

**A Study of the Political Divide Caused by the Implementation of 5G Wireless
Communication in Virginia**

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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

The transfer of information across long distances forms the backbone of electricity, food, transportation, and many other aspects of life. Cellular communication is the most important method of transferring information. The most current technology for everyday consumers to use is called 5G and the use of 5G in modern communication systems promises to give exponentially more information to the public at a faster rate than ever before. In the past 100 years, each “generation”, like 4G and 5G, corresponds with major leaps in wireless communications, which occur approximately every 10 years. Every generation includes an increase in data rate which allows for more features. For instance, the third generation of wireless technology (3G) enabled video calling and TV streaming (“Evolution of Wireless Technologies 1G to 5G in Mobile Communication”, 2018). The use of 5G in modern communication systems promises to give exponentially more information to the public at a faster rate than ever before. However, the new technologies associated with 5G are divisive. In fact, Robert F Kennedy Jr, a major Independent candidate for US President in 2024, linked 5G to COVID-19 saying “the global lockdown was stopping people from protesting to prevent ‘5G robber barons from microwaving our country and destroying nature’” (Temperton, 2020). The 5G debate is a hotly contested issue because of how intertwined it is to larger conspiracy theories. Figures such as RFK Jr wrap 5G in the larger web of conspiracy theories that forms their worldview. In general, some think that the new technology

is dangerous to the public and an overstep of ambition because the alleged health risks to the public outweigh the benefits of 5G.

This paper investigates the ways that 5G implementation in some cases has been met with resistance caused by conspiracy theories and how in other cases 5G has expanded despite conspiracy theories. Since it is too ambitious to cover the entire response to 5G from every location on Earth, this paper focuses on the reactions by institutions and individuals to 5G implementation in Virginia specifically.

Methods and Frameworks

The framework in this paper is *The Social Construction of Technology* by Bijker (Douglas, 2012) which focuses on the broad interaction between technology and humans and how the two have influenced each other. Overall, the book focuses on the broad interaction between technology and humans and how they influence each other. In SCoT, the author describes how people in the past view technological progress as scary and dangerous. This paper uses the SCoT framework to describe the same scrutiny that is currently being applied on 5G technology. The “The Evolution of Large Technological Systems” section of SCoT is the most applicable section for the research question of this paper because of the discussion of the load factor.

As described in SCoT, the load factor is the ratio of how much the maximum possible output of a system relates to the average output (Douglas, 2012). SCoT claims that the load factor is a much-relied indicator of the return on investment. The load factor concept was coined

by Bijker in order to look at the return on investment of a system over time. More specifically, humans view the need for technology through the abstraction of the “load factor” (Douglas, 2012). If the load factor of a technology decreases overtime, the technology is considered to be obsolete because there is no more room for potentially increasing the output or productivity of the technology. SCoT also claims that the load factor is a much relied indicator of the return on investment: “the load curve that indicates the load factor, or the utilization of investment and related unit cost, is a much relied on indicator of return on investment. [When the load factor is low] the managers of a technological system try to expand the system in order to acquire a more desirable load or diversity” (Douglas, page 66, 2012). For most systems, the load factor is relatively easy to determine. This framework is necessary for thinking about if a piece of technology is believed to be harmful. In that case, the load factor is an improper indicator of the return on investment because the possible benefits received from the technology would be vastly outweighed by the harm it would cause. Others see it differently if they believe that the technology does not present serious harm and therefore the load factor is an important indicator of the importance of a technology. The fight over 5G mirrors this scenario exactly. The conspiracy theories around 5G make some believe that 5G is harmful and inevitably obsolete. Because of the differing opinions concerning its safety, the issue of whether or not to implement 5G technology is divisive.

As conspiracy can shroud facts, it can sow the seeds of doubt into the minds of everyone, decision makers and non-decision makers alike. People who are in positions of power listen to fringe conspiracy theories which have real world implications. The future of wireless technology relies on how decision makers and non-decision makers believe in these conspiracy theories about 5G. Even if some can recognize the apprehension about 5G, they believe this is

insignificant compared to the potential benefits, like revitalizing rural areas by providing better connection to the internet. Just as there are many reasons for its benefits, some individuals and institutions have varying reasons for believing that 5G has significant detrimental effects. Nunez, in an article compiling 5G misinformation, summarized claims about 5G on social media like “COVID-19 vaccines contain 5G microchips, [the] 5G release is used to cover up the COVID-19 pandemic, [and] 5G causes headaches, migraines, and dizziness” (Nunez, 2021). As seen in the list of conspiracy beliefs, some have apprehension about how it could negatively impact current communication systems while others are worried about health concerns. Those who have the most immediate impact on the decision for implementation are government officials specifically in the FCC and the DoD, 5G network providers like Verizon and T-Mobile, and local and national politicians who draft legislation relating to 5G. Indirectly though, conspiracy theorists, who make citizens and decision makers believe that 5G has harmful effects, took control of the 5G fight. Heilweil makes the claim that “this idea [of 5G conspiracy and doubt] went mainstream because influential people amplified it” (Heilweil, 2020) and notes many instances of celebrities using their status to amplify 5G conspiracies. As conspiracy can shroud facts, it can sow the seeds of doubt into the minds of everyone, decision makers and non-decision makers alike. More broadly, the fight over 5G implementation is so crucial to tackle because there is the element of doubt in governments and institutions. The doubt in governments is dangerous because it leads to the erosion of modern society, giving the fight over 5G even more significance.

This paper tackles the issue set by the SCoT framework to determine how society adapts to and is shaped by the technology of 5G and how societal issues affect the creation of 5G. With the rise of work from home policies and the sudden demand for high throughput video services during the pandemic (like Zoom), the societal influence on 5G is more evident now than ever.

The method in which this paper examines 5G implementation from the SCoT framework is through case studies. Examining news articles describing how 5G impacts citizens and primary sources from 5G operators and local governments gives a broader perspective in the overall 5G battle. The purpose of viewing 5G from the perspective of a load factor is to recognize that the effectiveness of 5G lies ultimately in the net impact. The load factor is the appropriate device for discussing the fight over 5G because the argument ultimately boils down to deciding if the net return on investment for 5G implementation is positive or negative. If it is negative, 5G should be abandoned and if it is positive it should be embraced.

The purpose of this paper is to examine the differing opinions on the return on investment for 5G and how conspiracy theories have impacted the implementation of 5G. Examining how different communities in Virginia are tackling 5G provides evidence for how the doubt caused by 5G conspiracy theories is having an actual impact on 5G implementation.

Regulations on 5G

The motivation for 5G is that as more commercial operators intend to transmit information, newer technology is necessary to detect and manage all the users transmitting at the same frequency range and at the same time. The field of wireless communications relies upon transmitting information at designated and well governed frequency bands. Wifi ranges from certain frequency bounds and FM radio ranges from different bounds. However, if too many transmitters are transmitting at the same frequency, a user can not get a clear signal. Therefore, the FCC sets strict guidelines as to the power and frequency range companies are allowed to use to transmit. Over time as more commercial operators intend to transmit information, newer

technology detects and manages all the users transmitting at the same frequency range. This is the motivation for every generation of wireless communications.

Regulations are necessary to ensure companies are not just transmitting carelessly and the regulations on 5G are well defined to protect people. Companies like Ericsson and Verizon spend time to ensure that 5G is safe and within FCC regulations. In particular, the 5G operator Ericsson published a white-paper proving that the method of 5G deployment they utilize keeps within the regulated and standardized limits. In order to keep within the well-studied frequencies, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) created guidelines which all 5G operators follow to ensure human safety. The commission concluded that “no non-thermal health effects have been established as being caused by RF EMF (5G frequencies), including cancer” (Ericsson, 2021). So staying within the limits set by the commission ensures public safety. The commission released new guidelines in 2020 in accordance with the new frequency limits in which 5G operates. Ericsson concluded that “typical overall environmental 5G EMF exposure will remain at a small fraction of international limits even with 5G being deployed since the contribution from 5G is relatively small” (Ericsson, 2021).

5G worries some because of the increased frequency of 5G compared to previous generations. Henk De Feyter, an assistant professor of radiology at Yale School of Medicine says “the radio frequency 5G uses is higher than the previous iterations of wireless communication, including 4G and 3G...That is what sets it apart. But otherwise, the technology works the same way” (Laurence and Dinetz, 2022). It is known that for all electromagnetic waves above 100 kHz, “interaction mechanisms of [5G electromagnetic waves] with the human body have been extensively described and tissue heating...they become less penetrating into body tissue with increasing frequency and for frequencies above 6 GHz, the depth of penetration is relatively

short” (Karipidis et al., 2021). With this background in mind, the case studies of 5G can now be viewed from a more realistic perspective. In spite of the vast amount of studies governing 5G radiation exposure and conclusions regarding the safety of 5G, the questioning and lack of trust in 5G can now be contrasted with the scientific evidence and experimentation. In the face of science, some still hold firm beliefs against 5G. Conspiracy theories and pseudoscience influence individuals and institutions that have a significant influence on the direction of 5G.

Responses by Individuals

Multiple individual efforts in both directions spearhead the implementation of 5G. The case studies demonstrate how individual efforts focus on proliferation of ideas about 5G. Opponents of 5G formed interest groups and vocalized their worries through performative measures demonstrated in Case 1. Proponents of 5G utilize it for personal career development and because they believe that others will benefit from it, as seen in Case 2.

Case 1:

On one hand, there exists individuals who hold steadfast in the face of science. In Montgomery county, Maryland, a county bordering northern Virginia, a local council meeting showcased the fear of individuals in the community. Bonessi describes the turbulence during a council meeting concerning 5G. The residents express concern about the lack of a regulatory board with definitive answers about 5G and its impact. The president of the Environmental Health Trust, an advocacy group that warns about the effects of wireless radiation, strongly opposed new 5G towers in Montgomery County. During the hearing, the president Dr. Devra

Davis exclaimed, “there are a lot of myths about 5G and, unfortunately, we’re being sold something for which there are no standards. It’s being built and then we’ll figure it out” (Bonessi, 2022). Dr. Davis’s comment can have multiple interpretations, but the most important is the nature of the opposition in itself. The comment by Dr. Davis suggests a general mistrust of many institutions at play. There is a mistrust of the 5G operators, such as Verizon, T-Mobile, and Ericsson, and all engineers working to ensure that 5G is safe. There is a mistrust of the local politicians who are trying to uplift a community through 5G. There is a mistrust of federal government agencies who are in charge of protecting American citizens. The result of this mistrust is the mindset ready for conspiracy theories to fill the gaps. To some, every action or lack of action by the government is part of a larger conspiracy trying to promote an ideology. The mistrust exemplified in Dr. Davis’s quote fuels apprehension about 5G in the first place. When further describing the public’s reaction, Bonessi notes:

“The county government also accused the FCC of failing to update its radio frequency safety standard [...] ‘I do not consent to radio frequency microwave radiation, Anne Pritchard, a former registered nurse and longtime resident of Silver Spring told the council last month’” (Bonessi, 2022).

The fear of the people in Montgomery County stems from fear of the unknown. The fear of radiation and a mistrust of the government fuels the flames of conspiracy theory and encourages its proliferation.

From the opinions expressed during the council meeting in Bonessi, those who do not trust 5G have a mistrust in authority. Because of the mistrust in authority, the 5G issue is emblematic of

the weakening trust in democracy and governments. The relationship between mistrust and conspiracy theories is a thoroughly researched field. In fact, studies have found:

“correlations between a conspiracy theory endorsement and mistrust in authorities (Abalakina-Paap et al., 1999; Einstein & Glick, 2015, Meur & Imhoff, 2021), mistrust in institutions (Mari et al., 2022), and mistrust in experts (Imhoff et al., 2018)” (as cited in Frenken and Imhoff, 2022).

The quote demonstrates the reasoning behind the jump from 5G mistrust to conspiracy. The mistrust in 5G is masking a broader mistrust in authorities and institutions. Once an individual starts to lose trust in the authorities and institutions, conspiracy theories follow right behind to act as a form of reasoning. The ultimate goal for the rapid implementation of 5G, to those who do not have trust in the government, must have nefarious motives.

Case 2:

On the other hand, 5G in southwestern Virginia is opportunistically utilized by local council members to expand broadband access to constituents. Residents of Craig County have significantly benefited from the 5G and the county received an influx of new residents because of the new opportunities. In southwest Virginia, rural Craig county experienced little to no connection to the internet compared to most urban and suburban communities in Virginia. In fact “internet service crept at 2 megabits per second...the Federal Communications Commission has defined the minimum speed for broadband as 25 megabits per second” (Yancey, 2023). Craig County significantly lacked modern technology. The pandemic sparked change as it required

students to have an internet connection for online learning. At this junction, the people of Craig County had two directions to choose from: increase their access to the internet or risk slipping away progress in a post pandemic world. The result of this decision is what makes this case study particularly interesting. In spite of the apprehension and doubts cast by conspiracy theorists to paint 5G as scary, the county embraced 5G. Spearheaded by the county's secretary on broadband service, Craig County exponentially increased 5G access. With a simple request to T-Mobile, the company installed 5G infrastructure enabling access to 92.6% of residents while the county next to Carig only has 30.4% access (Yancey, 2023). Craig County, with a population of 5000, has similar access to 5G as counties in northern Virginia with hundreds of thousands of residents (Yancey, 2023). The efforts of Craig County councilman Jordan Laibosa personally contacted the CEO of T-Mobile to expand 5G access in his county. As a result, many new residents arrived to Craig county and local economic development is thriving because of new access to 5G (Yancey, 2023). The reason for this is the so-called "butter-fly effect" (Yancey, 2023). Access to 5G started as just a way to connect people in their homes to the internet. This addition however sparked a chain reaction of possibilities unknown to the community before. Now, farmers sell their produce and advertise it online thanks to the increased access to the internet and Craig County received a \$50,000 donation from T-Mobile. Yancey notes that there is a "veritable flood of newcomers" in Craig County because of the new access to 5G (Yancey, 2023).

Craig County is emblematic of how individuals incorporate 5G technology into their business to improve the economy and could be a footprint for how 5G is positively utilized in other rural areas. The introduction of 5G into this community demonstrates how a concerted effort to invest in the 5G infrastructure can have a positive effect from secondary opportunities. Compared to case 1, the desire to improve overcame the apprehension that may have been

present about 5G. Laibosa reached out to T-Mobile because of a need by the people for a better life. The fear of 5G could have been gripping Laibosa and prevented him from going into that direction. The inaction would have been very easy in fact. Simply do not do anything about it. But it seems like the situation in Craig County made Laibosa think outside of the box. In fact, Laibosa is a Republican at a time where many Republicans side with 5G conspiracy theories. The situation in Craig called for individuals to make a decision as to how to solve the lack of internet access and the actions by certain individuals to place their trust in 5G providers lead to positive results for the community. Craig County is a prime example of how conspiracy theories did not impact the roll out of 5G in this community.

Responses by Institutions

Institutions make major decisions based on the public's fear of 5G. For instance, the decisions made by large companies to expand or decrease 5G efforts vary wildly based on the fears of 5G. Some institutions see 5G as an unnecessary impediment that only requires more changes and updates to their infrastructure as seen in Case 1. Other institutions view 5G as a major opportunity to expand their business and productivity as in Case 2.

Case 1

The struggle between the government and a private company trying to expand access for 5G encapsulates the fighting between institutions. Instead of cooperating with one another, the

two sides are butting heads and remain at an impasse. The DoD and Ligado have conflicts over the 5G implementation of Ligado possibly affecting the CIA's and FBI's communication capabilities (Alleven, 2022). Back and forth statements between the DoD and Ligado express exactly opposite positions. The DoD mentions that Ligado's GPS transmitters would impact DoD GPS receivers and vaguely mentions doing harm to current systems (Alleven, 2022). When confirming which of their devices specifically hindered the DoD, Ligado just received silence (Alleven, 2022). The struggle between the government and a private company trying to expand access for 5G is emblematic of the fighting between institutions. In this case, conspiracy theories do not play a direct role. Compared to the Montgomery county board meeting, this 5G fight seems to be over incompatibility between institutions. The DoD has its own priorities and would rather not change or adapt for the sake of others. The fight over 5G in some cases comes down to a reluctance to do anything or to change.

Another institutional example of the response to 5G is legislation by the federal government limiting 5G implementation near airports based on the fear that 5G will disrupt airplane communications with air traffic control (Clark, 2022). Implementing 5G in this case would require a restructuring of how air traffic communication happens and this is an investment that would require financial support.

The Virginia Beach government prioritizes the resort industry and their priority informs local policy on 5G expansion. When it comes to the responses by federal agencies and local governments, it is evident that in these cases the decision for refusing 5G expansion is purely monetary. The institutions who don't allow 5G implementation think it is cheaper to maintain the current systems they have instead committing funds for evolving for the needs of 5G (Parker, 2019). As mentioned by Virginia Beach's chairman of the Resort Advisory Commission, "These

poles, they take up space...They're an immovable object near the bike path or pedestrian ways” (Parker, 2019). The decision against expanding 5G in Virginia Beach is met with the need to ensure a scenic view. Keeping the resort industry in Virginia Beach is a priority to the residents and therefore informs their opinion on 5G expansion.

Case 2

A private 5G network would exponentially improve the communication system of the port. The Port of Virginia is utilizing 5G to expand the productivity of the port. The Norfolk International Terminal (NIT) is a large section of the Port of Virginia and relies on high speed connections for ships and personnel on the port to coordinate where ships can load and unload. The NIT is undergoing an expansion that would almost double the number of containers that would pass through the port each year (O'Halloran, 2023). Performing this expansion, however, requires improving their wireless communication infrastructure. The private 5G network dedicated for the NIT would “replace spotty outdoor WI-FI and enable secure, instant voice text and data communications on the campus through Verizon” (O'Halloran, 2023). It is evident that the NIT desperately needed improvements to its wireless network. A shipping port must have clear lines of communication to transmit loads of important information quickly. A private 5G network would exponentially improve the communication system of the port. The vice-president of technology for the NIT notes:

“Shipping terminals are rugged, constantly changing outdoor environments that require super-reliable, ubiquitous connectivity for safe and adaptable operation. Verizon Private 5G provides that and gives flexibility to scale up and layer on more capability as our needs evolve” (O'Halloran, 2023).

It is obvious that the NIT relies on 5G because in the long run there will be a net positive gain. Embracing 5G is financially beneficial for the NIT. This is another important aspect to note about 5G. Institutions and individuals embrace 5G because they will ultimately make more money (in the case of the NIT) or further their political career (in the case of Jordan Laibosa). The CFO of Verizon touts the implementation of the 5G private network at the NIT to investors at Morgan Stanley saying “the company is seeing good traction with private networks, noting that customers like the reliability and dedicated bandwidth that they can get with a 5G private network” (Marek). The possibility of success and fortune can change the opinions of those who may be apprehensive. The fight over 5G and the influence of conspiracy theories ultimately will come down to who sees 5G as an opportunity for further success . This may be a nihilistic viewpoint straying from the SCoT framework, but the reality is that the perception of the effectiveness of 5G is ultimately subjective. On one hand, some can point to the concerns brought up by health concerns to justify their conclusion that 5G is overall not helpful. On the other hand, others can point to the growth that 5G has brought to towns and businesses as an example of effective improvement. In this case, the investment into 5G is ultimately worth it. The investment into 5G now for the Port of Virginia will enable more revenue for the Port of Virginia in the future.

Conclusion

The social and political divide over the implementation of 5G is alive and ongoing throughout Virginia and the United States. The overall cost-benefit tradeoff significantly affects the opinions of institutions. Institutions who will benefit from 5G in the long run will embrace 5G and those who think that 5G will have a net negative impact will stray away from 5G and make the necessary excuses to justify their decision.

The diverse population spread through urban, rural, and suburban areas in Virginia in conjunction with its proximity to the most sensitive governmental centers in the entire nation (such as the FBI and CIA) makes the 5G fight in Virginia particularly unique. This paper examines the ways people and institutions have been influenced directly or indirectly from conspiracy theories in the implementation of 5G. Some point to a general distrust of government. Others embrace 5G when it comes to ensuring the success of themselves and their organizations. The reasons for the fight over 5G are varying but ultimately the future generations of wireless communications relies on the decisions made currently. There is a fork in the road for wireless communications and conspiracy theories influence significantly where society goes from here.

Viewing the 5G from the SCoT framework, it is evident from the plethora of cases given that 5G implementation has an overall net positive effect on the overall population. The cases of 5G apprehension were not founded in reasoning. The reasons for apprehension mostly resided in a fear of the unknown and an unwillingness to change. As seen in all cases in which institutions or individuals raised questions about 5G, the reasoning fell flat and there was no consideration to the net benefits of 5G. There are no major scientific studies cited by institutions explaining their worries about 5G. In contrast, cases supporting 5G implementation demonstrate the positive outcomes associated with 5G.

As telecommunication upgrades continue, it is important to proceed with caution. As humans are exposed to new frequencies with future versions of cellular communication, safety testing is imperative. Human safety should never be compromised for the sake of profit and it is necessary to uphold engineering ethical standards. Society must be able to have trust in engineers at private telecom companies. A lack of trust led to the current situation with 5G in the first place.

When apprehension is set aside, there are positive outcomes. 5G implementation has a direct positive effect on the human population as demonstrated above. Additionally, there is science to back up the safety of 5G. From telecommunication operators to doctors, there exists a clear opinion from the cases above that 5G is safe. Therefore, in spite of the apprehension caused by conspiracy theorists, society should embrace 5G as it has an overall positive outcome for all.

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