HIDING IN THE OPEN: HOW TECH NETWORK POLICIES CAN INFORM OPENNESS BY DESIGN (AND VICE VERSA)

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"The economic lesson is timeless: if you control a key interface or bottleneck, you should open it up, but on your own terms and conditions."
~ Carl Shapiro and Hal Varian

INTRODUCTION

This paper seeks to establish how human-designed networks and different flavors of openness—institutional, organizational, informational, and resource-based—can and do coexist meaningfully. As part of that examination, this paper surveys fifty years of openness in the telecommunications and information technologies networking space. The focus is on how the term "openness" has been employed by regulators and others in the United States and what motivations appear to lie behind its use.

Four relevant industry sectors are reviewed. First, the paper examines the basis for the open Internet in the processes and resources of its "Middle Layers" architecture. These include the functional design elements of the end-to-end principle, network interconnection, agnostic

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bearer protocols, and modularity. Second, the paper explores access to local telephone networks in the FCC's Part 68 Carterfone rules, the Computer II basic telecommunications/enhanced information services dichotomy, the Computer III concepts of Open Network Architecture, the Telecommunications Act of 1996 requirement of unbundling basic telephony network elements, and wireless spectrum. Third, the paper analyzes the broadband access debates—from open access to network neutrality—from the perspective of openness. Finally, the paper discusses the technology and economic elements that help to create and sustain online platform companies and touches on concerns expressed in the recent Warner Policy Proposal. Key aspects of what is termed "functional openness" appear in all of these disparate venues.

The openness by design (ObD) framework is briefly introduced, as an analytical tool for understanding openness relating to factors such as complex systems, network design tradeoffs, and platform economics. The paper culminates by observing how openness should be considered from the human end-user perspective, particularly with the rise of new online technologies such as artificial intelligence, the Internet of Things, biometrics, and virtual reality. Ultimately, openness requires healthy degrees of trust and accountability in institutional entities, people, and processes—whether derived from markets, governments, or other inclusive decisional systems. The author's current *GLIAnet* project, building a trustworthy and open Web ecosystem, is proffered as one such option worthy of exploration.

I. OVERVIEW AND SUMMARY

Open standards. Open source. Open APIs. Open Internet. Open AI. Open data. Open science.

We all claim to love openness, from our political systems, to our consumer markets, our trade policies, and even our mindedness. Openness is an especially venerated concept in the information technology space and called out with approval seemingly everywhere. As one commentator puts it, "the architects of the twenty-first century digital age proclaim that *openness* is their foundational value."[1]

For the most part, openness proponents view it as an unalloyed

[1] ANDREW L. RUSSELL, OPEN STANDARDS AND THE DIGITAL AGE 1 (2014) [hereinafter RUSSELL, OPEN STANDARDS].

virtue, a way of meritoriously spreading the innovative and social value of a particular networked resource. And yet, surprisingly, no rigorous conceptual framework currently exists for assessing the relative value of open systems, especially in comparison to their more proprietary counterparts, such as fee-based commercial software. This ontological gap is especially troubling as new technology market and policy challenges, particularly affecting online data platforms, raise fundamental questions about the very efficacy of openness.

Was Facebook too "open" in its data sharing practices with Cambridge Analytica and other third parties?[2] Did Google deserve its $5 billion fine from the European Commission by being too "closed" in its deployment of open source-based Android?[3] And, does the policy of network neutrality—more recently dubbed "open Internet"—bolster or harm the aim of a truly "free and open" Internet?[4]

So what exactly is openness? How does it compare to its presumed opposite, which is enclosure? And why should we even care?

Here, the concept of openness is sketched out in the specific context of U.S. telecommunications and information networks—the lower and middle transmission layers of the Internet. Newer, networked emerging technologies (NETs)—such as cloud computing and social media platforms—also are discussed.[5] The paper then introduces the conceptual framework of *openness by design* ("*ObD*"). The overarching thesis is that openness can be a useful prism through which to examine corporate and public policies.

This paper should be especially relevant for the rise of networked emerging technologies. In order to be able to participate in searching discussions of 21st Century technology policy, stakeholders should fully appreciate both the benefits and the concerns raised by NET platforms. ObD is one way to better understand the activities of the NET platforms

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[2] Andrea Valdez, *Everything You Need to Know About Facebook and Cambridge Analytica*, WIRED, (Mar. 23, 2018, 10:00 AM), https://www.wired.com/story/wired-facebook-cambridge-analytica-coverage [https://perma.cc/MWT4-CWCA].

[3] Jack Nicas & Adam Satariano, *E.U. Fines Google $5.1 Billion in Android Antitrust Case*, N.Y. TIMES, (July 18, 2018), https://www.nytimes.com/2018/07/18/technology/google-eu-android-fine.html [https://perma.cc/C3B8-28RT].

[4] *Restoring Internet Freedom,* FED. COMMC'NS. COMM'N, https://www.fcc.gov/restoring-internet-freedom [https://perma.cc/GN6D-NYAD].

[5] Future papers will explore openness as a crucial element in other networked technologies, including software (open source, open standards), applications (open APIs), and computational systems (open AI algorithms).

and provide a potential accountability measure in its own right.

This paper does not seek to advocate for a particular version of openness, or take a firm position on the policy or regulatory issues addressed. No snap judgments should be inferred about the need or efficacy of any particular approach for any specific network or platform. Rather, the goal is to introduce greater clarity and consistency of nomenclature to the conversation, leading (hopefully) to a unified framework of conjoined terms and concepts. The intention is descriptive, not prescriptive; seeking commonalities, not imposing mandates.

For example, considerably more heat than light is cast when proponents of network neutrality claim to want to "protect an open Internet," while at the same time the policy's opponents seek to "restore the free and open Internet." Those political battles over access to network functionalities and services continue unabated.[6] However, before we can have a fruitful discussion about the relevance of openness, we first need a shared understanding between various sides of these debates about the underlying history and objectives of openness. That core understanding in turn will help drive a more thoughtful conversation about whether and how policymakers should consider forms of regulation for specific online networks and companies.

One key takeaway from this exercise, in fewer than ten words: interfaces and protocols tend to outlast politics and proclamations.

II. INTRODUCTION: THE LIMITS TO "NIRVANA-LIKE OPENNESS"

In March 2018, Michael Powell, former Chairman of the Federal Communications Commission (FCC) and current head of NCTA,[7] the Internet and Television Association, was interviewed for "The Communicators" television series.[8] His commentary provides considerable

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[6] *See, e.g.*, Petition for Forbearance from USTelecom to Fed. Commc'ns. Comm'n, WC Docket No. 18-141 (filed May 4, 2018), https://www.ustelecom.org/sites/default/files/documents/USTelecom%20Forbearance%20Petition.pdf [https://perma.cc/BT9C-YNAC] (seeking Section 160 forbearance from ILEC unbundling and resale requirements under Sections 251-252 of the Telecommunications Act of 1996). Among the proffered arguments in the Petition is that the broadband marketplace is "irrevocably open to competition." *Id.* at iv.

[7] *Michael Powell: President & CEO*, INTERNET & TELEVISION ASS'N, https://www.ncta.com/people/michael-powell [https://perma.cc/S98H-D8GS].

[8] *Communicators with Michael Powell*, C-SPAN (Mar. 22, 2018), www.c-span.org/video/?442919-1/communicators-michael-powell [https://perma.cc/CCB3-NZTW].

fodder for constructive dialogue.

Part of Powell's comments addresses the "fake news" reportedly facilitated by Facebook, as well as broader data privacy concerns. He called the Facebook situation "predictable and inevitable" due to the "mythology . . . that information always wants to be free and available, that openness is always good."[9] He attributed a lack of forethought about negative behavior and evil to this "Nirvana-like openness."[10]

Powell continued that "the government has been desensitized to that risk for some time," but "there is an awakening taking place."[11] Future regulatory discourse will necessarily be more comprehensive and will likely be dominated by privacy concerns associated with companies who amass intimate data sets, "particularly when those data platforms are open for use by others."[12] He decried the "asymmetry of the approach" between the NET platform companies ("edge companies") and the Internet access providers ("infrastructure companies") that he represents.[13] He called on regulators to develop a "coherent approach to everything in the value chain."[14]

In some important respects, Michael Powell and I agree that "openness" is not always good. But this point of agreement is merely the beginning, an open door, to a wider conversation. Where exactly should we go from here?

III. OPENNESS AS A SYSTEMS CONCEPT

The politically charged language of openness and enclosure can blind us to its nuances. In first unpacking the meaning of openness, it is useful to start at the beginning, in the natural systems that have arisen and taken over this planet for billions of years.

The world is made up of all types of systems, from simple to complex, from natural to human-made.[15] A system is an interconnected set of elements coherently organized in a way that achieves a function.[16] As it turns out, openness and enclosure are key qualities of every system. With

[9] *Id.*
[10] *Id.*
[11] *Id.*
[12] *Id.*
[13] *Id.*
[14] *Id.*
[15] DONATELLA H. MEADOWS, THINKING IN SYSTEMS: A PRIMER 3 (2008).
[16] *Id.* at 11.

physical systems, the concepts of the inside and the outside are born. What is part of the system is its inner components, while what is not part of the system lies outside of its boundaries. Openness does not exist in a vacuum (at least figuratively).

Biological systems introduce the concept of an organism and its environment.[17] The inner is then delineated as that substance and process to be protected and nurtured, while the outer is to be defended against or co-opted. In a typical mammal, for example, a haywire immune system (the inner) sees external threats where none exist. An underperforming immune system can succumb to the slightest external incursion.

This polarity suggests a constant struggle for perfect equilibrium, but that is not how living systems work. "Homeostasis" is a means of adapting, tweaking, and adjusting a system to its internal and external environments. Crucially, in these processes, a balance constantly is sought in order to achieve the ideal internal environment for that organism. While the goal does not change, there is no set path or final end state to achieving it. As the second law of thermodynamics tells us, only in the death of a system do the inner and the outer conjoin once again.

Humans are also systems. The human body includes many additional types of systems within it, such as the nervous, the immune, the respiratory, and the circulatory. Humans also possess psychological systems, and "openness to experience" is considered one of the five Big Traits.[18] However, here, as well, there are limits. As Carl Sagan once put it, "Keeping an open mind is a virtue—but, . . . not so open that your brains fall out."[19]

Humans, over time, have designed and created other types of systems, including communities, nation-states and economies—and of course the Internet—which are deemed in varying ways to be "open" or "closed" to their respective environments. Moreover, technologies can be seen as an extension of a human's physical and mental self into the outer world.

Complex adaptive systems (CASs) are a particular type of

[17] Ludwig von Bertalanffy, *The Theory of Open Systems in Physics and Biology*, 111 SCI. 23 (1950).

[18] *Big Five Personality Test Traits*, 123 TEST, https://www.123test.com/big-five-personality-theory [https://perma.cc/9TJ7-ULVQ].

[19] CARL SAGAN, THE DEMON-HAUNTED WORLD: SCIENCE AS A CANDLE IN THE DARK (1997).

system.[20] The CAS architecture is much richer than the sum of its parts. As such, the smaller scale interactions of elements within a CAS lead to larger scale structure and patterns, including non-linearities and emergent and self-organizing phenomena.[21] In complex systems, in other words, more is different.

All systems have a few salient features in common. First, systems include an inner and an outer: the individual thing or entity and its environment. This includes the establishment of boundaries, sometime permeable, that create a form of separation between the two sides. Increasingly experts are discovering that system boundaries mark a convenient, and not always definitive, demarcation between what is deemed the inner and the outer.

Second, all systems interact in some fashion with their environments. These interactions are a means of exchanging (adding or subtracting) resources, and so can be seen as more or less open.

Third, there are no absolutes in systems. All are comparative and contextual. This includes the notions of being open and being closed. A completely open system increases chaos, leading to dissolution—death. A completely closed system is a stifling order, leading to sterility—another form of death. When one speaks of open or closed systems, it is, thus, more precise to think about gradations between the two concepts.

Fourth, all systems involve trade-offs. In biological systems, for example, there is an overall balancing of risks and benefits, stagnation and flourishing. One must survive first as an individual, within a pre-defined physical enclosure, before cautiously reaching outward to the larger environment in a restrained posture of openness. This openness amounts to a need and desire to access external resources: information about the environment, energy to fuel the system, and potential mates to allow the system to reproduce itself. These tradeoffs are highly contextual; engaging in amorous activities while the lion is closing in might not be such a bright idea, both for one's own chances of survival and those of any future offspring.

Finally, these aspects of openness in systems inform our ways of

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[20] *See* Serena Chan, *Complex Adaptive Systems* (Nov. 6, 2011) (unpublished seminar paper) (on file with Massachusetts Institute of Technology, http://web.mit.edu/esd.83/www/notebook/Complex%20Adaptive%20Systems.pdf [https://perma.cc/C3QF-ANKU]).

[21] *See also* Richard S. Whitt, *A Deference to Protocol: Fashioning a Three-Dimensional Public Policy Framework for the Internet Age*, 31 CARDOZO ARTS & ENT. L.J. 689, 719–20 (2013) [hereinafter Whitt, *Deference to Protocol*].

considering openness in particular forms of networks. In particular, this paper employs a systems-based approach to openness in networks, meaning it will focus on how intentions, designs, and attributes can enhance, or stifle, a tendency towards openness.

IV. OPENNESS AS A NETWORKS CONCEPT

What is a network, and how should one distinguish it from a system? Many experts use the two terms interchangeably, and there is no clear consensus on the distinction between the two terms. For purposes of this analysis, a network is a subset of the larger category of systems. Thus, a system is something that is born from the natural environment, including human-constructed systems like economies. On the other end of the continuum, a network is a type of system that is designed, engineered, implemented, and operated by human beings. Often, networks are created with the intention of communicating and passing information, but they can have other functions as well. Typically, a human being can, at most, expect to manage complex systems, while still exerting a greater amount of control over interconnected networks.

A. Networks as Technologies

As defined here, networks are a form of human technology. As such, they possess certain fundamental characteristics:

- Technologies mediate forms of human interaction.
- Technologies are not neutral.
- Technologies are not deterministic or inevitable.
- Technologies are not a "force" or a "trend"; they constitute a human creation.[22]

Technologies can enrich the other modalities of life, including personal, social, economic, and political modalities. Technologies can also inhibit our ability to express ourselves freely and autonomously in these same modalities.

While there are many forms of technology in the world, enabling sectors such as transportation, energy, healthcare, and bioengineering, this particular paper focuses on communications and information network technologies.

[22] For more on each of these elements, *see id.* at 704–05.

As noted above, a technology is not easily severable from the culture in which it is embedded. This is also true of the various types of physical and virtual networks that humans have constructed over many decades to convey people, objects, and information between various places.

Networks can be found in many flavors: physical or virtual, formal or informal, centralized or decentralized. In most cases throughout history, network industries—from stagecoaches and canals to the postal service, electricity, telegraphs, railroads, and airlines—have been subject to some form of government regulation and oversight.[23] To many, the question of centralization actually ties directly to the concept of openness.[24] In fact, the perceived tensions and tradeoffs between open ("decentralized") and closed ("centralized") control "ha[ve] been the perpetual preoccupation of the builders of information and communications networks."[25]

Another related dichotomy is based on those entities who exist inside a network, versus those who find themselves outside it. As one scholar succinctly summarizes, "the question of inclusion/exclusion is the most fundamental in the network society."[26] Or as author Joshua Cooper Ramo puts it, "Today, no position is more important, formidable, influential, or profitable than that of the gatekeeper. Defining who is out of any network is among the most essential moves of design."[27] Ramo makes clear that these gates are not just the assumed physical structures of the recent past, such as the Internet backbone, but the gates also include code, protocols, encryptions, blockchains, languages, international trade arrangements, financial rules, and national laws.[28]

In such a target-rich environment of networks, everything can and should be put on the proverbial table. Here, the near-term aim is a searching examination of networked communications and information infrastructure in the United States—Layers 1–4 of the OSI protocol

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[23] *See* Kevin Werbach, *The Federal Computer Commission*, 84 N.C.L. REV. 1, 13 (2005) [hereinafter Werbach, *Computer Commission*].

[24] *See* Wendy Hanamura, *Decentralized Web FAQ*, ARCHIVE.ORG: BLOG (July 21, 2018), https://blog.archive.org/2018/07/21/decentralized-web-faq/ [https://perma.cc/2XQW-AL3Z].

[25] RUSSELL, OPEN STANDARDS, *supra* note 1, at 279.

[26] FELIX STALDER, MANUEL CASTELLS AND THE THEORY OF THE NETWORK SOCIETY 195 (2006).

[27] JOSHUA COOPER RAMO, THE SEVENTH SENSE: POWER, FORTUNE, AND SURVIVAL IN THE AGE OF NETWORKS 236 (2016).

[28] *Id.*

stack.[29]

B. Honing Our Focus

Nearly twenty years ago, Jason Oxman from the FCC's Office of Plans and Policy wrote that the growth and success of the Internet "can be attributed to one basic attribute: the openness of both the Internet and the underlying telecommunications infrastructure."[30] Four years later, in 2003, renowned telecom policy experts Doug Sicker and Dale Hatfield sought to test that claim by unpacking the meaning of openness as an integral part of telecom and information services networks.[31]

In undertaking one of the few systematic works of research in the field, Shah, Sicker, and Hatfield were able to acknowledge that: "Despite its importance, the term 'open' is often not clearly defined, is often taken to mean different things in different contexts, and has vastly different implications depending upon what level of the protocol stack is being considered."[32] The three authors found that "broad, liberal, and sometimes inconsistent use of the term" has made it difficult to extract some common concepts.[33] They sought instead to "offer a clearer, more unified and consistent definition of what constitutes openness" in telecommunications services and networks.[34] This paper endeavors to build on their seminal work.

V. FINDING OPENNESS IN TELECOM AND INFORMATION NETWORKS

Openness has been conceived and deployed to serve various purposes in the U.S. telecommunications ("telecom") and information services space. Some assume that asymmetry of power between networks and third parties/users leads to a desire for more "open" networks. Others

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[29] *See* Margaret Rouse, *OSI Model (Open Systems Interconnection)*, TECH TARGET: SEARCH NETWORKING (Apr. 2018) https://searchnetworking.techtarget.com/definition/OSI [https://perma.cc/B2X3-J8VJ].

[30] Jason Oxman, *The FCC and the Unregulation of the Internet* 5 (Fed. Commc'ns Comm'n Office of Plans and Policy, Working Paper No. 31, July 1999).

[31] Ashish Shah, Douglas C. Sicker & Dale N. Hatfield, *Thinking About Openness in the Telecommunications Policy Context*, TPRC 2003 (Sept. 1, 2003) http://spot.colorado.edu/~sicker/publications/thinking.pdf [https://perma.cc/7RAP-QPRR].

[32] *Id.* at 1.

[33] *Id.* at 2.

[34] *Id.* at 1.

conclude that a form of regulatory enclosure was adopted as a negation or quarantine of activities on one end of the network in order to facilitate openness on the other end.[35]

Shah, Sicker, and Hatfield defined openness in general terms as "unimpeded or freely available access to resources, and to processes."[36] The term "open networks" typically refers to an architectural arrangement or decision, particularly as it relates to access technology. In contrast, the term "proprietary" is often used to mean the opposite of open, rooted in ownership and denying access to the content/code/decision.[37] This distinction between resources and processes, and the crucial role played by accessibility, helps us set the stage for understanding the debate between both critics and proponents of an open Internet.

A. The Open Internet

The Internet represents one of the most successful examples of sustained investment and commitment to research and development in information infrastructure.[38] Part of its success can be attributed to its unusual origins at the "unlikely intersection of big science, military research, and libertarian culture."[39] Further, the early homogeneity of design and top-down control slowly gave way to a heterogeneity of design and bottom-up governance. This was an important evolution because it dispersed decision-making power to larger and more diverse groups of individuals.

The inclusive processes that produced the Internet are mirrored in its very nature as a resource readily available to others. These processes include agendas available for anyone to peruse, meetings available for anyone to attend, and draft documents anyone could review and comment on. Stated differently, the process accountability of representative entities, such as the Internet Engineering Task Force (IETF), and inclusive procedures, such as the request for comments (RFC) process, are enhanced by the resulting open standards and interfaces. Our inquiry reveals that

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[35] *See* Kevin Werbach, *Off the Hook*, 95 CORNELL L. REV. 535, 547 (2010).
[36] Shah, Sicker & Hatfield, *supra* note 31, at 12.
[37] *See id.* at 11.
[38] *See* Barry M. Leiner et al., *A Brief History of the Internet*, INTERNET SOC'Y (1997), https://www.internetsociety.org/internet/history-internet/brief-history-internet/ [https://perma.cc/AJ55-YVJR]; *see also* Whitt, *Deference to Protocol*, *supra* note 21, at 698.
[39] MANUEL CASTELLS, THE INTERNET GALAXY 17 (2002).

openness, while often mixed together in practice and in description, can be found in the resource, process, and entity components of the Internet. In this case, openness of form, formats, and forums follow openness of function.

1. Forms, Formats, and Forums: Open Standards

Standards are the technical format or definition approved by a recognized standards organization or consortium, or accepted as a *de facto* standard by industry.[40] They exist for a variety of programming languages, operating systems, data formats, and communications protocols. In turn, protocols constitute widely recognized technical agreements among computers and other devices about how data moves between physical networks.[41]

During its first decade, the Internet's design criteria were conceptualized via the technical standards used by computers, phones, software, and networking equipment to talk to each other.[42] The protocols that drive the Internet in turn were developed via "open" industry standards groups and processes.[43] Not surprisingly, "open standards mean different things to different people," and a definition "depends on the vantage point of the viewer and the type of technology being standardized."[44] Some proponents of open standards find it beneficial that they allow for the creation of new forms of governance that are "neither market nor hierarchy."[45]

Ken Krechmer observes that there are ten different requirements or views of open standards, depending on whether one is a creator, implementer, or user:

- Open meeting: participation is available for those who wish to attend.

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[40] *See* Vangie Beal, *What Is Standard*, WEBOPEDIA, https://www.webopedia.com/TERM/S/standard.html [https://perma.cc/3AME-Q4FN].

[41] *See What is a Protocol Exactly in Computer Science?*, QUORA (Oct. 31, 2015), https://www.quora.com/What-is-a-protocol-exactly-in-computer-science [https://perma.cc/8CDA-R8N9].

[42] *See* Whitt, *Deference to Protocol*, *supra* note 21, at 698–701.

[43] See *id.* at 702–03.

[44] Ken Krechmer, *Open Standards: A Call for Change*, 47 IEEE COMMS. MAG. May 2009 at 88, 88.

[45] RUSSELL, OPEN STANDARDS, *supra* note 1, at 279. The questions surrounding open standards deserve their own, more fulsome treatment. For now, we will limit our discussion to the working code of the Internet.

- Consensus: decisions are reached via various defined forms of agreement, with all interests discussed and agreement found without dominations.
- Due process: decisions are reached via established rules of conduct, including balloting and an appeals process.
- Open intellectual property rights: property rights fees are limited or not applicable to implement the basic standard.
- One world: the same standard is used for the same function, globally.
- Open change: any revisions are subject to transparency; all changes are proposed and agreed to in the standards body.
- Open documents: any written materials are subject to transparency; all may access and use.
- Open interface: the boundaries between two resources are clearly defined and readily available, not hidden or controlled.
- Open access: objective mechanisms are used to ensure conformance with accuracy, safety and proper use.
- On-going support: standards remain supported until user interest ceases.[46]

While many of these elements focus on the process side, they also include several forms of access to the underlying software resource.

It is clear that the concept of open standards rests on several core principles, including individual voluntarism, decisional consensus, and common standards.[47] This invokes the "paramount importance of well-defined procedures to guarantee public *participation* in the production of standards and liberal terms of *access* to allow public use of standardized technologies."[48] Again the dichotomy of process and access resurfaces.

An "open" process means any interested person can participate, know what is being decided, and be heard.[49] To Shah, Sicker, and Hatfield, it denotes free, widely-available, non-proprietary documentation.[50] At the IETF, for example, the Request for Comments (RFCs) themselves allow for inclusion by what it called "the Internet community"—in other words, those who actively participate in the standards processes. The IETF also has produced what is termed the "Tao

[46] Krechmer, *supra* note 44, at 90-93.
[47] *See* RUSSELL, OPEN STANDARDS, *supra* note 1, at 278–79.
[48] *Id.* at 279 (emphasis in original).
[49] Whitt, *Deference to Protocol*, *supra* note 21, at 703.
[50] Shah, Sicker & Hatfield, *supra* note 31, at 10.

of the IETF," fleshed out and revised over time, as an informal guidebook that emphasizes how the IETF employs all-inclusive processes, with open document reviews and open meetings.[51]

What Internet pioneer Steve Crocker called "a culture of open processes" led to the development of standards and protocols that became building blocks for the Internet.[52] Informal rules became the pillars of Internet culture, including a loose set of values and norms shared by group members. Unconventional entities—in this case, informal bodies of consensus—accompany these informal rules.[53] Today, there is no single governing body or process that directs the development of the Internet's protocols. Instead, we have multiple bodies and processes of consensus. Much of the "governance" of the Internet is carried out by so-called multistakeholder organizations (MSOs).[54] These include the Internet Society (ISOC), the Internet Engineering Task Force (IETF), the International Corporation for Assigned Names and Numbers (ICANN), and the World Wide Web Consortium (W3C).[55]

To one critic, however, the Internet's technical community of the 1990s was less democratic and inclusive than other industry standards bodies.[56] Andrew Russell believes that "they preferred the rapid dissemination of a pragmatic kludge to a time-consuming pursuit of new technical knowledge."[57] By way of contrast, the International Standards Organization (ISO) in 1978 developed the Open System Interconnection (OSI) reference model.[58] The ISO employs the "open system" moniker to describe its intentions, and the well-specified interfaces between each layer in the seven-layer reference model promote "openness."[59]

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[51] *The Tao of IETF: A Novice's Guide to the Internet Engineering Task Force*, IETF (Nov. 2, 2012), www.ietf.org/tao.html [http://perma.cc/HK9A-AWJE]; *see also* P. Hoffman & S. Harris, *The Tao of IETF: A Novice's Guide to the Internet Engineering Task Force: RFC 4677* (Sept. 2006), https://tools.ietf.org/pdf/rfc4677.pdf [http://perma.cc/DA8F-M7P9]; G. Malkin, *The Tao of IETF: A Guide for New Attendees of the Internet Engineering Task Force: RFC 1718* (Nov. 1994), https://tools.ietf.org/pdf/rfc1718.pdf [http://perma.cc/B7YX-PCYS].

[52] Whitt, *Deference to Protocol*, *supra* note 21, at 702.

[53] *Id.*

[54] *Id.*

[55] *Id.*

[56] *See generally* RUSSELL, OPEN STANDARDS, *supra* note 1, at 15–16.

[57] *Id.* at 275.

[58] Andrew L. Russell, *OSI: The Internet That Wasn't*, IEEE SPECTRUM (July 30, 2013, 1:17 AM), https://spectrum.ieee.org/tech-history/cyberspace/osi-the-internet-that-wasnt [https://perma.cc/55LR-MY55].

[59] Shah, Sicker & Hatfield, *supra* note 31, at 9-10.

Ironically, as Russell argues, ISO's attempt to utilize more formalized democratic mechanisms of international standardization to establish the OSI reference model may have been its downfall. In his words, "openness was OSI's founding justification, noblest aim, and fatal flaw."[60] Russell cautions that this little-understood history of OSI "has some troubling lessons for those who champion inclusivity, openness, and multi-stakeholder governance."[61] These very values "opened up OSI's process to strategies of delay and disruption and to internal conflicts that proved impossible to resolve."[62]

2. Function: Running Code

The Internet's "running code" reflects its unique heritage: open standards and public commons (as opposed to proprietary standards and private property). While much of its underlying physical networks, applications, and content come from the commercial, privately-owned-and-operated world, its logical architectural platform typically does not.[63]

Interestingly, openness does not appear to stand as an explicitly stated engineering design principle of the Internet. Instead, the overt interest is in connecting disparate networks. This may be because openness is not in itself an explicit design principle.[64] Instead, openness emerges as a phenomenon resulting from the operation of engineering design principles.

This apparent oversight makes sense, as Avri Doria explains. The world of Internet protocols and standards can be divided into three buckets: first (Bucket One), the general communications engineering principles, consisting of generic elements like simplicity, flexibility, and adaptability; second (Bucket Two) the specific design attributes of the Internet, such as the no-top-down design, end-to-end transmission, and layering; finally (Bucket Three), the actual operational resources, those naming and numbering features, such as the Domain Name System (DNS), intended to carry out the design principles.[65] So, the engineers

[60] RUSSELL, OPEN STANDARDS, *supra* note 1, at 24.
[61] *Id*.
[62] *Id*.
[63] Whitt, *Deference to Protocol*, *supra* note 21, at 722.
[64] *Id*. at 707-08.
[65] Avri Doria, *Study Report: Policy Implications of Future Network Architectures and Technology* (Berlin Symposium on Internet and Society, Pre-Conference Draft, Oct. 2011), at 7–18 (available at https://www.hiig.de/wp-content/uploads/2012/04/Future-

creating the protocols focused more on the Net's design attributes (Bucket Two) rather than on generic impact elements like openness (Bucket One).[66]

The Internet can be seen as having four foundational design elements,[67] which are laid out in the IETF's Request for Comment 1958 (RFC 1958).[68] Stating that the Internet does in fact have an architecture, the document indicates "in very general terms" that "the goal is connectivity, the tool is the Internet Protocol, and the intelligence is end to end rather than hidden in the network."[69] Moreover, "modularity is good. If you can keep things separate, do so."[70]

My gloss on this explanation in RFC 1958 is that the Internet's architecture has a goal (the why) of connectivity, a tool (the how) of the Internet Protocol (IP), the intelligence (the where) residing end-to-end, and the scaffolding of layering (the what).[71] So, the four foundational design elements of the Internet are:

- ***Network of networks: Connectivity***: The defining characteristic of the Internet is "a relentless commitment to interconnection."[72] Shah, Sicker, and Hatfield suggest that openness is the ability to negotiate the terms of interconnection with another network provider, through a peering (peer-peer) or transiting (customer-provider) agreement, or as driven by regulation.[73] RFC 1958 sees Internet connectivity as "its own reward."[74]

Network-Architecture-Draft-Paper.pdf [https://perma.cc/26XK-VMRJ]); *see also* Whitt, *Deference to Protocol*, *supra* note 21, at 706.

[66] Doria, *supra* note 65.

[67] *See* Whitt, *Deference to Protocol*, *supra* note 21, at 706–22.

[68] B. Carpenter, *Architectural Principles of the Internet: RFC 1958*, IETF (June 1996), https://www.rfc-editor.org/rfc/pdfrfc/rfc1958.txt.pdf [https://perma.cc/659K-ZHNZ]; *see also* R Bush & D. Meyer, *Some Internet Architectural Guidelines and Philosophy: RFC 3839*, IETF (Dec. 2002) https://www.rfc-editor.org/pdfrfc/rfc3439.txt.pdf [https://perma.cc/7SRM-SWSH] (updates elements of RFC 1958, and introduces the "Simplicity Principle" that complexity is the primary mechanism impeding efficient network scaling).

[69] Carpenter, *supra* note 68 at 2.

[70] *Id.* at 4. This RFC elsewhere states that "constant change" should be viewed as the sole surviving architectural design principle. *Id.* at 1.

[71] Whitt, *Deference to Protocol*, *supra* note 21, at 706–16.

[72] Kevin Werbach, *Only Connect*, 22 BERKELEY TECH. L.J. 1233, 1236 (2007).

[73] Shah, Sicker & Hatfield, *supra* note 31, at 6–7.

[74] Carpenter, *supra* note 68, at 2.

- ***Smart edges: End-to-end principle***: The general proposition of the "end to end" argument is that the core of the Internet (the network itself) tends to support the edge of the Internet (the end user applications, content, and other activities).[75] RFC 1958 states that the intelligence is "end to end rather than hidden in the network," with most work "done at the fringes."[76] As a result, "end-to-end functions can best be realised [sic] by end-to-end protocols."[77]

- ***Agnostic protocols: IP***: The IP is the single protocol that constitutes the "Internet" layer" in the OSI stack.[78] The IP was designed to be an "open" standard so that anyone can use it to create new applications (from above) and networks (from below).[79] This built-in indifference engenders uniformity and seamless operations in a multi-vendor, multi-provider public network.[80]

- ***Law of code: Layering***: The use of layering means that functional tasks are divided up and assigned to different software-based protocol layers.[81] In practice, modularity promotes fair and open competition between and among providers of the different layers by allowing competitors to compete with products that will interoperate.[82]

Interestingly, none of these four design elements of the Internet by itself can be said to bring about "openness." In fact, the concept of openness is not mentioned at all in RFC 1958.

Shah, Sicker, and Hatfield suggest that, because some of the benefits attributable to the end-to-end (e2e) principle—end user control, flexibility, innovation, and the facilitation of competition—can be perceived as related to openness, the e2e principle constitutes "the broadest application of openness."[83] Nonetheless, the element-specific evaluation they undertook may be too narrow. Likely, it is more useful and true to the complex system nature of a network, like the Internet, to see openness as an emergent phenomenon that flows from the unique interplay

[75] Whitt, *Deference to Protocol*, *supra* note 21, at 709.
[76] Carpenter, *supra* note 68, at 2, 4.
[77] *Id.* at 3.
[78] Whitt, *Deference to Protocol*, *supra* note 21, at 715.
[79] *Id.*
[80] Carpenter, *supra* note 68, at 2.
[81] Whitt, *Deference to Protocol*, *supra* note 21, at 708–09.
[82] Shah, Sicker & Hatfield, *supra* note 31, at 13.
[83] *Id.* at 6.

of the four design elements.

3. Some Takeaways about the Openness of the Internet

The discussion above demonstrates how the components of the Internet merged into its current state: a form of standardized protocols, a consensual forum of creators, a format of inclusive processes, and a set of functionalities that empower those at the edge. However one interprets a design for openness in these four components, the end result is generally as an open network. In systems-speak, openness is an emergent phenomenon, spanning the myriad ways the different parts work together to create the experience of the whole.[84]

Shah, Sicker, and Hatfield also emphasize that the three primary standards bodies involved in the history of the Internet highlight different aspects:

- OSI: values open communications between systems via adherence to standards;
- IETF: stresses bottoms-up organization, participation, and access; and
- IEEE: favors vendor neutrality and wide distribution.

Back in 2003, the authors concluded that such philosophical differences between the standards bodies are "worthy of separate examination."[85] To this point, such an examination remains to be undertaken comprehensively across the four components of the Internet's form, forum, format, and function.

Of course, this overarching openness came about voluntarily, rather than through the realm of prescriptive government action. The next two sections will examine the openness concept as it has been an implicit and explicit part of the long-regulated telecommunications industry.

B. Open Telecommunications Networks

For hundreds of years, common carriage has been the defining regime for various types of networks. In a previous paper, I examined the three strands of common carriage in what I termed private concentration,

[84] Moreover, the Internet has become perhaps the quintessential General Platform Technology (GPT). *See* Whitt, *Deference to Protocol*, *supra* note 21, at 718–19.
[85] Shah, Sicker & Hatfield, *supra* note 31, at 11.

public callings, and voluntary bailment.[86] In turn, these were based on several interrelated reasons why policymakers have had concerns about the underlying network:

- *Scarcity*: Network is relatively scarce due to persistent market power.
- *Value*: Network is profoundly important due to the nature of the business.
- *Publicness*: Network relies on public resources.
- *Holding out*: Network has implicitly engaged in providing service.

An interesting point to note is how closely some of the openness elements explored here match with these historical concerns.

Beginning in the mid-1960s, the FCC began wrestling with fundamental questions concerning the growing convergence in the United States between the "modern-day electronic computer" and "communication common carrier facilities and services."[87] Jason Oxman observed in 1999 that "the openness of the telecommunications network, mandated by the FCC, provided an architecture over which the Internet could reach into a majority of American homes and businesses."[88] As Oxman notes, that openness of the U.S. telecommunications infrastructure has not been an accident.[89] Indeed, as we shall see, it has been overtly designed to achieve explicit goals.

Over the last fifty-plus years, the FCC has sought to come up with workable definitions, market-opening measures, and competition/consumer safeguards to address the dependency of the computer-based information services on the infrastructure-based telecommunications services. At times, the concept of "openness" has been front and center in those deliberations. Many (including this author) have written volumes about the regulatory space the FCC created during this especially frothy period of vast technology and market changes. Here, the treatment will be more by way of an impressionistic sketch, with the prism of openness hopefully providing useful insights moving forward.

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[86] Richard S. Whitt, *Evolving Broadband Policy: Taking Adaptive Stances to Foster Optimal Internet Platforms*, 17 CATH. U.J.L. & TECH. 417, 481–99 (2009) [hereinafter Whitt, *Broadband Policy*].

[87] Robert Cannon, *The Legacy of the Federal Communications Commission's Computer Inquiries*, 55 FED. COMM. L.J. 167, 170-78 (2003).

[88] Oxman, *supra* note 30, at 31.

[89] *See id.* at 7.

1. Part 68 Rules

In the industry battles over the FCC's definitional and market entry provisions in the telecom/information services space, many have overlooked the seminal role of the Commission's Part 68 rules. Through the 1950s and '60s, the Carter Electronics Company battled then-phone monopoly AT&T for the right to attach its devices to the phone handset. The "Hush-A-Phone," a rubber cup silencer that slipped over the telephone mouthpiece, was denied a place on the network. Initially, the FCC agreed with AT&T that the Hush-A-Phone device was "deleterious to the telephone system and injures the service rendered by it."[90] The D.C. Circuit overturned the Commission's decision, finding no demonstrated harm to the phone network.[91]

Tom Carter eventually returned to the scene with a complaint to the FCC after AT&T banned his latest device, the Carterfone.[92] AT&T claimed that this new device violated a federal tariff provision against non-telephone company equipment—"foreign attachments"—being connected to the network.[93] This time, in 1968, the FCC ruled against the phone giant.[94]

The Part 68 rules ultimately were adopted in 1975. For the first time, the FCC recognized the ability of third parties to directly place non-interfering Terminal Equipment (TE)—sometimes known as customer premises equipment (CPE)—onto the public switched telephone network (PSTN). The equipment in question needs to meet technical criteria for preventing four proscribed harms to the telephone company ("telco") network: (1) electrical hazards to telco personnel, (2) damage to telco network equipment, (3) malfunction of telco billing equipment, and (4) degradation of service to customers other than the user of the TE and its customers. Even if one or more of these technical criteria is not met, the equipment still can be connected indirectly via protective circuitry.[95]

The Part 68 rules are notable in several respects. The most obvious is that, for the first time, unaffiliated third parties had established federal rules allowing them to attach their equipment to the telephone network.

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[90] Hush-A-Phone Corp. v. United States, 238 F.2d 266, 268 (D.C. Cir. 1956).
[91] Werbach, *Computer Commission*, *supra* note 23, at 17-18
[92] *Id.* at 18-19.
[93] *Id.* at 19.
[94] *Id.* at 19-20.
[95] *See Frequently Asked Questions, Part 68*, FED. COMMCN'S COMM'N, https://transition.fcc.gov/wcb/iatd/part68faqs.pdf [https://perma.cc/G3KY-Z3LD].

Beyond that general right, however, is the fact that the FCC was endorsing what amounted to a "do no harm" standard, with any degradation limited to the customers' own terminal equipment. Importantly, explicit benefits need not be established in order to gain the right—access is deemed its own reward.

In addition to creating the overall right, the FCC's stated aim also was "to privatize both the TE technical criteria development process and the TE approval process."[96] Responsibility for these functions was transferred to standards bodies accredited under the organization and standards committee methods of the American National Standards Institute (ANSI). A separate body, the Administrative Council for Terminal Attachments (ACTA), was responsible for publicizing the criteria, maintaining a database of all approved TE, and establishing a labeling system.

At the same time, there was a distinct price to be paid for this new form of network openness. As Kevin Werbach points out, under the Part 68 process, those who introduce devices dependent on connections to communications networks must always receive permission, or at minimum tacit approval, ahead of time. "That permission comes either from the network owner or a government agency."[97] So while the substantive standard changed appreciably, and the forum shifted from the network to the FCC, and then to a private body, the obligation itself remained intact. Even indirectly, the FCC would be in the business of policing the interfaces between the telephone network and end user communications devices.[98] Unlike with the Internet, some permission would be necessary to proceed with device innovation.

The Part 68 rules also implicitly introduced the concept of, what I term, first and second order competition. This duality would run throughout the Commission's subsequent telecom/information services rulings. In this case, the "first order competition" was for the actual equipment itself: modems, fax machines, and other network add-ons. The "second order competition" would be facilitated in adjoining markets by this move and includes network access services, enhanced services content providers, applications providers, and the like. Whether understood at the time or not, this second order aspect of the Part 68 rules paved the way for enhanced service providers (ESPs) to attach dial-up modems and other

[96] *Id.* at 4.
[97] Werbach, *Computer Commission*, *supra* note 23, at 11.
[98] *Id.* at 5.

types of equipment. The first seeds of the dial-up ESP market were sown.

Do the Part 68 rules betray any explicit recognition of "openness" in nomenclature or concept? Perhaps not. And yet, in essence, AT&T at the time was arguing that its telecommunications network needed to be "closed" in order to protect it from outside "foreign" attachments. The Commission countered that some greater degree of openness to such third-party attachments struck a reasonable balance between risks to the network and benefits to the marketplace. The further adoption of technical criteria (rather than outright bans in tariff language) as the policing factor, and the reliance on standards bodies, also provides an interesting parallel in line with where the Internet pioneers ended up. Here, then, is a first inkling of the openness/enclosure concept, as played out in a regulatory analysis of the risks versus benefits involved in a particular set of network tradeoffs.

Werbach also observes that Part 68 represents a federal agency taking over a market function and defining interfaces between networks. Each interface by definition links two different technology platforms. In this case, one specifies what activity is to be permitted, and the other specifies what activity is to be required.[99] Arguably, modifying a failing market is better than ignoring its deficiencies, to the detriment of dependent sectors and players. But the questions are begged: from whose perspective should a network be perceived as open, and how should such openness be achieved? This theme also appears in other FCC proceedings related to telecommunications and broadband networks.

2. Computer Inquiries

The FCC's *Computer Inquiry* decisions mark an especially fascinating evolution within the construct of openness. Even as far back as the mid-1960s, the Commission had the prescience to recognize that computer-based services are different from communications services and that the former depend directly upon the availability of the latter. The Commission also recognized that the nascent computing industry needed the space to compete free from undue interference from two sources: government regulators and communications carriers.[100]

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[99] *Id.* at 20.

[100] Richard S. Whitt, *A Horizontal Leap Forward: Formulating A New Communications Public Policy Framework Based on the Network Layers Model*, 56 FED. COMM. L.J. 587, 597 (2004).

As time went on, a third goal became apparent: allowing providers of the underlying telecommunications services to compete in the unregulated information services sphere, in effect creating new forms of competition and innovation without unfairly impacting the existing competitive information services market. But the overall objective was to benefit the competitive computer networks by creating an "open communications platform" that would be available to all users on a non-discriminatory basis.[101]

As we shall see, the conceptual evolution took several decades over many different political administrations of the agency. Generally speaking, the Commission utilized a mix of "separating out" implements to accomplish the three interrelated purposes of protecting ESP reliance on telco networks, preventing telco/government interference to ESPs, and promoting telco market entry. These purposes were driven largely by regulatory definitions and entailed various forms of what the Commission called "safeguards." This history is important to understand because eventually the wording and concept of openness became intertwined with these various regulatory regimes. For example, establishing safeguards that relied upon clear definitional lines between basic regulated services and unregulated enhanced services was tantamount to creating and sustaining "openness."[102]

The *Computer I* string of decisions sought to define which monopoly services should be subject to common carrier-style regulations

[101] Cannon, *supra* note 87, at 180.

[102] The FCC took other concrete steps during the 1980s and 1990s to help protect and promote the "nascent" enhanced services market. For example, the Commission in 1983 adopted the "ESP exemption" from above-cost per-minute carrier access charges, defining ESPs as end user of local network access services. *See, e.g.*, MTS and WATS Market Structure, CC Docket No. 78-72, Memorandum Opinion and Order, 97 FCC 2d 682, 711 (1983) (MTS/WATS Market Structure Order) ("[a]mong the variety of users of access service are . . . enhanced service providers"); Amendments of Part 69 of the Commission's Rules Relating to Enhanced Service Providers, CC Docket No. 87-215, Order, 3 FCC Rcd 2631 (1988) (ESP Exemption Order) (referring to "certain classes of exchange access users, including enhanced service providers"); Amendments of Part 69 of the Commission's Rules Relating to Enhanced Service Providers, Order, 2 FCC Rcd 4305, 4306 (1987) (ESPs, "like facilities-based interexchange carriers and resellers, use the local network to provide interstate services"); Access Charge Reform, CC Docket No. 96-262, FCC No. 97-158, First Report and Order, 12 FCC Rcd 15982, 16131-32 (1997) (Access Charge Reform Order) ("Information service providers may use incumbent LEC facilities to originate and terminate interstate calls."). As in other cases, the FCC employed its power of definition to carve the ESPs out of the long-distance carrier charging arrangements. *Id.*

from competitive services that should not. It so happened at the time that "pure communications" services were the monopoly services, while "pure data processing services" were the competitive services. The Commission adopted a third category of "hybrid services" that involved both communications and data processing; these would be classified on a case-by-case basis. *Computer I* also utilized what Kevin Werbach has called "a quarantine strategy" for data services.[103] With the carrier acting as both supplier and potential competitor to the data services market, the Commission was concerned about discrimination incentives. So, the agency adopted its "Maximum Separation" safeguards. This included fully separate subsidiaries for carriers to enter the data processing market.

Beginning in 1976, the *Computer II* decisions moved away from the three-headed definitional approach and instead adopted its now-famous basic/enhanced dichotomy. This bright-line test employed a layered model of regulation, inspired by the technical reference models of OSI and the ISP protocols stack.[104] Along with the reference design came the notion of classifying services based on the nature of the activity involved.

Further, the modular concepts introduced broadly in the 1970s and 1980s by OSI and IP brought the idea that layers, and the interfaces between, help foment openness to the network for the benefit of users and third parties. In Robert Cannon's words, "the underlying layer is made into an open communication platform available to all."[105] So, what was defined as a basic service required an interface between the (assumed closed) network and what was defined as an (assumed open) enhanced service. The concept of layered interfaces may prove useful to the concerns in Part VI about networked emerging platforms.

These definitions also were explicitly linked to the perceived need for structural safeguards. This required the telephone carriers to offer their data services via a separate affiliate, which in turn would provide non-discriminatory access to the underlying communications components. This step would help avoid discriminatory conduct and cross-subsidization of competitive activities by monopoly services.

So, in one respect, the basic/enhanced definition helped enable what Cannon has called "border regulations" between markets, where "the

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[103] Kevin Werbach, *The Network Utility*, 60 DUKE L.J. 1761, 1810 (2011) [hereinafter Werbach, *Network Utility*].
[104] Cannon, *supra* note 87, at 195.
[105] *Id.* at 197.

division between the markets can be easily discerned and maintained."[106] The ESP "equal access" requirement meant that, from the user side, non-discriminatory access would be granted to the underlying basic telephony network through "unbundling" and providing on equal terms the underlying basic transmission services. The FCC viewed this as a "structural constraint" on the potential for abuse by controlling access to and use of the underlying transmission facilities.[107]

Starting in 1985, the *Computer III* decisions for the most part maintained the basic/enhanced definitional distinctions. However, the agency began moving away from structural separation to what was considered a less regulatory approach: functional separation. For the first time, the incumbent local telephone companies (the telcos) could provide basic and enhanced services on a structurally integrated basis. The price for this new freedom, in addition to the adoption of accounting mechanisms and other "nonstructural" safeguards, was the requirement to open up the local telephone plant.

The Commission initially directed the Bell Companies to submit Comparably Efficient Interconnection (CEI) plans, detailing what services and functionalities the BOC was providing to its affiliated ESP. Those same services and functionalities were required to be provided on nondiscriminatory terms and conditions to non-affiliated ESPs. The BOCs then would submit plans to unbundle their local access networks into basic building blocks—Basic Serving Arrangements (BSAs) and Basic Service Elements (BSEs)—and make them available to ESPs to build new services. In this Open Network Architecture (ONA) regime, network interfaces and nondiscriminatory practices replaced corporate structures. Cannon called it a "progressive experiment in opening up the communications bottleneck."[108]

Shah, Sicker, and Hatfield concluded that openness in the *Computer III* docket was defined as access to network elements, interoperability, and design, motivated to provide competitors (ESPs) with the elements perceived as necessary to build information services. However, the form of *Computer III* openness was not limited to the ESPs. In addition to unbundling the basic telephone access network to the benefit of ESPs and others, the Commission in parallel was "opening up" opportunities for the telcos to compete in a structurally integrated

[106] *Id.* at 180.
[107] *Id.* at 192-93.
[108] *Id.* at 203.

fashion.[109] Theoretically, the openness would operate in both directions. The reality was not so clear-cut.[110]

In summary, the Commission's *Computer Inquiry* implements can be broken out as follows:

- Network access for ESPs: definitional insulators, functional safeguards
- Market insulation for ESPs: definitional insulators, behavioral safeguards
- Market entry for ILECs: structural safeguards, functional safeguards, behavioral safeguards

Finally, the *Computer Inquiry* decisions also continued the first order/second order competition distinction first evidenced in the Part 68 rules. While ESP competition was the avowed aim, the follow-on benefits to related sectors for content, applications, devices, and other data services clearly were also part of the Commission's thinking.

3. Telecommunications Act of 1996

The crucial legal backdrop of the Modification of Final Judgment (MFJ) was a U.S. government antitrust lawsuit against AT&T. The 1982 breakup of AT&T led to the 1984 MFJ, which included a blanket line-of-business quarantine on Bell Operating Companies (BOCs) in the CPE and information services markets.[111] The MFJ mandated functional and structural separation between local and long-distance services, as well as between telecommunications and information services.[112] By 1991, through a series of waivers and modifications, the BOCs were able to

[109] For a definitive overview of the interplay between ISPs and ILECs under the various Computer Inquiry regimes, see Robert Cannon, *Where Internet Service Providers and Telephone Companies Compete: A Guide to the Computer Inquiries, Enhanced Service Providers and Information Service Providers*, 9 CATH. U.J.L. & TECH. 49, 50 (2001).

[110] Kevin Werbach has labelled the ONA process "a failure" because it proved contentious in practice. Werbach, *Network Utility*, *supra* note 103, at 1831 n.322. The Ninth Circuit ultimately vacated the ONA rules in 1994, on the basis that the Commission had failed adequately to demonstrate they were an effective substitute for the structural separation requirements of *Computer II*. *Id.* Interestingly, that vacated decision has not yet been squarely addressed by the agency. *Id.*

[111] Joseph D. Kearney, *From the Fall of the Bell System to the Telecom Act: Regulation of Telecommunications Under Judge Greene*, 50 HASTINGS L.J. 1395, 1412–19 (1999).

[112] *Id.* at 1412–46.

enter the interstate information services market.[113]

Eventually, Congress adopted the Telecommunications Act of 1996, the first major overhaul of the Communications Act of 1934. At the time, the new statute was seen as a way to foment facilities-based competition in the local telephony markets, while providing a vehicle for the BOCs to enter the long-distance market.[114] In now-familiar parlance, Congress sought to "open up" the local and long-distance markets to further competition.[115] In doing so, the Act required the Bell Companies to abide by both structural (non-accounting) safeguards and accounting (non-structural) safeguards.[116] Through a series of proceedings and various waivers, most of these restrictions eventually were lifted, in the recognition of a shifting balance between market insulation for providers of information services and market inclusion for monopoly carriers of telecommunications services.

Shah, Sicker, and Hatfield posit that the drafters of the Telecommunications Act of 1996 saw openness as providing access to incumbent unbundled network elements ("UNEs"), motivated to provide competitors with the elements necessary to build information services.[117] This suggests that Congress was informed, if not directly influenced, by FCC thinking about forms of separation and other safeguards. In particular, the unbundled network elements regime of Section 251 mirrors the *Computer III* ONA/CEI modular models.

4. Wireless Spectrum

Regulation of the U.S. wireless telephony market evolved separately and differently from the wireline telephony market. Nonetheless, many of the concepts are the same. For example, the FCC has assumed authority over radio frequency emissions to define technical standards for "unintentional radiators," such as personal computers.[118]

The concept of openness has been expressly introduced into the wireless space. As one notable example, the FCC in 2007 sought to establish the license conditions for the auctioning of the 700 MHz

[113] *Id.* at 1441–46.
[114] *Id.* at 1454–58.
[115] *Id.*
[116] *Id.* at 1458.
[117] Shah, Sicker & Hatfield, *supra* note 31, at 3–4.
[118] Werbach, *Computer Commission*, *supra* note 23, at 5.

spectrum bands, including the so-called "C-Block."[119] Then-Chairman Kevin Martin was promoting the idea of facilitating a third broadband "pipe" into the home and saw the 700 MHz auction as offering the opportunity to enable the emergence of a nationwide wireless broadband competitor.[120] As the Commission was contemplating the specific rules that would govern the C-Block, Google submitted an *ex parte* letter in the proceeding asking the agency to establish the C-Block as an "open platform."[121] The letter noted that open platforms in the communications environment can take several different forms, "each introducing varying degrees of 'openness' into the larger system based on where and how the platform is placed within the modular layers of the network."[122]

Google specified the need for service requirements to govern four different platforms: open applications, open devices, open services, and open access:

- The *open applications platform* would give end users the ability to download and utilize software applications, content, and services. The letter noted this "no blocking" requirement was akin to the longstanding *Carterfone*/Part 68 rules applicable to the wireline network.[123]
- The *open devices platform* would enable end users to utilize handheld communications devices with the desired wireless network. The parallel was drawn here to the then-pending cable set-top box proceeding.[124]
- The *open services platform* would allow third parties to acquire wireless service on a wholesale basis. This request mirrored the simple resale requirement originally developed for the long-distance industry.[125]

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[119] Federal Communications Commission, Second Report and Order, WT Docket No. 06-150, FCC 07-132, adopted July 31, 2007, at para. 7 ("FCC 700 MHz Rules Order").

[120] Statement of Chairman Kevin J. Martin, accompanying FCC 700 MHz Rules Order, at 1.

[121] Letter from Richard S. Whitt, Telecom and Media Counsel, Google Inc., to Marlene H. Dortch, Fed. Commc'ns Comm'n, (July 9, 2007) [hereinafter Google ex parte letter]. The author of that letter and other contemporaneous Google filings is also the author of this paper. *See also* Richard Whitt, *The Promise of Open Platforms in the Upcoming Spectrum Auction*, GOOGLE PUB. POLICY BLOG, (July 10, 2007) https://publicpolicy.googleblog.com/2007/07/promise-of-open-platforms-in-upcoming.html [https://perma.cc/R86X-RQRT].

[122] Google ex parte letter, *supra* note 121, at 5.

[123] *Id.* at 5–6.

[124] *Id.* at 6–7.

[125] *Id.* at 7.

- The *open networks platform* would allow independent ISPs to interconnect their network facilities with the last-mile towers of wireless providers. The letter expressly pointed by reference to the open access requirement in the Computer Inquiries regime.[126]

In its letter to the Commission, Google expressly called out how the four conditions would facilitate two different types of competition and innovation. What Google labeled as "first order" competition would occur at the network layer, with the eventual licensee to build out and operate its wireless network. By contrast, "second order" competition would occur at the applications and content layers, where numerous entities—"software applications providers, content providers, device makers, Web-based entities, simple resellers, and mobile virtual network operators"—would be able to take advantage of the openness requirements to interact with the new broadband network.[127]

Ultimately, the Commission adopted the first two ("no blocking" and "no locking") of the four requested conditions,[128] and Google decided to participate in the auction.[129] Verizon Wireless eventually won the right to utilize the C-Block spectrum, "encumbered" by the two openness conditions.

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[126] *Id.* at 7–8.

[127] *Id.* at 4.

[128] *Serv. Rules for the 698-746, 747-762 and 777-792 MHz Bands, 22 FCC Rcd. 15289, at paras. 189-230 (2007), https://docs.fcc.gov/public/attachments/FCC-07-132A1.pdf* [https://perma.cc/6GD7-DHJ2]; News Release, Fed. Commc'ns Comm'n, FCC Revises 700 MHz Rules to Advance Interoperable Pub. Safety Commc'ns and Promote Wireless Broadband Deployment (July 31, 2007), https://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-275669A1.doc [https://perma.cc/K2B3-ZZVD]; *see also* Richard Whitt, *Signs of Real Progress at the FCC*, GOOGLE PUB. POL'Y BLOG (July 31, 2007), https://publicpolicy.googleblog.com/2007/07/signs-of-real-progress-at-fcc.html [https://perma.cc/AE5U-FBAG].

[129] In a subsequent filing, Google responded to criticism from AT&T and others by promising to actually participate in the auction up to the reserve price of $4.72 billion, should the four openness conditions be met. Google ex parte letter, *supra* note 121. Whitt later confirmed that Google's top priorities were the "no blocking/no locking" rules and that requesting the open services and open networks conditions amounted to regulatory tactics. *See* STEVEN LEVY, IN THE PLEX: HOW GOOGLE THINKS, WORKS, AND SHAPES OUR LIVES 223 (2011) ("Whitt explains that '[w]e figured if you asked for four, you might get two.'").

5. Some Takeaways about Open Telecom Networks

Stretching back nearly fifty years, the story of telecom regulation in the United States is one of exploring various ways to deliver the benefits of competition and innovation to consumers. Initially, the policymakers sought to regulate the services themselves, before shifting to a focus on the standards and interfaces and protocols (the inputs) to those services. That latter stage could be characterized as attempting to draw bright lines, based on the network functionality (what could be considered "functional openness").[130]

The functional openness approach appears to be informed by the notion that layered competition and innovation bring a number of important public interest benefits. Moreover, the various rulemakings appear to recognize both the value and the opportunity to pursue first order competition (the initial market) and second order competition (the follow-on markets).

Utilizing the adaptive governance formula mentioned earlier,[131] we can see how U.S. federal policymakers have parsed the facilitation of openness over the years:

- Forum: federal regulatory bodies and personnel (FCC, Congress, courts);
- Format: federal rulemaking and adjudication processes;
- Form: standardized physical, virtual, and informational interfaces; and
- Function: functional and structural separation between the regulated and the unregulated network layers, for various policy purposes.

Finally, as we have seen, openness at the FCC has been defined reactively and defensively, in response to a legacy of comparatively more closed networks. That defensive impulse has led to an affirmative desire for competition and user safeguards on nondiscriminatory terms.

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[130] One also could think of these components, whether physical network interfaces or spectrum bands, as regulated business inputs (RBIs).

[131] *See generally* Richard S. Whitt, *Adaptive Policymaking: Evolving and Applying Emergent Solutions for U.S. Communications Policy*, 61 FED. COMM. L.J. 483 (2009) [hereinafter Whitt, *Adaptive Policymaking*].

C. Open Broadband Access

The third bucket of telecom and information networks to explore is the broadband networks. In the broadband space, Shah, Sicker and Hatfield saw openness as an architectural design choice, driven either by regulation (of the ILECs) or technical and commercial motivations.[132]

In implementing the Telecommunications Act of 1996, the FCC initially concluded that the regulatory dichotomy of basic and information services essentially corresponded to the new statutory definitions of telecommunications services and enhanced services.[133] The Commission also found that the statutory term "advanced telecommunications capability" amounts to broadband services and fits the definition of telecommunications services, providing a basic transmission path from the end user to a service provider.[134] At the time, the ILECs were required to file interstate telecommunications tariffs for their DSL broadband services and unbundle their broadband networks to allow competing facilities-based providers to gain access to line and other capabilities.[135] The dial-up ESP world of the time can be viewed as constituting a type of "open access" regime that was extended by regulation into the broadband market.

As the 21st Century dawned, however, a new Commission had a different perspective. Through a series of decisions, the agency eliminated the *Computer III* unbundling and access requirements for ILEC broadband services and curtailed the unbundling regime for broadband elements.

1. Four Freedoms and One Policy Statement

In 2004, and again in 2005, two then-chairmen of the FCC came up with two different but related approaches to disciplining the market behavior of the incumbent broadband providers: Powell's bully pulpit and Martin's unenforceable policy statement. Both can be seen as representative of what could be considered "behavioral lite" safeguards—in other words, attempts to affect the market behavior of the broadband companies but without any actual regulations or enforcement mechanisms.

In February 2004, Chairman Powell gave a speech at the Silicon

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[132] Shah, Sicker & Hatfield, *supra* note 31, at 5.
[133] Cannon, *supra* note 87, at 191–92.
[134] Inquiry Concerning the Deployment of Advanced Telecomms. Capability, 13 F.C.C. Rcd. 14569, 15282 (1998).
[135] Werbach, *Computer Commission*, *supra* note 23, at 66.

Flatirons conference, where he announced the objective of "Preserving Internet Freedoms."[136] Chairman Powell lauded the Internet's "open architecture, which allows consumers to freely interact with anyone around the globe" and "has opened markets beyond the traditional geographic limitations."[137] To support "maintaining openness" on "the wide open seas" of the broadband-enabled Internet, Powell verbally challenged the broadband access providers to preserve four specified Internet freedoms: to access content, to use applications, to attach personal devices, and to obtain service plan information.[138]

Chairman Powell's Four Freedoms correlate in some fashion to the ways this paper has drawn out the various parameters of openness: access to information (transparency), access to network functionalities (first order competition), and access via the network to other functionalities (second order competition). Some have even suggested that these freedoms "mapped directly onto the FCC's open-access and nondiscrimination requirements from the *Computer Inquiries*."[139]

Notably, however, these particular elements of openness, as articulated by Chairman Powell, were directed only at the consumer. Nowhere does he address the potential need for preserving "Net freedom" by granting various degrees of functional openness to competing network providers, broadband ISPs, and providers of Internet applications and content. Openness elements on the consumer end of the broadband pipe presumably would suffice to protect those operating at the other end. Moreover, the freedoms were presented in classic "bully pulpit" format, with no suggestion of accountability or enforceability.

Barely sixteen months later, a new FCC Chairman took a different approach to the Powell Four Freedoms. As part of a decision deregulating the broadband ILECs, Chairman Martin included what he termed a "Policy Statement" containing "New Principles" to preserve and promote

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[136] Michael K. Powell, Chairman, Fed. Commc'ns Comm'n, Address at the University of Colorado School of Law Silicon Flatirons Symposium, Preserving Internet Freedom: Guiding Principles for the Industry, (Feb. 8, 2004), https://docs.fcc.gov/public/attachments/DOC-243556A1.pdf [https://perma.cc/AH9P-7HKA].

[137] *Id.* at 3.

[138] *Id.* at 3–6.

[139] Tom Struble, *The FCC's Computer Inquiries: The Origin Story Behind Net Neutrality*, MORNING CONSULT (May 23, 2017), www.morningconsult.com/opinions/fccs-computer-inquiries-origin-story-behind-net-neutrality [https://perma.cc/HCK6-6D3E].

the "open" nature of the public Internet.[140] This Policy Statement outlines four principles, the first three of which closely echoed the Powell formulation: consumers are entitled to (1) lawful content of their choice; (2) run applications and services of their choice; and (3) connect to the network of their choice with legal, non-harmful devices.[141] The fourth principle stated, "consumers are entitled to competition among network providers, application and service providers, and content providers."[142] That last statement expressly brought into play the desire for first and second order competition, but little other detail was provided.

As with the Powell Four Freedoms, the Martin Policy Statement on its face did not establish enforceable rules or otherwise attempt to promote functional openness.[143] In fact, Chairman Martin maintained his confidence that "regulation is not, nor will be, required."[144] This conclusion would be carried forward in an accompanying regulatory ruling.

2. Wireline Broadband Order

In August 2005, the FCC adopted its *Wireline Broadband Order*, which for the most part deregulated broadband services provided by the incumbent LECs.[145] That decision utilized the Commission's defining authority to now conclude that the ILECs' combined Internet access/broadband transmission services are a unitary information service and are thus outside the bounds of traditional common carriage regulation.[146] This definitional finding meant that third parties, such as broadband ISPs, are no longer granted functional access to broadband network facilities—either from the UNEs provided under the

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[140] News Release, Fed. Commc'ns Comm'n, FCC Adopts Policy Statement (Aug. 5, 2005) (https://docs.fcc.gov/public/attachments/DOC-260435A1.pdf [https://perma.cc/FU5Q-H9TE]).
[141] *Id.*
[142] *Id.*
[143] News Release, Fed. Commc'ns Comm'n, Chairman Kevin J. Martin Comments on Comm'n Policy Statement (Aug. 5, 2005), https://docs.fcc.gov/public/attachments/DOC-260435A2.pdf [https://perma.cc/VWQ9-7EVU] ("Policy statements do not establish rule nor are they enforceable documents . . . .").
[144] *Id.*
[145] FED. COMMC'NS COMM'N, FCC NO. 05-151, APPROPRIATE FRAMEWORK FOR BROADBAND ACCESS TO THE INTERNET OVER WIRELINE FACILITIES (2005) [hereinafter WIRELINE BROADBAND ORDER].
[146] Werbach, *Computer Commission*, *supra* note 23, at 67–68.

Telecommunications Act of 1996 or the access/unbundling requirements derived from *Computer III*. To the extent that openness previously was seen as including access to portions of the underlying basic transmission network, this redefinition eliminated that understanding.

The stated rationale for the shift in definition/policy was the competition between the cable broadband networks and telephony broadband networks, and the high likelihood of additional facilities-based market entrants such as broadband over powerline (BPL).[147] Shah, Sicker, and Hatfield surmised that the Commission's rationale for this critical change was that only by fully controlling both traffic and content over the networks could the broadband carriers reap the profits necessary to finance the upgrades of their infrastructure.[148] Such a conclusion does have some basis in network economics.[149]

While this author and others have criticized the factual and conceptual foundations of the *Wireline Broadband Order*,[150] those observations are not germane to this discussion. The salient takeaway is that the Commission was backing away from its previous reliance on the "access to networks" element in its overall openness strategy. And it did so through redefining Internet access over broadband.

3. Network Neutrality

With the elimination of the definitional, structural, and functional openness requirements in the *Computer Inquiry* decisions, the broadband providers appeared to have a clear path to begin providing online services on their own terms. And yet, that window of opportunity did not last long. In an October 2005 interview with Business Week, AT&T President Ed Whitacre delivered a warning that the large Internet companies of the day should expect to pay the phone companies for the broadband access

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[147] WIRELINE BROADBAND ORDER, *supra* note 145, at 27–38.

[148] Shah, Sicker & Hatfield, *supra* note 31, at 4–5.

[149] *See, e.g.,* Whitt, *Broadband Policy*, *supra* note 86, at 487–89 (discussing likelihood of "ruinous competition" should multiple facilities-based broadband competitors enter the market).

[150] *See., e.g.,* Richard S. Whitt & Stephen J. Schultze, *The New "Emergence Economics" of Innovation and Growth, and What It Means for Communications Policy*, 7 J. TELECOMM'S & HIGH TECH. L. 217, 291–96 (2009) (agency relied on inadequate record evidence, utilized an overly-narrow cost/benefit analysis, misunderstood the nature of market incentives, misapplied its own basic/enhanced definitional dichotomy, and leaned on its flawed predictive judgment); *see also* Whitt, *Broadband Policy*, *supra* note 86, at 476–81.

delivered to their customers.[151] To companies such as Google and Yahoo!, Whitacre's words constituted a unilateral power display: "Now what they would like to do is use my pipes free, but I ain't going to let them do that because we have spent this capital and we have to have a return on it. So there's going to have to be some mechanism for these people who use these pipes to pay for the portion they're using . . . . Why should they be allowed to use my pipes? The Internet can't be free in that sense, because we and the cable companies have made an investment and for a Google or Yahoo or Vonage or anybody to expect to use these pipes free is nuts!"[152]

At the time Whitacre made that statement, those same Internet companies believed they had no formal leverage over the broadband providers. Just a few months prior, as we have seen, the FCC had defined away the regulatory avenues previously available to gain "open" access to the ILEC networks. The Whitacre statements increased the concerns of the "OTT" companies to a "fever pitch."[153]

Some three years prior, academic Tim Wu had described the potential need for regulation to protect against the broadband companies' anti-consumer behavior.[154] While this initial analysis of what he first called "network neutrality" had some conceptual sway, the Whitacre interview provided rich empirical fodder for the Internet companies to actually mobilize. So, in many ways the inter-industry network neutrality battle began not with Tim Wu's 2002 academic paper on the topic but with the 2005 demise of the *Computer Inquiry* rules for broadband networks.[155]

Since the passage of the Telecommunications Act of 1996, Congress largely remained silent on the telecom regulatory front. In 2006, a new package of deregulatory telecom measures were considered by the Senate Commerce Committee. The Internet companies and their DC allies saw a rare window of opportunity and made the strategic decision to push

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[151] *Online Extra: At SBC, It's All About "Scale and Scope,"* BUS. WEEK (Nov. 7, 2005, 12:00 AM), www.bloomberg.com/news/articles/2005-11-06/online-extra-at-sbc-its-all-about-scale-and-scope [https://perma.cc/R4VV-Z5WV].

[152] Arshad Mohammed, *SBC Head Ignites Access Debate*, WASH. POST (Nov. 4, 2005), http://www.washingtonpost.com/wp-dyn/content/article/2005/11/03/AR2005110302211.html [https://perma.cc/N57V-6V64].

[153] Wade Roush, *The Origins of the Net Neutrality Debate*, MIT TECH. REV. (July 8, 2006), https://www.technologyreview.com/s/406079/the-origins-of-the-net-neutrality-debate [https://perma.cc/88TC-FDBJ].

[154] Timothy Wu, *Network Neutrality, Broadband Discrimination*, 2 J. TELECOMM'S & HIGH TECH. L. 141 (2003).

[155] *See id.*; Struble, *supra* note 139.

for the next best thing to the functional openness inherent in the *Computer Inquiry* safeguards: the behavioral remedy of network neutrality. Google and others introduced the network neutrality concept into the ongoing Hill debate, the telecom deregulation legislation eventually stalled, and a new partisan political battle was born.

Soon enough, mandates access to broadband networks became a language game in which regulatory definitions drove policy outcomes. The wording employed to describe a particular regulatory concept is all-important. Cannon warned years ago that the layered model embedded into the basic/enhanced dichotomy helps avoid "a mushed view of communications, when the differences between applications and the physical network cannot be perceived."[156] Oxman similarly pointed out that openness of the telecommunications network is not the same as openness of the data markets.[157] Both authors seemed to indicate that stacking concepts onto new words could prove troublesome.

Yet despite these warnings, we now live in an age of unclear words and meanings. For example, some (including the author) have called out the tech sector for a tendency to over-rely on easy sloganeering in place of educating policymakers on the important technical details of the Internet.[158] As this political advocacy unfolded, so did the nomenclature: broadband access became network neutrality, which was shortened to "Net" (as in Internet) neutrality, which then became open Internet. The original focus on accessing a functionally open broadband network turned into maintaining the neutrality of the underlying broadband network, then mimicking the supposed neutrality of the Internet, until finally morphing into protecting the very openness of the Internet. One end of the broadband pipe eventually became synonymous with the other.

The evolving uses of these phrases, mixed with the regulatory overhang of dreaded notions like "common carriage," resulted in many deliberate misconceptions and inadvertent confusions. Some of these inaccuracies are addressed in a previous paper.[159] To wit:

- Broadband connectivity does not equate to Internet access.
- Access to the Internet is not the same thing as the Internet.
- Regulating access to the Internet is not regulating or applying Title II to the Internet.

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[156] Cannon, *supra* note 87, at 205.
[157] Oxman, *supra* note 30, at 31.
[158] Whitt, *Deference to Protocol*, *supra* note 21, at 696.
[159] *See* Whitt, *Broadband Policy*, *supra* note 86, at 427–32.

- The issue is not about the neutrality of the Internet.

One imagines that the forces of pro-network neutrality saw good reasons to adopt the "open Internet" moniker for their advocacy purposes. However, while undoubtedly more evocative, the phrase conflates broadband access with the Internet as a platform of countless networks.

There should have been no great surprise, then, when the FCC decided to use that same conflation for its own purposes. The December 2017 "Open Internet" order touts the successful goals of "restor[ing] Internet freedom" and "honoring a bipartisan commitment to a free and open Internet."[160] Where network neutrality advocates focused on the free and open Internet from the user's vantage point, the FCC and broadband ISPs co-opted the phrase to describe both their own "freedom" to be "open" to pursue commercial arrangements and their end user customers' freedom to receive new services. Given the vague and undefined nature of the term "openness" as used in public debates, opponents of network neutrality were able to adopt, with ease, the term to suit their own advocacy.

One troubling outcome of these language games is that we may end up over- or under-regulating segments of the tech sector based on misapprehensions about the impact of our actions on networks and markets. Meanwhile, actual online users become lost in the haze. Each side presumes to speak on behalf of the best interests of the Internet and its users. However, the openness that may be taken away (or restored) by network neutrality's demise has been defined by only two sides of the network: the broadband provider/ISP and the other online entities of the Internet. The interests of the end user tend to be squeezed out. In future conversations about the crucial role of broadband platforms, what will openness look like for those who seek access to the Internet?

4. Some Takeaways from the Open Broadband Debates

First, while much of the recent inter-sector contest has been over the regulatory jurisdiction and enforcement hook in the statute, both sides have also contested the substance of the "access to resource" requirement—namely, the blocking, degrading, and prioritizing of Internet

[160] Restoring Internet Freedom, WC Docket No. 17-108, Declaratory Ruling, Report and Order, and Order, 33 F.C.C. Rcd. 311, at para. 1 (2018), https://www.fcc.gov/restoring-internet-freedom [https://perma.cc/498U-X5PY].

traffic. These same concerns directed towards nondiscriminatory treatment by network operators drove much of the FCC's past regulatory actions in the telecommunications policy space, from *Carterfone* to *Computer III*.[161]

Second, since 2005, the Commission has made no bones about moving away from the multiple ISPs architecture of the *Computer Inquiry* proceedings to a single, "bundled" ISP model (telecommunications network access plus information services network access).[162] By utilizing its power of statutory definition, the Commission has shifted the boundary line for competition further upward in the protocol stack.

Third, this string of regulatory decisions makes clear that "it is very difficult to reverse an already adopted technical architecture once the infrastructure is built and investment is made."[163] The Commission's decisions regarding the deployment of broadband access networks have created a path dependency that likely would make it challenging to envision reversing course and heading back to a more rigorous set of informational, behavioral, functional, and structural safeguards.

Fourth, and relatedly, while prior industry battles hinged on definitional distinctions that carried structural and functional implications, the network neutrality debate has always centered on the imposition of what I have termed a behavioral remedy. Arguably, while behavior may be easier to shape than the structural separation of functional interfaces, it is also easier to evade. By contrast, the functional approach—interfaces, standards, and protocols—whether treated as safeguards, and/or as market entry mechanisms, has a better chance of surviving effectively.

Finally, there is a small irony that, as we have seen, both sides of the broadband access debate have used regulators and would-be regulators as their chosen implements. Business models largely reliant on policymaker action (or inaction) should be held as all but ephemeral, regardless of which side of the debate one occupies. Functional remedies such as software interfaces, once adopted in the market, are more difficult to dislodge than a regulation unwanted by a politically strong industry sector. Interfaces typically outlast politics.

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[161] *See* discussion *supra*, Sections II-III.

[162] *See* John Blevins, *A Fragile Foundation—The Role of "Intermodal" and "Facilities-Based" Competition in Communications Policy,* 60 ALA. L. REV. 241 (2008).

[163] Shah, Sicker & Hatfield, *supra* note 31, at 5.

VI. OPEN PLATFORMS

Hopefully, this regulatory background demonstrates how openness is a meaningful paradigm that applies to various types of networks. As it turns out, the openness concept can be extended forward and outward to other layers of the Internet, such as networked emergent technology (NET) platforms.

A. From Networks to Platforms

It is safe to conclude that we are in the midst of the NET platforms era. While defining precisely what that means remains an "open" question, the impact of these technologies on society cannot be denied. It is useful first to consider the historical and economic roots of the typical platform.

1. The History of Platforms: Agoras Through the Ages

For thousands of years, economic markets were primarily physical and local. Buyers and sellers connected through innovations like farmers' markets and trade exchanges. In ancient Greece, the agora also served a wider societal function as a gathering place for commerce, politics, discourse, and entertainment.

In time, this connectivity function became its own successful business model. These exchanges do not necessarily (or solely) produce goods or distribute services of their own; instead, their primary value is their ability to directly connect different customer groups and enable transactions.[164] In short, they are useful platforms for carrying out commerce.

While prevalent throughout history, these market exchanges have only recently received serious attention in the economic literature. Noted French economist and Nobel-winner Jean Tirole formalized research efforts back in 2002. He first used the phrase "multi-sided markets" in his analysis of modern-day platforms such as the credit card business.[165] Since then, the term "multi-sided platform" (MSP) has gained general uptake.

It turns out that precisely defining what a platform is can be

[164] LAURA CLAIRE REILLIER & BENOIT REILLIER, PLATFORM STRATEGY: HOW TO UNLOCK THE POWER OF COMMUNITIES AND NETWORKS TO GROW YOUR BUSINESS 4 (2017).

[165] *See* JEAN TIROLE & STEVEN RANDALL, ECONOMICS FOR THE COMMON GOOD 378–400 (2017).

surprisingly difficult. Some use the term to describe the foundation of a product, such as an automotive chassis platform. Others refer to a broad-based technology, like the Intel platform. Another group employs the term to talk about economic transactions, such as the eBay online platform.[166] Initially, it may be useful to think broadly about a platform as a nexus of standardized rules and infrastructure that facilitates interactions among different users of physical and virtual networks.

Reillier puts it squarely into a narrower, commercial context: platforms are "businesses creating significant value through the acquisition, and/or matching, interaction, and connection, of two or more customer groups to enable them to transact."[167] Examples include malls, which link consumers and merchants, and newspapers, which connect subscribers and advertisers. They also include operating systems, game consoles, payment systems, ride-share platforms, smart grids, healthcare networks, and social networks. If a network is a type of system, a platform can be considered one type of network.

The critical asset in a platform is the community, which includes its members' resources. The more traditional pipeline model includes an enterprise that relies on a supply-chain to deliver goods and services to consumers in a retail market. When an entity decides to move instead to a platform model, three fundamental shifts in focus occur:

- From controlling scarce and valuable resources, to orchestrating community resources;
- From optimizing and dictating internal processes, to facilitating external interactions; and
- From increasing customer value, to maximizing total ecosystem value.[168]

Similarly, the platform-powered ecosystem is a business comprised of a mix of business models, including platforms. Why then move from the traditional pipeline to a platform mentality? Perhaps because, as Van Alstyne and his colleagues have found, when platforms decide to enter into a market that relies on the pipeline business model, "the platforms

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[166] REILLIER & REILLIER, *supra* note 164, at 21–22.

[167] *Id.* at 21–28.

[168] *See* GEOFFREY G. PARKER ET AL., PLATFORM REVOLUTION: HOW NETWORKED MARKETS ARE TRANSFORMING THE ECONOMY—AND HOW TO MAKE THEM WORK FOR YOU (2017); *see also* Marshall W. Van Alstyne et al., *Pipelines, Platforms, and the New Rules of Strategy*, HARVARD BUS. REV. (April 2016), https://hbr.org/2016/04/pipelines-platforms-and-the-new-rules-of-strategy [https://perma.cc/6C3V-QHHZ].

virtually always win."[169]

Apple's iPhone is an example of a platform designed to facilitate a classic two-sided market for app developers and app users. The growth in participants on both sides of the market led to sizable networks effects, a key part of platform strategy. These demand-side economies of scale mean that firms attracting more platform participants than their competitors can offer a higher average value per transaction. The resulting virtuous feedback loop of greater scale generates more value, which attracts more participants, which creates more value, and so on, in an iterative fashion.[170]

2. The Economics: Data Harvesting Meets Network Science

Over the past twenty years, most public attention has focused on the economic shift from the physical to the digital world, as abetted by the Internet—a virtual platform in its own right.[171] However, another profound economic shift has occurred in tandem: from traditional linear markets to multi-sided, digital platform markets.[172]

In particular, two-dimensional pipeline business models (buyers and sellers) are being transformed into multi-dimensional commercial platforms and ecosystems. These new platforms constitute a novel type of commercial firm, which use digital infrastructure to enable groups to interact. The digital era, with its ubiquitous computing power, widespread online access, and growing roles for mobile and environmental devices, presents unprecedented opportunities to expand and deepen the world's access to information.

As with defining platforms more generally, deciding which entities fit in the multi-sided platform (MSP) bucket is not an easy task. Nick Srnicek identifies four key characteristics. A MSP: (1) positions itself as an intermediary between users and the ground upon which its activities occur; (2) produces and is reliant on network effects; (3) uses the cross-

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[169] Van Alstyne et al., *supra* note 168.

[170] *Id.*

[171] The Internet is a classic General Platform Technology (GPT), a generic technology that over time comes to be widely used across the economy, enables many different and innovative uses, facilitates complementarities with existing and emerging technologies, and produces many spillover effects. Whitt, *supra* note 19, at 718. The GPT concept may have some relevance as we walk through a discussion of cloud computing and online data platforms.

[172] REILLIER & REILLIER, *supra* note 164, at 12.

subsidization of different services; and (4) controls the rules of governance of interactions.[173] Harold Feld of Public Knowledge produced a three-pronged test of his own for what he calls "digital platforms"—they (1) provide a two-sided or multi-sided market, (2) are accessed via the Internet, and (3) have at least one side that is marketed as a "mass market" service.[174] For purposes of this paper, there is no compelling need to settle on any one particular formulation. Instead, this paper employs the generic term "NET platform" to describe these multifaceted online structures and processes utilized by networked emerging technologies.

From a functional standpoint, NET platforms can be considered a combination of various Internet overlays (Web portals, mobile applications, computational systems) and underlays (networks, clouds, personal devices, sensing devices). These elements are mixed with large amounts of data: information derived from users' fixed, mobile, and online activities; various "offline" activities (collected via environmental, IoT, and robotic mechanisms); and data inferred by machine learning algorithms.

Commenters have observed that some of these NET platforms exhibit significant scale, scope, and reach.[175] Much of this phenomenon can be explained by network science and the rise of the Internet. Some twenty years ago, the original prognosticators, Carl Shapiro and Hal Varian (now chief economist at Google), recognized and described a new economy arising out of online information services taking advantage of various benefits from the open Internet.[176] Some of these economic factors include:

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[173] NICK SRNICEK, PLATFORM CAPITALISM 43–48 (2016).

[174] Harold Feld, *Platform Regulation Part II: Defining "Digital Platform"*, PUBLIC KNOWLEDGE (July 18, 2018) www.publicknowledge.org/news-blog/blogs/platform-regulation-part-ii-defining-digital-platform [https://perma.cc/9KSK-LJ37].

[175] *See* ANDREW MCAFEE & ERIK BRYNJOLFSSON, MACHINE PLATFORM CROWD (2017); SRNICEK, *supra* note 173; REILLIER & REILLIER, *supra* note 164; PARKER, ET AL, *supra* note 168; ALEX MOAZED & NICHOLAS L. JOHNSON, MODERN MONOPOLIES (St. Martin's Press 2016); SANGEET PAUL CHOUDARY, PLATFORM SCALE (2015); AMRIT TIWANA, PLATFORM ECOSYSTEMS (Andrea Dierna ed., 2014).

[176] CARL SHAPIRO & HAL VARIAN, INFORMATION RULES 11–14 (Harv. Bus. Sch. Press ed., 1999). Among other factors, Shapiro and Varian discuss the lock-in by legacy systems and switching costs for users from choosing a technology. *Id.* at 11–13. Network externalities are not limited to communications networks, but also are powerful forces in "virtual" networks. *Id.* They also appear in other networks-based enterprises, from postal services, railroads, airlines, and of course telephony. The key challenge is to achieve critical mass. *Id.* at 14.

- *Positive externalities*: All network users are better off when others join the network because its reach (and value) increases.
- *Positive feedback loops*: When positive externalities appear on both sides of a platform, positive feedback loops appear and amplify growth.
- *Economies of scale*: When the unit cost of production goes down with the volume of production; the largest company in a sector tends to enjoy the lowest cost base per unit. This is referred to as the supply side economy of scale.
- *Network effects*: Unlike traditional businesses, platforms often exhibit network effects: the value created for users goes up with the number of users. This is also known as demand-side economies of scale. Network effects can be direct (via users) or indirect (via third parties). In certain circumstances, network effects can be a significant barrier to entry for would-be competitors. As Shapiro and Varian point out, network effects do not necessarily indicate a meritocracy; technology launched by positive feedback also requires a healthy dose of luck.[177]
- *Critical mass*: When the growth of a network becomes self-sustaining.
- *Tipping point*: When the network, due to cumulative network effects, shift from one state (such as competition) to another state (higher concentration, including monopoly). [178]

Importantly, identifying these network-based economic effects—as provided by the open Internet and facilitated via relatively open telecommunications networks—should not dictate normative conclusions. To varying degrees, countless commercial and non-commercial ventures enjoy these network-based economic effects, to the collective benefit of many hundreds of millions of people. But there are countervailing concerns that might require societal attention.

B. Data Carriage: Back to the Future?

Online platforms can and do provide enormous benefits to society, due to the convergence of financial incentives, technology advances, and network science. These same factors also can lead to some challenges. As

[177] *Id.* at 177.

[178] REILLIER & REILLIER, *supra* note 164, at 31–38; PARKER, ET AL., *supra* note 168, at 82–83.

it turns out, these challenges have not gone unnoticed. Two notable examples bear mentioning below.

Again, this paper does not take a position on the merits of applying any specific types of openness measure to one or more of the NET platforms. Rather, the purpose is to observe that the societal concerns span the types of networks and platforms that exhibit certain technical, commercial, and economic characteristics.

1. Cloud Networks as Computer Utilities?

In the 1960s, the idea of time-sharing via large computers developed so that computer power could be harnessed and brought into the home, like electricity or water.[179] Author Tung-Hui Hu places modern-day cloud platforms within this infrastructural paradigm, "rooted in, and continuous with, the same landscape, environments, and architectures that have been used for centuries."[180] He even quotes Richie Etwaru who suggests that the cloud should no longer be considered a noun, but instead that "clouding" is best used as a verb.[181]

Others have noted the commonalities between past and present "clouds." In 2011, Kevin Werbach released his paper *The Network Utility*.[182] There, he drew parallels between the so-called "computer utilities" of the 1960s and the cloud computing platforms of today.[183] He noted that while networked computers need access to underlying communications utilities, networked computing platforms themselves can function as public utilities.[184]

Werbach observed that proponents of the computer utility model believed that computer processing could be as important to society as power and water.[185] He also noted that cloud computing is likely to produce the same kinds of dependencies that animated public utility regulation in other industries. In particular:

- Delivering applications through large remote data centers creates large economies of scale;
- Aggregating demand is a more efficient and high-performing

[179] TUNG-HUI HU, A PREHISTORY OF THE CLOUD 53–54 (The MIT Press ed., 2016).
[180] *Id.* at 148.
[181] *Id.* at 145.
[182] Werbach, *Network Utility*, *supra* note 103.
[183] *Id.* at 1815–18.
[184] *Id.* at 1816–19.
[185] *Id.* at 1817.

solution; and
- Cloud providers can capture and aggregate large volumes of user data.[186]

Werbach concluded that the FCC should broaden its focus to these evolving Internet platforms. To do so, he claimed the agency should relax its sharp distinction between regulated and unregulated services and "hone in on the major competitive, pro-innovation, and consumer-protection issues for a network of cloud services fed by communications carriers."[187]

Werbach's 2011 paper ticks off four major concerns for the FCC to investigate: nondiscriminatory access to connectivity (communications inputs), sufficient capacity and robustness, information governance (data privacy and integrity), and transparency. These concerns correspond well to the types of market-oriented openness explored here: namely, equitable access to network functionalities (first order access), equitable access through the network to other functionalities (second order access), and access to pertinent information (transparency).

2. "Dominant" Platforms as Essential Facilities?

In July 2018, U.S. Senator Mark Warner released the public policy equivalent of a bombshell: a 23-page draft white paper entitled *Potential Policy Proposals for Regulation of Social Media and Technology Firms*.[188] The Warner White Paper makes the case for new approaches to regulating dominant platform companies and divvies up the potential new duties into three overall buckets:

- *Disinformation duties*: duty to transparency, duty to label bots and to disclose online ads, duty to determine origin of posts/accounts, duty to identify inauthentic accounts, liability for state law torts (revising the intermediary liability provision in Section 230), and duty to provide access to public interest data.
- *Consumer protection duties*: an "information fiduciary" duty, GDPR-like data protection requirements, first party consent for data collection, ban on user interfaces determined to be unfair and deceptive trade practices, and algorithmic auditability standards.

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[186] *Id.* at 1821–22.
[187] *Id.*
[188] U.S. Sen. Mark Warner, *Potential Policy Proposals for Regulation of Social Media and Technology Firms*, AXIOS (Jul. 30, 2018), https://graphics.axios.com/pdf/PlatformPolicyPaper.pdf [https://perma.cc/UT4E-C9NH].

- *Competition duties*: data collection and use transparency, data portability requirement, mandated interoperability, and an "essential facilities" determination, including a nondiscrimination (FRAND terms and conditions) mandate.[189]

Strikingly, many of Warner's policy proposals mirror elements found in Title II of the federal telecommunications statute and the common carriage strands of private concentration, public callings, and voluntary bailment. These elements include:

- *Transparency*: analog to duty to provide users with service information;
- *Information fiduciary requirement*: analog to duty to protect user CPNI;
- *Data portability requirement*: analog to local telephone number portability;
- *Interoperability*: analog to Title II interoperability requirements;
- *FRAND terms and conditions*: analog to Title II nondiscrimination standard; and
- *Essential facilities classification*: analog to Title II common carriage.

The Warner draft does not define "dominance" or "dominant platforms." Nonetheless, individual companies—Facebook, Google, Twitter, Amazon, and Apple—are identified by name.[190] There is opportunity now to at least consider the possible need for and substance of such a definition. Recall, for example, that Joshua Cooper Ramo sees defining who is in and who is out of a particular network as an essential design feature of the early 21st Century.[191] To that end, Harold Feld recently coined the concept of the "Costs of Exclusion" (COE) from a platform ecosystem as a proxy for examining concerns that a particular NET platform may be dominant in harmful ways.[192] That may well be a start.

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[189] *Id.* at 1–5.
[190] *Id.* at 1.
[191] *See* RAMO, *supra* note 27, at 236.
[192] Harold Feld, *Cost of Exclusion as a Proxy for Dominance in Digital Platform Regulation*, PUBLIC KNOWLEDGE (July 19, 2018), https://www.publicknowledge.org/news-blog/blogs/part-iii-cost-of-exclusion-as-a-proxy-for-dominance-in-digital-platform-reg [https://perma.cc/8TM6-BTQV]. A companion Cost of Inclusion (COI) also could be a useful metric.

3. An Option: Encouraging More Trustworthy and Accountable Online Ecosystems

More will come of the Warner legislative proposal in the coming months. Such proposals tend to have the salutary effect of cracking "open" political, economic, and technological windows of opportunity. Perhaps these new ideas will have the opportunity to compete effectively in John Kingdon's so-called "garbage can" of policymaking.[193]

Both cloud computing and online data platforms raise legitimate questions about whether the Internet, contrary to its end-to-end, modular architecture, is fostering increasingly centralized and closed Web-based networks. One missing ingredient today appears to be basic human trust, an assurance that online interactions are founded on consent, accountability, and mutual benefit. With new technologies of data control now coming online—the Internet of Things, cloud computing, A.I. and machine learning, augmented reality, biometrics, and more—that existing trust and accountability deficit likely will get appreciably worse.

One approach to consider is to create a new Web ecosystem based on injecting greater legitimate trust and accountability into users' daily dealings with the open Internet. For example, the project known as *GLIAnet* seeks to create a more decentralized ecosystem of digital trust. [194] Briefly, the *GLIAnet* concept is premised on reconceiving a Web user's personal data as a virtual "*Lifestream*" of past practices, present actions, and future intentionalities. This rich and valuable dataset in turn could be shared voluntarily, in whole or in part, with new trustworthy entities, known as digital *TrustMediaries*. These entities, chosen by the user, would operate as digital interfaces between the user, the online NET platforms, and the Web. Other support elements in this user-driven ecosystem could include personal A.I. *Avatars*, individualized *Cloudlets*, self-sovereign Identity Layers (or *Personas*), and a host of distributed applications, devices, and services. Among other benefits, such an ecosystem could pose worthy market alternatives to the more intrusive "Ads+Data World" commercial model still underpinning many online platforms.[195]

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[193] JOHN W. KINGDON, AGENDAS, ALTERNATIVES, AND PUBLIC POLICIES 131 (1st ed. 1995).

[194] For further details, see Richard S. Whitt, GLIAnet: Building a Trustworthy and Open Web Ecosystem (Nov. 20, 2018) (unpublished manuscript) (on file with author).

[195] *Id.* Doc Searls has been prescient in advocating for what he calls the Intention Economy, where Web customers can drive demand via Vendor Relationship Management (VRM) tools. *See* DOC SEARLS, THE INTENTION ECONOMY (2012).

The "functional openness" paradigm described above relies on creating nondiscriminatory software interfaces to help "open up" various relatively closed network resources. In this instance, developing common standards and protocols, through open processes and entities, could ensure that *TrustMediaries* and other players in a *GLIAnet*-type ecosystem have viable opportunities to compete and provide innovative new options for users. In other words, it would be fruitful to explore creating a *Computer Inquiries*-like functional openness regime suitable for the online platforms era.

VII. DESIGNING FOR OPENNESS

We have seen the resource and process openness concept defined in various ways in the Internet context, played out through various regulatory regimes at the FCC, and becoming part of the regulatory conversation for NET platforms, including cloud computing and online data companies. The once seemingly-settled world of telecommunications and information services policy now seems topsy-turvy. What once was unregulated is now being considered for forms of "openness" requirements. What once was regulated has now been "opened" to a world free from such requirements. So, where do we go from here?

A. Past as Prologue

Are there actual principles of "openness"? If so, a key question is whether there are defining characteristics that unify the openness concept in designed networks and evolving platforms. Recall, for example, that Shah, Sicker, and Hatfield defined openness in general terms as "unimpeded or freely available access to resources, and to processes."[196] This paper has attempted to give further nuance to that observation.

First, resource accessibility can be achieved via both written "vellum" solutions, such as standards and regulations, and "functional" solutions, such as physical and virtual interfaces. The efficacy of each approach can vary depending on the type of underlying resource.

Second, the form of resource access should not differentiate unfairly. Shah, Sicker, and Hatfield found that non-discriminatory access

[196] Shah, Sicker & Hatfield, *supra* note 31, at 12.

is an integral aspect of openness.[197] This standard makes particular sense when the resource in question is scarce.

Third, process accountability can be further divided into the entities (the forum) and the format (the practices). Each of these can embrace varying degrees of openness that lend legitimacy to their efforts. Transparency, as in receiving access to relevant information, seems to overarch all of these considerations.

Finally, as our analysis of networks has demonstrated, openness can be deployed as different kinds of market entry and consumer protection safeguards:

- *Structural*: MFJ, *Computer II*; corporate structure as safeguard; line of business restriction;
- *Functional*: Part 68 rules, *Computer III*; interfaces and layers and interconnections as safeguard;
- *Behavioral*: Network neutrality;
- *Procedural*: Participation in standards bodies, rulemakings, and other decisional fora; and
- *Informational*: Powell's Four Freedoms, Martin's Policy Statement, platform terms of service.

The larger point is that the nature of the openness desired will vary depending on the perspective, the situation, and the element.[198] Where a communications market is at least theoretically susceptible to more competition and innovation, for example, the types of tradeoffs involved in a "functional openness" approach might make most sense.

The more "open" and more "closed" aspects of an information system often coexist and can change over time.[199] Openness then should be viewed not as a one-size-fits-all definition but as a continuum of conditions and as part of an openness/enclosure polarity. In general, though, we should want to develop and implement incentives that lead us towards, and not away from, mutually constructive openness of access and opportunity and process.

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[197] *Id.* at 12. Shah, Sicker, and Hatfield also utilized a layers-based analysis that informs the question of whether the information can be delivered through the network, and if there is discrimination against the delivery of this information. *Id.*

[198] *Id.* at 12.

[199] SHAPIRO & VARIAN, *supra* note 176, at 148.

B. Looking Ahead: ObD

As mentioned previously, openness by design (ObD) is one way to approach questions about the right context and scope for bringing openness to a particular system. Many initial observations are discussed elsewhere[200] and will be fleshed out in the coming months. For now, here is a quick overview.[201]

The openness/enclosure paradigm is rooted in the legitimate possession and use of power in everyday life. For that power to be wielded in economic and political markets, some degree of trustworthiness must be in place. That trustworthiness can be derived from a number of sources, but a posture and practice of openness can be one accountability measure.

As we have seen, openness is a highly contextual concept, whether applied to a resource, a process, an entity, a piece of information, a person, or even a stance. The ObD framework includes an express focus on a number of conceptual models and tools that collectively are useful in teasing out the implications and learnings.[202] We already have encountered four such tools: complexity systems thinking, network science, modular (layered) analysis, and platform economics.

In addition to more traditional framings such as competition law and consumer protection, here are a few other conceptual tools that might prove beneficial for future conversations.

Polarities management: a shifting continuum

Openness should not be seen as an absolute value, or always advantageous, or even the clearly optimal default position. Instead, complete openness exists at one pole of a recognized systems polarity with complete closure. The two poles form a constantly shifting continuum between provider (core) control and user (edge) freedom.

Design theory: a constant trade off

The school of top-down network design suggests that the major

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[200] Richard S. Whitt, Unleashing the Open: A Primer on Openness by Design (Aug. 25, 2018) (unpublished manuscript) (on file with author) [hereinafter Whitt, Unleashing the Open].

[201] For starters, the term "openness" is preferred over "open" because it correctly implies a constant pattern of becoming, rather than a static and polarized state of being. This openness is cultivated "by design" because it is a conscious, deliberate strategy, not a knee-jerk default or "organic" outcome.

[202] Whitt, Unleashing the Open, *supra* note 200.

engineering tradeoffs in networks are speed, security, and openness. If true, how does this inform how we think about openness in the context of networks and platforms?

Scope: a matter of degrees

There also are relevant factors in assessing the degrees of openness designed into a particular system. These factors range from mere knowledge to outright ownership. In order, from bestowing the least to the most openness, these factors include:

- Awareness
- Transparency
- Access
- Input
- Sharing
- Control
- Ownership

Moreover, other pertinent tools include game theory, risk management, human ethical codes, and Cynefin framing.[203]

VIII. CONCLUSION – OPENNESS FOR HUMANS

This paper has sought to demonstrate that, while highly contextual and nuanced, openness need not be an "inherently subjective concept."[204] If nothing else, spending some quality time and effort unpacking the notion of openness can bring useful points of objectivity to the table.

The discussion has focused on openness as applied to systems, network, and platforms. But, what about humans as individuals, systems, networks, or platforms? What about "openness," in essence, for the rest of us? The onrush of emerging online technologies—artificial intelligence (AI), Internet of Things (IoT), biometrics, virtual reality (VR), and the like—makes the answer to that question all the more urgent.

The aforementioned coming technology frontier includes a world with millions of times more processing power using quantum computing, billions of connected devices through the Internet of Things, trillions of augmented reality experiences, and countless impactful interactions between human beings and machine learning-trained algorithmic systems.

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[203] *Id.*

[204] Shah, Sicker & Hatfield, *supra* note 31, at 12.

Humans will increasingly be considered a digital entity projecting itself into the physical world, a virtual "lifestream" of 1s and 0s. In that context, where can we plausibly draw the line between openness and enclosure? How do we address legitimate social concerns about trust, security, consent, and accountability? What about honoring some of the openness principles discussed here, including access and inclusion and transparency? Can the autonomous human being still be enabled to interact, decide, and choose, on her or his own terms? Can humans also be more open by design? These remain unanswered questions for now but fodder for further societal conversation.[205]

Employing an "openness by design" framing can yield significant insights to benefit a public policy analysis of online-based business models and technology platforms. This includes understanding how resources, processes, entities, and information can be more or less accessible to those outside the system. These insights can extend to all layers of the Internet ecosystem, from access to networks and platforms, to the data, computational, devices, software, and applications layers. Further, ObD can be part of a larger, more comprehensive rethinking of policy (both public and corporate) and governance for the NET platforms sector.

A deeper understanding of these networks and platforms can also help us perceive when and how best to regulate. As one example, direct government involvement in the world of online networks and platforms may not include an appropriate appreciation for the many complex tradeoffs and considerations. For such a rapidly-evolving sector, prescriptive regulation carries the risk both of over-regulating legitimate network functions and under-regulating undesirable behavior.[206] Rather than dictating specific outputs and outcomes, policymakers might want to consider using discrete market inputs and incentives, such as "functional openness" so that market players themselves can shape the virtual landscape in more user-friendly ways.[207]

Accountable governance regimes for the online technology sector can serve everyone's best interests. Michael Powell's overarching observation remains valid. The window of opportunity is "open" to achieve a thoughtful and balanced approach to govern the technology

[205] *See, e.g.,* www.glia.net (The Author's *GLIAnet* Project describes using Digital TrustMediaries to foster a more open, user-driven Web).
[206] Whitt, *Deference to Protocol*, *supra* note 21, at 756–57.
[207] Whitt, *Adaptive Policymaking*, *supra* note 131, at 567–89.

sector at large. Perhaps openness by design, and the human trust and accountability it can engender, would be one fruitful way to get us there.