear and horror; for in their eyes, the bomb represented not the inevitable movement of progress but a sudden and destructive violation of the natural order of things. When viewed in this way, the polarization surrounding the bomb's introduction into society becomes an extension of the public's understanding of the bomb as an ambiguous entity, a technological monster whose unique characteristics threatened the established dichotomy between culture and nature. That is not to say that the sociocultural forces cited by other scholars played no role in shaping the reception of the bomb. They are a necessary component of any comprehensive account of the bomb's reception; however, they are not by themselves sufficient to fully explain the public's reaction. To do that, one must consider the ways the bomb itself impacted individuals via its unnatural combination of technological control and cosmic power.

Word Count: 4134

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## Prospectus

The most pressing of the seventeen sustainable development goals (SDGs) is climate action (UN Department of Economic and Social Affairs, n.d.). The United States has invested heavily in renewable energy sources to further this goal. In 2019 alone, the U.S. spent \$59 billion in green energy (Values, 2020). Despite the considerable size of these investments, green energy in the U.S. power grid accounts for only 20% of electricity generation (Energy Information Administration, 2021). Renewable energy cannot make a substantial reduction to greenhouse gas emissions from the electrical sector until it becomes a more prevalent source of power. A different approach is needed. One option is to optimize electricity generation and consumption. According to the Environmental Protection Agency (EPA), “the fastest [and] most cost-effective way” of accomplishing this is to promote efficient energy use among homeowners and other consumers of electricity (2018).

In view of the EPA’s suggestion, I propose the development of an electricity monitoring system to aid consumers in the energy conservation process. This system will be outfitted with an internal scoring mechanism to facilitate competition between users, thereby increasing their motivation to save energy. As this technical project requires the construction of a heterogeneous network to support its development and implementation, understanding the mechanisms behind successful network formation is critical to the success of this project. Neglecting this aspect of the project and treating the proposed system as somehow isolated from its sociotechnical context runs the risk of creating a system that cannot properly interact with those actors vital to the network’s success such as consumers and utility companies. If this outcome were to occur, the system’s ability to effectively address the problem of energy conservation would be crippled, inevitably leading to the failure of the project. Thus, to ensure the success of the system, it is

necessary to outline the basic principles of network creation as they appear in the structure of related sociotechnical networks.

Solving the problem of energy conservation then requires consideration not only of the issue's technical dimensions, but also of its social dimensions. In the next section, I outline the technical portion of my solution, which takes the form of the proposed energy monitoring system. To address the social dimensions of the issue, I employ actor-network theory to analyze the collapse of a related sociotechnical network: Microsoft's energy monitoring app Hohm. In that analysis, I explore how the interaction between consumers, utility companies, and the design of Hohm itself all contributed to the network's collapse. The results of this investigation are then used to construct a network formation strategy for the proposed system to help it avoid the pitfalls that ultimately led to the failure of the Hohm project.

### **Technical Project**

The vast majority of modern homes are outfitted with an outdoor electric meter (What is an Electric Meter, 2019). Although intended solely for use by utility companies, the electric meter can be of service to consumers as well. In particular, it can provide environmentally conscious individuals with a way to track and manage their energy usage. However, the overall design of the electric meter does not lend itself well to this process of energy conservation. For one, the meter's placement outside of the house makes checking it rather inconvenient, and since effective energy monitoring requires frequent observation of one's energy usage, this element in the meter's design limits its practicality as an energy tracking tool. The meter's greatest shortcoming though is that it cannot offer any information pertaining to appliance loads or unusual spikes in electrical activity. Because of this, the electric meter can never give consumers a detailed breakdown of their consumption and thus can never advise them on what areas of use

they should cut back in to achieve their energy conservation goals. This aspect of the electric meter combined with its inconvenient placement makes it an ill-suited tool for energy monitoring.

To address the deficiencies of the electric meter, a number of energy monitoring systems (EMSs) have been developed in recent years. Three such systems are the Curb EMS, the Sense EMS, and the Smappee EMS. The Curb EMS monitors total household energy usage through a number of sensors attached to the home's breaker box. The system can also interface with smart technologies, allowing users to interact with it via a smartphone and remotely control the power usage of their smart home devices (Product, 2019). In addition to having all the features of the Curb EMS, the Sense EMS is able to monitor normal appliances through the use of machine learning techniques (Technology, 2021). Unlike the Sense EMS, the Smappee EMS accomplishes appliance monitoring through custom-made switches that users can plug their appliances into. These switches enable users to remotely monitor and control all appliances plugged into a "Smappee switch" (Energy Management, 2021). The Curb, Sense, and Smappee EMSs all represent vast improvements over the electric meter. By enabling users to access the system via a smartphone, the Curb and Sense EMSs remedy the inconveniences associated with the electric meter's placement. Furthermore, through their support of appliance monitoring, the Curb, Sense, and Smappee EMSs all rectify the electric meter's inability to provide users with a complete picture of their consumption. They are adequate energy monitoring tools.

However, there is a problem in their design. These EMSs do not incentivize the act of energy conservation; rather, they simply assume that users will stay motivated throughout the energy conservation process. If this flaw in current energy monitoring systems is allowed to persist, then the effectiveness of these systems in helping consumers reduce their energy use and

carbon footprints will be significantly impaired. Consumers who get discouraged with their progress or who simply lose interest in reducing their electrical consumption will cease to use their EMS and let their energy spending stagnate. Without a means of facilitating user motivation, present EMSs will not be able to help such users. As a result, these systems will only partially accomplish their goal of helping consumers efficiently decrease their household energy use and greenhouse gas emissions.

The aim of this technical project is to avoid this design flaw by constructing a residential energy monitoring system that promotes user engagement in the energy conservation process. Given that contextualizing an activity in a competitive setting can promote user or “player” engagement in that activity, the proposed system will be equipped with an internal scoring mechanism that will allow system users to interact with each other over the Internet and compete with each other for the highest energy saving score (Healthy Competition, 2021). In addition to this feature, the system will be able to interface with users’ smartphones and to provide electrical usage data on individual appliances and the house as a whole. The former will be monitored using a “smart outlet” similar to the ones employed by the Smappee system while the latter will be monitored via a series of sensors connected to the home’s electrical panel.

The project will be divided into three subprojects to be developed concurrently. To support this division of labor, a requirement specifications document will be generated to specify the deliverable of each subproject and the conditions it must meet to pair well with the deliverables of the other two subprojects. The first subproject will deal with the system’s user interface. The graphical user interface (GUI) will be constructed for the Android platform, programmed in Java, and developed using the agile software development model. The second subproject will deal with the actual system application. This application will be coded in Java

and use the agile software development model as well. In addition, Microsoft's Azure service will be employed to store the system's data. The final subproject will focus on creating the system's "smart outlets" and will use the spiral development model. All requisite software for this part of the project will be coded in C or C++. After the completion of all subprojects, the system will be brought together as a whole, and a number of households will be recruited to test the system.

Initial design data for the system will be obtained from scholarly articles pertaining to the construction of energy monitoring systems as well as patents for existing systems like the Curb and Smappee EMSs. As the subprojects for the proposed system utilize iterative development, each iteration of the system will provide design data for the next iteration. As for demonstrating the value of the system, that will occur in the final stages of the project when it can be tested on a small group of households to prove that it accomplishes its intended goal of fostering user engagement in the energy conservation process.

### **STS Project**

In 2009, Microsoft made its first foray into the energy industry with its free energy monitoring application Hohm. Capable of interfacing with a home's smart meter, Microsoft Hohm was built to help consumers reduce their electrical costs and greenhouse gas emissions by providing energy-saving recommendations customized around their individual usage patterns (Ryon, 2009). While promising, the application never got off the ground, and two years later, Microsoft announced that it would be shutting down the Hohm project due to inadequate demand for the service (Timmer, 2011).

Current discourse around Microsoft Hohm attributes the product's untimely end to a wide variety of factors: consumer ignorance about EMSs, poor project planning, and lack of support

from utility companies (Fehrenbacher, 2011). Other less commonly cited reasons for Hohm's failure on the market include poor product design in the form of minimal "access to data at adequate bandwidth for reasonable cost" and the prevalence of consumer habits that deemphasize the importance of energy conservation (Donnal & Leeb, 2015; Castle, 2011).

While all these factors certainly played a role in Hohm's demise, they do not completely explain why the Hohm project failed. To elaborate, when a technical project falls apart, the blame does not lie solely on the individual parts that compose the project but also on the interactions between those various parts. Current discourse overlooks this fact and treats the previously listed factors as standalone issues that contributed to Hohm's failure rather than interrelated aspects of the same problem that together caused the breakdown of the Hohm project. As a result, all accounts for why Hohm was unsuccessful ignore the complex interaction between consumers, utility companies, engineers, and the product itself that ultimately led to the project's failure.

Focusing on this interaction and the associations between various network actors offers a more holistic approach towards understanding the collapse of the Hohm network. For this reason, I argue that insufficient project planning, poor product design, consumer ignorance, consumer habits, and utility disinterest all led to the failure of the Hohm network. More specifically, I contend that the interaction between these various factors quickened the network's demise with consumer ignorance and Hohm's poor design exacerbating utility disinterest in the product.

To frame my analysis of the Hohm project, I will draw upon the science, technology, and society (STS) idea of actor-network theory (ANT). Developed by STS scholars like Michel Callon, Bruno Latour, and John Law, this theory claims that all technical projects can be viewed

as a network of human and non-human actors with the interactions and connections existing between these actors determining whether the network and thus the project succeeds or fails (Cressman, 2009). In addition to ANT, I will utilize Michel Callon's concept of translation to pinpoint where Microsoft went wrong in the network formation process and to explain why certain actors were not integrated properly into the Hohm network (Callon, 1981). The evidence I will draw on to support my argument will be primarily taken from newspaper articles, interviews, consumer reviews, end-user comments, and company memos.

### **Conclusion**

The deliverable for the technical project laid out in this paper will be an energy monitoring system with a built-in scoring mechanism to promote user engagement via friendly competition. The STS research paper associated with this project will examine the causes behind the breakdown of the Microsoft Hohm system. The paper will rely on actor-network theory to identify all the relevant actors in the Hohm network and to explore how the interactions between these actors ultimately led to the network's collapse. The products of the technical and STS projects outlined in this prospectus will be used to address the sociotechnical problem of energy conservation. The energy monitoring system proposed in the technical project will address the technological aspects of the problem by improving upon existing EMSs. The research proposed in the STS project will resolve the social dimensions of the problem by providing the knowledge needed to ensure the success of the technical deliverable in the real world.

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