Space-Based Solutions to Virginia's Roadway
(Technical Paper)

Social Media and the Deterioration of Constructive Political Discussion
(STS Paper)

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Introduction

If you are looking for an explanation as to why the political environment of this country is what it is, the first place you should look is in your pocket. In a 2019 Atlantic article, Jonathan Haidt points out that because of social media, society is now being fed a constant feed of "outrage" opinions on current events while losing touch with older information that has better perspective and hard-earned wisdom (Haidt, 2019). Today's smartphones and social media apps currently have algorithms that are designed to keep their users actively engaged as much as possible (Orlowski, 2020). Besides the obvious moral and mental health issues surrounding the designs that make social media addicting, the addiction also means that individuals are spending more time interacting in a social and political environment that is not designed to feed its users information and content that will challenge one's beliefs and perspectives.

However, smartphones have the potential to save lives, reduce traffic, and save our society billions of dollars by giving drivers hazard warnings and integrated weather information to help keep them safe as they drive through inclement weather. According to Vaisala, when Oregon DOT utilized road signs to notify drivers of current weather conditions, crashes were reduced by 21% (Tarleton, 2020). Unfortunately, current navigation applications do not utilize weather forecasting in their traffic algorithms or provide drivers with warnings about hazardous road conditions. Smartphones have the potential to give drivers better real time weather data than road signs ever could. Weather data integration with navigation applications appears to be an opportunity that has yet to have been utilized. By developing a spacecraft with the ability to provide new real time weather data that is not being collected through current methods, this technical proposal hopes to improve situational awareness for drivers and reduce vehicle crashes in the state of Virginia. While this technical work plans to improve Virginia traffic conditions

with the use of smartphones, the STS research topic intends to closely analyze the way society interacts with these devices to root out the harmful practices that appear to be deteriorating political discussion in the U.S.

Technical Topic

Traffic in the state of Virginia costs its drivers about 9.5 billion dollars and hundreds of lives every year. According to TRIP, traffic congestion costs drivers in Virginia 4.6 billion dollars a year in lost time and wasted fuel, while vehicle crashes in the year 2018 alone lost the state approximately 6.4 billion dollars' worth of economic costs (Trip, 2020). In addition to the monetary costs, almost 4,000 people were killed on Virginia roadways between 2014 and 2018 (Trip, 2020). The majority of traffic issues in the state are concentrated around the northern Virginia and Hampton Roads metro areas, with specific highways such as I-95, I-81, and I-64 experiencing particularly heavy traffic congestion. Aside from traffic congestion the advancement of technology is about to bring in an entirely new era for motor vehicles, with autonomous vehicles expected to play a significant role in the not too distant future.

The causes of traffic and vehicle crashes are numerous, but unsurprisingly a significant number of crashes are related to inclement weather. A thesis by Yue Liu took fourteen-years of NHTSA data and found that 24% of vehicle crashes were weather related in the state of Maryland, a state very similar to Virginia in geography and weather. With 75% of weather-related crashes occurring on wet pavement and 15% occurring during snow (Liu, 2013). Making rain and snow the biggest contributors to weather related accidents. Weather hazards may pose a particular problem for autonomous vehicles, which already have a huge number of variables to consider when they are being programmed to operate on the road.

The MITRE Corporation, a non-profit research group, is investigating ways to reduce traffic in Virginia. Using their MITRE ideation process they conducted a workshop that closely refined the problems plaguing Virginia's roadways. They then conducted brainstorming and consensus building operations to put forth possible solutions to fix the problems. As previously mentioned, a contributing factor to traffic is inclement weather, so one of the solutions MITRE put forth is to use real time weather data to improve roadway safety across Virginia. This capstone group has been to tasked to investigate the practicality of this solution, and to bring forth a design deliverable, whether it be a device or system, that would turn this idea into a real-world solution.

The internal guidance for the MAE 4690/4900 Spacecraft Design Capstone project has laid out 12 tasks for the academic year 2020-2021. With the first 6 tasks expected to be completed by November 24, 2020 and the last 6 by May 30, 2021. The Spacecraft Design project team focused on "Real-time weather data to improve roadway safety" is led by Raeann Giannattasio and the other team members include: Allen Lang, Ariana Asquini, Avery Walker, Elias Topp, Ethan Vicario, Kyle Ebanks, Mici Cummings, Pranav Sridhar, and Rikia Freeman.

STS Topic

According to the Pew Research Center, eighteen percent of U.S. adults use social media as their primary source of political news (Mitchell, 2020). This group of Americans also happens to be less informed on political knowledge than those who use other mediums to access the news (Mitchell, 2020). Social media websites offer a relatively new and exciting way for individuals to connect with each other and tune in. Whether users are catching up on their friends' activities, or

finding out what is happening halfway around the world, information gets to social media consumers almost the instant something happens. Unfortunately, it seems now that disinformation and "inflammatory posts" are spread just as quickly (Rosen, 2018).

In addition to the spread of disinformation, scholars are noticing that social media is having substantial effects on their user's psychology in ways that are incredibly harmful. The recent Netflix docudrama, *The Social Dilemma*, features multiple former heads of social media websites such as Tristan Harris and other credible sources such as the social psychologist Jonathan Haidt. These individuals come forward to show how social media sites are making money but more importantly how the psychological effects of social media are damaging society. These problems include increased depression and suicide rates for young adults, algorithms that make it easier to get caught up in conspiracy theories, and the increased rate at which misinformation can spread just to name a few.

Speaking of algorithms, a study by several German professors from The University of Duisberg-Essen shows considerable evidence that the recommendation system of YouTube is responsible for creating "like-minded information spaces" that lack exposure to countervailing ideas (Rochert, 2020). The problem simply stated is this, the current state of social media is curating an environment of political discussion where the facts have become distorted and where nuance, diversity of opinion, and reasoned arguments are rapidly disappearing. Democracy requires open and reasonable communication between all parties and interests involved, using an agreed upon set of facts. However, the disconnected and tribal nature of current social media is making this more difficult not less. The intention of this research paper is to analyze the political effects of social media through two STS frameworks, technological momentum and wicked problems.

According to Thomas P. Hughes the idea of technological momentum is a "flexible" framework that lies somewhere between the poles of social constructivism and technological determinism (Hughes, 1994). Technological momentum is the idea that a technological system gains inertia with time. At the beginning of a new system it is relatively easy for society to manipulate and shape but as time goes by, and the system becomes more and more prevalent in the society, the nature of that system becomes much more difficult to change. A strong criticism of this framework is that it is still largely deterministic and does not provide a sufficient argument to be considered as a separate framework. In the early phases of social media, functions such as likes, retweets, sharing, recommendations, and direct messaging were constantly changing. Different social media applications were quickly rising to the top but then falling off the map. Social media, was very volatile in the beginning and heavily influenced by users, but over time has stabilized. This appears to be much more consistent with a technological momentum framework than a technological determinism framework, and will be investigated with greater detail going forward.

Eila and Margherita describe a wicked problem as a complex problem with no clear solution that can be viewed from multiple different perspectives regarding both the problem and the potential solution put forth to solve it (Elia & Margherita, 2018). As a result of contradicting interests, undefined goals, and incomplete perspectives, wicked problems by definition cannot be solved but the effects and issues related to the problem can be somewhat managed (Yawson, 2013). One critique of this framework is that it does make a sufficient distinction between a wicked problem and a non-wicked problem. This could be a fair point in some cases where the "wickedness" of the problem is being exaggerated, and the solutions and stakeholders are not as

difficult as some may believe. On the topic of social media and the dissemination of information, however, the extremely complex nature of the issue will make this point obsolete.

Research Question and Methods

Research Question: Why does the current state of social media foster an environment that appears to be more destructive than constructive to political discussion and debate in the United States?

To properly approach this question, this paper will first define what makes political discussion constructive or destructive and layout what an ideal case of political conversation might look like. Since U.S. politics and society is heavily centered around the constitution, the constitution and its writers will be used to help define this ideal. This cannot be considered a perfect ideal, however, given that the original constitution and its writers, many of whom were slave owners, had considerable faults. For this reason, it would be wise to also consider other liberal thoughts and ideas to help determine what constructive political discussion might look like.

Documentary research and discourse analysis will be the primary methods utilized in order to effectively answer the research question. While conducting the research and analysis there are several sub questions that should be considered. Has political division and extremism actually increased since the rise of social media? How do social media algorithms impact the information and content users are seeing and how does this impact their beliefs and knowledge? Is the lack of face to face interaction over these mediums part of the problem? Have attempts from social media companies to repress false information worked or made the situation worse? What ways has social media improved political discussion in the U.S.? Looking into the latest

literature on social media and society should help to answer some of these questions, thus building a better picture of the real impact social media is having.

To conduct documentary research many keywords will be utilized. Words such as: algorithms, propaganda, misinformation, censorship, psychological effects, social media, manipulation, and of course fake news. The remainder of the fall semester will be used to gather more sources and as much information and analysis on the topic as possible. Once research is established, the current plan is that the report will be divided into three subsections that are most relevant to answering the research question. The information that relates to the current state of social media and its effects will be organized into the first section. Then information that would help establish what healthy political discussion should look like and how that compares and contrasts with the current situation would be organized into the second section. The third section will then be dedicated toward to the potential solutions that have been laid out by experts, along with what the consequences of those solutions may be.

Conclusion

The technical project will provide MITRE with a potential solution to Virginia's Roadway Problems by the end of the fall semester. The specific subgroup focused on real time weather data hopes to provide a satellite-based solution that would provide improved real weather time data gathering that is relevant to Virginia drivers. Once a solution is determined, the project team will have a completed design by the end of the spring semesters after going through the Space Mission Engineering process. With the final impact being a greater situational awareness of weather-related road conditions that will reduce both vehicle accidents and the traffic congestion that they cause in Virginia.

With regards to the STS topic, the primary objective is to have a well sourced analysis of why social media is having such a negative effect on political discourse in the United States. This analysis will be viewed through the STS frameworks of wicked problems and technological momentum. Qualitatively speaking political discourse in the U.S. appears to be remarkable dysfunctional. This thesis will hopefully provide a better understanding of social media's role in this dysfunction. Along with an identification of the characteristics that should be addressed in order to create a more constructive environment for political discussion.

References

Amazeen, M. (2018). Reinforcing Attitudes in a Gatewatching News Era: Individual-level Antecedents to Sharing Fact-checks on Social Media. Retrieved 2020, from https://open.bu.edu/bitstream/handle/2144/34328/AmazeenVargoHopp_2018.pdf;jsessionid=1611BF37943DCDE932E6C5D6470B0480?sequence=1

Barrera, O. (2018). Facts, alternative facts, and fact checking in times of post-truth politics. Retrieved October 16, 2020, from https://www-sciencedirect-com.proxy01.its.virginia.edu/science/article/pii/S0047272719301859?via=ihub

Elia, G., & Margherita, A. (2018, March 20). Can we solve wicked problems? A conceptual framework and a collective intelligence system to support problem analysis and solution design for complex social issues. Retrieved November 02, 2020, from https://www.sciencedirect.com/science/article/pii/S0040162517308193

Haidt T, J., & Rose-Stockwell, T. (2019, November 12). The Dark Psychology of Social Networks. Retrieved October 16, 2020, from https://www.theatlantic.com/magazine/archive/2019/12/social-media-democracy/600763/

Hughes, T. P. (1994). Technological Momentum. Retrieved 2020, from https://collab.its.virginia.edu/access/content/group/e266e1e1-2ffd-4279-9392-ed04b3981909/Readings/Hughes%20-%20Technological%20Momentum.pdf

Kantrowitz, A. (2019, July 31). Man Who Built The Retweet: "We Handed A Loaded Weapon To 4-Year-Olds". Retrieved October 16, 2020, from https://www.buzzfeednews.com/article/alexkantrowitz/how-the-retweet-ruined-the-internet

Lim, S., & Bouffanais, R. (2019, December). Tuning Networks for Prosocial Behavior. Retrieved October 16, 2020, from https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=

Liu, Y. (2013). WEATHER IMPACT ON ROAD ACCIDENT SEVERITY IN MARYLAND (Master's thesis, University of Maryland, 2013) (pp. 4-10). College Park: Faculty of the Graduate School of the University of Maryland.

Madison, J. (1787, November 23). The Federalist Papers No. 10. Retrieved October 16, 2020, from https://avalon.law.yale.edu/18th_century/fed10.asp

Mitchell, A., & Jurkowitz, M. (2020, August 27). Americans Who Mainly Get Their News on Social Media Are Less Engaged, Less Knowledgeable. Retrieved October 16, 2020, from https://www.journalism.org/2020/07/30/americans-who-mainly-get-their-news-on-social-media-are-less-engaged-less-knowledgeable/

Orlowski, J. (Director). (2020). *The Social Dilemma* [Video file]. United States: Netlix. Retrieved 2020, from Netlix.com

Pew Research Center. (2020, February 04). Trends and Facts on Newspapers: State of the News Media. Retrieved October 16, 2020, from https://www.journalism.org/fact-sheet/newspapers/

Rochert, D., Weitzel, M., & Ross, B. (2020, July). The homogeneity of right-wing populist and radical content in YouTube recommendations. Retrieved October 16, 2020, from https://dl-acm-org.proxy01.its.virginia.edu/doi/pdf/10.1145/3400806.3400835

Rosen, J. (2018, September 18). America Is Living James Madison's Nightmare. Retrieved October 16, 2020, from https://www.theatlantic.com/magazine/archive/2018/10/james-madison-mob-rule/568351/

Tarleton, J. (2020). Using Weather Information to Reduce Accidents and Improve Traffic Flow. Retrieved November 02, 2020, from https://www.vaisala.com/en/case/using-weather-information-reduce-accidents-and-improve-traffic-flow

TRIP, A National Transportation Research Nonprofit, "Tripnet.org," February 2020. [Online]. Available: https://tripnet.org/wp-content/uploads/2020/02/TRIP_Virginia_BTN_Report_February_2020.pdf

Vraga, E. K. (2019). What can I do? How to use social media to improve democratic society. Retrieved 2020, from http://emilyk.vraga.org/wp-content/uploads/2020/02/Vraga_2018_Forum_AuthorCopy.pdf

Yawson, R. M. (2013). The 'Wicked Problem Construct' as a Framework for Organizational Development and Change. Retrieved 2020, from https://www.researchgate.net/publication/254965699_The_%27Wicked_Problem_Construct%27_as_a_Framework_for_Organizational_Development_and_Change