SPECIAL ISSUE
THE YALE INFORMATION SOCIETY PROJECT & YALE
JOURNAL OF LAW AND TECHNOLOGY DIGITAL PUBLIC SPHERE
SERIES

INFRASTRUCTURING THE DIGITAL PUBLIC SPHERE

Julie E. Cohen[*]

25 YALE J.L. & TECH. SPECIAL ISSUE 1 (2023)

The idea of a "public sphere"--a shared, ideologically neutral domain where ideas and arguments may be shared, encountered, and contested--serves as a powerful imaginary in legal and policy discourse, informing both assumptions about how public communication works and ideals to which inevitably imperfect realities are compared. In debates about feasible and legally permissible content governance mechanisms for digital platforms, the public sphere ideal has counseled attention to questions of ownership and control rather than to other, arguably more pressing questions about systemic configuration. This essay interrogates such debates through the lens of infrastructure, with particular reference to the ways that digital tracking and advertising infrastructures perform systemic content governance functions.

[*] Mark Claster Mamolen Professor of Law and Technology, Georgetown Law. Thanks to Hannah Bloch-Wehba, Ryan Calo, Jennifer Cobbe, Nick Couldry, evelyn douek, Brenda Dvoskin, Roberta Fischli, Sebastian Guidi, Natali Helberger, Daphne Keller, Orla Lynskey, Frank Pasquale, Jean-Christophe Plantin, Joris Van Hoboken, Michael Veale, and Ari Waldman for their helpful comments on previous drafts and to Evan Cernea, Conor Kane, Abigail Kunkler, and Sherry Tseng for research assistance.

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INTRODUCTION

The idea of a "public sphere"—a domain where ideas and arguments may be shared, encountered, and contested—serves as a powerful imaginary in legal and policy discourse. In the classic philosophical formulation, it describes a metaphorical space that is open and ideologically neutral—where everyone is afforded entry and the opportunity to speak, and where ideas stand or fall based on their intrinsic merits rather than on the basis of sovereign edicts or whims.[1] Particularly in the U.S., legal theorists of free speech differ on the mechanism of merit assessment, with some envisioning a domain of deliberative rationality and others a domain of market-like competition.[2] Experienced reality has always fallen short of the mark envisioned by either version; for all except a privileged few, the domain of public debate is one of both differential access and differential reception.[3] Even so, the imaginary of the public sphere does important cultural and legal work, informing both assumptions about how public communication works and ideals to which inevitably imperfect realities are compared. Those assumptions and ideals in turn shape legal debates about free speech guarantees, producing a discourse that is well known—even celebrated—for retaining an internal and insistently self-referential orientation in the face of rapidly changing technological and economic conditions.

Debates about free speech guarantees for the digital public sphere exemplify the tight, recursive interplay between legal imaginary and assumed reality. They also reveal the importance of shared understandings and unexamined assumptions about the capacities and affordances of the infrastructures that facilitate communication. Legal scholarship about online speech has long urged that the internet can and should support a digital public sphere

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[1] The classic formulation comes from the philosopher and social theorist Jurgen Habermas. See JURGEN HABERMAS, THE STRUCTURAL TRANSFORMATION OF THE PUBLIC SPHERE (1962). For a compact summary, see Jurgen Habermas, "The Public Sphere: An Encyclopedia Article," 3 NEW GERMAN CRITIQUE 49 (Sara Lennox & Frank Lennox trans.,1974).

[2] On the public sphere as a domain of deliberative rationality, see, e.g., Robert Post, *The Constitutional Concept of Public Discourse: Outrageous Opinion, Democratic Deliberation, and* Hustler Magazine v. Falwell, 103 HARV. L. REV. 601, 628-44 (1990). On the public sphere as a domain of market-like competition for supremacy, see, e.g., Lillian BeVier, *The Invisible Hand of the Marketplace of Ideas*, in ETERNALLY VIGILANT: FREE SPEECH IN THE MODERN ERA 233-55 (Lee C. Bollinger & Geffrey R. Stone eds., 2002).

[3] See CRAIG CALHOUN, ED., HABERMAS AND THE PUBLIC SPHERE (1993) (collecting essays elaborating these and other critical responses); see also Habermas, *supra* note 1 at 55 (observing that "the liberal model of the public sphere … cannot be applied to the actual conditions of an industrially advanced mass democracy organized in the form of the social welfare state").

that more closely approaches the imaginary ideal.[4] Here again, this is not to suggest unanimity; scholars who study online speech have differed about the best paths toward that goal, and as dysfunctions in the domain of online communication have emerged and intensified, they have disagreed about both causes and prescriptions. More uniformly, however, free speech thinking about the digital public sphere also has tended to overlook some of the most important ways that communication infrastructures shape online speech systemically, prioritizing particular patterns of engagement and interaction and deprioritizing others.

This essay uses the lens of infrastructure—defined (for now) as a structured arrangement that facilitates human activity across space—to interrogate current debates about content governance arrangements for the digital public sphere. That exploration begins with information platforms, which I have elsewhere defined as "information intermediar[ies] that use[] data-driven, algorithmic methods and standardized, modular interconnection protocols to facilitate digitally networked interactions and transactions among [their] users."[5] More particularly, it considers the means through which certain platformized communication systems have come to function as information infrastructures, and why that matters for online communication. Formally separate elements of platformized communication systems that face different users—the information displays produced by algorithmic optimization, the software modules provided to app developers and information partners, and the dashboards used to transact with advertisers—are interconnected at the infrastructural level, and the linkages between those elements give patterns of online communication their distinctive attributes. At a time when the digital public sphere's dysfunctions command an ever-larger share of public and legislative attention, they offer possibilities for improved governance that should not be overlooked.

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[4] For a sampling in chronological order, see Eugene Volokh, *Cheap Speech and What It Will Do*, 104 YALE LJ. 1805 (1995); David R. Johnson & David Post, *Law and Borders—The Rise of Law in Cyberspace*, 48 STAN. L. REV. 1367 (1996); Yochai Benkler, *Free as the Air to Common Use: First Amendment Constraints on Enclosure of the Public Domain*, 74 N.Y.U. L. REV. 354 (1999); LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD (2002); Dan Hunter & F. Gregory Lastowka, *Amateur-to-Amateur*, 46 WM. & MARY L. REV. 951 (2004); *see also* John Perry Barlow, "A Declaration of the Independence of Cyberspace" (Feb. 8, 1996), https://perma.cc/H6KG-GQ7F; JILLIAN C. YORK, SILICON VALUES: THE FUTURE OF FREE SPEECH UNDER SURVEILLANCE CAPITALISM (2022).

[5] Julie E. Cohen, *Tailoring Election Regulation: The Platform Is the Frame*, 4 GEO. TECH. L. REV. 641, 656 (2020).

The argument moves in three parts. First, I explore the relatively thin conception of infrastructure that underlies current legal and policy debates about online content governance. Second, I introduce a thicker, interdisciplinary conception of infrastructure and explain how it illuminates the digital public sphere's seemingly intractable dysfunctions. Finally, I consider lessons of that exercise for efforts to improve governance of the digital public sphere, including new European initiatives for more comprehensive digital platform regulation and proposals for decentralized, blockchain-based alternatives to platform-based communication environments.

I. IMAGINING THE DIGITAL PUBLIC SPHERE: THE ABSENCE OF INFRASTRUCTURE

In general, legal scholarship about the digital public sphere and its content governance problems does not treat infrastructure as a distinctive consideration. The word is used rarely, and most often in passing.[6] This is not to say that free speech scholarship is unconcerned with the capabilities of technological facilities for online communication. Quite the opposite: It is intensely concerned with the private content governance activities of dominant technology platform providers.[7] And it is also intensely concerned with the problem of "new school speech regulation"—or speech

[6] *See, e.g.,* Jack M. Balkin, *Digital Speech and Democratic Culture: A Theory of Freedom of Expression for the Information Society*, 79 N.Y.U. L. REV. 1 (2004); Jack M. Balkin, *Old-School/New School Speech Regulation*, 127 HARV. L. REV. 2296 (2014); Jack Balkin, *Free Speech Is a Triangle*, 118 COLUM. L. REV. 2011 (2018); Yochai Benkler, *Degrees of Freedom, Dimensions of Power*, 145 DAEDALUS 18 (2016). Two notable recent exceptions to this rule are Courtney C. Radsch, *Platformization and Media Capture: A Framework for Regulatory Analysis of Media-Related Platform Regulations*, 28 UCLA J.L. & TECH. 175 (2023) (arguing that platformized advertising infrastructures lie at the root of the power imbalance between platforms and news publishers), and Theresa Josephine Seipp, Natali Helberger, Claes de Vreese, & Jef Ausloos, *Dealing with Opinion Power in the Platform World: Why We Really Have to Rethink Media Concentration Law*, 11 DIGITAL JOURNALISM (forthcoming 2023) (arguing that platformized infrastructures confer substantial power on platforms to shape public opinion), https://doi.org/10.1080/21670811.2022.2161924.

[7] *See, e.g.*, evelyn douek, *Governing Online Speech: From "Posts-as-Trumps" to Proportionality and Probability*, 121 COLUM. L. REV. 759 (2021); DAVID KAYE, SPEECH POLICE: THE GLOBAL STRUGGLE TO GOVERN THE INTERNET (2019); Kate Klonick, *The New Governors: The People, Rules, and Processes Governing Online Speech*, 131 HARV. L. REV. 1598 (2018); Eugene Volokh, *Treating Social Media Platforms Like Common Carriers?*, 1 J. FREE SPEECH L. 377 (2021); *see also* TARLETON GILLESPIE, CUSTODIANS OF THE INTERNET: PLATFORMS, CONTENT MODERATION, AND THE HIDDEN DECISIONS THAT SHAPE SOCIAL MEDIA (2018) (bringing a technology studies perspective to bear on these activities).

regulation emanating from governments but effectuated by and through third-party intermediaries who supply the means of communication.[8] However, in keeping with the decades-long scholarly tradition of foregrounding *ownership* of facilities for communication and *control* of discrete items of content as the principal variables shaping expressive freedom, scholarly thinking about these issues has identified market dominance, targeted censorship, and jawboning as the predominant problems in need of analysis.[9]

Legal scholars who study free speech law have long recognized that ownership and control of the means of communication matter. Over the course of the twentieth century, as first print and then broadcast and cable empires emerged, they mapped the ways that patterns of ownership, advertiser-driven financing, and broadcast licensing shaped access to and use of facilities for mass communication.[10] With the advent of digital communications networks and platforms, they recognized (with varying degrees of alarm or glee) that ownership could now translate into more fine-grained processes of content control.[11] But they have

[8] Balkin, *Old-School/New School Speech Regulation*, *supra* note 7; see also Michael D. Birnhack & Niva Elkin-Koren, *The Invisible Handshake: The Reemergence of the State in the Digital Environment*, 8 VA. J.L. & TECH. 6 (identifying the same dynamic).

[9] *See, e.g.*, Balkin, *Old-School/New School Speech Regulation*, *supra* note 7; Balkin, *Free Speech Is a Triangle*, *supra* note 7; Derek Bambauer, *Orwell's Armchair*, 79 U. CHI. L. REV. 863 (2012); Derek Bambauer, *Against Jawboning*, 100 MINN. L. REV. 51 (2015); Eric Goldman, *Why Section 230 Is Better than the First Amendment*, 95 NOTRE DAME U. L. REV. ONLINE 34 (2019); Ellen P. Goodman, *The First Amendment Opportunism of Digital Platforms*, German Marshall Fund, Feb. 11, 2019, https://www.gmfus.org/news/first-amendment-opportunism-digital-platforms; Daphne Keller, *Lawful but Awful? Control Over Legal Speech by Platforms, Governments, and Internet Users*, U. CHI. L. REV. ONLINE, June 28, 2022, https://lawreviewblog.uchicago.edu/2022/06/28/keller-control-over-speech/; Daphne Keller, *Amplification and Its Discontents: Why Regulating the Reach of Online Content Is Hard*, KNIGHT FIRST AMEND. INST. (2021), https://knightcolumbia.org/content/amplification-and-its-discontents; *see also* Anupam Chander & Uyen P. Le, *Data Nationalism*, 64 Emory L.J. 677 (2015).

[10] *See, e.g.*, C. EDWIN BAKER, ADVERTISING AND A DEMOCRATIC PRESS (1994); C. Edwin Baker, *Giving the Audience What It Wants*, 58 OHIO ST. L.J. 311 (1997); Balkin, *Digital Speech and Democratic Culture*, *supra* note 7; Yochai Benkler, *Overcoming Agoraphobia: Building the Commons of the Digitally Networked Environment*, 11 HARV. J.L. & TECH. (1998); see also NOAM CHOMSKY, MANUFACTURING CONSENT (1988); ITHIEL DE SOLA POOL, TECHNOLOGIES OF FREEDOM (1984).

[11] *See, e.g.*, Volokh, *Cheap Speech and What it Will Do, supra* note 4, at 1834; Benkler, *Free as the Air*, *supra* note 4, at 359; Julie E. Cohen, *A Right to Read Anonymously: A Closer Look at Copyright Management in Cyberspace*, 28 CONN. L. REV. 981 (1996); LAWRENCE LESSIG, CODE AND OTHER LAWS OF CYBERSPACE (1999).

been slow to reckon with the ways that communication infrastructures configure systemic patterns of flow.

When free speech scholars do think about infrastructure, they are apt to cite Brett Frischmann's magisterial treatment of the subject from the perspective of demand-side economics.[12] As Frischmann explains, infrastructures have three characteristics: they are consumed nonrivalrously (for at least some ranges of use); social demand is driven primarily by downstream productive activities that require the resource; and they serve as inputs into a wide range of private, public, and social goods and services.[13] Different choices about ownership and management of infrastructural resources shape the patterns of downstream relationships and uses in ways that produce large external effects. Sound infrastructure policy therefore must consider more than just the factors affecting the supply of infrastructure (e.g., fixed costs). This work has clear implications for policymakers concerned with public access to the means of communication. Yet the demand-side perspective counsels relatively greater attention to the distributive effects of cost-based segmentation of access and use and less consideration of other ways that infrastructures configure uses (a point to which I will return in Part II, below).

The reflexive conflation of questions about infrastructure with questions about ownership and control has important downstream implications for discussions about content governance mechanisms and ways to improve them. If infrastructure is a (largely) inert input to content targeting decisions made by or imposed upon infrastructure owners, then, conversely, content governance involves decisions taken above the infrastructural level and consists chiefly in targeting particular communications for blocking or removal based on their content or their origin. In light of the public-private distinction embedded within the deep structure of U.S. free speech thinking, it is axiomatic that, in the main, these activities cannot and should not be mandated or indirectly influenced by governments, and that the few exceptions should be crisply defined and vigilantly policed to prevent mission creep.[14] It

[12] BRETT M. FRISCHMANN, INFRASTRUCTURE: THE SOCIAL VALUE OF SHARED RESOURCES (2012).

[13] *Id*. at 61-66.

[14] *See, e.g.,* Balkin, *Free Speech Is a Triangle*, *supra* note 7; Jack M. Balkin, *Free Speech in the Algorithmic Society: Big Data, Private Governance, and New School Speech Regulation*, 51 U.C. DAVIS L. REV. 1149 (2018); Bambauer, *Against Jawboning*, *supra* note 10; Danielle Keats Citron, *Extremists Speech, Compelled Conformity, and Censorship Creep*, 93 NOTRE DAME L. REV. 1035 (2018); Seth Kreimer, *Censorship by Proxy: The First Amendment, Internet Intermediaries, and the Problem of the Weakest Link*, 155 U. PA. L. REV. 11, (2006).

is also axiomatic that competition among owners of communication systems is the preferred means of ensuring diversity of content and speakers, and that distortions arising from market dominance should be resolved by importing concepts derived or extrapolated from antitrust and competition policy into the domain of media regulation.[15]

Platformized communication systems have posed two types of persistent and confounding challenges to that understanding of the digital public sphere and its governance mechanisms. Notably, each involves problems of systemic configuration and the underlying organizational decisions and imperatives that produce it. Free speech thinking about the digital public sphere and its governance problems has not dealt with either challenge particularly well.

First, content governance programs need to be implemented at scale within large, complex organizations that also have other priorities. Most obviously, this engenders the same kinds of operational challenges that all large, bureaucratic processes confront.[16] Even the most judiciously crafted program of content governance will experience both episodic glitches and larger, systemic process and quality control problems—some inhering in the particular nature of the work and others arising from the scale of the enterprise. Line workers and supervisors will make mistakes about particular items of content, and there will be inconsistencies within categories of content. The rates and directions of the errors will matter, as will the available pathways for correction and review.[17] Content governance bureaucracies, however, do not operate in isolation. They sit within larger organizational contexts

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[15] *See, e.g.,* Jack Balkin, *How to Regulate (and Not Regulate) Social Media*, 1 J. FREE SPEECH L. 71 (2021); Eric Goldman & Jess Miers, *Online Account Terminations/Content Removals and the Benefits of Internet Services Enforcing Their House Rules*, 1 J. FREE SPEECH L. 191 (2021); Goodman, *The First Amendment Opportunism of Digital Platforms*, *supra* note 10. *But see* Volokh, *Treating Social Media Platforms*, *supra* note 8 (concluding that broad constitutional leeway exists for common carriage mandates). For a careful exploration of the questions surrounding dominance and cooperation in content removal, see evelyn douek, *The Rise of Content Cartels*, in THE TECH GIANTS, MONOPOLY POWER, AND PUBLIC DISCOURSE, KNIGHT FIRST AMEND. INST. (2020), https://knightcolumbia.org/content/the-rise-of-content-cartels.

[16] For a comprehensive analysis of the challenges surrounding accountable administration of content moderation, see Deirdre K. Mulligan & Kenneth A. Bamberger, *Allocating Responsibility in Content Moderation: A Functional Framework*, 36 BERKELEY TECH. L.J. 1091 (2021).

[17] *See* evelyn douek, *Governing Online Speech*, *supra* note 8; Brenda Dvoskin, *Expert Governance of Online Speech*, 64 HARV. INT'L L.J. 85 (2023); Mulligan & Bamberger, *supra* note 17; Ari Ezra Waldman, *Disorderly Content*, 97 WASH. L. REV. 907 (2022).

and routinely encounter other organizational processes and their animating priorities. The sum total of the content governance performed within platformized communication systems includes all of those processes and reflects all of the priorities.[18]

The recursive pattern of free speech thinking about the digital public sphere and its governance problems has no readily available frame of reference for such discussions, so it has mostly ignored them in favor of arguments about the harms of censorship and the legal significance of ownership and control within content moderation silos. Some commentators argue that, since regulation privileges incumbents and perfect identification of illegal content is impossible, no officially imposed duties should exist at all.[19] Others wonder whether formal nondiscrimination mandates should issue to protect disfavored viewpoints and speakers (although there is considerable difference of opinion about which viewpoints and speakers are being disfavored).[20] Still others conclude that transparency and process obligations informed by human rights paradigms should attach to platforms' private censorship operations because of the extraordinary power that platforms exercise to remove content without accountability.[21] The mainstream of free

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[18] *See, e.g.*, Jeff Horowitz, *The Facebook Files*, THE WALL STREET JOURNAL, https://www.wsj.com/articles/the-facebook-files-11631713039?mod=article_inline; Ferenc Huszar, et al., *Algorithmic Amplification of Politics on Twitter*, 119 PROCS. OF THE NAT'L ACADEMY OF SCIS. OF THE UNITED STATES OF AMERICA, 1 (2021), https://www.pnas.org/doi/10.1073/pnas.2025334119; "YouTube Regrets: A Crowdsourced Investigation into YouTube's Recommendation Algorithm," THE MOZILLA FOUNDATION 13–19 (July 2021), https://assets.mofoprod.net/network/documents/Mozilla_YouTube_Regrets_Report.pdf; *see also* Rebecca Hamilton, *Governing the Global Public Square*, 62 HARV. INT'L L.J. 117, 127 (2021).

[19] *See, e.g.*, Eric Goldman & Jess Miers, *Why Can't Internet Companies Stop Awful Content?*, ARS TECHNICA, Nov. 27, 2019, https://arstechnica.com/tech-policy/2019/11/why-cant-internet-companies-stop-awful-content/.

[20] *See, e.g.,* Volokh, *Treating Social Media Platforms*, *supra* note 8. On the which-viewpoints-and-speakersquestion, see Angel Diaz & Laura Hecht-Felella, "Double Standards in Social Media Content Moderation," Brennan Center for Justice, 4 Aug 2021, https://www.brennancenter.org/our-work/research-reports/double-standards-social-media-content-moderation; Waldman, *Disorderly Content*, *supra* note 18.

[21] *See, e.g.*, KAYE, SPEECH POLICE, *supra* note 8; Paddy Leerssen, *An End to Shadow Banning? Content Moderation Transparency Rights in the EU's Digital Services Act*, 48 COMP. L. & SEC'Y REV. (April 2023), https://doi.org/10.1016/j.clsr.2023.105790; Nicolas P. Suzor, Sarah Myers West, Andrew Quodling, & Jillian York, *What Do We Mean When We Talk About Transparency? Toward Meaningful Transparency in Commercial Content Moderation*, 13 INT'L J. COMM'N 1526 (2019); NICHOLAS P. SUZOR, LAWLESS: THE SECRET RULES THAT GOVERN OUR DIGITAL LIVES (2019); *see also* Niva

speech thinking about the digital public sphere has had much more difficulty conceptualizing as legally cognizable the harms arising from under-removal of content, even as the evidence of such harms—to public health, to democratic processes, to traditionally marginalized communities, and to teen mental health, among others—has mounted. All of these discussions would benefit considerably from access to complete and accurate data about how platforms actually are administering content governance across all of their organizational processes, but—except for carefully curated displays of aggregate removal numbers—the platforms aren't talking.

Second, and relatedly, speaking about targeting and removal in the fairly absolute terms suggested by the ideas of "control" and "censorship" papers over a state of systemic, technical complexity in which far more fine-grained tuning of content flows at scale is the norm. Platformized communication systems can alter the availability of both individual items of content and entire feeds or user accounts in a wide variety of ways, including removal but also including upranking or downranking, shadowbanning, flagging, and monetization or demonetization.[22] These interventions can be deployed post hoc or as filters that affect the ability to post new content or the extent to which that content is visible to and viewed by others. Those who operate platformized communication systems also might—but more generally do not—effectuate removal more systematically in other ways that sit entirely outside the "content moderation" frame. For example, they might revisit arrangements for content syndication with repeat violators of content policies or ban or shadowban apps that repeatedly and systematically violate such policies.[23] More ambitiously, they might consider the ways that platform tools for creating and sustaining focused interest

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Elkin-Koren & Maayan Perel, *Contesting Algorithms: Restoring the Public Interest in Content Filtering by Artificial Intelligence*, 7 BIG DATA & SOC'Y 2053951720932296 (2020), https://doi.org/10.1177/2053951720932296.

[22] *See* Eric Goldman, *Content Moderation Remedies*, 28 MICH. TECH. L. REV. 1 (2021).

[23] *See, e.g.,* Daisuke Wakabayashi, *YouTube Drops Logan Paul from Premium Advertising*, N.Y. TIMES, Jan. 10, 2018, https://www.nytimes.com/2018/01/10/technology/logan-paul-youtube.html; Mark Bergen, *How YouTube Broke Up with PewDiePie (Then Got Back Together Again)*, THE VERGE, Sept. 6, 2022, https://www.theverge.com/23339163/pewdiepie-like-comment-subscribe-mark-bergen-book-excerpt-youtube-adpocalypse; Jack Nicas, *Alex Jones's Infowars Is Removed from Apple's App Store*, N.Y. Times, Sept. 7, 2018, https://www.nytimes.com/2018/09/07/business/infowars-app-alex-jones-apple-ban.html; Nico Grant, *Parler Returns to Google Play Store*, N.Y. TIMES, Sept. 2, 2022, https://www.nytimes.com/2022/09/02/technology/parler-google-play.html.

groups intersect with patterns of repeated and systematic content policy violations.[24]

In U.S. free speech thinking about content governance, disagreements about how to understand systemic processes of content tuning play out against the backdrop of litigation about the meaning of statutory language that immunizes providers of platform-based communication services from liability for transmitting and/or removing content provided by others, and these discussions, too, are powerfully structured by considerations of ownership and control.[25] One hears, variously, that content owners are expressing their editorial opinions about what would be useful to users; that they are providing users with "neutral tools" to get the content that they want; and (more honestly, to the extent that it dispenses with pretensions about the feasibility of either forming opinions or achieving neutrality given the scale and speed of the operations in question) that they are giving users what users' revealed preferences indicate that they want. The very expensive lawyers representing large technology firms and the eminent scholars who file amicus briefs on their behalf construct careful arguments about how to reconcile the apparent inconsistencies among these positions.[26] As I have argued at greater length elsewhere, such arguments usefully divert attention from the sui generis nature of the function that platform-based communication intermediaries perform:

> They work to define a new category of information-related activity that consists of non- content-based expression—that is simultaneously in-between users and content (and therefore not content) and useful to users who want content (and therefore expressive). Because its purveyors are not providing content, they are … definitionally exempt from legacy regimes of

[24] *See, e.g.,* Craig Silverman, Craig Timberg, Jeff Kao, & Jeremy B. Merrill, *Facebook Hosted Surge of Misinformation and Insurrection Threats in Months Leading Up to Jan. 6, Attack, Records Show*, PROPUBLICA, Jan. 4, 2022, https://www.propublica.org/article/facebook-hosted-surge-of-misinformation-and-insurrection-threats-in-months-leading-up-to-jan-6-attack-records-show.

[25] For the statutory language, see 47 U.S.C. § 230(c)(1)–(2).

[26] See, e.g., Brief for Meta Platforms, Inc. as Amicus Curiae in Support of Respondent, pp. 23-27, Gonzalez v. Google, No. 21-1333 (2023); Brief for Microsoft Corporation as Amicus Curiae in Support of Respondent, pp. 7-26, Gonzalez v. Google, No. 21-1333 (2023). *See also* Daphne Keller, *The Stubborn, Misguided Myth that Internet Platforms Must Be 'Neutral'*, Wash. Post., July 29, 2019, https://www.washingtonpost.com/outlook/2019/07/29/stubborn-nonsensical-myth-that-internet-platforms-must-be-neutral/. For more detailed discussion, see Frank Pasquale, *Platform Neutrality: Enhancing Freedom of Expression in Spheres of Private Power*, 17 THEOR. INQ. L. 490-97 (2016).

> media regulation…. Because what they provide gives the torrent of online information a more definite structure, it can be … [characterized] as providing both utility and *moderation*. The language of moderation simultaneously proclaims intermediaries' virtue … and diverts attention from questions about why flows of online information are *im*moderate to begin with. It therefore represents a significant narrative triumph.[27]

Scholars from a number of neighboring fields, including privacy, media regulation, election regulation, and information governance, have observed that, in light of what is now known about how processes of data-driven patterning shape content flows within platformized communication systems, it would make far more sense for scholars and policymakers interested in content governance to pay attention to all of the ways such processes are engineered. In particular, they link the digital public sphere's content dysfunctions to the platform business model, which involves harvesting behavioral data from individual users and using it to target information flows for maximum user engagement.[28] They have explained at length—in an amount of detail that should give pause to anyone hoping to "fix" content moderation by mandating greater transparency and better interface design—why privacy-protective preferences do not translate into privacy-protective behaviors and why individualized, notice-and-consent-based mechanisms are ineffective tools for disciplining predesigned, networked assemblages for data-driven patterning that operate at scale.[29] They

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[27] JULIE E. COHEN, BETWEEN TRUTH AND POWER: THE LEGAL CONSTRUCTIONS OF INFORMATIONAL CAPITALISM 100 (2019).

[28] *See* Jennifer Cobbe & Jatinder Singh, *Regulating Recommending: Motivations, Considerations, and Principles*, 10 EUR. J.L. & TECH. (2019), http://dx.doi.org/10.2139/ssrn.3371830; COHEN, BETWEEN TRUTH AND POWER, at 75-107; Cohen, *Tailoring Election Regulation*, *supra* note 6; Ellen P. Goodman, *Digital Information Fidelity and Friction*, THE TECH GIANTS, MONOPOLY POWER, AND PUBLIC DISCOURSE, KNIGHT INST. (Feb. 26, 2020), https://knightcolumbia.org/content/digital-fidelity-and-friction; RICHARD L. HASEN, CHEAP SPEECH: HOW DISINFORMATION POISONS OUR POLITICS AND HOW TO CURE IT (2022); NEIL RICHARDS, WHY PRIVACY MATTERS (2021); Tomer Shadmy, *Content Traffic Regulation: A Democratic Framework for Addressing Misinformation*, 63 JURIMETRICS J. 1 (2022).

[29] *See* Alessandro Acquisti et al., *The Economics of Privacy*, 54 J. ECON. LIT. 442, 442–43 (2016); Solon Barocas & Helen Nissenbaum, *Big Data's End Run Around Anonymity and Consent*, *in* PRIVACY, BIG DATA, AND THE PUBLIC GOOD: FRAMEWORKS FOR ENGAGEMENT 44 (Helen Nissenbaum, Julia Lane & Victoria Stodden eds., 2014); Solon Barocas & Helen Nissenbaum, *On Notice: The Trouble with Notice and Consent*, *in* PROCEEDINGS OF THE ENGAGING DATA FORUM: THE FIRST INTERNATIONAL FORUM ON THE APPLICATION AND

have begun to explore other, design-based strategies for interrupting the flows of data that underlie and constitute current platform-based assemblages.[30] And they have suggested, finally, that design-based strategies for constraining the platform business model are much likelier to survive restrictive free speech review in the courts than more content-focused mandates would be.[31] The mainstream of legal and scholarly debate about the digital public sphere seems to understand these interventions either as mystifying yawps or as tedious digressions from the real issues (which have to do with superstructural content controls, jawboning, chilling effects, and the like).[32]

In sum, free speech thinking about the digital public sphere and its content governance problems remains anchored in a particular understanding of the relationship between infrastructure and governance that revolves around the themes of ownership and control. As a result, questions about how platformized communication systems and their associated capabilities for data-driven patterning configure and govern the digital public sphere

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MANAGEMENT OF PERSONAL ELECTRONIC INFORMATION (2009), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2567409; Nora A. Draper & Joseph Turow, *The Corporate Cultivation of Digital Resignation*, 21 NEW MEDIA & SOC'Y 1824 (2019); Seda Gürses & Joris van Hoboken, *Privacy after the Agile Turn*, in CAMBRIDGE HANDBOOK OF CONSUMER PRIVACY 579 (Evan Selinger, Jules Polonetsky & Omer Tene eds., 2018); Woodrow Hartzog, *The Inadequate, Invaluable Fair Information Practices*, 76 MD. L. REV. 952, 959 (2017); Kirsten Martin, *Privacy Notices as Tabula Rasa: An Empirical Investigation into How Complying with a Privacy Notice Is Related to Meeting Privacy Expectations Online*, 34 J. PUB. POL'Y & MARKETING 210 (2015); Neil Richards & Woodrow J. Hartzog, *The Pathologies of Digital Consent*, 96 WASH. U.L. REV. 1461 (2019); Ari Ezra Waldman, *Designing Without Privacy*, 55 HOUS. L. REV. 659 (2018); Ari Ezra Waldman, *Cognitive Biases, Dark Patterns, and the 'Privacy Paradox'*, 31 CURR. ISS. PSYCHOL. (2020), https://doi.org/10.1016/j.copsyc.2019.08.025; Lauren E. Willis, *When Nudges Fail: Slippery Defaults*, 80 U. CHI. L. REV. 1155, 1170–200 (2013).

[30] *See* Julie E. Cohen, *Turning Privacy Inside Out,* 20 THEOR. INQ. L. 1 (2018); WOODROW J. HARTZOG, PRIVACY'S BLUEPRINT: THE BATTLE TO CONTROL THE DESIGN OF NEW TECHNOLOGIES (2018); *see also* Cynthia Dwork & Aaron Roth, *The Algorithmic Foundations of Differential Privacy*, 9 FOUND. & TRENDS THEORETICAL COMPUTER SCI. 211 (2014); Janet Vertesi, *Seamful Spaces: Heterogenous Infrastructures in Interaction*, 39 SCI. TECH. & HUM. VALUES 64 (2014).

[31] *See, e.g.*, Julie E. Cohen, *How (Not) to Write a Privacy Law*, ESSAYS ON DATA AND DEMOCRACY, KNIGHT FIRST AMEND. INST. (Mar. 23, 2021), https://knightcolumbia.org/content/how-not-to-write-a-privacy-law; Cohen, *Tailoring Election Regulation*, *supra* note 6; HASEN, *supra* note 30; Shadmy, *supra* note 30.

[32] A notable exception is Keller, *Amplification and Its Discontents*, *supra* note 10, which takes the arguments seriously but finds them outweighed by concerns that regulating the platform business model would generate slippery slopes inexorably leading toward censorship).

systemically are left mostly unexplored. To have that discussion, it is necessary to consider the matter of infrastructure more carefully.

II. CONFIGURING THE DIGITAL PUBLIC SPHERE: THE POWER OF INFRASTRUCTURE

The infrastructural perspective usefully illuminates features of the contemporary platformized digital public sphere that are under-explored in the legal literature on online content governance and its dysfunctions. As we have just seen, infrastructure figures in that discussion chiefly as a necessary conduit for communication, whose ownership may affect the conditions of access. But that description does not exhaust the list of functions that infrastructures for online communication perform, and consequently it does not exhaust the possibilities for governance that such infrastructures present.

In Susan Leigh Star and Karen Ruhleder's formulation, which has influenced a generation of scholarship in STS and cognate fields, a structured arrangement for facilitating human activity becomes infrastructure when it sinks into the background, becoming a taken-for-granted way of mediating between local and larger scales.[33] Star and Ruhleder urge, therefore, that the important question for infrastructure studies is not "what is an infrastructure?" but rather "when is an infrastructure?".[34] Factors relevant to answering that question include reach and scope, embodiment of shared standards, and the extent of user and social habituation. Another relevant factor is visibility; infrastructure is largely transparent when working as expected, and, conversely, most visible when it undergoes breakdown.[35] Because of their scale and the investment they require, infrastructures can be the objects of deliberate construction—as, for example, with the large-scale public works projects that (for many) represent the paradigmatic examples of infrastructure. But infrastructures also can emerge more gradually, taking shape from decisions made by providers of widely used services. Infrastructure is, therefore, a verb as well as a noun.[36]

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[33] Susan Leigh Star & Karen Ruhleder, "Steps Towards an Ecology of Infrastructure: Design and Access for Large Information Spaces," 7 *Info. Sys. Research* 111 (1996).

[34] *Id*. at 112.

[35] *Id*. at 113.

[36] *See, e.g.,* Helena Karasti, *Infrastructuring in Participatory Design*, 1 PROCS. OF THE 13TH PARTICIPATORY DESIGN CONFERENCE 141 (2014); Susan Leigh Star

Additionally and importantly, infrastructuring projects of all sorts have sociotechnical predicates that can—and inevitably do—reflect both deliberate choices and unexamined assumptions about how uses will be configured. Despite—and sometimes because of—their transparency when working as expected, infrastructures do not simply facilitate individual and social activities but also shape them by virtue of the affordances and constraints that they incorporate and continually reinscribe. As anyone who has driven through a major urban area using the highway system can attest, toll systems that require each car to stop and those capable of detecting and debiting drivers' accounts while cars are moving at normal speed create very different patterns of flow, and those patterns in turn have gradually catalyzed more durable reconfigurations to produce and prioritize speed and seamlessness.[37] Broadening out and down, decisions about the locations of roads and highways and the particular ways they connect or bypass communities "articulate social relations to make a variety of social, institutional, and material things (im)possible."[38]

Another useful set of perspectives on infrastructure comes from scholarship in cultural studies and communication studies, both fields that emphasize the mutually constitutive relationships between social structure and patterns, on one hand, and narratives and imaginaries on the other. Blake Hallinan and James Gilmore observe that infrastructures both underwrite formalized expectations about how the activities they facilitate are supposed to work and instill imaginaries that structure conscious and unconscious reasoning about the purpose(s) and social meaning(s) of those activities.[39] So, for example, circuit breakers designed to limit the load that home air conditioning systems place on electrical grids during the summer are intended not only to encourage different behaviors than infrastructures that do not set such limits but also to instill different sensibilities about the ways individual consumption

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& Geoffrey C. Bowker, *How to Infrastructure*, *in* Handbook of New Media: Social Shaping and Consequences of ICTs (Leah A. Lievrouw & Sonia Livingstone eds., 2002); Volkmar Pipek & Volker Wulf, *Infrastructuring: Toward an Integrated Perspective on the Design and Use of Information Technology*, 10 J. ASS'N FOR INFO. SYS. 448 (2009).

[37] See generally Nikhil Anand, Akhil Gupta, & Hannah Appel, *The Promise of Infrastructure* (2018).

[38] Nikhil Anand, Akhil Gupta, & Hannah Appel, "Introduction: Temporality, Politics, and the Promise of Infrastructure," in Anand, Gupta, & Appel, *supra* note 39, at 4.

[39] Blake Hallinan & James N. Gilmore, "Infrastructural Politics Amidst the Coils of Control," 35 CULTURAL STUD. 617 (2021).

affects collective wellbeing.[40] Broadening out and down, efforts to redesign the grids to incorporate sophisticated, data-driven capabilities for monitoring, metering, and regulating energy use express judgments about the range of possible values—both conservation-related and profit-related—that such efforts might serve.[41]

In sum, infrastructures are structured arrangements that facilitate, undergird, shape, and normalize the conditions of possibility for human activity over spaces and across scales. Therefore, and inevitably, they represent "critical locations through which sociality, governance and politics, accumulation and dispossession, and institutions and aspirations are formed, reformed, and performed."[42] All of this is also true of infrastructures for online communication. They determine the precise ways communication may be transmitted, received, and recirculated; as a practical matter, then, they shape both experiences and perceptions of what is ordinary and natural in the linked realms of private and public interconnection and sensemaking. At the same time, their transparency when working as expected cuts against the possibility of surfacing the expectations they encode as "natural" and subjecting the processes of encoding to critique, contestation, and redesign.

These observations about infrastructures and infrastructuring might be understood as simply echoing the concerns of current movements to consider platforms and their communication affordances in terms of their "design." Although infrastructure thinking and design thinking are cognate activities, they differ in important ways. The language of design connotes a human viewer, and perhaps for that reason, design thinking about the platformized communication environment and its pathologies has prioritized questions about whether and how to reengineer the features of networked environments that users perceive, notably including the choice architectures that platform interfaces offer and uses of "dark patterns" to conceal or frustrate certain types of choices.[43] Infrastructure thinking has a different orientation; it

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[40] On air conditioning addiction and the coming threat of blackouts, see generally Steve Matthewman & Hugh Byrd, *Blackouts: A Sociology of Electrical Power Failure*, SOC. SPACE 1, 4–15 (2014).

[41] See generally Marianne Ryghaug, Tomas Moe Skjølsvold & Sara Heidenreich, *Creating Energy Citizenship Through Material Participation*, 48 SOC. STUD. SCI. 283 (2018).

[42] Anand, Gupta, & Appel, *supra* note 40, at 3.

[43] *See, e.g.*, Ellen P. Goodman & Karen Kornbluh, *The Stakes of User Interface Design for Democracy*, GERMAN MARSHALL FUND OF THE U.S., June 2021,

probes downward and outward to consider the underlying, habituated arrangements through which activities of exchange and the social orderings they produce are enabled and shaped at scale.[44] The quest for fair choice architectures has a way of rendering underlying arrangements for data harvesting and real-time, data-driven patterning invisible; infrastructure thinking aims to expose those arrangements and consider what they ask us to take for granted.[45]

Dominant platforms have attained infrastructural scale and transparency to critique by leveraging a particular modular structure for data collection and exchange. Consider three specific sites of both emergent infrastructuring and emergent governance of online communication. One is the processes of algorithmic optimization that platforms perform to determine how to present information to users. A second is the platform software developer kit (SDK). A third is the platform advertising dashboard.

Begin with platforms and their constituent processes of algorithmic optimization. Most basically, platforms use algorithms to rank order content (including advertising) for presentation to users. As is now well understood, that process is pervasively structured using data collected both from and about users. As is somewhat less well understood, platforms optimize their rank ordering of content for surplus extraction, and both content metadata and behavioral data play central roles. Platforms work to keep their users engaged and generating flows of data that can be captured and monetized. Data about the particular types of content that keep users engaged, drawing eyeballs and also clicks and shares, are therefore considered extraordinarily important, as are data about the social networks within which sharing occurs. The content feeds that platforms provide to their users order and reorder content in real time according to priorities that are partly responsive to user requests but also partly determined by the platform in light of the

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https://www.gmfus.org/sites/default/files/Goodman%2520%2526%2520Kornbluh%2520-%2520user%2520interface%2520design.pdf; HARTZOG, *supra* note 32; Working Group on Infodemics, *Policy Framework* (Nov. 2020), https://informationdemocracy.org/wp-content/uploads/2020/11/ForumID_Report-on-infodemics_101120.pdf.

[44] Infrastructures are, therefore, complex sociotechnical systems that incorporate components with distinct affordances. On the concepts of affordance and sociotechnical system and the importance of distinguishing between them, see Julie E. Cohen, *Turning Privacy Inside Out,* 20 THEOR. INQ. L. 1, 17-20 (2018).

[45] See generally Gurses & Van Hoboken, *supra* note 31; Blagovesta Kostova, Seda Gurses, & Carmela Troncoso, *Privacy Engineering Meets Software Engineering: On the Challenges of Engineering Privacy by Design*, arXiv preprint (2020), arXiv:2005.12273

engagement imperative.[46] The feeds provided by the most dominant platforms mediate users' access to their own social networks and to the wider internet, instilling expectations of seamless personalization and convenience in access to a wide variety of online resources and services.[47] (As we will see below, this experience also reflects the infrastructuring work done by SDKs and advertising dashboards.)

Equally important, dominant platform providers have worked hard to associate their pervasive infrastructuring of networked spaces with values of abundance and openness—and, conversely, to ensure that the nature of the predictive patterning they impose does not become (or remain) a focus for the public and for policymakers. As Tarleton Gillespie has explained, in the public discourse about platforms that began to emerge in the early 2000s, the term "platform" itself served that purpose. The idea of the "platform" as a flat surface for communication connoted user empowerment and "elide[d] the work of policing the platform's edges."[48] To similar effect, Christian Sandvig's thought-provoking exploration of public discourses about algorithms as they have unfolded from the mid-twentieth century to the present illustrates that framing internet search algorithms as obedient and politically neutral processes, akin to factory assembly lines, was a deliberate choice that foregrounded ideas of scale, automation, and astonishing, mysterious power while eliding some of the most important factors structuring algorithmic outputs: users, their data, and the advertising-based business model.[49]

These examples illustrate, moreover, that the relationship between infrastructural imaginaries and speech imaginaries has

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[46] For more detailed explanations, see Cobbe & Singh, *supra* note 30, at 7-10; Nathalie Marechal, Rebecca MacKinnon, & Jessica Dheere, *Getting to the Source of Infodemics: It's the Business Model*, May 27, 2020, Open Technology Institute, New America, https://www.newamerica.org/oti/reports/getting-to-the-source-of-infodemics-its-the-business-model/; Anthony Nadler, Matthew Crain, & Joan Donovan, "Weaponizing the Digital Influence Machine: The Political Perils of Online Ad Tech," DATA & SOC'Y (2018), https://datasociety.net/library/weaponizing-the-digital-influence-machine/.

[47] *See* Cristina Alaimo & Jannis Kallinikos, *Social Media and the Infrastructuring of Sociality*, 62 RES. SOCIOL. ORG. 289 (2019); Panos Constantinides, Ola Henfridsson, & Geoffrey G. Parker, *Platforms and Infrastructures in the Digital Age*, 29 INFO. SYS. RES. 381 (2018). On the broader implications of the ways that platform-based, programmable infrastructures mediate user experiences, see NICK COULDRY & ANDREAS HEPP, THE MEDIATED CONSTRUCTION OF REALITY: SOCIETY, CULTURE, MEDIATIZATION (2016).

[48] Tarleton Gillespie, "The Politics of "Platforms," 12 *New Media & Society* 347 (2010).

[49] Christian Sandvig, *Seeing the Sort: The Aesthetic and Industrial Defense of the Algorithm*, 11 MEDIA-N 35 (2015).

been mutually constituting. Both the idea of the platform as a flat surface and that of the algorithm as a neutral and obedient ordering process did important early work to reinforce narratives about the digital public sphere's primary attributes of accessibility and ideological neutrality, foregrounding the familiar levers of owner and user agency described in Part I and submerging the effects of other processes involving systemic configuration. That work encouraged scholars and policymakers trained in the U.S. free speech tradition to see what they expected to see, and as a result, it became more difficult to make the particular kinds of work done by and through online communication infrastructures visible.

Yet, even as the imaginary of the digital public sphere crystallized around the empowering attributes of platforms and their algorithmic plumbing, expectations about the domain of online communication were shifting to encompass and normalize some newer experienced realities. For example, scholars of communication have documented the ways that the compact, automated, engagement-optimized structure of social media feeds flattens epistemic authority and incentivizes zingy one-liners and in-group-versus-out-group signaling rather than thoughtful, nuanced engagement.[50] Researchers also have explored the patterns of user behavior that emerged after some platforms, including Twitter and Facebook, responded to publicity about the viral spread of online hate and harassment by introducing flags and checkmarks along with rules for using them. In particular, they documented unanticipated (but foreseeable) uses of flags in ways that leveraged the underlying, engagement-optimized structure of platform feeds, for purposes that ranged from signaling in-group status to conducting renewed campaigns of harassment to amplifying disinformation.[51]

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[50] *See, e.g.*, William J. Brady, et al., *How Social Learning Amplifies Moral Outrage Expression in Online Social Networks*, 7 SCI. ADVANCES (2021), https://www.science.org/doi/10.1126/sciadv.abe5641; Kokil Jaidka, Alvin Zhou & Yphtach Lelkes, *Brevity Is the Soul of Twitter: The Constraint Affordance and Political Discussion*, 69 J. COMM. 345 (2019); Alice E. Marwick, *Why Do People Share Fake News? A Sociotechnical Model of Media Effects*, 2 GEO. L. TECH. REV. 474 (2018); Christoph Neuberger, et al., *The Digital Trasnformation of Knowledge Order: A Model for the Analysis of the Epistemic Crisis*, 27 ANN. INT'L COMM'C'NS ASS'N (2023), https://doi.org/10.1080/23808985.2023.2169950.

[51] Kate Crawford & Tarleton Gillespie, *What Is a Flag For? Social Media Reporting Tools and the Vocabulary of Complaint*, 18 NEW MEDIA & SOC'Y 410 (2016); Brittany Fiore-Silfvast, *User-Generated Warfare: A Case of Converging Wartime Information Networks and Coproductive Regulation on YouTube*, 6 INT'L J. COMM. 1965

Next, consider the SDK, an off-the-shelf utility prepared and distributed by platform proprietors to facilitate development of apps and utilities that run on their platforms and to enable cross-device and cross-service logins. SDKs instantiate the maxim "write once, run everywhere"; they are building blocks that can be employed by third parties to offer services in a particular digital environment without having to learn the underlying application programming interfaces for each environment. In economic terms, SDKs are complements that extend the value proposition platforms offer to their users. From an infrastructural perspective, however, SDKs function as "boundary resources" that enable critical kinds of system extension and control.[52] They incentivize app development, embody cross-service arrangements with information partners, and embed the data-driven business models into which app developers and information partners are recruited.

Legal scholars have explored techniques for incentivizing and governing app development and cross-service information partnerships principally using the lenses of antitrust and competition law.[53] Those discussions have paid relatively little attention to SDKs and the particular functions they perform. From a competition law perspective, platforms facilitate app development and distribution and enter cross-service information partnerships for reasons that are straightforwardly (anti)competitive. A rich ecosystem of compatible apps and a comprehensive set of complementary information services accessible with a single login can extend a platform's reach and/or cement its dominance.[54] Platforms restrict app development and distribution for a variety of

(2012); Adrienne Massarini, *#Gamergate and The Fappening: How Reddit's Algorithm, Governance, and Culture Supports Toxic Technocultures*, 19 NEW MEDIA & SOCIETY 329, 338–41 (2017); Michele White, *Everything in Moderation: The Regulating Aspects of Craigslist and the Moral Assertions of "Community Flagging," in* BUY IT NOW: LESSONS FROM EBAY 208–14 (2012).

[52] Ahmad Ghazawneh & Ola Henfridsson, *Balancing Platform Control and External Contribution in Third-Party Development: The Boundary Resources Model*, 23 INFO. SYS. J. 173 (2013).

[53] *See, e.g.*, Friso Bostoen & Daniel Mandrescu, *Assessing Abuse of Dominance in the Platform Economy: A Case Study of App Stores,* 16 EUR. COMP. J. 431 (2020); Lina M. Khan, *The Separation of Platforms and Commerce,* 119 COLUM. L. REV. 973 (2019); Nikolas Guggenberger, *Essential Platforms,* 24 STAN. TECH. L. REV. 237 (2021); Damien Geradin & Dimitrios Katsifis, *The Antitrust Case Against the Apple App Store,* 17 J. COMP. L. & ECON. 503 (2020); Christopher T. Marsden & Ian Brown, *App Stores, Antitrust and Their Links to Net Neutrality: A Review of the European Policy and Academic Debate Leading to the EU Digital Markets Act,* 12 INTERNET POL'Y REV. (2023).

[54] See generally Jacques Cremer, Yves Alexandre de Montjoye, & Heike Schweitzer, Competition Policy for the Digital Era: Final Report (2019); Stigler Committee on Digital Platforms: Final Report (2019).

reasons, some relating to the desire to block competition and others responding to regulatory and consumer protection concerns.[55]

Largely overlooked in those discussions has been the other way that SDKs further platform proprietors' commercial and competitive goals: Platforms of all sizes have used SDKs as the centerpieces of so-called "ecosystem" strategies for layering their proprietary data collection and exchange protocols systematically across the underlying infrastructure of the open internet.[56] Specifically, SDKs are designed to harvest user data, transmit it to platform data centers to augment already-existing user profiles, and push profile-driven content back to websites and apps.[57] Collection of location data and provision of location-related content are particularly widespread functions of SDKs for mobile apps. Many apps embed mapping functionality provided by Google (for Android) or Apple (for iOS) that confers the capacity to track user location persistently and funnel the data to the proprietor of the platform ecosystem. Tools for data-driven mapping within mobile environments are infrastructural in all of the ways described above: they embody shared standards and use them to mediate user experiences of physical spaces, they are transparent when working as expected, and they instill expectations of seamless, data-driven

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[55] *See, e.g.*, Alex Hern, *Apple Concedes on 'Anticompetitive' Restrictions in App Store*, GUARDIAN, Sept. 2, 2021, https://www.theguardian.com/technology/2021/sep/02/apple-concedes-on-anticompetitive-restrictions-in-app-store; Sarah Perez, *Following FTC Complaint, Google Rolls Out New Policies Around Kids' Apps on Google Play,* TECHCRUNCH (May 29, 2019), https://techcrunch.com/2019/05/29/following-ftc-complaint-google-rolls-out-new-policies-around-kids-apps-on-google-play/; Zack Whittaker, *Apple Restricts Ads and Third-Party Trackers in iPhone Apps for Kids*, TECHCRUNCH (June 3, 2019), https://techcrunch.com/2019/06/03/apple-kid-apps-trackers/

[56] *See* Fernando N. van der Vlist & Anne Helmond, *How Partners Mediate Platform Power: Mapping Business and Data Partnerships in Social Media Ecosystems*, 8 BIG DATA & SOC'Y 1 (2021); Anne Helmond, David B. Nieborg, & Fernando N. van der Vlist, *Facebook's Evolution: Development of a Platform-as-Infrastructure*, 3 INTERNET HISTORIES 123 (2018); Jean-Christophe Plantin, et. al., *Infrastructure Studies Meet Platform Studies in the Age of Google and Facebook*, 1 NEW MEDIA & SOC'Y 293 (2018); Steven Englehardt & Arvind Narayanan, *Online Tracking: A 1-Million-Site Measurement and Analysis*, in PROC. 2016 ACM SIGSAC CONF. ON COMPUTER AND COMMUNICATIONS SECURITY 1388 (2016).

[57] Tobias Blanke & Jennifer Pybus, *The Material Conditions of Platforms: Monopolization Through Decentralization*, 6 SOC. MEDIA + SOC'Y (Oct.-Dec. 2020); Anne Helmond, *The Platformization of the Web: Making Web Data Platform Ready*, 1 SOC. MEDIA + SOC'Y (Apr-Jun 2015); Christian Kurtz, et al., "Accountability of Platform Providers for Unlawful Personal Data Processing in Their Ecosystems—A Socio-Techno-Legal Analysis of Facebook and Apple's iOS According to GDPR," 9 *Journal of Responsible Technology* 100018 (2022), https://doi.org/10.1016/j.jrt.2021.100018.

mapping that in turn underwrite contemporary imaginaries of mediated, turn-by-turn mobility and convenience.[58] More generally, SDKs furnished to app developers and information partners collect a wide variety of behavioral data about users and their interactions with apps and partnered services, and those data flows are purposed and repurposed in aid of multiple functions.

As with infrastructures of all kinds, SDKs' transparency while working as expected conceals the deep structuring they work to impose within platformized communication systems. Neither the app developers who incorporate SDKs nor the app users whose activities they affect need to know all that much about how their data harvesting functions work. In the EU, users have the right to make choices about the collection and processing of personally identifiable data, which would seem to mean that operating systems and their tethered SDKs need to be designed in ways that offer such choices, although the allocation of legal responsibility is contested.[59] In the U.S., where there is no general data protection law, mobile ecosystems have begun to offer users more limited choice sets covering, for example, whether apps may access contacts, cameras, and other utilities, and whether they may track location constantly or only while an app is in use. In both jurisdictions, platforms and other actors in their ecosystems have incorporated the relevant choice sets into their operations via interfaces designed to ensure minimal disruption to their data harvesting operations.

Finally, consider the advertising dashboard, a set of tools directed toward would-be advertisers seeking to reach customers for their goods and services or audiences for their messages. The advertising dashboards devised and supported by giant platform companies perform a number of interlinked functions, only some of which are directly visible. First, subject to some restrictions, they permit advertisers to specify the kinds of audiences they want to reach using categories and keywords. From one perspective, this is a very traditional direct marketing technique, but ad dashboards that

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[58] On digital mobility infrastructures and their governance effects, see Julie E. Cohen, "Infrastructuring Data Futures," in GLOBAL GOVERNANCE BY DATA (Gavin Sullivan, et al., eds., forthcoming).

[59] Regulation (EU) 2016/ 679, of the European Parliament and of the Council of April 27, 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/ 46/ EC (General Data Protection Regulation), 2016 O.J. (L 119) 1. On the distribution of responsibility across controllers embedding or providing SDKs, see René Mahieu & Joris Van Hoboken, *Fashion-ID: Introducing a Phase-Oriented Approach to Data Protection?* EUROPEAN LAW BLOG (Sep. 30, 2019), https://europeanlawblog.eu/2019/09/30/fashion-id-introducing-a-phase-oriented-approach-to-data-protection/.

use machine learning to extract patterns from platformized data flows have been known to permit targeting based on very nontraditional keywords.[60] Second, they allow more sophisticated advertisers (a category that includes for-profit companies, political campaigns and advocacy committees, and large non-profit organizations) to upload profiles of their target audiences derived from data they already possess about their own customers or members.[61] In either case, specifications furnished via the advertising dashboard become the starting point for rapid, iterative processes of data matching and predictive patterning designed to identify as precisely as possible the subgroup(s) of platform users most likely to engage with the ads.[62] The advertising dashboard operated by Meta additionally allows advertisers to upload and test different ads or even tiny variations on the same ad. When this is done, Meta uses A/B testing both to refine user targeting and to identify the particular ads likely to elicit the highest rates of engagement from particular users.[63]

Third and importantly, the advertising dashboards devised and supported by giant platform companies offer pricing for "ad impressions," which are digital objects created by platforms to represent the likelihood that any single user will view an ad.[64] As with other media, prime placements cost more, but pricing for ad

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[60] Julia Angwin, Madeleine Varner & Ariana Tobin, *Facebook Enabled Advertisers to Reach 'Jew Haters'*, PROPUBLICA (Sept. 14, 2017, 4:00 PM), https://www.propublica.org/article/facebook-enabled-advertisers-to-reach-jew-haters; Sam Levin, *Facebook Told Advertisers It Can Identify Teens Feeling 'Insecure' and 'Worthless,'* The Guardian (May 1, 2017), https://www.theguardian.com/technology/2017/may/01/facebook-advertising-data-insecure-teens. *But see* Ava Kofman & Ariana Tobin, *Facebook Finally Agrees to Eliminate Tool That Enabled Discriminatory Advertising*, PROPUBLICA (June 22, 2022, 4:30 PM), https://www.propublica.org/article/facebook-doj-advertising-discrimination-settlement; Ilya Cherepakhin, *Here's How Meta Is Changing Facebook Ads Targeting for 2022*, SEARCH ENGINE J., Dec. 30, 2021, https://www.searchenginejournal.com/meta-facebook-ads-targeting/430239/.

[61] Ian Bogost & Alexis C. Madrigal, *How Facebook Works for Trump*, THE ATLANTIC (Apr. 17, 2020, 2:00 PM), https://www.theatlantic.com/technology/archive/2020/04/how-facebooks-ad-technology-helps-trump-win/606403/.

[62] *Id*.; Michael Veale & Frederik Zuiderveen Borgesius, *Adtech and Real-Time Bidding under European Data Protection Law*, 23 GER. L.J. 226, 227–33 (2022); Salome Viljoen, Jake Goldenfein, & Lee McGuigan, *Design Choices: Mechanism Design and Platform Capitalism*, 8 Big Data & Soc'y (2021), doi: 10.1177/20539517211034312.

[63] Bogost & Madrigal, *supra* note 63.

[64] Cristina Alaimo & Jannis Kallinikos, *Objects, Metrics and Practices: An Inquiry into the Programmatic Advertising Ecosystem*, in LIVING WITH MONSTERS? SOCIAL IMPLICATIONS OF ALGORITHMIC PHENOMENA, HYBRID AGENCY, AND THE PERFORMATIVITY OF TECHNOLOGY (eds. U Schultze, M. Aanestad, M M€ahring, et al., 2018).

impressions differs sharply from print or television ad pricing in other important ways. When the platform is both the seller and the exchange, it can vary the pricing for ad impressions directly to suit its own purposes, offering better pricing to those willing to supply more precisely targeted user data and/or to give the platform more control over which ad versions are shown to which users.[65] In other cases, ad impressions are sold through third-party adtech companies that mediate structured interactions around so-called "open display" spaces on websites or apps controlled by third-party publishers. Sets of intermediaries, nominally representing sellers and buyers of advertising, interact in complex processes of real-time, programmatic bidding not unlike those operated by financial exchanges, in which the price for, say, ten thousand ad impressions fluctuates from second to second depending on what the parties agree.[66] Unlike trades on financial exchanges, however, the pricing for ad impressions varies according to the quality and granularity of the user segmentation that both parties are able to provide.[67] That process, in turn, is both intermediated and infrastructured by Google. Notwithstanding the nominal designation of demand-side and supply-side representation in the bidding process, all stages of the programmatic bidding process are dominated by Google-controlled entities, and perhaps more importantly, by Google's data analytics, which integrate Google's proprietary SDKs and modular data exchange protocols.[68]

Fourth and finally, it is worth noting what advertising dashboards—including both platform-specific arrangements and so-called open display arrangements—do not do. They do not offer pricing transparency to advertisers, nor do they adjust pricing in exactly the ways that, for example, an economist or price theorist might assume.[69] Bidding on ad impressions generates price fluctuations that vary according to each dashboard's own internal optimization processes. Bidders accept prices according to their willingness to pay, but laws of supply and demand have very little

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[65] Bogost & Madrigal, *supra* note 63; Viljoen, et al., *Design Choices*, *supra* note 64.

[66] *See* COMPETITION & MARKETS AUTHORITY, ONLINE PLATFORMS AND DIGITAL ADVERTISING: MARKET STUDY FINAL REPORT 262-66 & App. M (July 1, 2020) [hereinafter CMA, FINAL REPORT], https://www.gov.uk/cma-cases/online-platforms-and-digital-advertising-market-study; Veale & Borgesius, *supra* note 64, at 227-33.

[67] Veale & Borgesius, *supra* note 64, at 227-33.

[68] CMA, FINAL REPORT, *supra* note 68, at 266-92, 303-06 & Apps. F, M (July 1, 2020), https://www.gov.uk/cma-cases/online-platforms-and-digital-advertising-market-study.

[69] See generally Viljoen, et al., *Design Choices*, *supra* note 64; Salome Viljoen, *Informationalism Beyond Managerialism*, 86 L. & CONTEMP. PROBS. (forthcoming 2024).

to do with the mechanisms for allocating ad impression purchases to particular placements. They also do not offer any opportunity to verify that the views or clicks comprising an ad impression object represent views or clicks by human users. Impressions are "sold ex ante, ahead of being effectively produced," and the counts eventually making up specified ad impression purchases also may be partly or even wholly automated.[70] This, in turn means that advertisers wishing to offer goods or services to the public are asked to engage in a suspension of disbelief that operates on multiple levels: they are asked to believe that platforms' black-boxed processes of predictive patterning offer improved efficacy relative to other possible methods of targeted or semi-targeted marketing, and they are asked to believe in the meaningfulness of the efficacy metrics around which ad impression objects are constructed. But both the dashboard and the ad impression objects too have become sites of habituation and (infrastructural) transparency while working as expected: they are what participants in digital advertising markets now expect to encounter.

Both SDKs and ad dashboards play important roles in shaping the reality of networked digital communication as experienced by platform users. Most basically, SDKs supply the data that enables algorithmic tuning of recommender systems to optimize for engagement, while ad dashboards generate both additional inputs to algorithmic tuning and the cash flows that keep the system humming along. But the infrastructuring of the domain of online communication around information flows between and among predictive algorithms, SDKs, and ad dashboards also accomplishes much more. Although platforms do not disclose their targeting and ranking algorithms, motivated third parties can use their own techniques of optimizing for engagement to game ad dashboards and recommender systems for heightened visibility. That represents a particular draw for some very nontraditional groups of "advertisers" seeking to spread disinformation, sow public resentment and polarization, manufacture support for totalitarian regimes, and spread ethnonationalist ideologies.[71] The result is that platformized communication infrastructures have become key facilitators of what Henry Farrell and Bruce Schneier describe as the "common knowledge attack" on democracy; they are entry points and incubators for strategies designed to undermine the stability of

[70] Alaimo & Kallinikos, *supra* note 66, at 118; *see also* CMA, FINAL REPORT, *supra* note 68, at 297, 301-03; Morgan Meaker, *How Bots Corrupted Advertising*, WIRED, Sept. 29, 2022.

[71] Nadler, Crain, & Donovan, *supra* note 48.

commonly recognized facts and commonly understood principles of democratic ordering.[72]

Commentators and scholars who wonder whether predictive targeting is really that effective, or who muse about whether platformized communication systems do not simply surface other, more fundamental social and economic pathologies, mistake both the kinds of efficacy that the systems afford and the roles that predictive targeting plays. The value proposition that platformized communication systems offer to *commercial* advertisers is infrastructural. The systems accessed via ad dashboards are structured, habituated arrangements for disseminating commercial messaging to fragmented, widely dispersed audiences across a bewildering variety of fora and devices. Whether the ads "work" in any of the traditional ways thought to matter to marketers, or as well as the techniques that marketers used when media infrastructures were configured differently, is very nearly beside the point—and marketers understand that platforms also afford other, "organic" promotional opportunities. The value proposition that platformized communication systems offer to those seeking to weaponize online communication flows is different. Platformized infrastructures for data harvesting and data-driven, programmatic advertising are astonishingly effective mechanisms for propagating disinformation, hate, and conspiracism because of the synergies between predictive targeting and social circulation that they embody.[73] Predictive targeting based on political and social affinity widens (or eliminates entirely) the so-called Overton window of acceptability that traditionally has constrained political messaging.[74] Social circulation of the most well-crafted messages among the in-groups for which they were designed gives those messages momentum and staying power—and social circulation generates data about social networks that feeds back into recommender systems, honing them as vehicles for more effective propagation of common knowledge attacks.

In making sense of the ways these communication patterns shape the domain of online communication, it is important to

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[72] Henry Farrell & Bruce Schneier, *Common Knowledge Attacks on Democracy*, Publication No. 2018-7, BERKMAN KLEIN CENTER FOR INTERNET & SOCIETY (Oct 2018), https://pdfs.semanticscholar.org/4b52/376ddf73591114d597f992acdfe108a1607a.pdf.

[73] Nadler, Crain, & Donovan, *supra* note 48.

[74] Nathan J. Russell, *An Introduction to the Overton Window of Political Possibilities*, MACKINAC CENTER FOR PUBLIC POLICY (Jan. 4, 2006), https://www.mackinac.org/7504; David M. Perlman, *Applied Computational Social Choice Theory as a Framework for New Cyber Threats*, CYBER DEFENSE REV. 57, 75–77 (2019).

understand online communication flows as having systemic and waveform attributes that reflect both network laws and the effects of deliberate engineering activity. The imaginary of the digital public sphere works systematically to elide and suppress those attributes, so perhaps a different imaginary (and a bit of poetic license) can help: Much as the earth looks like a stable sphere when viewed from outer space, the imaginary of the digital public sphere connotes a stable, self-equilibrating domain for public deliberation and democratic self-government. Close up to the oceans or in the troposphere, the reality changes. One is confronted with the structural properties of a vast, uncontrollable, interconnected system comprised of calm surfaces and sheltered retreats; unplumbed depths and treacherous shoals; powerful currents and vast, roiling waves; and localized zones of breathtaking volatility. The boundaries between calm and turbulence can shift suddenly, and outbreaks of turbulence are impersonal and unforgiving. And the earth's uncontrollable, interconnected flows also now bear the unmistakable imprint of human activity in their deep structure. In the Anthropocene era, the climate's systemic and waveform properties have become more extreme, more volatile, and more threatening to animal, plant, and human life.[75]

Concluding that platformized online communication systems do not "cause" toxic polarization, deepening ethnonationalism, or rapidly metastasizing "alternative facts" pathologies because human beings have always been tribal and credulous makes about as much sense as concluding that human activity does not "cause" climate change because there have always been storms. The earth's climate is a complex, interconnected system that operates according to certain physical laws, notably including laws that define tipping points between different kinds of systemic equilibria. Systemic patterns of human activity, for which humans unquestionably bear responsibility, are gradually but inexorably tipping the climate into a different systemic pattern characterized by greater extremes, more pronounced volatility, and expanding, toxic "dead zones."[76] In a similar way, platformized communication infrastructures are tipping human societies away from (concededly imperfect) democratic equilibria into different systemic patterns characterized by more widespread and deeply

[75] Intergovernmental Panel on Climate Change, *Weather and Climate Extreme Events in a Changing Climate*, *in* IPCC SIXTH ASSESSMENT REPORT (2021) [hereinafter, IPCC, *Weather and Climate Extreme Events*], https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-11/; Mark C. Urban, *Accelerating Extinction Risk from Climate Change*, 348 SCI. 571 (2015).

[76] IPCC, *Weather and Climate Extreme Events*, *supra* note 77; Andrew H. Altieri & Keryn B. Gedan, *Climate Change and Dead Zones*, 21 GLOB. CHANGE BIOL. 1395 (2015).

entrenched affinities for tribal enmity, xenophobia, conspiracism, and authoritarianism. Would-be despots and merchants of hate have always existed within human societies; now, they can mobilize powerful, automated assemblages for stoking suspicion, resentment, and xenophobia. Networked superspreaders have always existed within human societies; now, they exist within an infrastructure that expands their reach and exposes them to new strategies of cooptation from the margins.[77] But nothing about platformized communication infrastructures was ever natural, and the architects of the platformized, massively intermediated digital public sphere have worked systematically to enhance the volatility, amplitude, and force of the waves that reverberate across it.

Institutional arrangements for online content governance ignore the key infrastructural formations of platformized communication systems almost entirely. In the case of platform firms themselves, that approach is deliberate. Internally, the organization of dominant platform firms testifies to the ways that processes of algorithmic optimization, fed by data harvested using SDKs and fine-tuned via recursive interactions with ad dashboards, function as content governance mechanisms. But the dominant platforms do not want to see increasingly vociferous public critiques translated into more effective, externally imposed regulation of their infrastructuring strategies, so they prefer to speak of content removal or "moderation" as requiring localized, post hoc adjustments to community standards and reporting policies. In the case of the broader public and legislative debates about the possibilities for more effective public governance, however, all three infrastructural formations represent important missed

[77] On the centrality of mainstream media organizations and political figures with contemporary geographies of disinformation and propaganda, see YOCHAI BENKLER, ROBERT FARIS & HAL ROBERTS, NETWORK PROPAGANDA: MANIPULATION, DISINFORMATION, AND RADICALIZATION IN AMERICAN POLITICS (2018); YOCHAI BENKLER, CASEY TILTON, BRUCE ETLING, HAL ROBERTS, JUSTIN CLARK, ROBERT FARIS, JONAS KAISER & CAROLYN SCHMITT, MAIL-IN VOTER FRAUD: ANATOMY OF A DISINFORMATION CAMPAIGN (Berkman Klein Ctr. Research Publication No. 2020-6, 2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3703701. On the complementary, amplifying effects of platform-based media infrastructures, see Joan Donovan, *Source Hacking: Media Manipulation in Practice*, DATA & SOC'Y (Sept. 4, 2019), https://datasociety.net/library/source-hacking-media-manipulation-in-practice/; Nadler, Crain, & Donovan, *supra* note 48; Manoel Horta Ribeiro, Raphael Ottoni, Robert West, Virgílio A. F. Almeida & Wagner Meira, *Auditing Radicalization Pathways on YouTube*, 2020 PROC. 2020 CONF. ON FAIRNESS, ACCOUNTABILITY, & TRANSPARENCY 131 (Jan. 2020), https://arxiv.org/pdf/1908.08313.pdf; Francesca Tripodi, *Searching for Alternative Facts*, DATA & SOC'Y (May 16, 2018), https://datasociety.net/library/searching-for-alternative-facts/.

opportunities for more effective governance of the digital public sphere.

III. GOVERNING THE DIGITAL PUBLIC SPHERE: THE POSSIBILITIES OF INFRASTRUCTURE

The lens of infrastructure exposes attributes of the domain of online communication that the imaginary of the digital public sphere persistently submerges, and it also surfaces governance possibilities that policymakers have spent relatively little time considering. In particular, it reminds us that current patterns of online communication are not inevitable features of the digital public sphere's natural evolution but rather are the result of infrastructuring work undertaken for particular, self-interested purposes. Patterns of online communication flows now engineered systemically for maximum volatility and virality might be engineered differently, and free speech law for the digital public sphere might be reenvisioned as permitting—or even requiring—public governance mandates that attempt to restore conditions of flow more compatible with the survival and healthy functioning of democratic institutions. Moving governance of the domain of online communication (partly) into the infrastructure need not entail abandonment of free speech values and anti-censorship imperatives. To the extent that the lens of infrastructure suggests different registers for governance, however, it does necessitate some rethinking of traditional assumptions equating structural control with censorship and privatization with counterpower. It also necessitates some careful rethinking of regulatory targets and methods.

It is useful to begin with the advertising dashboard, which offers low-hanging fruit to policymakers seeking to change systemic properties while respecting free speech values. Recall that the dashboard is designed to elicit information from advertisers that can be used to optimize both ad targeting and ad content. The interlinked processes of targeting and pricing bypass questions about content control almost entirely, instead keying ads to user profiles and to attributes of communication that determine its capacity for viral spread.[78] One can pay for a good placement with money, but one also can pay with customer data or with ad copy optimized for faster user-driven throughput. This rewards advertisers that are most

[78] Bogost & Madrigal, *supra* note 63; Nadler, Crain, & Donovan, *supra* note 48.

willing to participate in the ongoing process of infrastructuring the digital public sphere for volatility and turbulence.

Policymakers in the U.S. have engaged with the advertising dashboard chiefly via proposals to require greater transparency in personal information collection and more specifically in election-related advertising.[79] Large questions remain about the extent to which such proposals would produce data capable of being made intelligible to the public, and even larger questions remain about the extent to which such knowledge, if available, would cause members of the public to change their own behavior.[80] In particular, user choice seems wildly unlikely to interrupt flows of disinformation and ethnonationalism that many users and communities seek out and work to amplify. Many strategies for weaponizing the ad dashboard, moreover, rely on messaging that, on its face, would not qualify as election-related at all. And proposals to regulate personal information collection typically include exceptions for so-called contextual advertising, which involves targeting ads to particular types of content—e.g., conspiracy themed or "alternative facts" based content—rather than to particular types of users.[81]

But the advertising dashboard also presents other, more directly effective governance possibilities. Consider first pricing transparency, a traditional domain of economic regulation. Simply requiring platforms to provide additional disclosures about their existing pricing mechanisms likely would produce only general information about ad impression objects, bidding mechanisms, and opportunities for programmatic advertising. More effective interventions would target the dashboard's ability to function as a mechanism for incentivizing and privileging turbulence-generating, polarization-enhancing content. One might begin, for example, by: imposing predefined, deliberately clunky windows of mandated price stability (say, the thirty-minute or one-hour blocks used for decades by television broadcasting systems); imposing similarly predefined, deliberately clunky pricing categories for different types

[79] The list of proposed bills focused on transparency is very long. For two leading examples, see Honest Ads Act, S.1356, 116th Cong. (2019); American Data Privacy and Protection Act, H.R. 8152, 117th Cong. (2022). See generally Cohen, *How (Not) to Write a Privacy Law*, *supra* note 33.

[80] See sources cited *supra* note 33; *see also* Lilian Edwards & Michael Veale, *Slave to the Algorithm? Why a 'Right to an Explanation' Is Probably Not the Remedy You Are Looking For*, 16 DUKE L & TECH. REV. 1, 59-60 (2017).

[81] *See* Julie E. Cohen, *A Systems Approach to Cheap Speech: Flash Trades, Engagement Levers, and Destabilization Attacks*, BALKINIZATION, Apr. 7, 2022, https://balkin.blogspot.com/2022/04/a-systems-approach-to-cheap-speech.html; Gilad Edelman, *Follow the Money: How Digital Ads Subsidize the Worst of the Web*, WIRED, Jul. 28, 2020, https://www.wired.com/story/how-digital-ads-subsidize-worst-web/; HASEN, CHEAP SPEECH, *supra* note 30, at 60.

of advertisers (much as current systems for licensing music public performance rights have different rates for, e.g., large concert arenas, bars, and small retail enterprises); and requiring (and auditing) assurances that mechanisms for counting ad impressions exclude "inauthentic" (i.e., non-human-operated) accounts.[82] All of these interventions, designed principally to require various kinds of fundamental fairness and good faith in dealings between platforms and advertisers, would have beneficial knock-on implications for the digital public sphere, because they would work to untether ad pricing from an advertiser's ability to generate virality and volatility.

Consider next SDKs and their built-in data harvesting capabilities. Such capabilities can be addressed to some extent by existing data protection laws that attempt to offer users more comprehensive and granular choices. As noted above, however, such choices have only limited utility as structural governance tools. Here too, policymakers have other, more direct strategies available to them. One might, for example, impose one-way restrictions on flows of geolocation data (into apps, but not back out again); mandate encrypted, on-device sandboxing of behavioral data generated through app usage; and require (and audit) certification of compliance with those restrictions. Such requirements would serve some very traditional consumer protection goals. In the contemporary digital economy, pattern-driven, predictive targeting turbocharges scams and organized business models based on structural exploitation (e.g., payday lending) by helping scammers identify likely marks and their times and places of greatest

[82] The first two interventions would operate by injecting friction into digital advertising circuits; on friction and its uses as a regulatory tool, see Goodman, *Digital Information Fidelity and Friction*, *supra* note 30; Brett Frischmann & Susan Benesch, *Friction-in-Design Regulation as 21st Century Time, Place, and Manner Regulation* (working paper 2022), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4178647; . On television advertising markets, see Edward C. Malthouse, Ewa Maslowska & Judy U. Franks, *Understanding programmatic TV advertising*, 37 INT'L J. ADVERT. 769, 771–74 (2018). On public performance rate structures, see Lydia Pallas Loren, *The Dual Narratives in the Landscape of Music Copyright*, 52 HOUS. L. REV. 537, 570–78 (2014). Several domestic and foreign jurisdictions have begun to experiment with proposals requiring certain kinds of inauthentic content to be labeled. See, e.g., Bolstering Online Transparency Act, SB 1001, CAL. BUS. & PROF. CODE §§ 17940–17943 (2019) (bots); Afiq Fitri, *China has just implemented one of the world's strictest laws on deepfakes*, TECH MONITOR (Jan. 10, 2023), https://techmonitor.ai/technology/emerging-technology/china-is-about-to-pass-the-worlds-most-comprehensive-law-on-deepfakes (deepfakes). To my knowledge, none has proposed requirements targeted specifically at bots in online advertising markets.

vulnerability. [83] It permits, and even encourages, price discrimination to shade into predatory pricing.[84] Real-time auctions for so-called open display advertising also broadcast user data indiscriminately to a variety of intermediaries and potential bidders with scant regard for the scope of the "consent" that users initially provided.[85] Sandboxing geolocation and behavioral data on users' devices would make all of these practices more difficult, giving regulators a leg up in their efforts to combat scams and offering an alternative to more direct forms of price regulation. And here too, requirements directed at infrastructures for information flow would have beneficial knock-on implications for the digital public sphere, because they would interrupt the seamless circuits of pattern-driven, predictive targeting that generate affordances for turbulence and weaponization.

One might wonder why policymakers should conduct these sorts of regulatory experiments if the primary targets are platforms and their constituent processes of algorithmic optimization—the sites at which the digital public sphere's infrastructural affordances for volatility, virality, and viciousness—and, along with them, for tribal polarization, conspiracism, and civic distrust—are continually tuned and adjusted. Globally, thinking about platform governance is undergoing a pronounced shift. A growing crop of journalistic exposés and NGO reports on platform optimization practices now more clearly spotlights the systemic dysfunctions that platformized communication systems have created, and policymakers around the world are paying attention.[86] In the U.S., ideas about the feasible horizons for digital platform regulation continue to revolve around ownership and control (as with proposals to break up the largest platforms and/or to mandate interoperability between platform services) and/or notice and choice (as with proposals to give individuals more power to say no to data collection and more

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[83] *See, e.g.*, Shanti Das, *Google Profiting from 'Predatory' Loan Adverts Promising Instant Case*, GUARDIAN, Mar. 13, 2022, https://www.theguardian.com/technology/2022/mar/13/google-profiting-from-predatory-loan-adverts-promising-instant-cash; Jeremy B. Merrill & Hanna Kozlowska, *How Facebook Fueled a Precious-Metal Scheme Targeting Older Conservatives*, QUARTZ, Nov 19, 2019, https://qz.com/1751030/facebook-ads-lured-seniors-into-giving-savings-to-metals-com; Roger Allan Ford, *Data Scams*, 57 HOUS. L. REV. 111 (2019).

[84] Ryan Calo, *Digital Market Manipulation,* 82 GEO. WASH. L. REV. 995 (2014); Viljoen, *supra* note 71.

[85] Veale & Borgesius, *supra* note 64.

[86] *See, e.g.*, Content-Sharing Algorithmics, Processes, and Positive Interventions Working Group, *Part 1: Content-Sharing Algorithmics and Processes*, GLOBAL INTERNET FORUM TO COUNTER TERRORISM (July 2021), https://gifct.org/wp-content/uploads/2021/07/GIFCT-CAPI1-2021.pdf; Marechal, et al., *supra* note 48; Working Group on Infodemics, *supra* note 45.

information about what data collection entails).[87] Rather than continuing to dwell on the inherent limitations of those approaches—which, in any case, seem destined to remain permanently affixed to the proverbial drawing board—it is instructive to consider two more ambitious experiments now being put into play: the European Union's new digital economy regulations, which promise a new approach to public governance of platform power, and a redesign initiative known as Web3 that seeks to disrupt platform power technologically.[88]

The European Union's new digital economy regulations represent an ambitious effort to create a new paradigm for structural oversight of platforms and their constituent processes of algorithmic optimization. In brief, the regulations define obligations for large "gatekeepers" that provide one or more designated "core platform services" in the digital economy (the Digital Markets Act (DMA)).[89] They define separate obligations for "online platforms" that make hosted content available to the public and additional, more stringent obligations for "very large online platforms" that function as central nodes in the domain of online communication (the Digital Services Act (DSA)).[90] The DSA's requirements for online platforms mostly

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[87] On the breakup and interoperability proposals, see generally Herbert Hovenkamp, *Antitrust and Platform Monopoly*, 130 YALE L.J. 1952 (2021); Rory Van Loo, *In Defense of Breakups: Administering a Radical Remedy*, 105 CORNELL L. REV. 1955 (2020. On the notice and choice proposals, see generally Cohen, *How (Not) to Write a Privacy Law*, *supra* note __.

[88] A third group of experiments, underway in China, is immensely important for the future evolution of platformized information infrastructures globally but lies outside the scope of this particular essay. *See* Mark Jia, *Authoritarian Privacy*, 91 U. CHI. L. REV. (forthcoming 2023), https://dx.doi.org/10.2139/ssrn.4362527; Sangeet Paul Chaudary, *China's Country-as-Platform Strategy for Global Influence*, BROOKINGS TECHSTREAM, 19 Nov 2020, https://www.brookings.edu/techstream/chinas-country-as-platform-strategy-for-global-influence/.

[89] Commission Regulation 2022/1925, art. 2, ¶¶ 1-2, 2022 O.J. (L 265) [hereinafter Digital Markets Act] (defining "gatekeeper" as an entity providing core platform services and "core platform services" to include online intermediation services, online search engines, online social networking services, video-sharing platform services, number-independent interpersonal communications services, operating systems, web browsers, virtual assistants, cloud computing services, and online advertising services); *id*, art. 3, ¶¶ 1-2 (specifying criteria for gatekeeper designation); *id*, art. 5-7 (defining the obligations of gatekeepers to eliminate practices that may otherwise limit contestability or prove unfair to third parties, end users, or business users).

[90] Commission Regulation 2022/2065, art. 3(i), 2022 O.J. (L 277) [hereinafter Digital Services Act] (defining an online platform); *id*., art. 20-28 (imposing obligations on "online platforms"); *id*., art. 33, ¶¶ 1, 4 (defining a "very large online platform" as one that has at least 45 million average monthly active recipients in the EU); *id*., art. 34-42 (imposing additional obligations on very large online platforms).

concern user-facing transparency (regarding ad placement and recommender systems), choice (regarding recommender systems), and rights to fair process (regarding complaint and dispute resolution systems).[91] They also require online platforms to prioritize reports of illegal content raised by "trusted flaggers."[92] Very large online platforms additionally must conduct risk assessments relating to, among others, fundamental rights, civic discourse, electoral processes, and risks to physical or mental health and must implement mitigation measures.[93]

The DSA's requirements represent very good ideas but promise only limited success. Offering expanded choice sets to the very same communities that create, circulate, and seek out disinformation, ethnonationalism, and other dangerous content seems unlikely to reduce such flows and far more likely to concentrate them in places where they are least visible and most likely to engender lasting harm. The idea seems to be that more disclosure will dissuade the disinformation- or hate-curious and provide useful warning signals to the merely confused, but a lot depends on how the disclosures are conveyed and processed within wider public and mass media discourses. Research on the effects of programs to institute online warnings about disinformation supplies a catalog of ways that such efforts can produce unintended results.[94] The "trusted flagger" regime for content removal must be implemented within political and journalistic contexts that—for good reason—have prized access and equal treatment for "both sides" of controversial issues and that have struggled to develop

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[91] Digital Services Act, art. 17 (requiring statement of reasons for removal of content), 20-21 (prescribing complaint- handling and dispute resolution procedures), 26 (requiring online platforms to present advertisements in an obvious manner and allow recipient to see and change parameters used to select that recipient), 27 (requiring transparency regarding recommender system parameters); *see* Nayanatara Ranganathan, *Regulating Influence, Timidly*, in PUTTING THE DIGITAL SERVICES ACT INTO PRACTICE: ENFORCEMENT, ACCESS TO JUSTICE, AND GLOBAL IMPLICATIONS (Joris van Hoboken, et al., eds., 2023), https://verfassungsblog.de/dsa-regulating-influence/.

[92] *Id.*, art. 22 (defining "trusted flaggers," providing criteria for their designation and de-designation, and requiring online platforms to process notices submitted by such flaggers without undue delay so long as those flaggers are acting within their designated area of expertise).

[93] *Id*., art. 34-35.

[94] See, e.g., Katherine Clayton et al., *Real Solutions for Fake News? Measuring the Effectiveness of General Warnings and Fact-Check Tags in Reducing Belief in False Stories on Social Media*, 42 POLITICAL BEHAV. 1073 (2020); Gordon Pennycook et al., *The Implied Truth Effect: Attaching Warnings to a Subset of Fake News Headlines Increases Perceived Accuracy of Headlines Without Warnings*, 66 MGMT. SCIS. 4944 (2020); Filipo Sharevski, et al., *Misinformation Warnings: Twitter's Soft Moderation Effects on COVID-19 Vaccine Belief Echoes*, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8675217/.

norms and practices more sensitive to amplification effects.[95] The DSA speaks only in the most general terms about the kinds of risks that should be deemed to trigger mitigation duties. It does not specify what risk mitigation needs to entail, and policymakers wanting to provoke change are not writing on a clean slate but rather stepping into a landscape within which the managerialist language of risk assessment and mitigation signals a minimalist, performative approach to addressing those questions.[96]

The DMA—the regulation that does not directly prescribe requirements bearing on "content moderation"—represents a far more ambitious effort to drive structural change in platformized communication systems. It prohibits designated gatekeepers (i.e., the very largest and most dominant platforms) from combining or cross-using information collected through a "core platform service" with any other service.[97] So, for example, once the DMA takes effect (and following official issuance of gatekeeper designations for the relevant services), Google would be barred from integrating the datasets collected and used by Google Search and YouTube and barred from integrating either of those datasets with data collected and used in its digital advertising business. Apple would be barred from requiring iPhone users to subscribe to Apple-branded identification, web browsing, or payment services. Additionally, designated gatekeeper providers of digital advertising services must disclose, on request, daily information about ad prices and publisher remuneration to both advertisers and publishers.[98] Important implementation questions remain about each of these provisions, but reimagining platform governance as an endeavor spanning multiple regulatory domains and requiring new, fundamentally structural

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[95] Joan Donovan & danah boyd, *Stop the Presses? Moving From Strategic Silence to Strategic Amplification in a Networked Media Ecosystem*, 65 AM. BEHAVIORAL SCIENTIST (2019); Whitney Phillips, *Part 2 "At a Certain Point You Have To Realize That You're Promoting Them": The Ambivalence of Journalistic Amplification*, *in* THE OXYGEN OF AMPLIFICATION: BETTER PRACTICES FOR REPORTING ON EXTREMISTS, ANTAGONISTS, AND MANIPULATORS ONLINE (May 22, 2018), https://datasociety.net/wp-content/uploads/2018/05/2-PART-2_Oxygen_of_Amplification_DS.pdf; James Tager & Summer Lopez, *Hate in the Headlines: Journalism and the Challenge of Extremism*, PEN AMERICA, Nov. 17, 2022, https://pen.org/report/hate-in-the-headlines/.

[96] Digital Services Act, § 5, art. 35 (requiring that providers of very large online platforms and search engines create "reasonable, proportionate, and effective mitigation measures," and providing a brief list of examples. On the managerialist approach to regulatory oversight, see Julie E. Cohen & Ari Ezra Waldman, "Introduction: Framing Regulatory Managerialism as an Object of Study," *Law and Contemporary Problems* (forthcoming 2023); *see also* Margot Kaminski, *Regulating the Risks of AI*, 103 B.U. L. REV. (forthcoming 2023).

[97] Digital Markets Act, art. 5, ¶ 2(b)-(c).

[98] Digital Markets Act, art. 5, ¶ 9-10.

governance strategies represents an enormous step in the right direction.

The DMA's structural separation mandates, however, contain important gaps that correspond to the infrastructural formations identified in this essay, and those gaps create opportunities for regulatory arbitrage on a massive scale. There are multiple ways in which information about users can be gathered and aggregated, and multiple ways of infrastructuring to safeguard business models based on such arrangements. Most obviously, because users may now be invited to port their newly interoperable profiles from one platform to another, the portability options on offer likely also will include the opportunity to move data from one core platform service to another to ensure maximum efficiency and convenience.[99] There is no reason, however, to develop post hoc, atomistic arrangements for transferring information that can be collected more directly. For example, revised SDKs might include multiple, redundant data harvesting facilities that connect to each core platform service, with bandwidth as the only limitation on data throughput. The DMA does not speak to data collection at all, and that is so by design. Within the European regulatory cosmos, such matters are the domain of data protection law. As a result, it is wholly unclear whether and under what circumstances SDKs furnished by designated gatekeepers and incorporating multiple redundant data feeds to different platform services would violate the prohibition on combining core platform service datasets. (The new SDKs would, of course, incorporate correspondingly more complex consent panels designed to the exacting specifications of data protection regulators.) As this thought experiment should suggest, viewing platforms' data collection practices exclusively through a data protection lens is a category error with significant implications for the project of effective platform governance. Gatekeeper providers of digital advertising services, meanwhile, must provide only greater transparency about their ad pricing and performance metrics—a requirement that takes the background engineering principles now structuring digital ad offerings for granted, and that will not accomplish the type of untethering described above.[100]

A different kind of intervention, emanating from the U.S. but gaining ground globally, seeks to disrupt platform power technologically by developing new kinds of federated communication structures based on protocols for decentralized

[99] Digital Markets Act, art. 6, ¶ 9; see generally Andrew Cormack, *Is the Subject Access Right Now Too Great a Threat to Privacy?*, 2 EUR. DATA PROTECTION L. REV. 15 (2016).

[100] Digital Markets Act, art. 6, ¶ 8.

exchange and authentication. New coalitions of tech entrepreneurs, funders, and activists have begun to coalesce around a vision for a "Web3" comprised of such structures, in which patterns of online communication shift decisively away from the giant tech platforms.[101] Web3 specifications vary in the details but incorporate at least the following pillars: New, peer-to-peer communication protocols will be used to establish decentralized communication channels not controlled by dominant platforms; ownership of communicative spaces organized around those protocols will revert to commons-based units that can set their own terms for acceptable public dialogue; and blockchain-based technologies will ensure the authenticity of communications using tamper-proof audit logs.[102]

To begin with, it is necessary to take Web3 evangelists' assertions about the disruptive force of competitive pressure on faith. So far, there is little evidence to suggest that federated communication protocols will attract enough committed users to create durable exceptions to the network laws that have drawn all-important teenaged and twenty-something populations around the globe to flock to MySpace and then Facebook and then Instagram and now (perhaps) TikTok and thereafter the Next Big Thing.[103] Even if Web3 protocols manage to disrupt the operations of existing incumbents (or, in the case of Twitter, to capitalize on self-immolation), it seems safe to predict that new networked structures for centralized routing of communication flows will emerge and that many people will use them. To be clear, this is not an argument about the indestructibility of today's incumbents; it is an argument

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[101] *See, e.g.*, Gavin Wood, *Why We Need Web3*, Medium, Sept. 12, 2018, https://gavofyork.medium.com/why-we-need-web-3-0-5da4f2bf95ab; Kevin Roose, *What is Web3?*, N.Y. TIMES, https://www.nytimes.com/interactive/2022/03/18/technology/web3-definition-internet.html (last visited Mar. 3, 2023, 4:58 P.M.); *see also* Bernard Marr, *What is Web3 All About? An Easy Explanation with Examples*, FORBES (Jan. 24, 2022), https://www.forbes.com/sites/bernardmarr/2022/01/24/what-is-web3-all-about-an-easy-explanation-with-examples/?sh=531b31d22255 (noting that the concept is.a "work-in-progress" but that decentralization, rather than government or corporate control, is its defining principle).

[102] *See* Roose, *supra* note 103; David Rozas, Antonio Tenorio-Fornes, & Samer Hassan, *Analysis of the Potentials of Blockchain for the Governance of Global Digital Commons*, 4 FRONTIERS IN BLOCKCHAIN (2021), https://www.frontiersin.org/articles/10.3389/fbloc.2021.577680/full; *see also* Joost Bambacht & Johan Pouwelse, *Web3: A Decentralized Societal Infrastructure for Identity, Trust, Money, and Data*, Semantic Scholar (Mar. 1, 2022), doi:10.48550/arXiv.2203.00398.

[103] On generational shifts in social media usage, see generally Emily A. Vogels, Risa Gelles-Watnick & Navid Massarat, *Teens, Social Media and Technology 2022*, PEW RESEARCH CTR (Aug. 10, 2022), https://www.pewresearch.org/internet/2022/08/10/teens-social-media-and-technology-2022/.

about the inevitability of recentralization in one form or another. Within the Web3 cosmos, assertions about the power of protocols to enforce and preserve decentralization command unquestioning adherence, but both history and network science tell very different stories.[104]

Putting aside questions about the durability of decentralization movements, however, the lens of infrastructure teaches that the more important question is whether decentralized, federated communication structures would manage to disrupt processes for harvesting and aggregating data and targeting flows of published content, including advertising, in ways informed by predictive patterning. It is important to remember that interpersonal communications are not the only kinds of content that people want to access and share online, and that (for now, at least) communication apps will remain nested within operating systems on devices that likely will retain capabilities for behavioral tracking and targeting. Digital content and digital advertising industries would need to develop new strategies to account for centripetal moves by some communities, but it also seems reasonable to predict that they would learn to do so.[105] It is also important to remember that the worst pathologies of the domain of online communication rely on synergies between pattern-driven, predictive targeting and processes of social circulation. Web3 evangelists have yet to devise a satisfactory plan for addressing this issue. Some seem to think that competition plus greater transparency will do the trick; as should be clear by this point, however, relying on the self-interested motivations of online communities to stem flows of disinformation, ethnonationalism, and other dangerous content flows *that appeal to those same communities* is a pipe dream. And tamper-proof audit logs designed to make communication trails permanent and public will also function to give campaigns of disinformation, hate, and harassment permanent online lives.[106]

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[104] See generally ALBERT-LASZLO BARABASI, LINKED: THE NEW SCIENCE OF NETWORKS (2002); TIM WU, THE MASTER SWITCH: THE RISE AND FALL OF INFORMATION EMPIRES (2012).

[105] The federated cookie consent dashboards developed by digital service providers in jurisdictions where the GDPR applies are suggestive in this regard. See generally Jan Tolsdorf, et al., *A Case Study on the Implementation of the Right of Access in Privacy Dashboards*, in PRIVACY TECHNOLOGIES AND POLICY 23 (Nils Gruschka, et al., eds. 2021); Cristiana Santos, et al., *Consent Management Platforms Under the GDPR: Processors and/or Controllers?*, in *id.* 47.

[106] *See* Molly White, *Abuse and Harassment on the Blockchain*, Jan. 22, 2022, https://blog.mollywhite.net/abuse-and-harassment-on-the-blockchain/; Thomas Stackpole, *Cautionary Tales from Cryptoland*, HARV. BUS. REV., May 10, 2022, https://hbr.org/2022/05/cautionary-tales-from-cryptoland.

As Gillespie and Sandvig cautioned a decade ago, and as the lens of infrastructure underscores, terminology does important work in these continuing debates. In the case of Web3, stirring exhortations about expressive liberty and resistance to centralized power mask a powerfully traditionalist agenda. The belief that adjustments to ownership and control of digital protocols can, should, and will meaningfully and permanently alter the domain of online communication, restoring the experiences and sensibilities of an earlier and freer era, reflects classic free speech thinking about the digital public sphere. The fact that Web3 initiatives have been able to marshal so much financial support and amass so much cultural capital in such a relatively short time underscores the hold that the public sphere imaginary continues to assert.

The "gatekeeper" terminology, in contrast, is intended to signal a change from business as usual, and especially to emphasize concerns about structural domination of multiple, interlocking domains of economic and social activity.[107] Those concerns are extraordinarily important. And yet the infrastructuring work done by dominant platforms also operates in other registers. As we have just seen, platforms do not exercise particularly comprehensive or consistent vigilance in guarding their own gates, because it is not profitable to do so. To put the point a different way, culling "livestreamed videos of terrorist acts" while optimizing for properties of flow that amplify sympathy for the ideologies motivating such acts, incentivizing fresh infusions of those ideologies, and empowering the formation of communities and networks within which those infusions circulate, is not simply an instance of inattentive gatekeeping.[108] The systemic and waveform properties of communication flows matter, and decisions about how

[107] Peter Alexiadis & Alexandre de Streel, *Designing an EU Intervention Standard for Digital Platforms*, EUI Working Paper RSCAS 2020/14; Nicolas Petit, *The Proposed Digital Markets Act (DMA): A Legal and Policy Review*, 12 J. EURO. COMP. L. & PRACTICE 529 (2021); *see also* Karine Barzilai-Nahon, *Toward a Theory of Network Gatekeeping: A Framework for Exploring Information Control*, 59 J. AM. SOC. INFO. SCI. & TECH. 1493 (2008).

[108] *See* Global Internet Forum to Counter Terrorism, *Content Incident Protocol*, https://gifct.org/content-incident-protocol/ (last visited Feb. 24, 2023) (touting incident response protocol for livestreams); Avaaz, "Facebook: From Election to Insurrection," Mar. 18, 2021, https://secure.avaaz.org/campaign/en/facebook_election_insurrection/; Global Internet Forum to Counter Terrorism, Annual Report 25, 28 (2021) (expressing aspiration to move beyond identifying livestreams to identifying other content depicting or pointing to ongoing terrorist acts), https://gifct.org/wp-content/uploads/2021/12/GIFCT-Annual-Report-2021-PV.pdf; Avaaz, "Far Right Networks of Deception," May 22, 2019; Counter Extremism Project, *Ok Google, Show Me Extremism: Analysis of YouTube's Extremist Video Takedown Policy and Counter-Narrative Program* (2018), https://www.counterextremism.com/ok-google.

to engineer those properties are legitimate subjects of public contestation and public governance. The "ecosystems" terminology now conventional in business and management literatures more usefully draws attention to the infrastructural qualities of platformized communication systems and the strategies through which they are constructed and maintained.[109] Brought into policy dialogues, however, it risks reinforcing perceptions that the current systemic and waveform properties of online communication flows are natural and inevitable. Platformized infrastructures for online communication are neither.

CONCLUSION

Infrastructures are structured arrangements in the ordering of human activity that burrow deep into the fabric of economic, social, and political life. The patterns they facilitate may, and often do, produce both collective benefits and collective harms. At the same time, they present a kind of transparency—transparency while working as expected—that relies on practical and ideological normalization and that, consequently, is deeply resistant to strategies for engendering visibility. Collective (or "external") harms that inhere in patterns of activity manifesting at scale can be particularly difficult to name, understand, and counteract, and this is doubly true for collective harms entrenched infrastructurally.

It is past time, however, to name, understand, and counteract the collective harms produced by current platformized infrastructures for online communication, which now threaten the continuing viability of democratic societies worldwide. Those societies have been and remain profoundly imperfect. They are better than the alternatives now nurtured by the systemic and waveform properties of communication flows within the platformized digital public sphere. Constituting the digital public sphere differently will require rethinking content governance infrastructurally, with particular focus on the formations that enable real-time, data-driven programmability, behavioral personalization, optimization for engagement, and weaponization.

[109] For useful reviews of the relevant literatures, see Ron Adner, "Ecosystem as Structure: An Actionable Construct for Strategy," 43 *Journal of Management* 39 (2017) (acknowledging the term's metaphorical nature); Andreas Hein, et al., "Digital Platform Ecosystems," 30 *Electronic Markets* 87 (2020) (using the term ecosystem uncritically in its transplanted context).