Original Article

Contesting Infrastructural Futures: 5G Opposition as a Technological Drama

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Abstract

This paper addresses the public contestation of the rollout of the fifth generation of mobile telecommunications networks (5G) in the Netherlands. Drawing on Pfaffenberger's framework of technological dramas, we analyze the variety of symbolic expressions about 5G made in documents published by "design constituencies" leading the technology's implementation, "ambivalent intermediaries" reporting on 5G's implementation and its emerging controversial status in the news, and by "impact constituencies" who organize on Facebook to oppose against 5G. The analysis describes a variety of publicly performed narratives and activities that build on symbolic meanings of a supposed public need for 5G, imaginaries of 5G futures, and scientifically manageable and responsible innovation. The paper demonstrates how the technological drama of 5G is constituted by tensions between different interpretations of these publicly performed meanings.

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However, amidst the drama, meanings of public need and imaginaries of 5G futures are temporarily suspended, constraining the stage for opposition and enforcing partial closure of the conflict.

Introduction

Long confined to technology industries and governments, discussions about the fifth generation of mobile telecommunications (5G) in the Netherlands became public when residents of the small municipality of Utrechtse Heuvelrug successfully campaigned against local plans to deploy 5G antennas on "smart" lamp posts. Driven by concerns about privacy and health effects of electromagnetic field (EMF) radiations, in the two years following this case, worries about the rollout of 5G at national and local levels have intensified. Peaking in the spring of 2020, opposition against 5G became associated with theories linking the new technology to elites conspiring against the public and with arson attacks on cell towers. By the end of May 2020, a total of twenty-nine cell towers had been set on fire across the Netherlands (Sjoukes and Spieksma 2020). Perplexed by the beliefs and methods of 5G opponents, local, national, and international media commentators sought explanations in misinformation spreading through social media (e.g., Temperton 2020; Van Gool and Van De Ven 2020), while ignoring the views and strategies of groups supporting the rollout of 5G and their relation with strategies of opposition.

The 5G controversy is one of many examples of controversies about wireless technologies and digital, "smart" infrastructures analyzed by Mukherjee (2020), Moore and Stilgoe (2009), and Soneryd (2007), among others. These scholars primarily draw from ideas developed in science and technology studies (STS), in which this paper is anchored as well. We particularly use Pfaffenberger's (1992) work on technological dramas as a metaphorical tool kit that draws attention to the meaning of symbolic expressions, including sociotechnical imaginaries and their contestations, produced and performed by the main competing groups in the 5G conflict. The dramaturgical perspective directs the analytic process to protagonists, antagonists and broader audiences, and the symbolic charge of various narratives and activities that bind them. Specifically, the dramaturgical

perspective enables the analytic inclusion of the members of society who lack a position among institutional stakeholders who construct and perform imaginaries of 5G, but who nevertheless develop interpretations and actions around the technology and its implementation. The paper proceeds with a brief review of STS approaches to public controversies about technological innovations, followed by a discussion of our use and adaptation of Pfaffenberger's framework. Our main methodological choices are explained before presenting the results of our analysis. We conclude our paper by reflecting on the results and considering the usefulness of the technological dramas framework for explaining the 5G controversy.

Public Controversies in STS

Public controversies about innovations have often been used as opportunities to learn about public involvement in science and technology. Influential in this field is actor-network theory's insistence to study controversies as hybrid issues binding together human actors and nonhuman actants (Callon 1993; Latour 1992). Extending the notion of hybrid issues, Marres (2010) traces how "material publics"—heterogenous assemblages of human and nonhuman entities—emerge from material effects produced in technological societies. Adopting a similar hybrid view on wireless technology controversies in India, Mukherjee (2020) describes how human and nonhuman entities, from cell towers to media commentators, mediate awareness of EMF radiation issues (Mukherjee 2020). This hybrid view is extended in studies of digital networks where technological controversies are regarded as empirical objects in their own right, for instance, by conceiving of hyperlinks and hashtags as material actants in controversies (Marres and Moats 2015; Marres 2015; Venturini 2010). Following arson attacks on cell towers in the Netherlands, United Kingdom, and Australia in the spring of 2020, digital methods have been used to map the online networks that mediate 5G skepticism and conspiracy theories (e.g. Van Gool and Van De Ven 2020; Bruns, Harrington, and Hurcombe 2020). These cartographies of 5G as a public issue mediated by social media have, in turn, also mediated social media as a public issue (Marres and Moats 2015). However, while creating insightful overviews of the emergence of actor-networks of opposition against 5G, commitment toward studying human and digital dimensions symmetrically has tended to downplay the very matter of contention, in this case, 5G technology (cf. Marres 2015). This comes at the expense of the social constructivist encouragement to symmetrically

analyze competing arguments, visions, and knowledge claims about technology (Bijker, Hughes, and Pinch 1993).

Of particular interest for our purpose is the role of symbolic activities deployed by governmental and corporate actors responsible for 5G's implementation to sway publics into favorable interpretations of the technology. Lampel (2001) and Rosental (2021) have analyzed symbolic performances such as product demos and market pitches as vehicles to simultaneously persuade key support groups, such as investors, journalists, and politicians, and to preempt "counter demonstrations" from publics concerned about the risks of technology. However, both Rosental and Lampel are less concerned with performances in public technology controversies than with the social functions of demonstrations for relations between technological, political, and economic elites in research and development networks. Pfaffenberger's framework of technological dramas (1992) extends this attentiveness to performative displays with the explicit aim of analyzing challenges to technological innovations by broader, noninstitutional publics.

Technological Dramas

Pfaffenberger developed his metaphor of technological drama to emphasize "the performative nature of technological 'statements' and 'counterstatements,'" involving "the creation of scenes (contexts) in which actors (designers, artifacts, and users)" play roles, each with a particular purpose, before an audience (Pfaffenberger 1992, 286). Drawing parallels with Woolgar's (1991) metaphor of "technology as text," Pfaffenberger argues that technological dramas resemble a literary genre and that analyzing these dramas demands close attention to the range of narratives and activities surrounding the implementation, use and contestation of technologies.

Technological dramas begin, in Pfaffenberger's terms, when *design constituencies*—the groups behind a technological design—surround their innovation with discursive media aimed to "regulate" its interpretations favorably. Like Lampel (2001) and Rosental (2021), Pfaffenberger argues that innovations necessitate frameworks of meaning to create needs that did not necessarily exist before. These frameworks of meaning are described, firstly, in terms of myths, which are used to mystify the political aims of technologies while justifying the innovation to audiences. For example, the presentation of "smart" urban infrastructures typically builds on narratives of crises such as rising population, overwhelmed infrastructure and sustainability demands (Sadowski and Bendor 2019). Such sociotechnical

imaginaries (Jasanoff 2015) of digital salvation mystify corporate interests in creating new markets while preventing consideration of alternative solutions to societal challenges. Importantly, however, Pfaffenberger is not exclusively committed to discursive myth creation, emphasizing that regularization processes also entail the staging of "secular rituals" that regulate social behavior in accordance with the political goals of an artifact (Pfaffenberger 1992, 294). Rituals involve carefully designed activities that presuppose a willingness to "go along with the game" (Pfaffenberger 1992, 295), thereby making a technology's aims come to life to a broad audience. For example, product demonstrations of new consumer gadgets "ritualize" the regular consumption of devices equipped with the latest computing and connectivity standards that afford ubiquitous convenience (cf. Rosental 2021). Ultimately, technological regularization aims to define away alternative interpretations and to "naturalize" technological artifacts and the political structures they embody (Pfaffenberger 1992).

Pfaffenberger describes how in the second "act" of technological dramas, *impact constituencies*—members of the public experiencing disadvantages caused by the technology—engage in redressive activities to minimize the negative effects they experience. This includes substituting the mythos of regularization with more favorable frames of meaning through "countersignification," the "counterappropriation" of technologies from which impact constituencies have been excluded, and sabotage, subversion or circumvention of coercive technological artifacts and features. Although these oppositional strategies are not placed in a hierarchy, myth-substitution serves as the legitimation for any activity that aims to openly challenge the technology. Because the cultural meanings that technological regularization draws on are inherently open to interpretation, exploiting such indeterminacies is a key mechanism for voicing and legitimating opposition. For example, techno-utopian myths of digital salvation from crisis inherently correlate to powerful opposites in the form of techno-dystopian imaginaries of technological subjugation, which are deeply rooted in popular culture (Vanolo 2016; Jasanoff 2015). Although redressive strategies may lead to "technological reconstitution," involving the redesign of artifacts in line with alternative ideologies, it is also common for connections between technological activities and social meanings to erode through "designification." Here, competing meanings recede from public consciousness, as technological artifacts and their contexts and associated behaviors become taken for granted, paving the way for claims about the neutrality of technology (Pfaffenberger 1992).

Audiences and News Media as Ambivalent Intermediaries

Pfaffenberger's framework enables a clear definition of competing actors in technological conflicts and a rich description of their strategies. Where Marres's issue-based "material publics" and Mukherjee's "environmental publics" unite artifacts and competing human actors under one denominator of "publics," Pfaffenberger's framework calls for an explicit delineation between protagonists (design constituencies) and antagonists (impact constituencies) in technological conflicts. Moreover, technological dramas are also performed in front of audiences who become part of the scenes. Upholding the dramaturgical metaphor, we might ask which stages foster insight into the perspectives of broader audiences. Sociologists studying public reactions to technological innovation have generally turned to mass media as stages where such public perspectives on technologies, or their "larger issue culture," are reflected and shaped (Gamson and Modigliani 1989).

The formation of technological innovation as a publicly contested issue broadly follows processes of collective definition, continuous social construction, and interpretive struggle (Maeseele 2018, 5; Geels and Verhees 2011). Resonating with the tendency of design and impact constituencies to selectively employ particular interpretive frameworks in their strategies, definitions of technological issues in mass media function to include or to limit participation of certain publics in the conflict. Where technical definitions typically narrow participation, framing issues beyond technical expertise allows their reach to expand. Such conflict expansion can be driven by an emphasis on dramatic dimensions of conflicts, and a concomitant growth in media coverage. Nonspecialist sections and opinion pages, for instance, provide more scope for the attribution of symbolic meaning to issues (Maeseele 2018; Gamson and Modigliani 1989). Usually, however, reporting on technological conflicts favors ambivalent frames of meaning that can be interpreted flexibly (Gamson and Modigliani 1989). Hence, due to their capacity to offer equivocal readings of technologies and conflicts surrounding their implementation and use, mass media can act as ambivalent intermediaries that stage the conflict between competing actors in technological dramas for broader audiences.

It is thus clear that Pfaffenberger's metaphor of technological drama is rooted in the wider STS literature and can be further articulated with media studies about the construction of social problems. In our own research, Pfaffenberger's metaphor functions as an operational analytic lens that help

to identify how and by whom the technological drama is played out; it moreover draws our analytic strategy to the stage of news media and to members of the public who are included or excluded from the drama in particular ways. In the following section, we describe our methodological choices for selecting and analyzing sources that produce and reflect this public contestation of 5G.

Method

We frame the 5G controversy in the Netherlands as a technological drama. 5G rollout is most actively pursued by the European Union (EU), Dutch government, and Dutch telecom corporations (VodafoneZiggo, KPN, and T-Mobile), who are the design constituency in this case. Data from this constituency were collected from web sources, including both strategy and marketing material. The data spans roughly seven years (2013-2020), totaling thirty policy documents, research reports, meeting minutes, infographics, videos, various web pages, and a speech transcript (see Online Appendix A). While this empirical material is not comprehensive, it does capture key documents from the main 5G design constituency actors in the Netherlands.

Given social media's role in mediating 5G opposition, we selected the largest 5G opposition Facebook page: "WIJ WILLEN GEEN 5G NEDERLAND" ("We do not want 5G the Netherlands," WWG5GNL henceforth) as indicative for the impact constituency.[1] We extracted more than 7,000 unique posts and comments made in the first six months (March to October 2020) since WWG5GNL was created, using a software script developed at the Erasmus University Rotterdam (Lee 2020). Consent for these activities by participants was obtained by approaching the group administrators and making the lead researcher and the research intentions known to all members through a post on the page itself. To minimize disclosure of the identity of WWG5GNL members, all user names and references to them (e.g. tags) were replaced with pseudonyms in numbered format. Quotes used in the Results section are translations from Dutch to English involving minimal modifications that retain original meanings while rendering reidentification difficult.[2]

Lastly, Dutch national newspapers have reported on 5G developments and conflicts since the technology was first announced in the early 2010s. As we have explained previously, we view news media as "ambivalent intermediaries" in the 5G conflict. To be sure, taking into account that there are broader user groups—not only opponents of 5G—who meddle in the
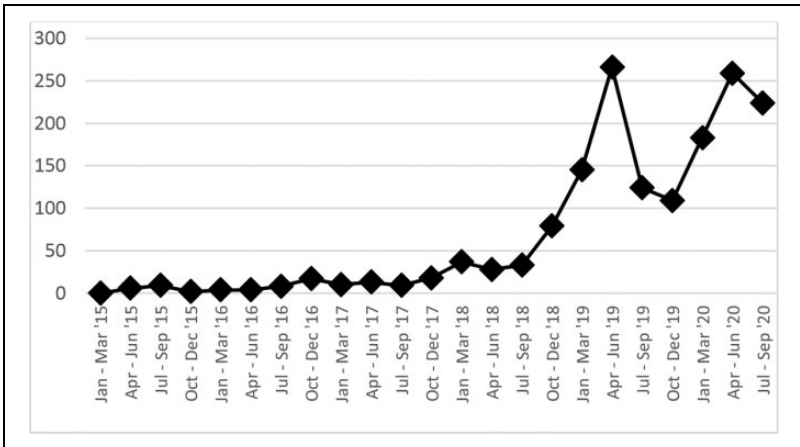
Figure 1. Cumulative number of publications about 5G in eight Dutch newspapers (per quarter).

conflict through media like Facebook, Twitter, and Instagram, a more comprehensive analysis could also engage with social media as "ambivalent intermediaries" in the 5G conflict. However, given the unique position taken by mass news media to report on issues by adhering to principles of journalistic impartiality, we have pragmatically selected news media as the primary ambivalent intermediaries for our study. Using the query "5G," we searched Nexis Uni for articles published between January 2010 and October 2020 in eight Dutch newspapers: the four largest national dailies (*De Telegraaf*, *Algemeen Dagblad*, *de Volkskrant*, and *NRC Handelsblad*), and four regional papers (*De Limburger*, *De Gelderlander*, *De Stentor*, and *Noordhollands Daglad*). This relatively long time frame allows us to see how 5G was reported on over time, from its first appearance as a novel source of news to a more established subject. Removing irrelevant articles and focusing on three peak moments of 5G reporting (January–March 2018, April–June 2019, and April–June 2020) resulted in a final selection of 562 articles for analysis.

The selected documents were coded for recurring meaningful elements pertaining to 5G. For example, design constituency documents often mention infrastructure inadequacies in terms of coverage, speed, and reliability as well as technological potentials and anticipated applications of 5G. In our sample of news articles, we found statements that simultaneously emphasize financial incentives for telecom industries, anticipated industrial

applications, and economic and societal transformations that 5G is expected to bring about. Conversely, in WWG5GNL group discussions, we found that members emphasize the sufficiency of contemporary connectivity standards, the uselessness of anticipated technological applications, and the pushing of technology irrespective of public needs or concerns (see Online Appendix B for a schematic presentation of this analytical procedure). The analysis led us to discern how conflict about 5G centers on a few contested meanings and activities produced by design constituencies, ambivalent intermediaries, and impact constituencies. To continue with the example given above, statements about the limitations of existing infrastructure were interpreted as signifying an imminent public need for ubiquitous and fast 5G connectivity. Newspapers join in the discussion by partially reproducing 5G regularization while simultaneously tempering it, for instance, by emphasizing economic imperatives and doubting benefits for ordinary telecommunications users. By the same token, impact constituencies countersignify 5G as redundant connectivity. In total, we found three main meanings of 5G interpreted in opposing ways by the main competitors in the drama, which newspapers partially reproduce, contributing to the emergence of 5G as a publicly contested technology. Adapting Pfaffenberger's framework, we describe these meanings as a set of interrelated statements and counterstatements from design constituencies who "regulate" 5G, ambivalent intermediaries providing a broader public stage for 5G and the emerging conflict in the news, and impact constituencies redressing dominant framings of 5G.

Design Constituencies: The Regularization of 5G

In its key policy document *Connectivity for a Competitive Digital Single Market—Towards a European Gigabit Society*, the European Commission postulates that there is an imminent public need for 5G by stressing infrastructural inadequacies, untapped potential of consumer devices, and the specter of societal digitalization: "While basic broadband is available to every European . . . . this is no longer good enough for the ongoing digital transformation. Around half of Europeans own a smartphone, but cannot use its full potential because of major gaps in mobile data coverage and quality. Within the next 10 years, up to 50 billion objects, from homes to cars and watches, are expected to be connected worldwide—the great majority of them wirelessly" (European Commission 2016, 3). Elsewhere, design constituencies emphasize "enormous increases in data usage" (VNG 2019, 12), "customer expectations" (VodafoneZiggo 2020), and claim that

Figure 2. Video stills taken from "Welke Visie Heeft Het Ministerie van Economische Zaken En Klimaat (EZK) Op 5G?" (Rijksoverheid 2020b, time stamps 1:12, 1:16, and 1:20).

people "want to be available always and everywhere" (Ministerie van Economische Zaken en Klimaat 2018, 6). Taken at face value, this narrative offers a one-sided perspective of public needs while leaving much unexplained about the infrastructural requirements that mobile connectivity demands (cf. Webb 2019). Moreover, the public is incorporated as a society of producers and consumers, inevitably swept up in a process of digitalization, while questions about social, ethical, and political ramifications are ignored. Beyond allusions to customer expectations, the needs of European and Dutch citizens are not addressed, and neither is it explained how they stand to benefit from digital transformations and the full potential of smartphones. Instead, a public need for 5G is constructed as imminent by drawing on digitalization as an inevitable prospect that is best addressed by actively stimulating it.

Supplementing narratives of imminent public need, design constituencies nurture speculations on futures where ubiquitous "connectivity" enabled by 5G marks societal progress. The description of existing and speculative examples of technological convenience for private consumption, as well as technological solutions to societal challenges provide a positive template for 5G's impact: "Soon we will have access to our favorite content in yet more places, new worlds will open before us, and together we will be able to confront even greater societal challenges. From care at a distance to precision agriculture with drones, to public transportation where autonomous buses ensure accessibility of remote areas" (Rijksoverheid 2020, time stamp 1:12). In this example, the narrative moves from ubiquitous access to entertainment to opening "new worlds" and the confrontation of societal challenges. Anticipated applications further regulate the image of 5G as enabling to cross the threshold to utopian sociotechnical imaginaries of digital futures as visualized in Figure 2.

Beyond these imaginaries, 5G-enabled futures are constructed in experiments with 5G applications conducted in bounded sites designated with terms like field labs, hackathons, testbeds, pilots, and smart city projects: "How can societal challenges in cities—like rising healthcare needs or traffic problems—be solved with new technologies? . . . The 5G-testing frequency in Eindhoven can be used for pilots with a societal impact for everybody in the city. A concrete example in preparation is 'Connected Ambulances' . . . to offer 'assistance at a distance' in the diagnosis and preparation for treatment with superfast 5G connections" (VodafoneZiggo 2020a). In these bounded sites of 5G experimentation, technological solutions take a more concrete shape and form. Members of the public are also invited to actively participate, either as consumers testing new products or as entrepreneurs contributing to technological and economic innovation. In this way, people are differentially incorporated into 5G regularization (Pfaffenberger 1992). 5G is thus presented as a precondition for a range of solutions that herald a future digital utopia. These narratives are ritually brought alive in bounded sites of 5G experimentation, which function to lift the veil of the positive affordances that 5G has in store, "projecting" the technology into a context of infinite innovative capacity to benefit private consumption, entrepreneurialism, and overall societal progress.

When opposition against 5G emerges, however, design constituencies shift their narrative, framing opposition as a reiteration of a long-standing controversy about detrimental health effects resulting from EMF radiation emitted by telecommunications technologies:

> We are aware of the existence of concerns in society about EMF of mobile networks . . . . As a supplier of vital infrastructure KPN is accountable for the safety of mobile networks for humans and the environment. Because mobile technology and research into its effects are continuously developing, it is also important to keep a finger on the pulse. Therefore, we continuously keep ourselves informed about the latest scientific publications from leading institutions. . . . KPN will act immediately if the government changes norms or recommendations based on new scientific insights. (KPN 2021)

In this instance, a member of the design constituency publicly displays awareness of public concerns, while restricting those concerns to EMF and public health. This is a selectively narrow account of reasons why people oppose to 5G and portrays the issues as capable of being comprehensively settled through scientific expertise and regulatory authority. A double containment of concerns, first by narrowing them down to strictly scientific

discussions and second by pledging vigilance to scientific and technological developments, functions to mitigate uncertainties about 5G as a novel technology, signifying it instead as responsible and scientifically controllable innovation.

Ambiguous Intermediaries: 5G in the News

Throughout the three news peaks analyzed in this study, tradeshows like the Mobile World Congress (MWC) and auctions of frequency bands by the Dutch government drive reporting on 5G in business and technology sections. These articles simultaneously reproduce and temper regularization narratives of imminent public need and 5G futures. For example, an article about telecom trends at the MWC simultaneously emphasizes business sector needs and autonomous vehicles' dependency on 5G: "The telecom industry searches for new revenue and thinks it will generate these from yet-to-be-built 5G networks. The target group is initially the business sector, which needs high quality networks for industrial applications. The emergence of self-driving cars also depends on networks that communicate blazingly fast. . . . More than previous upgrades of network technology, 5G has the potential to provide an economic impulse through applications in the medical sector, logistics and smart cities" (Hijink 2018). In regional and national news media, themes familiar from the regularization of 5G alternate with an emphasis on economic imperatives and potential telecom industry revenues. Yet compared with regularization, economic interests are framed as primary drivers of 5G implementation, rather than the needs of ordinary citizens: "Where 3G made it possible to smoothly load Internet pages with image and sound, 4G cleared the path for smooth mobile video streaming, however, for consumers who have little use for heavy games and virtual reality, the benefits of 5G remain less clear" (Van Bergen 2020). Under this tempering of expectations of 5G, we also subsume articles about the provisional and uncertain status of 5G, exemplified by disappointing results in ongoing practical experiments and unimpressive data transfer improvements upon early launches of the technology.[3] What we take from this is that while the economic imperatives behind 5G are clear, a purported public need for 5G appears to be less evident. Although this relates to one point of contention between impact and design constituencies, in this stream of newspaper reporting 5G has a modest status as one of many new technologies and is not regarded as a pressing public issue.

The first signs of public contestation of 5G appear in reporting of local resistance to 5G rollout in the spring of 2018. Although these early 5G

antagonists do cite privacy concerns, reports focus on EMF radiation and public health. Articles mention Dutch regulation of telecommunications radiation is comparatively lenient and outdated. Reproducing elements of adjustment narratives of heedless public experimentation (see section "Impact Constituencies: Redressive Strategies"), these articles meet opposition by portraying 5G as an uncertain novel technology, requiring careful regulation: "The rollout of a 5G-network possibly results in a public health risk because with the arrival of the network an uncontrolled growth of antennas is expected, among others in advertising columns and lamp posts, which will significantly increase the radiation density" (Winterman 2018). In the first and second news peaks (January–March 2018 and April–June 2019), newspapers invoke the prospect of uncontrolled antenna construction and increasing radiation. However, after the Dutch government responds by commissioning research into health effects of EMF radiation, the stage for opposition becomes constrained by the science of EMF radiation and public health: "'There is not a single convincing piece of evidence that electromagnetic radiation for mobile communication constitutes a danger for public health,' says Eric van Rongen, chairman of the International Commission on Non-Ionizing Radiation Protection. 'Below the exposure limitations there is no proof for harmful effects,' reacts Monique Beerlage, general secretary of the Knowledge Platform Electromagnetic Fields, per e-mail" (Van De Weijer 2018). The portrayal of 5G changes from an uncertain, potentially harmful technology, into a safe and responsible innovation, and opposition is disavowed as misinformed. Ambivalent motivations for 5G implementation are driven to the background in favor of superficial references to the future of mobile Internet. Where opposition is given a stage and countered through a scientific expertise, this leaves little room for nuanced perspectives on 5G regularization.

In the course of 2019, 5G becomes embroiled in an emerging international trade conflict. By spring 2020, public opposition against 5G intensifies, and the technology is firmly established as an object of public contention in news reporting. Articles on the trade conflict generally portray 5G as a strategic asset with economic and intelligence advantages. The Netherlands is drawn into these events through intelligence reports warning against Chinese espionage and by revelations of corporate theft by former Chinese employees in the Dutch telecom industry:

> Parliament raised concerns following news that Chinese ex-employees have stolen corporate secrets from chip machine manufacturer ASML. Questions were raised about plans to purchase and use technologies like 5G in the

future. "It is again a proof that our vital sectors, including 5G, must be protected," Christian Democrat MP Joba van den Berg reacts to the case of espionage. And Liberal Democrat MP Kees Verhoeven reacts: "Of course this influences the question about Chinese interference in our vital infrastructure of the future." (Van Der Aa 2019)

The portrayal of 5G as "vital infrastructure of the future" draws attention to threats of malicious foreign interference—for instance, through a theoretical "kill switch" that can be activated at a distance to harm national vital infrastructures (Hijink 2020). This focus on the more dramatic components of the trade conflict suspends earlier questions about 5G regularization and reconfigure it as a technological inevitability in a global arms race in which lagging behind compromises economic and national security. The sudden intensification of public opposition against 5G in the spring of 2020 adds to this staging of dramatic components of 5G. Foregrounding impact constituencies once again, newspapers report on arson attacks on telecommunications antennas and publish investigative pieces on individuals and groups associated with the spread of 5G conspiracy theories.

Outrage about the methods used by this new wave of opponents dominate opinion articles and letters to editors:

Soon telecom carriers want to roll the 5G network out over the Netherlands so all of us will be yet better to reach. But there are people who think that 5G has caused the coronavirus to spread around the world. After all, where was it tested for the first time? In Wuhan, China! And where did all that corona-misery start? In Wuhan! Moreover, 5G gives much radiation!!! And that makes you sick!!! With many exclamations the anti-5G lobby has been trying for ages to bring this to our attention, but we, the sheeple, are not listening. We believe researchers who say there is no relation between corona and 5G, and that research has shown there are no adverse effects of 5G radiation. We do not want to listen. And now those 5G fools are setting transmission towers ablaze to stop the signal. With this they partially disable telephone traffic, and emergency responders cannot be reached, at this time when that is so necessary. (De Jong 2020)

5G opposition narratives and activities are criticized by drawing boundaries between pragmatic acceptance and misinformed skepticism. Reference to increased reliance on telecommunications in the COVID-19 crisis functions to further condemn 5G opposition. Similar to trade conflict reporting, a focus on the dramatic dimensions of the conflict suspends

considerations of 5G regularization. The emphasis placed on corporate and state interests in 5G implementation and reservations about the benefits of 5G networks for ordinary citizens in earlier reporting on 5G have disappeared from reporting on 5G as a publicly contested issue. The same suspension of critical considerations of motivations for 5G implementation can be observed in investigative pieces about conspiracy theories and political discontent, whereas opinion pages use the trade conflict and public 5G controversies metonymically to discuss subjects as diverse as international relations or societal unrest. An exception are a few articles on the political and cultural demands of societal digitalization, where the metonymic significance of 5G opposition signals existing and future tensions. In general, however, once conflicts over 5G acquire dramatic properties, news reporting suspends its earlier reticence to unambiguously embrace technological regularization, relegating 5G itself to the background. From an uncertain innovation embodying a variety of contestable functions, meanings, and values, 5G transforms into a self-evident innovation in the field of telecommunications. In contexts of intense conflict, newspapers foreground strong contrasts, communicating approval or rejection for certain activities, reproducing one side of the 5G conflict in the press.

Impact Constituencies: Redressive Strategies

Created on March 25, 2020, the purpose of the Facebook group WWG5GNL is to stop the rollout of 5G in the Netherlands. Citing fears about harms to health expressed by citizens and scientists in its page description, the group was most active in the six months following its creation (March–October 2020). During this period, the group counted 37,000 members who placed over 7,000 unique posts and comments, on which our analysis is based.[4] Although the group counts two administrators, there was little to no moderation of the comments section at the time of data collection. From its inception, members share pictures of cell towers in construction or already erect. Cell tower sightings are made close to homes, schools, playgrounds, and on commutes mainly in cities and suburban areas. These sightings are accompanied by descriptions and discussions of a variety of health complaints, including dizziness, tinnitus, and headaches, which members ascribe to the appearance of antennas in their direct vicinity: "we are getting a strange taste in our throats . . . sometimes lasting a couple of hours. Being attentive, I found out this occurred this afternoon when I was in the vicinity of a 5G antenna. Could that be the cause?" (Member FB554).
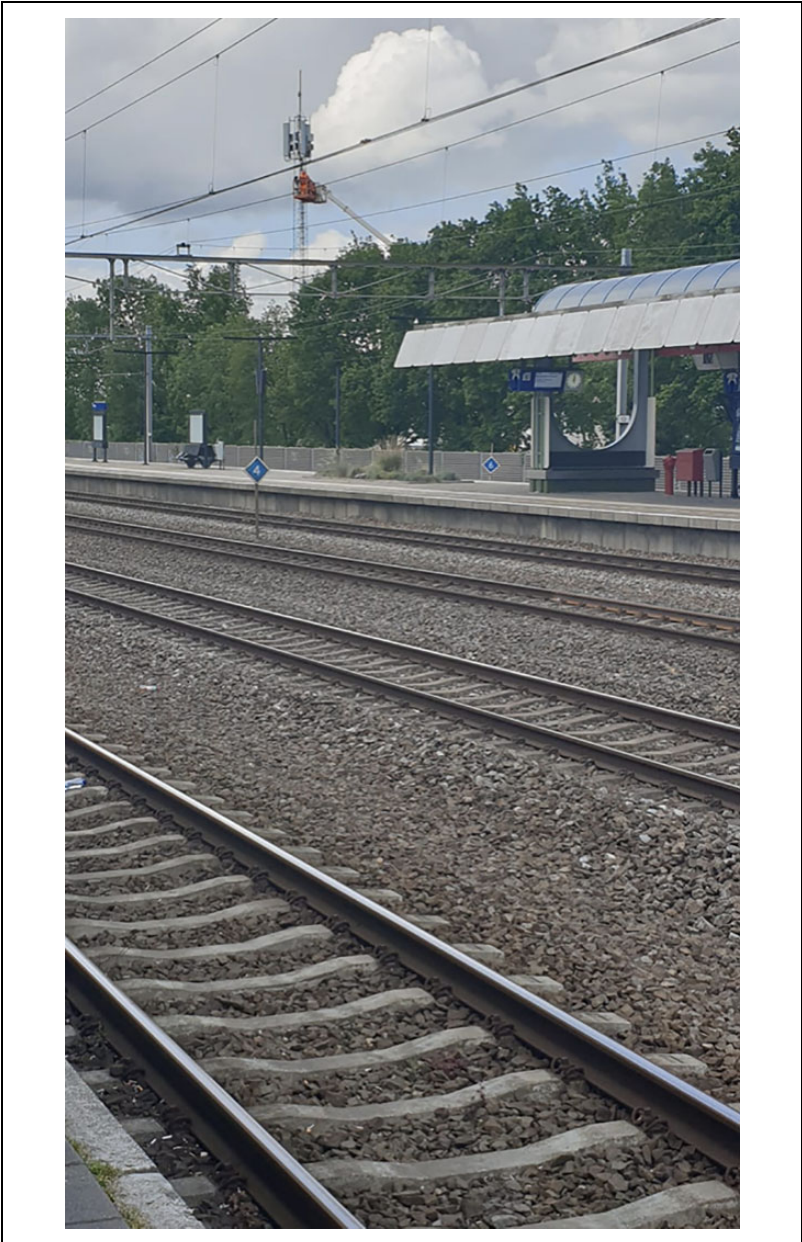
Figure 3. Cell tower sightings. *Source*: Photograph from a train station taken by a member of WWG5GNL printed here with permission.

Figure 4. Cell tower sightings. *Source*: Photograph of a residential building taken by the first author of this paper, which mimics the "on the go" style common to pictures of cell tower sightings in WWG5GNL Facebook group.

Members also share articles, videos, and websites dedicated to the EMF radiation controversy, EMF radiation measurements in their environments, and information about radiation protection. Readings of science,

observations of radiant technologies in the living environment, interactions with EMF measuring devices, and exchanges with peers are critical for the construction of invisible EMF radiation and telecommunications technologies as objects of controversy (Soneryd 2007). This variety of activities is accompanied by narratives that draw on uncertainties about 5G as a novel technology:

> I'm wondering what the long-term consequences are of living under a dense net of 3 Ghz. The government says it's harmless and that everything is in accordance with regulations. But the same government has claimed before that new technologies are OK. Think of chromium six paint, anti-vomiting medication for pregnant women which led to deformed children, solvents, asbestos. This line can get quite long, who and which institution can give 100 percent certainty that we won't get damaged? (Member FB1203)

Historical examples of harmful technologies render assurances given by design constituencies unconvincing, paving the way for counterstatements that portray 5G as a potentially dangerous innovation for humans and the environment. Noting the lack of public consultation about 5G implementation, this new meaning leads impact constituencies to express outrage: "We are just test bunnies!!! We couldn't even vote or choose for 5G. It was just placed!! I know for sure that these radiations do something to our bodies. I think that within a few years more diseases will come, like cancer. . . . Those radiations just destroy your cells" (Member FB1127). Terms like test bunnies and lab rats function to position citizens as involuntarily involved in a potentially dangerous experiment on a societal scale, countersignifying 5G as heedless public experimentation. For those looking to attribute blame, this prompts speculation about hidden agendas of conspiring global elites behind 5G rollout and encouragement to abandon telecommunications altogether: "this is not 2g, 3g, 4g, this is a military weapon, made to depopulate. You should get rid of your smart products, turn them off. . . . You should turn off your Wi-Fi and that of your telephone, Wi-Fi, Bluetooth, mobile data, not even watch television . . . then they'll only activate what's in the air" (Member FB633). Here, theories linking 5G to COVID-19 can be found: 5G causes COVID-19, it weakens the immune system to make one more susceptible to COVID-19 or, as above, 5G (in combination with COVID-19) is a military technology purposefully created to depopulate. Moving away from the more established routes of EMF controversy, these narratives often trigger disagreement from members who prefer to confine

discussions to the uncertainties of EMF science. Although this illustrates the internal diversity of impact constituencies, outrage about the ongoing implementation of 5G regardless of opposition dominates, allowing members to speculate on hidden motivations for 5G implementation.

Narratives of imminent public need and the affordances of 5G for specific technological applications form another important source for articulating opposition:

> 4G is . . . fast enough. And why do we need self-driving cars are we then so stupid that we can't even drive cars ourselves? . . . The elite is laughing itself to death about us the people who are seriously speculating about 5G. It's all about faster Internet peeps! . . . I love technology but I love life more. The Elite is joking and push it almost harder. . . . We never needed 5G. We always did it without it! (Member FB114)

Complementing countersignifications of heedless public experimentation, WWG5GNL members negate the necessity for faster connectivity for citizens, in this instance, ridiculing the technological solutions that 5G enables. Rather than serving public needs, 5G is recast as serving values of faster mobile communications in their own right. "The elite" are not interested in citizens' speculations, but in pushing 5G regardless of peoples' desires or objections. At the same time and somewhat paradoxically, imminent public need is reinterpreted by lamenting a growing societal dependence on mobile communications: "Because they know they are in power they have first made us very dependent and now we stand with our backs against the wall. We don't want 5G, but we can barely do without our mobile phones and related providers" (Member FB1775). Here, meanings of public need are replaced by terms like dependency and addiction to mobile phones and connectivity, consciously fabricated by those who "are in power." In this way, broad currents of sociotechnical change are framed as a conscious effort on the part of hegemonic elites to control helpless citizens, which upholds countersignifications of 5G as redundant connectivity, while at the same time noting a societal dependence on mobile connectivity, including among impact constituencies themselves.

Finally, in the course of the six months we observed WWG5GNL's interactions, members use 5G's status as a pivotal technology for the future to construe this future as dystopian. This is often done by drawing on the dialectic of sociotechnical imaginaries of ubiquitous convenience, on the one hand, and ubiquitous surveillance and control, on the other:

> We all see these advertisements on television that say 5G is coming to your community. It's going to be something major for all of you. . . . It's going to make all your lives so much better. And I must say it's very convincing. When I watch these advertisements, I think that it's great, I can barely wait until it's here . . . to be able to download a videogame in six seconds instead of sixteen seconds. Is that why they spend five billion dollars on 5G? No, the reason is surveillance and data harvesting, not for you and me, it's for Bill Gates, Jeffrey [Bezos], Zuckerberg and all other billionaires. Bill Gates says . . . his fleet of satellites will be able to watch every square centimeter of the planet twenty-four hours a day. It's only the beginning. (Member FB1288)

In this example, 5G-enabled convenience is portrayed as a myth to cloak agendas of corporate surveillance and control, embodied by leading personas in "big tech" and the government. This narrative is especially potent in eliciting outrage against 5G in a context of technological explorations for pandemic management. For instance, an emergency bill granting the *RIVM* (the Dutch National Institute for Public Health and the Environment) access to data from telecom antennas to track crowd movements and infection rates led to many expressions of anger and frustration in the group (see Rijksoverheid [2020a] for an announcement of the emergency bill). Such events, though not necessarily directly related to 5G, reinforce perceived links between 5G and COVID-19, and universal 5G-enabled surveillance and societal control. Lastly, the quote also demonstrates how speculations on dystopian futures often use 5G metonymically to signify looming sociotechnical change at large. Ultimately, the countersignifications of 5G described above in combination with ongoing activities of sighting cell towers culminate in recurrent expressions of sympathy for, or allusions to the destruction of cell towers.

> Member FB615: Is it now also our turn?? Just took this picture.[5]
> Member FB2112: It's so sad that everywhere you encounter those rotten things.
> Member FB701: And nobody does something, except taking pictures . . . .
> Member FB211: Burn it.

As a term, 5G brings together a host of visible and invisible artifacts like computer chips, smartphones, cables under the ground, and radio waves in the air. In the absence of a single, unifying 5G artifact, opposition is directed at what is concretely visible: ubiquitous telecom antennas

Figure 5. Sighting of cell tower installation. *Source*: Photograph taken by a member of WWG5GNL and printed here with permission.

positioned in plain sight, which come to embody the feelings of frustration and disempowerment experienced by impact constituencies. Epistemological dimensions of health concerns from radiation interact with political

dimensions of ignorance from decision makers in government, telecom industries, and society at large (cf. Moore and Stilgoe 2009). While 5G incorporates social categories differentially, its implementation affects everybody living in proximity to cell towers, constraining opportunities for voluntarily opting out. Where public protests and judicial litigation[6] do not produce the desired outcomes, WWG5GNL members allude to sabotage as a means of asserting opposition, thus symbolically "counterdelegating" the ostensibly coercive implementation of 5G.

Discussion and Conclusions

In this paper, we used the technological dramas framework to understand the narratives and activities of key actors in the public controversy about 5G. We have analyzed how design constituencies invest in narratives of public need and utopian imaginaries of 5G futures that are concretized in bounded sites of experimentation. When encountering opposition, these narratives and activities are temporarily suspended in favor of framing 5G as scientifically manageable, responsible innovation. In news reports, initial reticence toward narratives of public need is abandoned as scientific experts disavow concerns about EMF radiation, while circulation of conspiracy theories and arson attacks on cell towers provoke condemnations of 5G opposition. In response, impact constituencies share 5G sightings and exchange information about health complaints while negating a public need for 5G and producing imaginaries of 5G dystopia. Finally, these counter-significations legitimate expressions of sympathy with the destruction of telecommunications infrastructure. Working with Pfaffenberger's framework, this article has foregrounded competing symbolic meanings of 5G and their reciprocal and recursive relation with spatial activities, including 5G experimentation, sighting and measuring 5G radiation, the avoidance of digital technologies, and sabotage of cell towers.

   We argue that the selective suspension of meanings in the technological drama work to enforce partial closure of the conflict. While 5G is "projected" into a context "regulated" by symbolic myths of imminent public need and imaginaries of 5G futures, the stage for emergent opposition is narrowed to an epistemological matter of EMF radiation and its effects on health. Unlike the inherent interpretive flexibility of narratives regarding public needs and sociotechnical imaginaries, the EMF debate allows for partial closure of the conflict through recourse to scientific and technological expertise. Such a selective engagement with opposition works to "designify" 5G as a controversial technology, which has political

ramifications. Impact constituencies, however, perceive the exclusion of symbolic and political dimensions of their opposition as expert ignorance, which works to entrench their perceived oppression and serves to legitimate their activities (cf. Moore and Stilgoe 2009).

Social media have enabled us to analyze the enactment of the 5G drama in unique ways. In this context, we see social media architectures and users structuring a part of the 5G drama to self-reinforce technological and political discontent. Yet, opposition against 5G has a history that predates the advent of ubiquitous digital media (Meese, Frith, and Wilken 2020; Moore and Stilgoe 2009; Soneryd 2007; Tiffany 2020). Opposition to 5G has long drawn on scientific indeterminacies, anecdotal evidence, and sociotechnical imaginaries which, as we have shown, have become reproduced in the 5G drama in the Netherlands. Hence, while the role of digital media architectures is important for the 5G drama, they do not fully account for the contested meanings and activities at the hearth of the drama, which have a longer history that is firmly rooted in technological societies.

Inevitably, there are limitations to our reliance on digital sources for the drama that competing actors play out. Both the implementation of 5G and opposition to it are long-term projects driven by the formation of complex coalitions of actors and a variety of technical, scientific, legal, and political strategies and actions, which are not fully covered in this analysis. This includes, for instance, the structure and practices of the International Telecommunications Union, the political and legislative capacities of the EU, as well as international groups of "fringe" or "dissident" scientists and environmentalists who have organized against radiant technologies for many decades. Attentiveness to the broader histories, organization, strategies of, and interactions between these groups could reveal more insight into the trajectories of power relations in the conflict about 5G and related technologies.

Concluding our paper, we encourage further study of technological controversies to enrich debates on societal digitalization and its enabling technologies. In a context where digital technologies and imaginaries of societal digitalization are increasingly framed as inevitabilities, it is important to safeguard critical interrogation of the political values embedded in technologies and imaginaries. While perplexity with antagonistic viewpoints and violent strategies is understandable, dismissing opposition as merely misguided and misinformed risks ignoring its relation with alternative frameworks of meaning that respond to the social contexts into which—to use Pfaffenberger's terminology—decision makers "project" new technologies that fulfill digitalization agendas. These social contexts and their

contestations require critical scrutiny so that processes of technological innovation do not alienate publics from processes that may significantly influence the way our societies function.

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Supplemental Material

Supplemental material for this article is available online.

Notes

1. At the time of data collection (April 2020), the group counted a little less than 37,000 members. As of April 2022, the number of members has decreased to a little more than 33,000.
2. These activities were conducted in keeping with advice by the privacy officers and ethical committee of the Department of Public Administration and Sociology of Erasmus University Rotterdam.
3. The 3,500-megahertz frequency band designated by the European Union for fifth-generation (5G) networks affords the highest data transfer standards for the projected 5G networks. In the Netherlands, however, this frequency band is currently in use by Dutch intelligence agencies and satellite services and will not be released for commercial 5G until at least mid-2023. Until that time, telecommunications corporations are trialing a "light" version of 5G, using 700-megahertz frequency bands that affords an incremental improvement of existing 4G data transfer rates.
4. This number has decreased to just under 33,000 in November 2022.
5. Figure 5 is similar to, but not the same photograph referred to in the quote.
6. Civic action groups STOP5GNL and *Bond tegen overheidszaken* (Union Against Government Affairs) have litigated on a national level against 5G implementation since 2020, mainly by claiming public health risks. So far, the courts have dismissed all their claims.

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