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# Explaining the technological acceptance of 5G: Quantitative and qualitative insights from China and the United States

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## Abstract

This study examines people's acceptance of the fifth generation (5G) of wireless and mobile communication technologies at a time when such services and devices were just approaching consumer availability. It utilizes the Technological Acceptance Model to the frame analysis of key perceptions of 5G technology, as well as the social climate surrounding it. Quantitative and qualitative data were gathered from adult samples in China and the United States to assess how they understand and perceive 5G technology. The results show that perceived technological features (e.g., perceptions of usefulness and speed) explain the favorable attitudes and adoption intentions in the two countries, whereas personal privacy concerns explain the negative attitudes and intentions. The results also demonstrate that, while 5G technology was often regarded as an instrument for national elevation in China, we see more concerns about rumored negative effects of the technology on health in the United States.

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## Introduction

This study examines people's attitudes toward and intention to adopt the fifth generation (5G) of wireless and mobile communication technologies just as the services and devices were becoming available. Essentially, 5G is an infrastructure upgrade raising the bar for data speed and capacity, making mobile media more efficient. Prior to and during its rollout, 5G increasingly became a key topic in mass media and public discourse. The advertising presented 5G as a step into an imagined future of virtual and augmented realities, where objects equipped with artificial intelligence communicate with each other, and there are no digital divides (Campbell et al., 2021). Moreover, the news media reported on not only the promises and challenges of 5G, but also the market competition and geopolitical conflict between China and the United States (Keane, 2021; Sherman, 2021; Woykearchive, 2018).

This study captures a moment when the media was saturated with advertising and news about 5G, yet the technology itself was only starting to become available for consumer use. By accounting for the key predictors of people's attitudes and adoption intentions, this study explains the reception of a technological shift that, according to the press and industry, heralds a new era of mobile media and communication (GetWireless, 2021). This shift is an ongoing project, playing out over time across multiple strata of features, services, and devices. Therefore, this study helps lay groundwork for research on other dimensions of adoption as well as future technologies supported by 5G, with implications for novel uses and consequences of mobile media and communication.

For theoretical footing, this study draws from the Technological Acceptance Model (TAM) for explaining the attitudes and uses of new communication technologies. This framework is useful in identifying relevant technological and social factors that shape people's attitudes toward and intentions to adopt a new technology. We rely on TAM to examine how perceptions of the technology (e.g., usefulness, ease of use) are related to people's attitudes toward and intentions to adopt 5G. In addition, we expand TAM by considering social factors, including the perceptions of geopolitical conflict and privacy to understand the acceptance of 5G.

Hypotheses and RQs were empirically addressed by conducting quantitative and qualitative surveys of adults in China and in the United States, two markets where a great deal of groundwork had been laid regarding the deployment and early consumer use of 5G. To illustrate, China reached more than 355 million 5G users in 2021 (China Internet Network Information Center, 2022), while the United States approached 41.3 million subscriptions at that time (Statista, 2021). China and the United States are also two societies in which 5G has garnered a great deal of media attention—as a technological upgrade with implications for everyday life (Campbell et al., 2021) and as a source of privacy concern and geopolitical strife, particularly among China and the United States

(Keane, 2021). More generally, previous generations of mobile media and communication have taken root as a primary means for maintaining relationships, accessing news, entertainment, and conducting work in both societies (Liu, 2020; Wei and Zhang, 2008), providing common ground among the differences that may distinctively condition the acceptance and shaping of 5G.

## Theoretical framing

### *Technological perceptions*

Scholars have proposed a number of theories to study the adoption of new technologies, such as Diffusion of Innovation (Rogers, 1962), Domestication (Berker et al., 2005), Mobile Phone Appropriation Model (Wirth et al., 2008), and the TAM (Davis, 1989). This study is particularly aligned with TAM's focus on explaining users' acceptance of a new technology. The TAM is rooted in theories of planned behavior and reasoned action, proposing that people's attitudes and behavioral intentions are shaped by their perceptions and beliefs of a given technology (King and He, 2006). At its core, the TAM examines how cognitive belief factors, including perceived usefulness and perceived ease of use, shape people's attitudes and intention to use a new technology (Venkatesh and Davis, 2000). The theory proposes these perceptions lead to favorable attitudes toward a technology, which in turn boost people's intentions to adopt it (Davis, 1989). While early TAM studies focused on new technologies in workplaces, more recent applications of the theory have extended it to other contexts including homes and everyday life (Chuah et al., 2016).

The model has been used to investigate the acceptance and adoption of information and communication technologies, including blogs (Hsu and Lin, 2008), smartphones (Park and Chen, 2007), cloud services (Park and Kim, 2014), wearable devices (Chuah et al., 2016), and virtual reality (Manis and Choi, 2019). According to TAM, the *perceptions of usefulness* boost favorable attitudes and intentions to adopt through beliefs about enhanced efficiency (Chuah et al., 2016; Park and Chen, 2007). In recent years, telecoms have been highlighting 5G's capacity to enhance the usefulness of mobile media in a variety of domains, including health, education, work, relationships, transportation, and entertainment (Campbell et al., 2021). These discourses may translate into greater acceptance of 5G. Another factor of TAM is *perceived ease of use*, where one is "free of mental and physical efforts" (Davis, 1989: 320). This part of the model proposes that features of a technology, combined with users' level of digital efficacy, shape their attitudes toward it (Chuah et al., 2016; Venkatesh and Davis, 2000). Consistent with previous literature, we expect that people have favorable attitudes toward a technology that is perceived as easy to understand and use. We thus hypothesize:

H1: Perceptions of usefulness will be associated with favorable attitudes toward 5G.
H2: Perceptions of ease of use will be associated with favorable attitudes toward 5G.

In addition to the two factors, speed is another key predictor indicator that is related to people's attitudes toward and intention to adopt 5G. As 5G supports various functions

including synchronous interactions, real-time location awareness, and streaming, speed is indeed at the center of the features of 5G and the extent it can easily be weaved into the flows of everyday life. Indeed, "faster" is at the core of 5G's essence, both in terms of what the technology has to offer and how it is socially imagined in the media (Campbell et al., 2021; Sherman, 2021). As such, we include perceptions of speed in the following block of TAM variables predicting attitudes toward 5G:

H3: Perceptions of speed will be associated with favorable attitudes toward 5G.

## Social factors

While TAM focuses on users' perceptions of and experiences with a new technology, the model has been progressively expanded to account for external social factors that also play a role in shaping people's attitudes and intentions (e.g., Venkatesh and Davis, 2000). For example, as a framework commonly applied in organizational settings, aspects related to organizational culture and climate have been incorporated into the model, which function with technological perceptions in shaping attitudes and adoption (Villena-Manzanares et al., 2020). In the case of 5G, media serve as an especially important source of social shaping because of their importance for information diffusion, prior to adoption and usage as well as throughout appropriation (Wirth et al., 2008). In addition to media exposure to 5G, we also examined perceptions of the social climate surrounding it, particularly about geopolitical conflict and privacy protection. This is far from an exhaustive list of relevant social factors, but as we turn to next, these factors capture some of the salient factors that might shape how people think and feel about 5G.

## Media exposure

Technological rhetorics are formative in the understanding of innovations and upgrades, and media play an important role toward that end (Baym, 2015; Wirth et al., 2008). Previous research shows that people use media to interpret scientific advancements (e.g., Donk et al., 2012) and to form attitudes about new technologies (e.g., Cui and Wu, 2019; Ho et al., 2013). We contend this is particularly important for the adoption of new technology, as people may not assess it through direct personal experience. Therefore, we recognize media as a salient source of information and opinions during this early stage of 5G's introduction, and anticipate media exposure to be a meaningful predictor of people's attitudes toward it.

As a social factor, media exposure may function differently in China and the United States. In China, news media play a key role in spreading official discourses and policies to the public. Previous studies found that news coverage of 5G and AI in China focused mainly on economic growth and impact (Mansell and Plantin, 2022; Nguyen and Hekman, 2022). By contrast, 5G messages in the United States included diverse topics including privacy, geopolitics, and health misinformation (Frith et al., 2023). As such, we expect that exposure to 5G news could generate different outcomes: those who read news about economic growth might have favorable attitudes toward the technology,

whereas people who read news about privacy and conspiracies may have less favorable attitudes. We hence ask the following research question:

RQ1: How is exposure to 5G messages in mass and social media related to attitudes toward it in China and the United States?

## 5G at the center of geopolitical strife

Another factor potentially related to people's attitudes toward and intention to adopt 5G is the international conflict surrounding it, particularly geopolitical strife between China and the United States. In fact, global telecommunication infrastructures have a long history of international contention (Headrick and Griset, 2001). In the late nineteenth century, the United States was a challenger on the global stage, as Britain controlled the telegraph and submarine cables (Hills, 2007). The use of new information and communication technologies provided opportunities for shifting positions among actors, particularly as the United States pursued the coaxial and deepwater cable industries after World War II (Starosielski, 2015), and fiberoptic and mobile communication technologies have helped the United States expand its presence as an international leader for media infrastructures (Starosielski, 2015). Over the past three decades, China has jockeyed for competitive footing on the global telecommunication landscape in general, and mobile media in particular. While the US firms were among the leading actors in the infrastructural development between the 2G and 4G eras, China's telecom sector has been moving toward global expansion and industrial innovation (Hong, 2017; Zhao, 2010). The rise of 3G technology in China revealed ambitions to develop its own proprietary standards and contend with the United States in its own domestic market. During that infrastructural shift, China Mobile successfully deployed the new mobile communication standard TD-SCDMA to compete with American CDMA2000 and European WCDMA in China. In the 4G era, China further promoted its TD-SCDMA, contributing to more than 10 percent of its domestic market share by 2015 (Hong, 2017).

In recent years, Chinese firms like Huawei have successfully deployed 5G devices and equipment domestically and internationally, while American firms have focused mainly on the domestic market (Woykearchive, 2018). China's leadership has raised concerns about security and privacy in the West, with accusations that Chinese telecoms, and China itself, cannot be trusted (Kaska et al., 2019). Chinese president Xi Jinping considers 5G to be an important instrument for economic development at home and abroad, declaring that China will share 5G technology with other countries (France-Presse, 2019). By contrast, Donald Trump's administration announced bans on Huawei in the United States and urged other countries to do the same (Keane, 2021).

For these reasons, we include geopolitical conflict as a potential factor that may have shaped people's attitudes toward the technology. On the one hand, it is possible this attention to 5G made it more salient as a technological development important enough to warrant international contention. This aspect of the geopolitical climate suggests that the stakes are high in the battle over 5G, possibly reinforcing expectations for it as a "next-generation" technology. On the other hand, we might expect that heightened

awareness of the geopolitical strife surrounding 5G could dampen enthusiasm by generating concern that the conflict could have negative consequences for national security and international relations. As such, we ask the following research questions:

RQ2: How is the awareness of geopolitical conflict surrounding 5G related to attitudes toward it in China and the United States?

### *5G and privacy protection*

This study also accounts for perceptions of the privacy and security of 5G. In recent years, the development of algorithms, big data, and smart technologies have heightened concerns about privacy and data security (Zuboff, 2015). Also, recent research demonstrates that privacy risks of new technology negatively impact technological acceptance (Park and Jones-Jang, 2022). In the case of 5G, concerns over surveillance have been elevated, with accusations that Huawei and China cannot be trusted partners in the security of 5G data. In 2019, NATO's Cooperative Cyber Defense Centre of Excellence concluded that Huawei and China pose serious risks to the security of 5G data, warning that "Possible loss or interruption of availability, integrity or confidentiality in [5G] systems could have a significant adverse effect on society" (Kaska et al., 2019). While this narrative puts 5G in a geopolitical context, it also resonates with heightened digital privacy concerns at the individual level. Although individuals may not always act on it, people do care about the privacy of their personal data, and it is a common source of concern (for a review, see Barth and de Jong (2017)). This, combined with accusations that certain 5G developers cannot be trusted, provides grounds to anticipate that personal privacy may factor into how people were feeling about the technology. We therefore hypothesize:

H4: Perceptions of 5G privacy insecurity will be negatively associated with people's attitudes toward it.

Beyond attitudes, we are also interested in explaining participant intentions to adopt and use 5G technology as it was being introduced (Davis, 1989). There is a well-established positive relationship between attitudes toward technologies and intention to adopt them (Lee et al., 2003), and this trend has been found for smartphones (Park and Chen, 2007) as well as previous generations of the wireless infrastructure (Chong et al., 2010). Thus, we hypothesize:

H5: Attitudes toward 5G will be positively associated with people's intention to adopt it.

## Methods

### *Quantitative survey*

In this study, we gathered a mix of quantitative and qualitative data to test our hypotheses and address the research questions. Participants for the quantitative survey were recruited

via Qualtrics from China ($N = 518$) and the United States ($N = 507$) as part of a larger investigation on mobile media adoption and usage in September 2020. Qualtrics used a stratified quota sampling strategy to achieve variance in demographics including age, gender, and income by drawing from opt-in online panels of people wanting to participate in research in these two countries. Twenty-five participants with the same IP address were eliminated as potential duplicates, and ten participants were dropped for not completing required tasks.

*Perceived usefulness*. Perceptions of usefulness were captured by asking participants to what extent they agree with the following two statements: (1) A 5G smartphone would be useful to me, and (2) I think 5G would help me get more things done. The answers range from 1 = strongly disagree to 7 = strongly agree. We combined these two items to measure perceived usefulness for China (Pearson's $r = .62$, $M = 5.87$, and $SD = 0.91$) and the United States (Pearson's $r = .82$, $M = 4.53$, and $SD = 1.60$).

*Perceived ease of use*. To capture this variable, participants were asked to what extent they agree with the two statements: (1) I think it would take time to learn how to use 5G products and services, and (2) It would be a challenge for me to learn how to use 5G products and services. Similar to the first variable, the answers range from 1 = strongly disagree to 7 = strongly agree. We combined these two items into indexes of perceived ease of use for China (Pearson's $r = .62$, $M = 4.70$, and $SD = 1.42$) and the United States (Pearson's $r = .74$, $M = 3.78$, and $SD = 1.68$).

*Perceptions of speed*. Perceptions of enhanced speed were measured by the following three questions: (1) 5G is going to be much faster, (2) The speed of 5G will allow people to do more advanced things, and (3) People with 5G will not have to wait to stream and download content. Indexes were constructed for China (Cronbach's $\alpha = .70$, $M = 6.07$, and $SD = 0.72$) and the United States (Cronbach's $\alpha = .84$, $M = 5.40$, and $SD = 1.09$).

*Media exposure*. This study asked about news and social media to capture reported levels of exposure to messages about 5G in the media. Participants were asked: (1) Over the last several months, how often have you heard about 5G from news? (2) Over the last several months, how often have you heard about 5G from social media? The answers range from 1 = Never to 6 = Every day. These two items were combined to measure media exposure to 5G for China (Pearson's $r = .74$, $M = 4.08$, $SD = 1.30$) and the United States (Pearson's $r = .66$, $M = 2.44$, $SD = 1.43$).

*Perceived geopolitical conflict*. Participants were asked to agree or disagree with three statements about the geopolitical conflict over 5G, including (1) 5G is an important part of the United States–China trade war/conflict, (2) 5G is at the center of political conflict among the United States, China, and other countries, and (3) 5G is the source of international security concerns. The three items were combined into indexes of perceived geopolitical conflicts in China (Cronbach's $\alpha = .81$, $M = 4.99$, and $SD = 1.40$) and the United States (Cronbach's $\alpha = .84$, $M = 4.41$, and $SD = 1.23$).

*Privacy protection*. Personal data privacy was measured with one item asking participants the extent to which they agree with the following statement: With 5G, personal data will be kept private and secure. Responses were reverse-coded to represent perceptions of privacy insecurity among participants in China ($M = 2.48$ and $SD = 1.29$) and the United States ($M = 3.62$ and $SD = 1.55$). Tables 1 and 2 provide correlations between these predictors.

**Table 1.** Correlations of predictor variables in China.

| | Usefulness | Ease of use | Speed | Media | Geopolitics |
|---|---|---|---|---|---|
| Usefulness | | | | | |
| Ease of use | .391 *** | | | | |
| Speed | .575 *** | .468 *** | | | |
| Media | .105 * | .118 *** | .116 *** | | |
| Geopolitics | .178 *** | .183 ** | .281 *** | .037 | |
| Privacy | .414 *** | .290 *** | .386 *** | −.071 | .124 *** |

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

**Table 2.** Correlations of independent variables in the United States.

| | Usefulness | Ease of use | Speed | Media | Geopolitics |
|---|---|---|---|---|---|
| Usefulness | | | | | |
| Ease of use | .400 *** | | | | |
| Speed | .537 *** | .303 *** | | | |
| Media | .319 *** | .200 *** | .356 *** | | |
| Geopolitics | .173 ** | .096 * | .245 *** | .278 ** | |
| Privacy | .567 *** | .264 *** | .461 *** | .274 ** | .225 ** |

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

*Attitude toward 5G*. 5G attitude was measured by asking participants: (1) My impression of 5G products and services is (1 = Extremely bad, 7 = Extremely good), and (2) My impression of 5G products and services is (1 = Extremely negative, 7 = Extremely positive). We combined these two items to measure people's attitudes toward 5G in China (Pearson's $r = .71$, $M = 6.87$, and $SD = 0.82$) and the United States (Pearson's $r = .88$, $M = 5.09$, and $SD = 1.31$).

*Intention to adopt 5G*. This variable was captured by asking participants to what extent they agree with the following statements: (1) I intend to switch my wireless service to 5G as soon as I am able, and (2) I intend to buy a 5G smartphone in the near future (1 = Strongly disagree to 7 = Strongly agree). These items were combined into the indexes of intention to adopt 5G in China (Pearson's $r = .61$, $M = 5.85$, and $SD = 1.01$) and the United States (Pearson's $r = .82$, $M = 3.93$, and $SD = 1.85$).

*Control variables*. We controlled for demographic variables, including age ($M_{Ch} = 41.36$, $M_{US} = 47.49$), gender ($Male_{Ch} = 49.5\%$, $Male_{US} = 48\%$), and education ($M_{Ch} = 4.54$, $M_{US} = 4.50$).

## Open-ended questionnaire

An open-ended questionnaire was used for complementary insights into what people in China and the United States were thinking about 5G, how they came to know about it,

adoption intentions, and expectations for 5G. Participants for this component were separately sampled during the same time (September 2020) and using the same strategies as the quantitative instrument ($N = 58$ in China, $N = 52$ in the United States). As with the quantitative survey, these data were collected online using Mandarin in China and English in the United States and were part of a broader project involving other open-ended items. Participants were asked to elaborate in writing on three sets of open-ended prompts: (1) Please explain what you know and think about 5G, and where you heard about it. (2) In what ways do you think the future might be different with 5G? Please explain. (3) Do you plan to upgrade to 5G when it becomes available? Please explain why/why not.

To analyze the qualitative data, we drew from guidelines recommended by Braun and Clarke (2012) and Hammersley and Atkinson (1995). The first step was to become familiar with the responses by thoroughly reading and re-reading transcripts. During this stage, each author took notes to help identify patterns in the responses. The authors then shared and compared notes to identify areas of consistency and any differences across them. Through a series of meetings and discussions, the authors came to agreement on a set of emergent topics, followed by more nuanced themes and observations through subsequent rounds of review. The final step was to select and agree upon representative quotations to help illustrate themes.

## Results

### *Quantitative survey*

To test the hypotheses, we first ran ordinary least squares (OLS) regression models using people's attitudes toward 5G as the criterion variable, followed by additional models considering the intention to adopt 5G as the criterion variable. Table 3 reports the regression results. Specifically, H1 predicts that perceived usefulness is positively associated with people's attitudes. Model 1 and Model 2 show that perceptions of usefulness were significantly related to favorable attitudes toward 5G in both China and the United States, $b = .38$, $p < .001$ and $b = .26$, $p < .001$, respectively. Thus, H1 is supported.

H2 anticipates a positive relationship between perceived ease of use and favorable attitudes. Model 1 and Model 2 show that ease of use does not yield significant results in China or the United States. H2 is thus rejected. Moreover, H3 expects that perceptions of speed would be associated with favorable attitudes. This hypothesis is supported, as both Models 1 and 2 show perceptions of speed to be linked to favorable attitudes toward 5G for participants in China ($b = .25$, $p < .001$) and the United States ($b = .31$, $p < .001$).

Furthermore, RQ1a explores the relationship between exposure to 5G information and people's attitudes. The findings indicate media exposure to be significantly linked to positive attitudes in China, $b = .06$, $p < .01$, but not with attitudes for the US sample. In addition, RQ2 addresses the relationship between perceptions of geopolitical conflict and the criterion variable. We find perceived geopolitical conflict not to be significantly associated with attitudes toward 5G in China or the United States. Interestingly, Model 4

**Table 3.** OLS regression models predicting the (1) attitudes and (2) adoption of 5G.

| | China | The United States | China | The United States |
|---|---|---|---|---|
| Attitudes | | | 0.38 *** (0.05) | 0.34 *** (0.06) |
| Usefulness | 0.38 *** (0.04) | 0.26 *** (0.03) | 0.29 *** (0.05) | 0.48 *** (0.05) |
| Ease of use | −0.02 (0.02) | −0.03 (0.03) | 0.02 (0.02) | 0.01 (0.04) |
| Speed | 0.25 *** (0.05) | 0.31 *** (0.05) | 0.14 * (0.06) | −0.03 (0.07) |
| Media exposure | 0.06 ** (0.02) | 0.04 (0.03) | 0.02 (0.02) | 0.16 *** (0.04) |
| Geopolitics | −0.03 (0.02) | 0.06 (0.04) | 0.04 (0.02) | 0.18 *** (0.05) |
| Privacy | −0.13 *** (0.02) | −0.25 *** (0.03) | −0.17 *** (0.03) | −0.14 ** (0.05) |
| Age | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | −0.01 * (0.00) |
| Gender (male = 1) | 0.06 (0.05) | 0.04 (0.08) | 0.03 (0.06) | −0.10 (0.11) |
| Education | 0.00 (0.03) | 0.06 (0.04) | 0.00 (0.04) | −0.06 (0.05) |
| Constant | 2.82 *** (0.35) | 2.51 *** (0.37) | 1.07 * (0.44) | 0.20 (0.52) |
| *N* | 505 | 485 | 505 | 485 |
| Adjusted $R^2$ | 0.48 | 0.56 | 0.54 | 0.61 |

Note: Unstandardized coefficients with standard errors in parentheses.
*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

reveals a positive relationship between perceived geopolitical conflict and intention to adopt 5G in the United States, $b = .18$, $p < .001$.

H4 anticipates a negative association between the perceptions of personal data security and attitudes toward 5G. Table 3 shows that those who are sensitive to the personal privacy implications of 5G are less likely to have favorable attitudes toward it (China: $b = -.13$, $p < .001$, the United States: $b = -.25$, $p < .001$) and less likely to adopt it (China: $b = -.17$, $p < .001$, the United States: $b = -.14$, $p < .001$). H4 is thus supported.

Finally, H5 expects that people's attitudes are positively related to their intention to become a 5G adopter. Model 3 and Model 4 provide supporting evidence for this hypothesis, revealing a positive association for the sample in China, $b = .38$, $p < .001$ and the United States, $b = .34$, $p < .001$.

## *Open-ended responses*

Qualitative data provide complementary insights into the hypotheses and research questions. To start with, we find that responses from both countries to be highly consistent with the findings for the TAM variables of speed, perceived usefulness, and ease of use. Participants in China and the United States recognized 5G as the next generation of the wireless communication technology whose speed will have an impact on the ways people use mobile media to go about everyday life. Evidence of this theme can be seen in comments throughout, such as 5G "has faster speeds. This network has less latency. This network has faster download speeds and upload speeds" (the United States); "5G is fast Internet speed, so there has no need to wait for downloading videos" (China). A participant in the United States recognized how increased speed may have repercussions for everyday life, writing: "people will be able to connect

faster. That means they can respond to text messages, emails, and more in a more rapid manner. As a result, 5G can improve the response time and effect greater change. On the other hand, it may raise expectations of response time enough that people will become even more impatient with malfunctioning technology."

Along with speed, more general perceptions of usefulness were also evident in responses, illustrated by a participant from China who wrote that "5G could bring greater convenience and benefits to people." The qualitative data suggest that participants, particularly those in China, believed that because of its enhanced offerings, "5G will fundamentally change people's lives." Moreover, we note that, consistent with the quantitative data, ease of use did not emerge as an important factor in the qualitative responses. This point was brought up by only one participant from China who concluded that 5G technologies will not be challenging to adapt to.

When looking at where they have learned about 5G, we begin to see differences emerge across the samples. Respondents from China and the United States both mentioned a range of 5G media sources, including TV news, social media, websites, and advertising. Participants noted seeing 5G advertising across television, online, and analog signs (e.g., at a bus stop in China). Although 5G media exposure was mentioned in both samples, this theme is more prominent in the sample from China, whose participants were more likely to comment on it. We also find that participants from China distinctively connected 5G with the society and national security. As one participant explained, "5G has accelerated the development of industrialization. It improves intelligent improvement. So internet downloads are fast. Additionally, 5G has made a huge contribution to the modern defense construction." Another respondent from China similarly shared, "5G brings rapid development and improvement to our country's construction, national defense technology, and people's lives." These findings suggest that participants in China considered 5G a key instrument for elevating China's development and status through industrialization and national defense.

However, we do not observe such comments in the US sample. Instead, responses from the United States tend to move in more critical directions, with several discussing allegations that 5G causes health and environmental problems. For example, one person mentioned, "I've heard about 5G on YouTube. It was about the bad things of 5G and how it could harm you, with the bad radiation and how it's killing animals/birds and stuff." Another participant from the United States similarly shared, "I haven't heard good things about 5G. I heard it's dangerous. I heard it can hurt children just being close to a tower. I don't think it should be allowed in the United States. I would rather have healthy happy children."

Further skepticism on the part of US respondents can be seen in comments expressing negative attitudes and intentions not to adopt. In contrast to the enthusiasm for 5G more consistently depicted through the comments from China, a notable subset of participants in the United States expressed intentions to push back on pressure to adopt 5G, with some hesitant about the added expense they assume it will cost and others echoing the health concerns noted above. As one participant in the United States explained, "Doctors whom I respect are raising questions about deleterious health effects from 5G. We're already at risk from electromagnetic radiation, given how connected we all are. Is it really worth

sacrificing our health in order to communicate even more quickly?" Although these concerns were thematically evident, most of the participants in the US sample, along with even more in China, discussed 5G as offering technological and social advances.

Finally, we find that the perceptions of 5G as a source of geopolitical conflict not to be directly addressed beyond brief mentions of national defense. In fact, only a few participants in China mentioned how 5G could be a source of tension between China, the United States, and other countries, evidenced by the comment, "Huawei's 5G technology is advanced, but it has been suppressed by various countries due to political considerations." References to national security in China were more in the context of improving overall domestic security technology, along with economic and other benefits for Chinese people, than in the context of geopolitical strife involving other countries.

## Discussion

### *Summary*

Drawing from TAM, this study examines key predictors of people's attitudes toward 5G and intentions to adopt it at a moment when 5G networks and devices were on the cusp of becoming available for consumer use. The quantitative and qualitative insights help explain people's perceptions and acceptance of 5G in China and the United States. Among the technological variables, perceptions of usefulness and the speed of 5G predicted positive attitudes in both China and the United States, but the ease of use was not significant in either. Among the social factors, insecurity about privacy protection predicted less favorable attitudes in both samples, while media exposure only predicted positive attitudes in China. As expected, having favorable attitudes toward 5G was positively associated with intention to adopt in both countries. In addition to attitudes, perceived usefulness, geopolitical awareness, and personal privacy concern were directly associated with intentions to adopt the technology.

Findings from the qualitative responses offer several points of triangulation. As with the quantitative data, perceived usefulness and the speed of 5G stood out as salient for participants in the qualitative samples, while ease of use was not as frequently mentioned as a consideration for 5G adoption. Participants from both China and the United States discussed news, social media, and advertising as primary sources of information about 5G, with advertising as most prominent. Whereas participants from China expressed enthusiasm about 5G, both personally and as an instrument to elevate the nation, attitudes, and intentions to adopt were more mixed in the US sample, with some expressing concerns over rumors about 5G causing cancer and other health problems.

### *Interpretations*

This study opens a new line of scholarship explaining attitudes toward 5G by comparing TAM in two of its largest markets. While perceptions that 5G will enhance usefulness and speed predicted positive attitudes as expected, ease of use was not a meaningful factor in either the quantitative or qualitative analyses. This finding might be explained by the

limited scope of what 5G initially had to offer for everyday uses. While 5G was being advertised and imagined as a game-changer for mobile media and communication (Campbell et al., 2021), for the ordinary person, the initial step into this new future was/is largely a matter of upgrading to 5G network service with a 5G-enabled phone. Because the initial transition to 5G was more about enhancing the speed and utility of the existing practices than introducing revolutionary new ones, it presented little by way of requiring new skills, likely mitigating concerns about ease of use at this early moment in its diffusion. One might speculate that ease of use could emerge as a meaningful factor in explaining attitudes and intentions to adopt more novel features and applications of 5G in the future.

Second, we combine technological perceptions with social factors to examine people's understanding of 5G. Whereas technological perceptions help account for expectations of user experience, the social variables help account for aspects of environment surrounding 5G that may also factor into attitudes and intentions to adopt. We considered privacy and geopolitics as social factors shaping people's attitudes and intentions. Whereas privacy protection concerns negatively predicted attitudes and intentions across the samples, awareness of the geopolitical conflict surrounding 5G played a more limited role, not being linked to attitudes in either sample. One explanation may be that privacy perceptions were operationalized at the level of personal data protection, and both China and the United States highlight the importance of personal data in recent years. By contrast, geopolitics achieved a significant result only in the United States, likely because 5G has been widely framed as a political issue by the US politicians and media, whereas it is mainly considered as economic leverage in China. Indeed, the US media has consistently framed 5G as a national security concern and geopolitical conflict with China, and such coverage might have limited which 5G technologies people in the United States considered using. Another plausible reason is that those with high levels of security concerns are often early adopters in the United States, hence they are more likely to adopt 5G. Moreover, the nonsignificant result in China is probably related to the fact that Chinese media was emphasizing economic influence rather than geopolitical conflicts (Mansell and Plantin, 2022).

Third, we also examine the role of media in explaining people's attitudes and intentions. The findings can be further considered in light of the messaging from Chinese President Xi Jinping, who has prioritized 5G as an instrument for economic, industrial, and political elevation (France-Presse, 2019; Woykearchive, 2018). Considering China's history in the telecom industries, its recent rise as an international partner/leader with 5G, and the close relationships between government, media, and telecoms in China, it is not surprising that the messaging around 5G in the US media would include a different range of perspectives with more degrees of freedom for criticism of the technology. This interpretation aligns with the instances in the qualitative data where respondents in the United States expressed concerns about health rumors, overconnectivity, and cost, which were not evident in the responses from China where sentiments of national elevation were evident. Empirical research on 5G advertising from China and the United States also supports this point, showing US telecoms have a domestic focus while Chinese telecoms promote international partnerships and Xi Jinping's vision of 5G as an avenue for China's development and elevation (Campbell et al., 2021).

## Future research and limitations

This study offers an initial step into a line of research that could be ongoing with 5G and future generations of wireless technology. As noted, it is expected that 5G networks will support a number of important innovations in wireless communication and transportation, with implications for health, work, leisure, and how people go about their daily lives. The telecoms have envisioned a future with 5G where there are no barriers separating doctors and patients, students and learning, workers and field sites, and people from being connected to the word and each other. Along with images of augmented, virtual, and holographic realities supported by 5G, the telecoms also portray a future where delivery drones and automatic vehicles rely on 5G networks for greater coordination with other objects for logistics, transportation, and everyday tasks (Campbell et al., 2021). Although it might be more realistic to suggest 5G will help bring current innovations into everyday life practices, so too will there be opportunities for research to explain which get taken up. As 5G does get taken up and its applications continue to develop, future research should go beyond attitudes and adoption intentions to explain usage. The Mobile Phone Appropriation Model would be useful in this regard as it helps explain how functional, symbolic, normative, and restrictive evaluations condition usage of mobile media (Wirth et al., 2008).

There are also opportunities to build and improve upon the models and variables utilized in this study. As noted above, we added speed to the traditional TAM predictors, which include perceptions of usefulness and ease of use. Future research might consider other functional aspects of usefulness, such as network coverage, as well as particular dimensions of usefulness, including connecting with others, coordination, entertainment, and other core uses of mobile media. Furthermore, this study leaves room much work to be done with media as a source of people's perceptions. Beyond the overall levels of exposure, future research should offer a more nuanced account of the types of media channels, the content within/across them, and forms of media involvement by the user. We know from previous scholarship that interpersonal interactions can be as important as mass media when accounting for how people evaluate emerging technologies (e.g., Ho et al., 2013; Wirth et al., 2008). Future research should try to account for which voices people are attending to as they hear about 5G through interpersonal as well as mass media communication.

Personal privacy protection is another aspect that calls for future research. This factor stood out as a meaningful predictor of attitudes and intentions across the two samples, suggesting concerns about privacy can dampen enthusiasm and adoption. More research should be done to understand the drivers behind this perception and how it continues to function in attitudes and the ongoing adoption of 5G and the technologies it supports. Moving forward, we recommend using a more robust measure of personal privacy perception. The social factors included in this study were identified through the secondary analysis of data the authors collected for a larger project, offering only one item related to personal privacy and 5G, and future measurements should include additional items.

Another limitation to be addressed in future research is the use of cross-sectional data. Due to resource constraints, this study was limited to collecting one wave of quantitative

data, hindering the extent to which we can make causal claims. Future survey research in this area should offer a longitudinal perspective with multiple waves of data. Moving forward, scholars should also keep in mind the utility of qualitative data to complement, triangulate, and interpret survey results. This study entailed written responses to a set of prompts, and interactive interviews or focus groups could offer richer data to work with.

The international nature of this study is both a strength another limitation to build on. As explained in the introduction, China and the United States present a set of cultural, economic, and political circumstances that make them compelling points of entry for research on the technological acceptance and social shaping of 5G. Yet, the diffusion and adoption of 5G is a worldwide phenomenon offering different meanings, uses, and implications for different societies. Future research should strive to expand on the international perspective taken in this study.

## Concluding remarks

5G has been promoted and imagined as a revolutionary next-generation technology. At the time this study was conducted, 5G was not yet widely available for consumer use, providing the opportunity to examine and explain how people in two leading markets were feeling about this new technology before the chance to use it. Survey data show how certain perceptions of 5G, particularly its usefulness and speed, consistently predicted positive attitudes across the samples, while perceived ease of use did not, likely because of the incremental nature of the shift. In addition to those shared trends across the samples from China and the United States, analysis of the social variables points to the international differences in the media and geopolitical climates surrounding 5G. The qualitative data suggest a range of more critical perspectives on 5G in the United States compared to China, where the technology is discussed as an instrument of national elevation. Moving forward, future research should try to account for other factors involved in the technological acceptance of 5G, new developments in mobile media and communication supported by 5G technology, and other societies with other circumstances. This study may also serve as a foundation for similar research on future generations of wireless infrastructure and technologies, including 6G and beyond.

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