



Assessing the Risks of Huawei's 5G Technology in the United States



ENODO
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Trachtenberg School
of Public Policy
& Public Administration

THE GEORGE WASHINGTON UNIVERSITY

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BACKGROUND

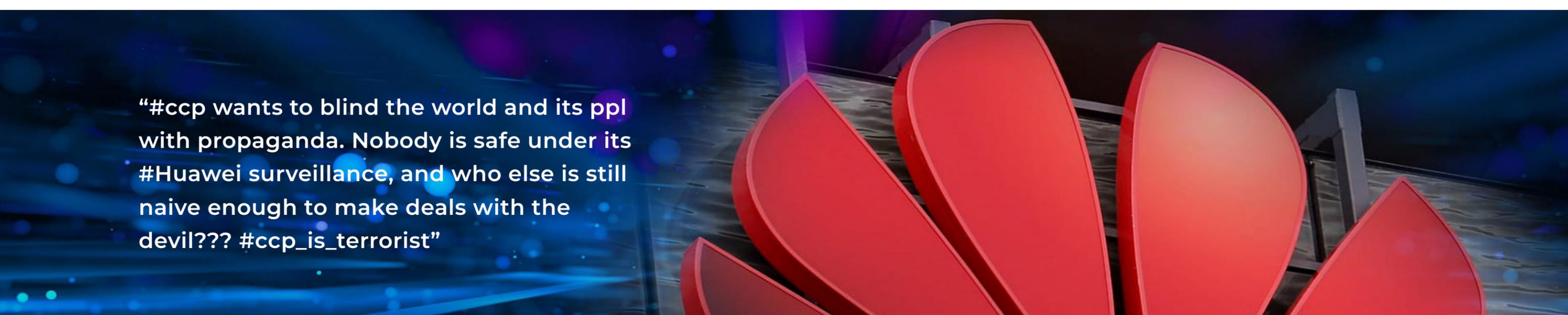
ENODO Global Inc. and the George Washington University (GW) Trachtenberg School of Public Policy and Public Administration partnered on a Capstone Project to identify and understand the Social Risks associated with Huawei's 5G communications technology. The Capstone team conducted a four-month, multi-phased project designed to examine the security risks associated with Huawei's 5G implementation in the U.S., economic impacts of sanctions against Huawei and its 5G rollout, and social implications associated with Huawei's 5G technology.

Project findings uncover the various challenges faced by both Huawei and the U.S. government and highlight their inability to shape public perception. Recommendations deliver novel solutions to help both Huawei and the U.S. Government develop and enact favorable policy decisions for 5G implementation and create a coherent communications strategy that addresses stakeholder concerns and shapes public perception surrounding Huawei's U.S. market entry.

EXECUTIVE SUMMARY

5G technology is the future of U.S. telecommunications, however, its integration into the existing infrastructure is uncertain. Only a select few telecommunications firms possess the capability to compete for the U.S. market. While industry experts and the general consumer are generally not concerned with who leads the implementation, the U.S. government has designed policies and taken actions to block Huawei from implementing its 5G technology into the U.S. telecommunications network. The government's current activities center around the risks to national security, which is shared by many stakeholders who distrust Huawei due to its perceived relationship with the Chinese Communist Party (CCP). Many are unnerved that the CCP has the capability to obtain personal and proprietary information from Huawei's technology.

Perceptions associated with economic implications, however, reveal more polarized opinions about Huawei. Stakeholders see barring Huawei from the U.S. market as a missed opportunity or a safety measure to keep out unfair, subsidized competition, either of which do not account for U.S. tariffs and subsidies. Viewed from a social lens, people simply do not know enough about Huawei. This lack of knowledge reveals the challenges that both Huawei and the U.S. government face and presents opportunities to uncover fertile ground for changing the narrative and more importantly, public perceptions about Huawei. Addressing the security, economic, and social risks, enables both Huawei and the U.S. government to create a strategy to move forward with 5G deployment and the future of telecommunications.

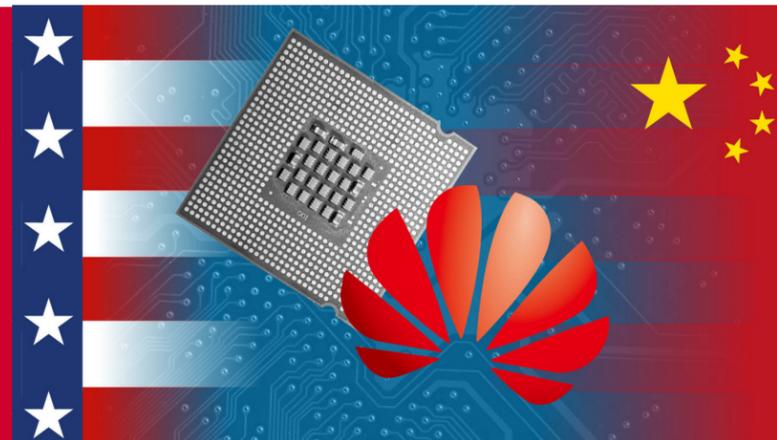


“#ccp wants to blind the world and its ppl with propaganda. Nobody is safe under its #Huawei surveillance, and who else is still naive enough to make deals with the devil??? #ccp_is_terrorist”

KEY FINDINGS

- ▶ There is no clear evidence that Huawei's technology or 5G implementation pose a threat to U.S. national security
- ▶ Implementation of Huawei's 5G network will not have a significant impact—positive or negative—on the U.S. economy
 - Individual companies and different sectors (i.e. semi-conductor) may experience a reduction in revenue and market share
- ▶ The social applications and benefits of 5G technology are not fully realized nor well communicated (i.e. urban and rural communities)
- ▶ U.S. public perception is the U.S. government's and Huawei's greatest obstacle in determining the future of 5G technology in the U.S. telecommunications market
- ▶ Industry leaders, policy makers, and the general public:
 - Want greater transparency from the U.S. government on the reasoning behind policy decisions directed toward Huawei
 - Associate Huawei with the Chinese Communist Party (CCP) news media and online discussions are dominated by narratives that provoke anxiety and fear
 - Remain uninformed about specific security concerns and the economic impact related to Huawei's 5G technology and implementation

“Thank you. National security must be put on the first priority. It will be a wise move to Ban Huawei as a 5G vendor.”



RECOMMENDATIONS

- ▶ The U.S. government should allow Huawei to implement its 5G technology into the existing telecommunications architecture under the following conditions - Huawei must:
 - Participate in an open architecture initiative with U.S. Government agencies and industry leaders to investigate security concerns
 - Engage with regulators directly to review the firm's products and services
 - Identify and remediate material deficiencies in order to establish trust and cooperation
 - Build trust with the U.S. government and industry leaders by decoupling its relationship with the CCP
- ▶ Use Huawei's successful engagement with the UK's Huawei Cyber Security Evaluation Center (HCSEC) as a model for evaluation
- ▶ Work with allies to pursue the implementation of intellectual property laws in China
- ▶ Work with U.S. telecommunications companies to rapidly develop alternatives for Huawei's technology (i.e. 6G)
- ▶ Remove Huawei from the U.S. Entity List that cuts off U.S. suppliers and forces Huawei toward self-sufficiency

“We expect that our business will inevitably be affected. We will try all we can to seek a solution... survival is the key word for us at present.”

Chairman Guo Ping



RESEARCH DESIGN / METHODOLOGY

The Capstone team combined a convergent / divergent research methodology with qualitative and quantitative analysis, over a four-month period, to uncover unique insights into the various risks associated with Huawei's 5G technology and its implementation. The team combined survey data, academic research, and targeted interviews with leading telecommunications experts to form the basis of its qualitative data. It used ENODO Global's customized data analytics platform to obtain quantitative data through topic modeling and sentiment analysis in order to gauge public perceptions of identified risks.

The Capstone team also applied customized research methods to assess the security, economic, and social risks related to Huawei in each project phase, which produced specific insights for each topic area.

Phase 1: Security Risk → Conducted five expert interviews with individuals in the U.S. government and the telecommunications industry; surveyed panel attendees at a Huawei specific event to gauge views from an informed community; and piloted a random sample survey of 1,000 U.S. residents to measure general public perception.

Phase 2: Economic Risk → Analyzed economic literature, financial disclosures, as well as economic and trade data to quantify potential impacts that result from sanctioning Huawei.

Phase 3: Social Risk → Examined publicly available white papers and marketing materials on 5G benefits, Huawei, and its competitors to better understand how these concepts are being presented to U.S. consumers.

PHASE 1: SECURITY RISK ANALYSIS

The GW team began their analysis with preliminary research through online resources from media outlets to gauge the public's understanding of Huawei, 5G technology, and the U.S.-China trade dispute. The research team also relied on key sources from government and inter-governmental regulators to identify perceptions of Huawei (e.g. NATO's Cooperative Cyber Defense Center of Excellence). Overall, the team found that the extent to which sources believe Huawei to have a direct link to the Chinese government varied significantly.

Second, The GW team attended a February 13, 2020 informational event "Commercial Application of 5G: Security Uncertainties with 5G Deployment" to help contextualize findings in the initial analysis of news sources and expert research papers. The team surveyed event attendees (as discussed below and shown in Figure 1) to gauge the perceptions of Huawei's security risk amongst an informed audience. Event panelists suggested that the U.S.'s aggressive anti-Huawei lobbying among the international community has overshadowed their ability to persuade other governments to cooperate using the risk-based evidence available. They suggested this approach has limited U.S. leadership on how Huawei should be integrated into national networks going forward.

Third, the team conducted five expert interviews with an activist, a think tank director, a telecommunications network industry leader, a trade administration policy advisor, and a legislative aide who covers telecommunications for a prominent U.S. Senator. Responses were unsurprising based on the general research, such as interviewees having a generally negative perception of Huawei's relationship with the CCP. Other responses were unexpected, such as each interviewee recommending more private sector involvement and market-based solutions in response to Huawei's 5G network (key statements outlined below in Table 1).

Interview Key Statements: (paraphrased)

- The public hears more from politicians about the Huawei security issue than from technology experts.
- You cannot ensure that the software won't carry a backdoor, and networks are usually controlled by one provider with major costs to change. Therefore, with Huawei there is always a risk of giving them control of a network, and all data in that network, due to Chinese law requiring Huawei to comply with the CCP.
- Sovereignty over technology resources and infrastructure is as important as natural resource control would have been in the future.

Table 1. Expert Interview Key Statements



PHASE 1: SECURITY RISK ANALYSIS

In addition to the expert interviews and background research, the team employed two surveys to form the basis of its quantitative findings. As previously discussed, the team first surveyed attendees at a panel on Huawei's security risks to gauge general opinions and knowledge of an informed audience that actively seeks out additional information on Huawei. Many respondents indicated some familiarity with Huawei, but were not convinced of the security or economic risk that Huawei may pose. Similar to the industry interviews, respondents for this survey were very concerned with Huawei's cooperation with the CCP.

The second survey launched by the team collected responses from a sample of 1,000 individuals in the U.S. to gauge opinions and knowledge of the general public regarding Huawei and 5G technology.

A majority of respondents to this question noted they were unfamiliar and unconcerned with Huawei. Additionally, 40% of respondents are neutral towards the U.S. federal government's response to perceived security issues with Huawei (results seen in Figure 2). These insights further informed the comparative analysis of the general public's perception of Huawei to the perception of industry stakeholders and experts. Digging into the data further, it is interesting to note that as education level increases among the population, so does belief in Huawei's potential security risks. From the survey, those with a Master's degree or higher are significantly more likely than those with college education or below to believe Huawei is a national security risk. Additionally, those who identify with the Republican party are more likely to believe Huawei poses a security risk than their Democrat counterparts (45% and 31%, respectively).

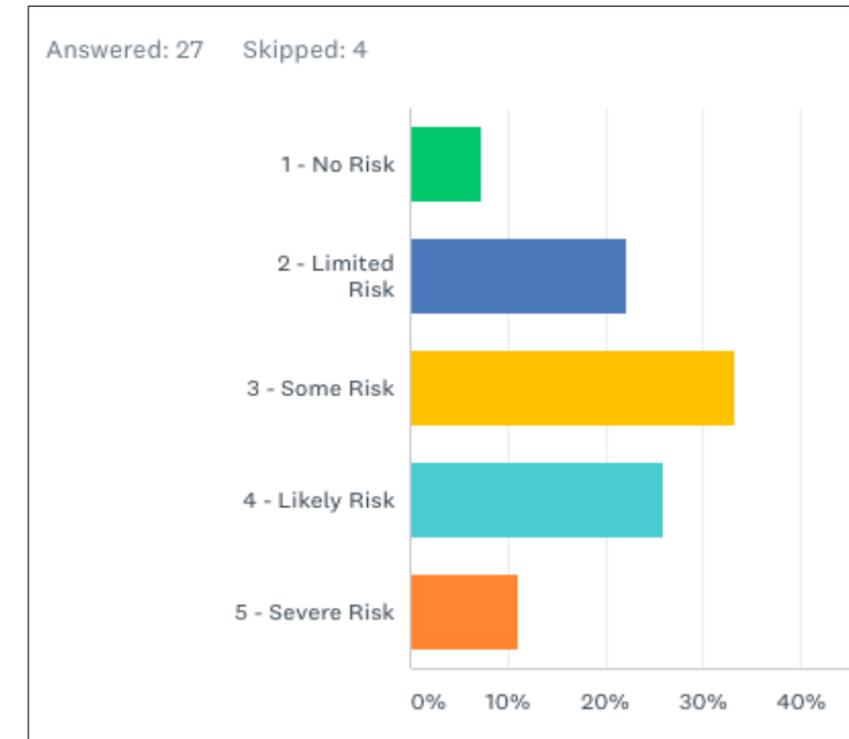


Figure 1. Huawei 2/13/20 Event Informed Audience Survey Results – On a Scale of 1-5, How Severe of a Security Risk Does Huawei Pose to the United States?

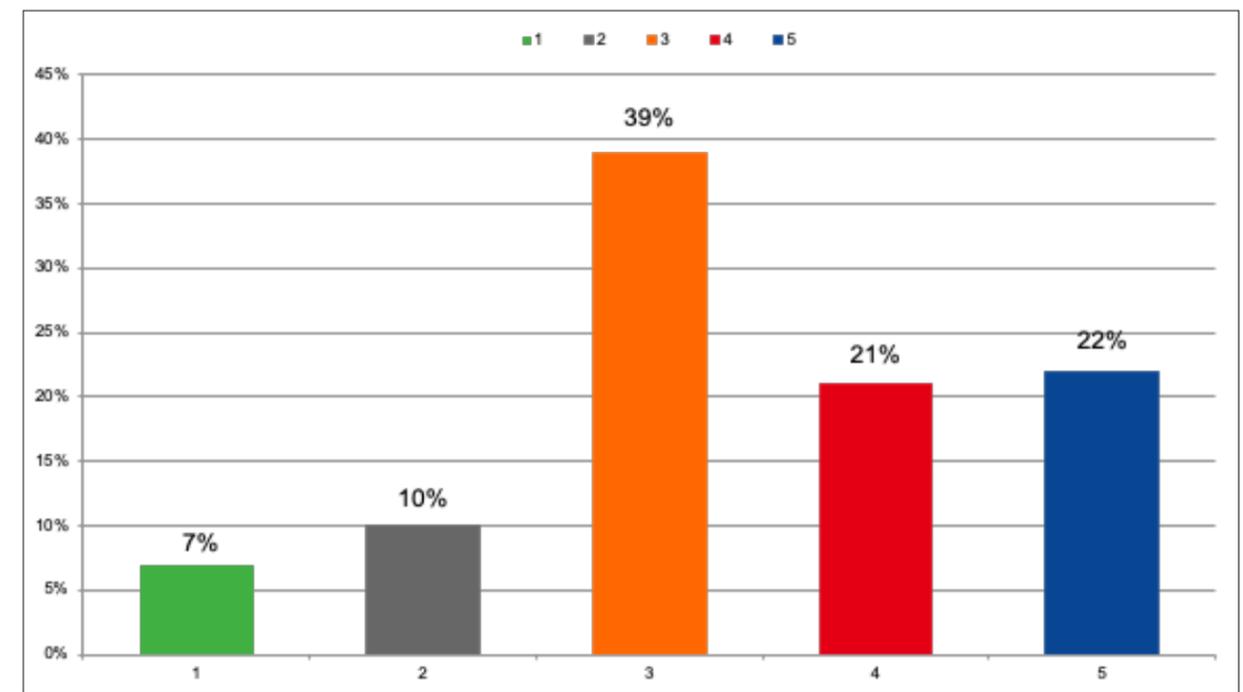


Figure 2. Omnibus General Audience Survey Results 3/19/20 – On a scale of 1-5, with 1 being no risk at all and 5 being a severe risk, how much of a security risk do you think Huawei poses to the U.S.?



PHASE 1: SECURITY RISK ANALYSIS

Finally, the team examined ENODO Global's broader sentiment analysis of social media data associated with security risk. Initial findings show that while 45% of active social media users have a negative sentiment towards Huawei's security risks, the majority of individuals still view the company in a neutral or positive light.

Topic modeling of this data also shows that online security risk conversations regarding Huawei are mostly concerned with the challenges of integrating 5G equipment and / or replacing Huawei's telecommunications technology in the existing U.S. infrastructure.

These results, in conjunction with the expert interviews and survey findings, suggest that industry and government concerns are not being communicated effectively and that there is more opportunity to solidify the policy narrative related to Huawei's security risks.

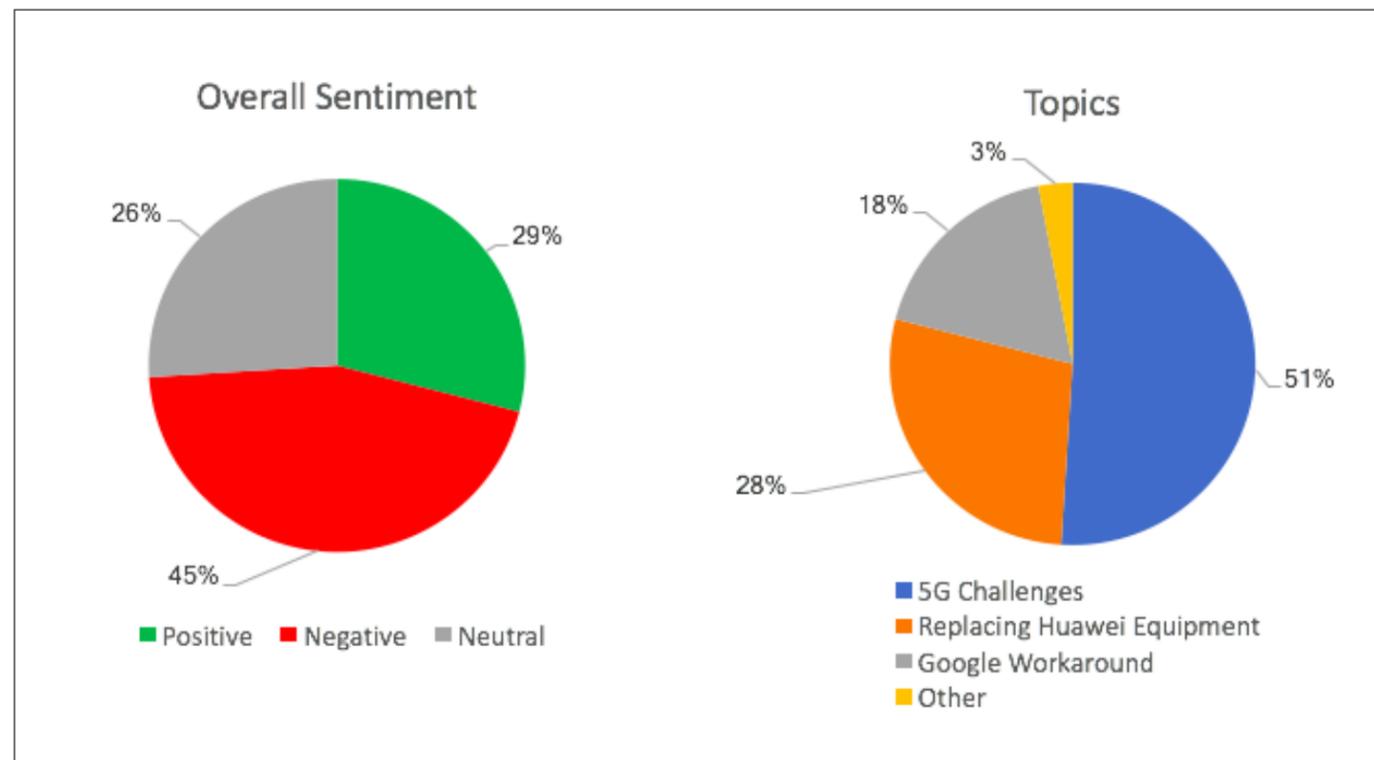


Figure 3. ENODO Sentiment Analysis and Topic Modeling 4/15/20 – Security Risk

PHASE 2: ECONOMIC RISK ANALYSIS

According to ENODO Global's topic modeling data, the overall sentiment related to economic risk was neutral. Online conversations about Huawei were tainted by the U.S.-China trade war, which has dominated conversations since 2019. Other topics identified were concentrated around the German-U.S. relationship, as Germany adopted Huawei's 5G technology, despite U.S. pressure, and around 5G technology's economic impact, as 5G technology is hailed as the next industrial revolution.

Based on the topics identified in the social media data, the capstone team's qualitative analysis focused on intellectual property right disputes and the Department of Commerce's Entity List ban that are at the core of the U.S.-China Trade dispute, and the economic impacts of a timely 5G uptake in the U.S. The scope of this project focused on the relationship between U.S. government and industry leaders and Huawei.

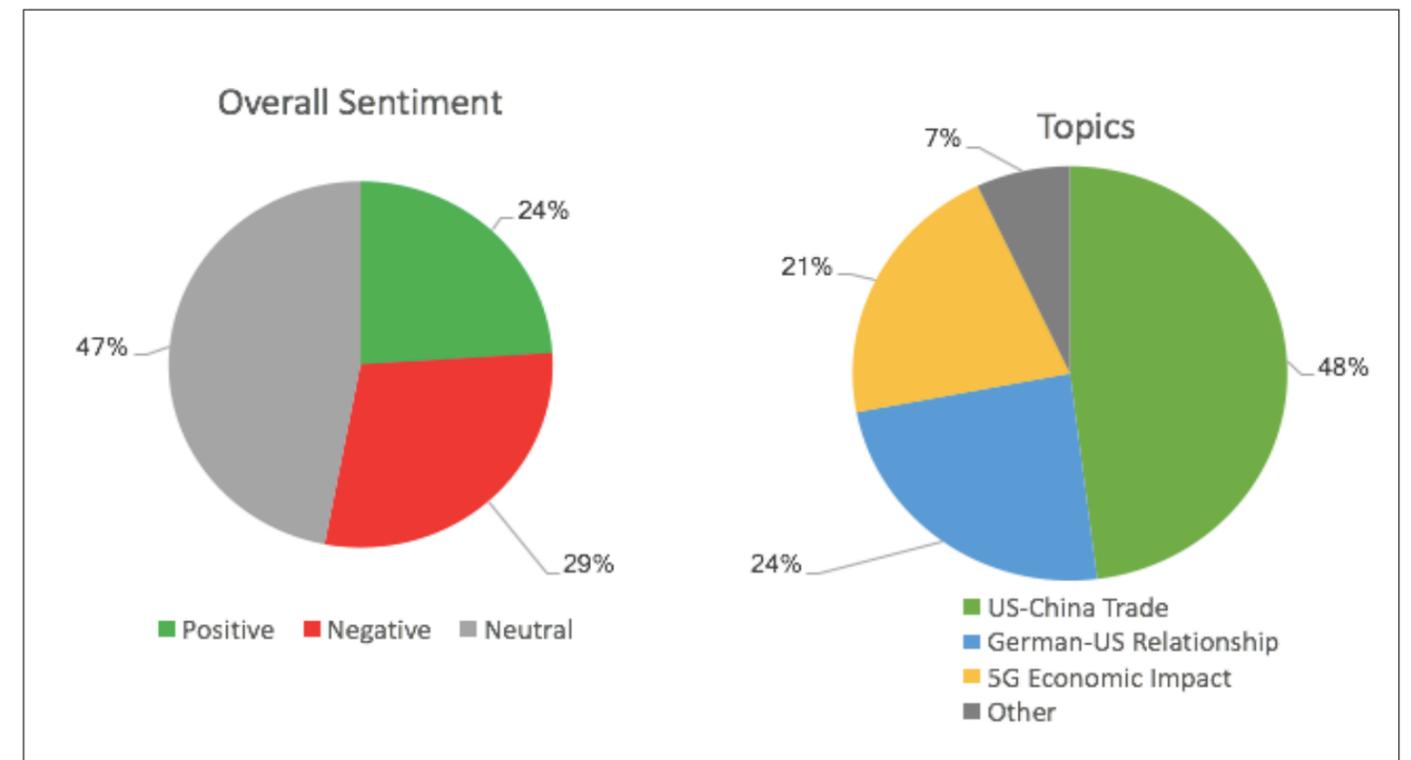


Figure 4. ENODO Sentiment Analysis and Topic Modeling 4/15/20 – Economic Risk

PHASE 2: ECONOMIC RISK ANALYSIS

Intellectual Property Rights: Lax implementation of international intellectual property laws in China has been a key point of conflict in trade negotiations between U.S. and China for decades. The U.S. has accused Huawei of intellectual property theft, most recently in February 2020. U.S. policy has focused on pressuring ally nations not to collaborate on research and development with Huawei, and has forced universities within the U.S. as well to end their collaborations with Huawei. In response, Huawei has adopted an open-source technology strategy.

5G is set to revolutionize the internet and power futuristic technologies like artificial intelligence and quantum computing. Quantifying the economic impact of 5G, which is positioned to usher in technologies that have not yet been universally deployed, is difficult. What is concerning is that small network carriers in rural areas in the U.S. have suffered because of the U.S. government's move to extricate Huawei's infrastructure from rural networks. As a result, the U.S. government earmarked \$1 billion USD to compensate rural networks for the replacement of Huawei equipment with its competitors in February 2020, which the Telecommunications Industry Association has said will "help the U.S. lead the way in 5G security."

Although compensating small rural network carriers is imperative to ensure coverage in hard to reach rural areas, Huawei is still the cheapest 5G option thus far. As 5G is deployed throughout the nation, it is especially important that networks are deployed equitably as the resulting improvements in technology are set to transform the way U.S. consumers do business and also provide social services like education and healthcare. Restricting access to Huawei could exacerbate inequalities within the country if core urban areas receive 5G coverage sooner than rural periphery areas and marginalized communities.

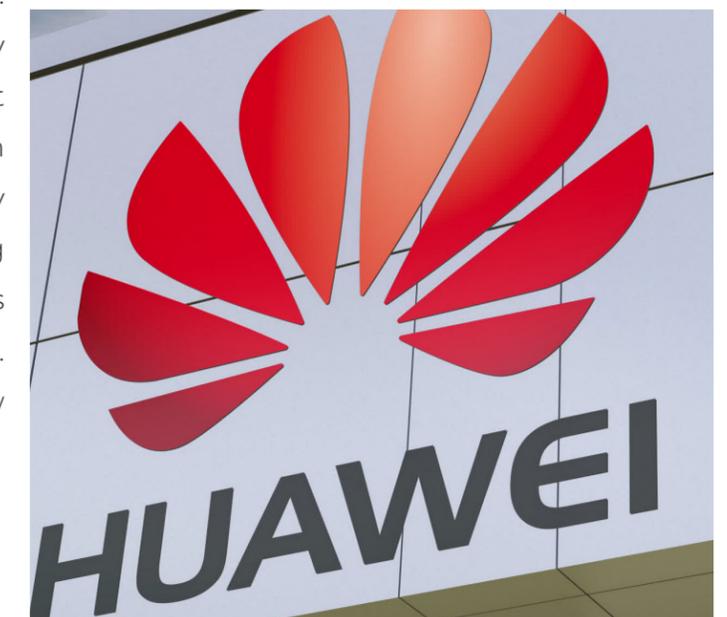
Department of Commerce's Entity List: On May 15, 2019, the Department of Commerce added Huawei and its affiliates to the Bureau's 'Entity List.' The Entity List imposes specific license requirements "for the export, reexport, and/or in-country transfer of controlled items" on foreign companies that are believed to have violated U.S. national security interests. This move immediately produced two casualties within the U.S. economic landscape: Google and the U.S. semiconductor industry. Although Huawei claimed to not be affected by the loss of supply of semiconductors, it was reportedly affected by the ban of export of Google's services.

Google immediately suspended Huawei's Android license, which effectively cut the firm off from the second largest cell phone manufacturer in the world.

Similarly, there was immediate backlash from the U.S. semiconductor industry. Despite a largely positive market, stock prices of semiconductor firms like Qualcomm, which earns 5% of its revenues through business with Huawei, and Broadcom fell substantially. Consequently, the semiconductor industry urged the government to "work with the industry". Since May 2019, the Administration has delayed implementation of the Entity List and granted numerous extensions, the most recent of which is set to expire on May 15, 2020. However, The Semiconductor Industry Association (SIA), the trade association and lobbying group for the U.S. semiconductor industry, protested media outlets overstating the scope of the government's temporary reliefs. According to the SIA, "The (temporary entity list) license is narrowly focused and does not allay our concerns about economic impacts on the semiconductor industry. The license only allows continued exports of parts for servicing related to existing (as of May 16, 2019) networks and handsets, not exports for new products. Moreover, no new sales to Huawei for new equipment are permitted.

As a result, the license offers only very limited relief to suppliers of Huawei, including U.S. semiconductor companies, as the majority of their business with Huawei involves sales for new devices."

A key finding from the team's survey of the U.S. general public was that 40% of consumers are unsure of Huawei's economic risk (results seen below in Figure 5). The risks identified in the economic literature review were not in line with the risks identified in surveys of the general public, nor with ENODO Global's topic modeling. From an economic viewpoint, there is a discrepancy among the industry's perspective of Huawei's economic risk compared to how U.S. consumers view the issue. From this finding, it is the responsibility of policy makers to safeguard the economic interests of U.S. consumers.



PHASE 3: SOCIAL RISK ANALYSIS

A review of white papers and marketing materials put out by the telecommunications industry, including Huawei and its competitors, the team gauged how 5G benefits are being communicated directly to consumers.

In particular, the team was interested in whether consumers actually believed that Huawei could bring these benefits to market faster and cheaper than their competitors.

At the same time, online conversations put little emphasis on Huawei's perceived advantages in the 5G market, despite the narratives in popular media. Instead, topic modeling of social perceptions shows that key online narratives related to Huawei's 5G technology are "fear," novel associations with COVID-19, and an idea that the firm may be a "divisive force" if allowed to enter U.S. markets.

These findings suggest that Huawei's marketing of 5G benefits has not connected with the general public. Despite this, sentiment analysis of Huawei's social perceptions shows that a majority of consumers still see the firm in a neutral or positive light. Accordingly, there may be an opportunity for Huawei to reshape the online narrative and brand engagement strategy in its favor by emphasizing the ways in which the firm's technology can bring tangible benefits to consumers

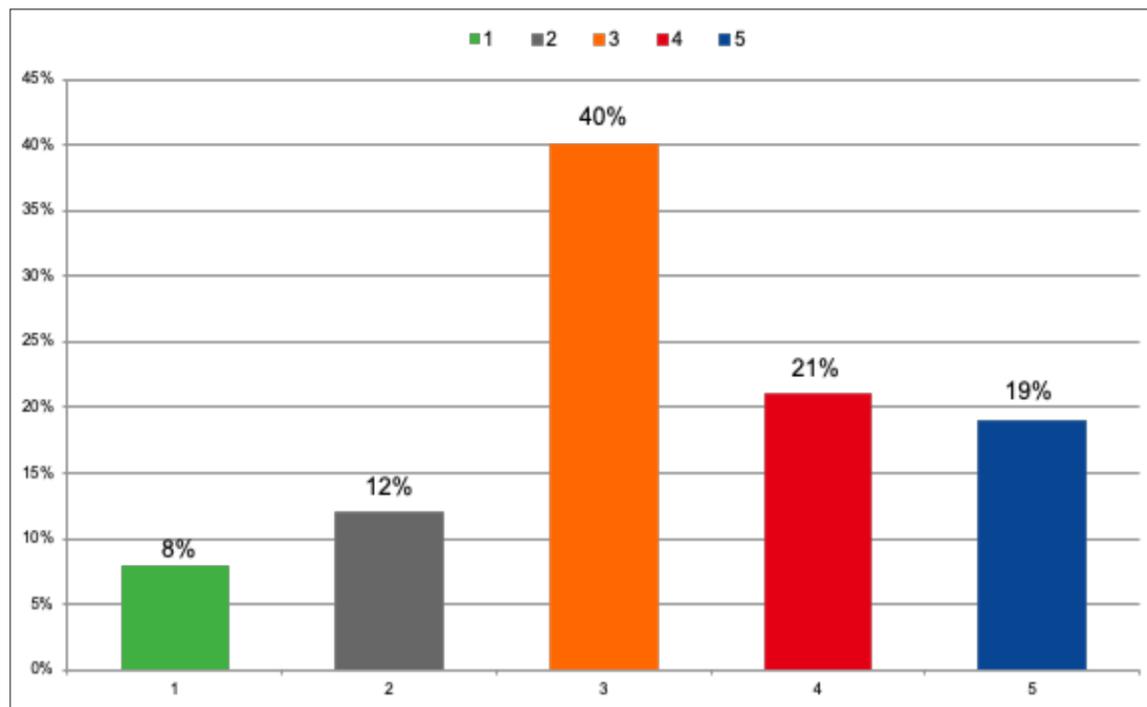


Figure 5. Omnibus General Audience Survey Results 3/19/20 – On a scale of 1-5, with 1 being no risk at all and 5 being a severe risk, how much of an economic risk do you think Huawei poses to the U.S.?

Using ENODO Global's perception data, the team sought to understand whether the use cases touted by Huawei and other telecommunications firms, such as 5G enabling autonomous vehicles or remote health care applications, resonated with consumers in online conversations.

While consumers have a general understanding that 5G can contribute to faster internet speeds, ENODO Global's sentiment analysis (shown in Figure 6) demonstrates that consumers do not engage with Huawei's branding of 5G benefits and the ways they could impact everyday lives.



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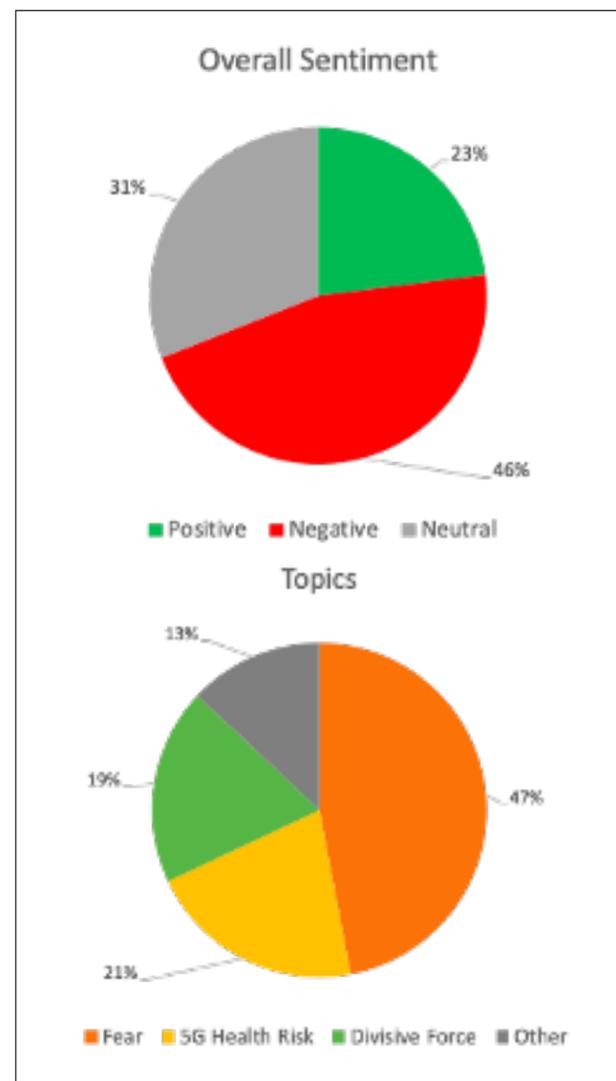


Figure 6. ENODO Sentiment Analysis and Topic Modeling 4/15/20 – Social Risk

CONCLUSION / WAY AHEAD

China's suspected role in the COVID-19 pandemic has reinforced the current administration's efforts, which has opposed since inception the integration of Huawei's 5G technology into the U.S. telecommunications architecture. Huawei, due to the sensitive nature of its business and suspected relationship with the CCP, is in the crosshairs of policy decisions designed to negatively impact the company, which in turn counter-Chinese influence in U.S. markets. Huawei faces considerable challenges in a highly charged political environment due to heightened anti-Chinese public sentiment and a tsunami of negative news reporting and online discussions associated with its capabilities.

Creating a nationwide 5G telecommunications network benefits all stakeholders. However, to gain favorable policy decisions that enable Huawei to implement its 5G technology into U.S. telecommunications networks, Huawei must implement a series of initiatives designed to deliver tangible projects that promote economic opportunities for U.S. companies. These initiatives must be transparent, measurable, and establish protocols that address security concerns while simultaneously illustrating the economic and social benefits of Huawei's technology. Moreover, they must be reinforced by consistent communications and engagements that allay fears, build trust, and disassociate Huawei from the CCP.

ENODO Global welcomes the opportunity to collaborate with U.S. Government and private sector stakeholders to provide actionable insights that inform sound policy decisions across the three policy categories (i.e., security, economic and social). These insights emerge from real-time crowdsourced collection and analysis of public sentiment associated with the intended benefits of digital transformation and improved connectivity proposed by 5G technology. ENODO looks forward to assisting Huawei and the U.S. government find common ground and usher in a new era of telecommunication with the U.S.





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