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# THE WOULD-BE TECHNOCRACY

## EVALUATING EFFORTS TO DIRECT AND CONTROL SOCIAL CHANGE WITH INTERNET PROTOCOL DESIGN

*Farzaneh Badiei and Bradley Fidler*

ABSTRACT

This article discusses the shortcomings of value in design approach to protect human rights on the Internet. It argues that Internet protocols do not single handedly mitigate human rights on the Internet and in order to measure their impact, they need to be put in context. In other words, instead of design determinism, contextual analysis of Internet technologies that involve Internet protocols should take place.

Keywords: Internet protocols, human rights, IETF, infrastructure

Values in design (ViD) of the Internet is both a research and political program, with ViD research drawing heavily on recent works by scholars such as Lessig and DeNardis.[1] ViD scholars operate under the assumption that Internet protocols (IPs) can be designed such that their use will necessarily and durably promote human rights and want to better understand the underlying process. In terms of ViD as a political program, participants seek to institutionalize this mode of thinking within Internet standards bodies, particularly the Internet Engineering Task Force (IETF), thereby adding an explicit political dimension to their work. To determine whether standards and protocols can enable, strengthen, or threaten human rights, a group of ViD scholars has formed a working group, named the Human Rights Protocol Consideration Research Group (HRPC RG), under the Internet Research Task Force of the Human Rights Research Group. Members of this research group—human rights activists, academics, and

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1. Lessig; DeNardis, *Protocol Politics*.


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engineers—produce papers related to human rights. Many of these papers deal with perhaps their most influential publication, Request for Comment (RFC) 8280, which outlines a (still valid) summary of their positions.[2]

Furthering human rights is a special case of a general claim, namely, *context-independent technological determinism*: that technologies and technological artifacts can be structured to exercise the same political force regardless of context. This article is a critical analysis of context-independent technological determinism, the special case of rights-promoting IPs. It is based on our analysis of RFC 8280 and other work by the HRPC RG. We share the HRPC RG's normative commitment to human rights in general and to an Internet that furthers them. However, we argue that efforts to institutionalize elaborate human rights considerations within the IETF or other standards bodies will curtail any positive impact the Internet may have on human rights. Furthermore, we extend Mueller and Badiei's earlier work on the logical difficulties with such a research or political program.[3] We do so by investigating (i) the historical evolution and logical basis of context-independent technological determinism, (ii) relevant case studies derived from the history of the Internet and related communication protocols, and (iii) additional social and institutional implications of treating IPs as political objects. We conclude with our own requirements, which we believe are a prerequisite to such a political program.

To understand the ViD framework, it is important to note that human rights are a special case of politics and that IPs are a special case of technological artifacts. These terms require some unpacking. With *politics*, we refer to any organized control over any level of human activity that is guided by human values. These human values may range from ideologies to personal preferences, for example, from liberalism to Robert's Rules. (We call them "human" values to avoid confusion with technical parameters, etc.). The human values we hold that relate to our understanding of how we ought to organize human activity, then, are political values. We cannot stress enough that politics is a value-neutral term and that it does not refer to things being "overly" political, or to objectionable ideologies or preferences, just as it does not mean only agreeable politics. Democracy, authoritarianism, human rights, and human subjugation are all special cases of politics. Instead, *politics* refers to a constant condition of human life. Levels of human activity include everything from the macro

2. Ten Oever and Cath.

3. Mueller and Badiei.

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level of government to the micro level of, for example, a committee. This definition does not prevent anyone from arguing that certain political frameworks are better than others or objectively true. *Political framework* in this context is not a relativist definition; it is an operationalization. Just as Claude Shannon wanted to deal with information independently from its semantic meaning, we want to discuss politics as a property of human society.[4]

With *artifacts*, we refer to existing technologies. These may include individual instances of hardware or software as well as larger technical systems or infrastructures. We believe that separation of protocols and specifications from the implementation phase is an analytical and strategic mistake that requires correction. We use *existing technologies* to separate the term from ideal cases. We also separate technological artifacts from any human activity linked to a particular technology, such as trained operation of a machine. This distinction is important because it allows us to separate the effects of a technical artifact alone from the causal forces of associated ideas and human action.

## Political Technologies: Context Dependence

Systematic inquiry into the relationship between technical artifacts and politics is a major, even central, part of modern thought. Scientists, scholars, and engineers have been investigating the ways technology and politics shape one another since the origins of modern social science and even science itself. As such, we do not intend to conduct a full analysis of these wide-ranging intellectual histories, to say nothing of their global origins. Instead, our purpose is to outline several major trends and to make the case that this mode of thought in Internet standards circles is not novel but a part of a longstanding inquiry.

Robert Boyle, who is understood in the history and sociology of science as one of the first scientists, viewed the experimental method as a technology that could make a new political order possible.[5] Adam Smith and Karl Marx, early economists with vastly contrasting ideas, believed that certain technologies, when widespread, would lead to certain kinds of politics (each saw a special role for transportation and communication in

4. Shannon, 379–423.

5. Boyle; Shapin and Schaffer.

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this causal link).[6] Max Weber, who set much of the program for modern sociology, elaborated a more complex set of relationships between transportation, communication, and polity.[7]

The literature on context-dependent technology is expansive. Contemporary thinkers have identified Alexis de Tocqueville in this tradition, and his discussion of the relationship between political structures and the manufacturing sector is explicit enough to be included in a prehistory of modern scholarship.[8] The questions at hand have always surrounded the kind, degree, and cause of what the social sciences call isomorphisms, or the structural and functional similarities, between politics and technology.[9] In this sense, it is a question of the causal relationship between technical artifacts and politics. Put simply, which can affect the other? Do certain political orders tend to create specific kinds of technology? Conversely, do certain technologies set limits on, or enable, the social orders from which they spring?

These thinkers linked technological artifacts with economic production, institutions, and culture; complex causal forces between artifacts and politics went both ways. In this sense, the broad tradition is at least not what we could call *context independent*, in that no technology would exert a pure causal force independent of its social context. Emphasis on the political forces that shaped when, where, and for what purpose society developed technologies meant that technological artifacts did not usually appear as an independent variable or external causal force. Technology brought change, but it did so in a complex, multivariate environment. This kind of inquiry is specific not to any single thinker but to the social sciences and humanities, and it has continued from the eighteenth and nineteenth centuries until the present day.

Technological artifacts were always fully context dependent; what matters here is the attention to social context and its powerful shaping of technological forces. By the 1980s, a new set of interdisciplinary fields was revisiting the question of technology and society, although not always in response to this substantial intellectual tradition. Of those of greatest relevance to our analysis, the interdisciplinary field of science and technology studies made these questions absolutely central. Affiliated scholars

6. Smith; Marx.
7. Weber.
8. Kranakis, Bijker, and Pinch.
9. See also, Conway.

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have undertaken case studies relevant to our inquiry, including studies on electrical networks, the Internet, scientific research networks, transportation, building architecture, and music.[10]

In communications studies, the *Handbook of New Media* provides a useful overview of how scholars in this field have studied the social shaping and consequences of information and communication technologies (ICTs), technologies whose social force is at least partially dependent on their context. This study of "system features" entailed analysis of the two-way causal links between the user and the technology.[11] A branch of scholarship also focuses on values for design and considers values such as privacy in another context-dependent approach.[12]

Bowker and Star have long been associated with, among others, the emerging interdisciplinary field of infrastructure studies and the social study of standards.[13] Their focus has been on how standards and classification regimes are social in their construction and, once in place, potentially enduring in their impacts. Significantly, they note the inefficiency of the abstract conceptualization of technological design that does not consider concrete use cases and users.[14] Perhaps the most radical response to the question of value in design is the variety of methods known widely as actor–network theory (ANT).[15] Although it does not contain novel insights into network structure and does not make testable predictions, its most famous practitioners have exercised an enduring influence over humanist thinking through their renegotiation of our ability to distinguish between people and things.[16]

Another strand of value in design research focuses on data protection by design, privacy-enhancing technologies (PETs), and privacy by design (PbD). PETs have been around from as early as the mid-1990s. The European Commission, which aimed to advocate for such approaches, and a working group it had established, in a 1997 report, stated that "[PETs] involve organizing and engineering the design of information and communication systems and technologies with a view to avoiding,

10. Hughes; Latour and Woolgar; Kranakis, Bijker, and Pinch; Pinch and Trocco.
11. Rice; Rogers.
12. Nissenbaum; Ackerman, Darrell, and Weitzner; Warnier, Dechesne, and Brazier, 431-445.
13. Bowker and Star.
14. Ibid., 32.
15. Latour and Woolgar.
16. Anttiroiko.

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or at least, minimizing, the use of personal data."[17] PETs derived from a more context-dependent approach, but they were gradually replaced with PbD, which is more deterministic, though it preserved some of PETs' context-dependent characteristics.[18]

One of the early advocates of PbD, Ann Cavoukian, believed that PbD extends to three spheres of technology: (i) IT systems, (ii) accountable business practices, and (iii) physical design and networked infrastructure.[19] The reference to business practices could signal a context-dependent angle of PbD, but, in general, Cavoukian holds strong views about using technology to embed privacy into the design of IT systems. PbD later appeared in legislation such as the General Data Protection Regulation (GDPR), but how it would work in practice remained unclear.[20] Scholars have criticized this approach. For example, Koops and Leenes emphasize that "privacy regulation cannot be hardcoded in the system or an architecture. Hence the concept of PbD has not embedded values in technology; rather, policies, laws, and incentives have changed the ways software companies use technology that collects and handles data."[21]

## Political Technologies: Context Independence

The twentieth century also marked the appearance of scholarship on relatively context-independent technologies. We qualify this description because few works are fundamental enough to claim a total contextual dependence or independence. Nonetheless, it is still possible to point out traditions that are largely context independent, and, indeed, conflict between these two positions caused a great deal of debate and absorbed a great deal of scholarly energy over the past half-century.

Another line of reasoning is visible throughout the twentieth century. A smaller number of thinkers broke with—or offered the possibility of breaking with—the context-dependent, multivariant emphasis and sought to assign technological artifacts an independent causal force. In short, this is the assumption that technological artifacts can contain

17. Working Party on the Protection of Individuals with regard to the Processing of Personal Data.

18. Koops and Leenes.

19. Cavoukian.

20. Koops and Leenes.

21. Ibid.

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context-independent political values and have the same force everywhere. These thinkers believe technologies have an overwhelming and inevitable power to drive human actions and social change and, as is logically required for this analysis, understand research and development as "self-generating." This means technology is the embodiment of power and authority, regardless of other elements that interact with it.

Lewis Mumford, for example, argues that at the level of technological systems, some are inherently democratic and others authoritarian—an argument reconsidered (but not supported unequivocally) a half-century later by Langdon Winner. In this line of thinking, technological artifacts can be context independent and thus can determine political outcomes independently of their political context. Most famously, the "warhorse" technological determinism of a Marxist variant already present in classical political economy produced the teleology of historical "stages" powered by changes to a society's economic forces. However, even these works tend to speak of context-independent technological systems or infrastructures: for example, that nuclear weapons require hierarchical governance, that industrial factories organized under capitalism would generate worker alienation, that industrially produced media would create certain psychosocial consequences. It follows that comparatively small technological changes to a large system or infrastructure would not (save in exceptional circumstances) alter the political force of an assembly line, television broadcast system, or nuclear reactor. Many of these frameworks, notably the Marxist ones, also waver on the issue of context, allowing that under a radically different political order, the political character of these technologies could change.

The empirical foundations of context-independent scholarship are necessarily retrospective, as it is only in the historical perspective that the social consequences of a technology can be observed. (We discuss the ex post nature of this scholarship below.) But this work has nonetheless been appealing as the intellectual underpinning that would permit us to refashion previously neutral or unnoticed technologies as tools of *purposefully directed* social control. If technology can exert a context-independent influence on society, then why not engineer it for its social impacts and, in so doing, use technology as a new lever of control over society? In previous liberal-democratic societies, at least in theory, social planning had been the domain of actors with democratic legitimacy obtained through formal political structures. The design, distribution, and use of most technological artifacts, in contrast, would be the domain of the market. Hayek, for

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example, explicitly identifies telecommunications infrastructure as a basis of the price system.[22]

Nevertheless, ex post, context-independent thinking provided a path to the theory and practice of technocracy, which seeks to replace the abovementioned democratic legitimacy of policy setting with an authority based on technical expertise and (often) the backing of state power.[23] Outside of the state, its most visible source, in theory and practice, is the state-adjacent firms of Silicon Valley.[24] Indeed, the Skinnerian "instrumentalist reason" of the "big other" identified by Zuboff could be read as the beginnings or an early attempt to build a new regime of technocratic demand management,[25] although, the ability of firms to carry out their behavior modification is controversial and was likely overstated in Zuboff's work.[26] Recently, this intellectual and social program has reemerged in the domain of Internet policy and commentary. The most notable change in the rediscovery of some of these ideas is that this new generation of scholars has separated them from their political origins and contemporary homes in state power and the "big tech" of Silicon Valley. Context-dependent work remains, but it now coexists with a philosophy and practice that shares a great deal with radically different political and economic programs.

Mueller and Badiei analyzed the varying adoption of these context-independent ideas in thinkers and organizations associated with the Internet.[27] Of the groups and trends they identify, two stand out as encompassing the dual claims that a technological artifact's politics may be context independent and known in advance. The first, the "Code is law" school, which originated in the late 1990s with Reidenberg,[28] Lessig,[29] and others, argues that "code" is one of a small number of major sources of political order. In an argument echoing similar claims by Veblen,[30] Lessig notes that the relative importance of code is increasing regarding the other sources (law, norms, and the market). The second, the "values in design" school, reflects the traditions of Mumford and Winner, and argues that technological artifacts

22. Hayek; Putnam.
23. Akin; Sadowski and Selinger.
24. Sadowski and Selinger.
25. Zuboff.
26. Vinsel.
27. Mueller and Badiei.
28. Reidenberg.
29. Lessig.
30. Veblen.

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*can* have context-independent political effects. We believe that, in general, these and related frameworks should continue to interrogate their intellectual and political debts to technocratic and/or authoritarian programs. For now, however, we turn to recent proposals in Internet standards bodies that take as their starting point varying aspects of the context-independent view and identify potential problems with the mechanisms being proposed in the hope that we can modify the way forward in the pursuit of knowledge about IPs and human rights.

## Method

We apply the historical method of historicism to a series of short case studies. Modern historicism seeks to understand historical phenomena without anachronism or teleology. It provides a strategy for understanding plans, values, techniques, and even technical architectures in their original, historical terms rather than conducting a post hoc evaluation from the present. One goal of historicist research is to identify why certain decisions or designs came to be instead of taking for granted knowledge acquired or opinions standardized after the fact. Thomas Kuhn's *The Structure of the Scientific Revolutions* is an important work in this tradition, as it reveals the different, inner logic of each scientific paradigm, rather than portraying the history as the gradual reduction of error.[31] Shapin and Schaeffer's *Leviathan and the Air-Pump* is another example.[32]

We put this strategy to use in understanding the original motivations, design philosophies, and beliefs concerning a set of core Internet technologies. As our argument is that these ideas have changed significantly over the decades, a historicist approach is important to prevent present-day understandings from overwriting historical reality. To take the Domain Name System (DNS) as an example, it is important for us to understand how its social function was understood in 1982 (before it was called DNS) and 1992, not only what we now understand it to be.

We draw on three case studies: the Exterior Gateway Protocol (EGP) and the Border Gateway Protocol (BGP), the DNS, and WHOIS. We selected these cases to better understand (i) the unobservability of politics in technological design, (ii) how the understanding of a technology's

31. Kuhn.

32. Shapin and Schaffer.

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core function can shift over time, and (iii) how a changing sociohistorical context will alter a technology's perceived (or actual) political function. Empirically, we restrict our sources to primary, contemporaneous materials and peer-reviewed secondary sources that draw on such primary sources. Here, records from the Defense Advanced Research Projects Agency (DARPA) Internet Program, which funded and directed EGP and DNS development, are important; so too are standards, documents, and representative Listserv discussions. The conclusions reached from this evidentiary standard, typical of peer-reviewed historical scholarship, can and do diverge from community lore and official histories (compare Russell's analysis of the early Transmission Control Protocol (TCP) standards-setting process to the Internet Society's recollection-based "A Brief History of the Internet"[33]).

In what follows, we first provide a brief background on the HRPC RG's work and its evolution. Then, we identify empirical and analytical difficulties we believe are embedded in ViD and related approaches. We subsequently turn to a historical analysis of key IPs to assess their suitability for context-independent thinking and as potential tools of social control.

## Human Rights Protocol Considerations

In 2015, the Internet Research Task Force chartered the HRPC RG. Its goal remains, in part, "to research whether standards and protocols can enable, strengthen or threaten human rights," as the rights-enabling qualities of IPs "might be degraded if they are not properly defined, described and sufficiently taken into account in protocol development."[34] Mueller and Badiei have identified problems with the group's charter and related publications. Their criticism can be summarized as follows: while the intended functions of the HRPC RG appear to rest on the assumption that context-independent values can be known and thus encoded in advance,[35] a close look at the language reveals hedges, and it often retreats to heavily contextual, multicausal thinking—the kind we see in DeNardis's work.[36] In other words, when pressed on the causal relationship between technological

33. Russell; Leiner et al.
34. Internet Research Task Force.
35. Mueller and Badiei.
36. DeNardis, "Hidden Levers of Internet Control."

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artifacts and politics, the HRPC RG rightly rejects any certainty regarding the ability to encode human rights into IPs.

Indeed, as the work of the research group progressed and discussions took place, it became apparent that encoding rights in the design of IPs was, at the very least, challenging:

> The research group's position is that hard-coding human rights into protocols is complicated and changes with the context. At this point, it is difficult to say whether or not hard-coding human rights into protocols is wise or feasible. Additionally, there are many human rights, but not all are relevant for information and communications technologies (ICTs).[37]

When it comes time to actually theorize the relationship between technological artifacts and politics, the HRPC RG takes a sophisticated and contextual approach, which can be seen in their documentation of the back-and-forth between protocols and politics in RFC 8280.[38] Such a position allows us to continue in the long tradition of studying the intersection of politics and technology, and building new tools and adjusting our political orders in response to the other. It does not permit us much more than that, and it does not give us the tools to encode context-independent political values into technical artifacts. It does provide a pretext to begin introducing a new regulatory regime or simply cultural pressures into standards making, a matter we return to below.

Yet the practical goals of the HRPC RG go beyond this measured analysis. RFC 8280 provides thirty-four technical concepts and maps them to "rights potentially impacted":

> It is, however, important to make conscious and explicit design decisions that take into account the human rights protocol considerations guidelines . . . In addition, it contributes to (1) the careful consideration of the impact that a specific protocol might have on human rights and (2) the dissemination of the practice of documenting protocol design decisions related to human rights.[39]

37. Ten Oever and Cath.
38. Ibid.
39. Ibid.

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Their goal, then, is to subject protocol development to explicitly political considerations. As noted by Mueller and Badiei, the IETF has long required a discussion of security implications, and most observers conclude that the work of engineers, as a creative activity, reflects at least in part their values. In contrast, the HRPC RG is advocating for an explicit consideration of political values in protocol design in the furtherance of specific political ends. Engineers would be expected to identify their own political views and to explain, and perhaps justify, their design decisions on political grounds.[40]

This approach has the potential to create difficulties on a few grounds. Mueller and Badiei identify four areas of difficulty or impossibility. (i) Human rights, especially as encoded in the United Nations' (UN) Universal Declaration of Human Rights (UDHR), are contradictory and can only be interpreted locally and interpretively, both in terms of their relevance to protocol considerations and their contemporary significance. (ii) Protocols that do provide some functionality that proves inconvenient to large organizations can simply be replaced, as has already happened, such as with Transport Layer Security (TLS) 1.3. (iii) Using protocols to pursue political ends immediately raises the question of legitimacy: The IETF lacks the political legitimacy to set political policies for the planet, let alone a single country. Turning it into a political body for certain political values might increase its legitimacy for dispersed and highly cosmopolitan populations in a limited number of countries, but it would likely trigger the use of replacement organizations by large portions of the rest of the planet. Their final objection is related to the issues raised in previous sections of this article, namely (iv) that the political impact of protocols can be known only after (ex post) they are designed, but to successfully encode political force into a protocol in advance, these politics must be knowable before (ex ante) they are implemented.[41]

## Problems with Expanded Political Considerations

Mueller and Badiei's work, then, can be understood to contain two strands of criticism: institutional and geopolitical realities, on the one hand, and the temporal sequence of implementation and political consequence, on

40. Mueller and Badiei.
41. Ibid.

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the other. Here, we introduce a new set of fundamental challenges that further warn us against the ViD program.

*The Difference Between Design and Design Decisions*

As noted by Mueller and Badiei, we can attempt to measure political impact only ex post. It is from this impact that, as they argue, political impact is retroactively mapped to design. But let us take ViD at its word and leave aside, for a moment, the problem posed by linear time. We are still faced with the problem of the difference between at least two kinds of early design: (i) as a basic architecture or specification and (ii) as a set of decisions concerning the design. The additional moral and ideological introspection required by the ViD framework conflates these two by assuming that a set of design decisions, made in the absence of countervailing forces, will be instantiated in the design (e.g., an architecture, specification, or the like), because what we can actually measure ex post is not the decision-making, intent, or moral character of the designer. All we can resolve is the design (as architecture, etc.). Linking the demonstrated outcome of a protocol to private, subjective states is impossible.

We cannot know what other people are thinking, and research in psychology, neuroscience, psychiatry, and other fields reminds us that we are unreliable judges of the connections between our own thoughts, feelings, and actions. Protocols are complex things, and their development necessarily involves weighing trade-offs produced by different technologies, institutions, and interests. It is, in essence, the dimensionality problem posed by commodity selection under marginal utility theory: there is no repeatable or (externally, to observers) knowable way to come to a conclusion that rationally balances them all.[42] RFC 8280 identifies "protocol design decisions related to human rights," which necessarily refers to some of the decisions made during the design of a protocol. Protocols are complex things, requiring whole classes of decisions, some made freely, others not, some unknown to the author, others taken for granted as facts of life.

The act of delineating design decisions from a cluster of thought is not an objective operationalization. The actual thinking behind the decisions cannot be described, or completely known, by anyone—just as we are usually unable to provide a formal set of guidelines necessary for others to replicate our own creative behavior, because thought can be approximated but

42. Keen.

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in itself it cannot be formalized.[43] It is unclear how anyone could know in advance which parts of the design decision were political, which were not, and what their impact might be. We are all pathologically bad at understanding the significance of our behavior and the genesis of our thoughts and feelings, and we are usually instinctively wary of people who claim to have this power.

In Mueller and Badiei's argument, perceived political impact must be mapped backward to design, creating the illusion of a knowable causal chain. Here, we must make another unreliable and empirically indefensible leap, from design to (knowable, specifiable) design decision. Design decisions that were once created without political intent, or created with an altogether different set of politics, are then reassigned new meaning with retroactive continuity (a retcon, in contemporary language).

### *Toward Performance Considerations*

The problem we identify above is not merely a logical consideration; it may have serious institutional consequences. We are concerned that it will be impossible "to make conscious and explicit design decisions that take into account the human rights protocol considerations guidelines."[44] In keeping with our analysis above, this would require a superhuman level of awareness of one's unconscious, and the unconscious of others. It would also require that we divine which components of a protocol were truly responsible for the political impact.

If the designer of a protocol is asked to interrogate these human rights considerations, they are no more capable of giving us a reliable account of their intent than we would expect regarding such (again, superhuman) self-knowledge from a corporate representative, as most IETF participants are, or a corporation. And intent is logically, morally, and politically different from consequence. In short, there is nothing left to do in this space but to perform. Without a reliable way to operationalize thought—and with no real knowledge of the actual political significance of these decisions, as they will have not yet occurred—the practice would necessarily be performative. The HRPC RG/ViD framework and program seems designed to bring these issues to the fore and make them an active part of

43. Westergard.

44. Oever and Cath, 11.

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discussion, and critique, at the IETF. But critique is no better off in any methodological or epistemic or fortune-telling sense.

Others have noted that the broader environment in which actors and protocols function is crucial.[45] What justifies belief in a perfectly communicative space, free of personal, corporate, government, pathological, religious, philosophical, and whatever other influences and distortions? The ViD framework is reminiscent of the early history of internalist histories of science and engineering that did not stray from the lab and that located all relevant decision-making in that space in that it is located at the level of the individual and necessarily heroic (if she is a causal island unto herself) engineer. Since its inception, the functioning of the IETF has not mirrored this assumption. Engineers may participate as individuals in the IETF, but it does not follow that their contributions are equally individual. Instead, participants—and especially the most influential individuals—are there with the support of a firm with a direct interest in the outcome of the design and deliberations. Depending on one's perspective, these organizations exist to either profit through competition or aggrandize power, but in no mainstream framework are their utterances taken at face value.

## Case Studies

The following case studies serve to highlight the multiple problems identified earlier. We have chosen initial case studies to cover the areas of routing and naming.

### *EGP and BGP*

EGP[46] and its successor, BGP,[47] both serve as routing and reachability protocols for autonomous systems. Autonomous systems are groups of networks (or a single network) under the policy control of a single entity.

DARPA directed its contractor Bolt Beranek and Newman to begin creating the framework for autonomous systems in the late 1970s, in keeping with design ideas sketched no later than the summer of 1978 and based on recent architectural innovations from its Internet Program. Accounts of

45. Faraj, Kwon, and Watts, 185.
46. Rosen.
47. Lougheed and Rekhter.

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the original purposes of the autonomous system vary—like many other architectural features of the modern Internet, the system has multiple "fathers" and just as many views as to its "true" purpose. EGP and BGP can both be understood as moves to permit the scaling of the Internet beyond the networks (and border routers) over which DARPA had real or de facto programmatic authority.[48] Before autonomous systems, Internet routers (then, gateways) were visible to one another, and a single misconfiguration could, theoretically, have brought down internetwork routing, just as similar errors had cratered ARPANET connectivity in a famous event some years before.[49] Autonomous systems insulated routing errors within each autonomous system from the interautonomous system routing architecture of the Internet. Furthermore, it also meant that organizations could build and run arbitrary interior routing algorithms, provided they could participate in IP routing.[50] This, in turn, triggered a sudden growth of router companies, some started by engineers with ties to the DARPA program itself. Thus, taken together, EGP and BGP can be seen as a part of the initial moves toward privatization of the Internet, which involved removing its core routing from services of a single firm and permitting others to create routers and routing algorithms.

Although the EGP specification includes numerous details, it is explicit that its purpose is not just expanding routing but also establishing the domain framework that would eventually become the BGP-powered autonomous system. Under EGP, ARPANET became the first core autonomous system, and the expansion to an arbitrary number of autonomous systems would await a protocol like BGP.[51] As such, it was a part of handing organizations far more freedom and autonomy to organize their own networks. Yet in helping ensure the victory of TCP/IP (TCP/IP), it also reduced freedom by helping impose a network architecture that resulted in a fairly homogenous system of IP and Ethernet, rather than the heterogenous mix of local networks and addressing systems originally envisioned.[52]

The reason why EGP transitioned to BGP varied among different actors. Cisco, a company formed due to the opportunities created by EGP and which employed one of the original BGP authors, portrayed EGP as a

48. Fidler.
49. McQuillan and Walden.
50. Fidler.
51. Rosen.
52. Russell and Schafer; Fidler.

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technical problem in interconnection efficiency.[53] Others made economic arguments, for example, in an IETF meeting in 1988, raising concerns that "the costs of the current interconnectivity approach are large. They result in either having very labor-intensive routing configurations or in less than adequate interconnectivity and the resulting long paths and lack of robustness."[54] Others focused on control: Cisco's newsletter stated that with the Internet's diversification, network managers needed to assert some control over their resources by introducing types of user policies, but EGP made no provision for this. These policies were related to technical and economic issues, especially in the case of ISPs.[55] Nevertheless, the move to BGP was not equally welcomed by all actors. Vendors and other implementers of BGP had concerns about implementing a new and complex protocol.[56]

But there was another major reason for the shift from EGP to BGP. EGP and even BGP were deployed in a period known today as the protocol wars, a conflict largely between a community, led by DARPA, which supported a suite of internetworking protocols centered on TCP and IP, and a community that favored the International Organization for Standardization's (ISO) Open System Interconnection (OSI).[57] The OSI was, in its design, a more structured interconnection system with the seven-layer model we now associate with the (DARPA-originated) Internet. The official line within the US Department of Defense (DoD) and National Institute of Standards and Technology (NIST) was, until the mid-1990s, that DARPA protocols would be used until OSI was ready.[58] Within DARPA, this was seen as the necessary delay to cement their dominance via adoption. Any protocol that contributed to the (DARPA) Internet's rapid ability to scale was thus implicated in the struggle between a loosely DARPA-led group of famously (but perhaps not altogether) technocratic or meritocratic engineers and a far more open and multiconstituency decision-making process at OSI. It was the expertise with which corporations sent skilled representatives to derail negotiations and successfully push their corporate interests that massively influenced OSI design and that was in part responsible for OSI's delays and the victory of TCP/IP.

53. Cisco.
54. IETF Meeting Proceeding: Internetworking Working Group.
55. Caesar et al.
56. Bowers and Gross.
57. Russell.
58. Handley, 120.

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Ultimately, the intentions behind the design decisions, behind the design, and behind the impact of EGP and BGP are opaque. If there were political intentions, taken as a whole, they were not consistent, cohesive, or coherent.

### *The Domain Name System*

Researchers based at the University of Southern California Information Sciences Institute (USC-ISI) began developing the DNS in the late 1970s. By 1985, they had an early DNS server running at USC-ISI. DNS was designed for multiple reasons: to create a distributed database to replace the aging hosts file to provide greater flexibility to local sites in managing their own name (and mail) bindings,[59] to create autonomy for top-level domains,[60] and to create a new political structure that could mediate Internet governance.[61] As is well known, to accomplish these goals, the system required a "root": the highest point of authority necessary to delegate authority to the top-level domains.[62]

Despite the extensive historical records (e.g., Listservs, interviews, and RFCs), it is unclear what happened so that the root was created from the level of detail required by the proposed framework. Although the USC-ISI team solicited proposals from the broader Internet community, none of these offered a distributed system that would have avoided some central point of control. We do not know whether Su, Postel, or Mockapetris (the main contributors to the DNS design) considered other possibilities, or how they understood the politics of their decisions. Their decision might have just been because mathematicians and engineers are drawn to hierarchical designs and it was more common.[63]

The DNS project moved forward, and it is unclear exactly who in the organizational hierarchy (at USC-ISI, or at DARPA's Internet Program, or at the Defense Communications Agency, now DISA) drove it forward. Even assuming that political values and inner states can be measured confidently, the location of the major decisions cannot be identified.

Today's IETF standards are no longer the domain of DARPA, but the same relationships hold: they involve individuals working on behalf of

59. Abbate.
60. Su and Postel.
61. Simon; Fidler and Russell.
62. Mueller.
63. Several hierarchical databases, such as ANSI SQL, were popular.

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large and often somewhat secretive organizations. If asked to identify the politics of design, there are major structural (market) constraints that prohibit a Google or a Huawei employee from divulging anything more than a well-crafted public relations statement in response. Had they been forced to document their political thinking, any documentation would have been a creation in response to measurement.

Dominant accounts of technological innovation are biased in favor of individual inventors,[64] and the expectation that a single or small group of engineers can speak for the complex ecology of thought behind design decisions falls within that mode of explanation. Nonetheless, what can we make of Su, Postel, and Mockapetris's motivations? Let us assume they had been instructed to make conscious and explicit design decisions and consider their politics. At the time, the Internet was a US-run infrastructure. The move toward regional Internet registries and the globalization of Internet governance was years away.[65] The term *Internet governance* was not used at least until the commercialization of the Internet in 1995.

We can consider three moments in the evolution of DNS. The samples vary dramatically in their political character, and each system administered the root with different means and to different ends. The first, in 1985, was an experimental system for a largely American ecosystem of government contractors and researchers, governed by the DoD. The second, in 1995, was a global infrastructure governed by an emerging global Internet community that was strategizing on how to best sever its vestigial ties to that same DoD. The third, in 2005, was a global multistakeholder organization preparing a stewardship transition with the Department of Commerce.

In each period, the political character of the design appeared different, as it resulted in different regimes of governance with different political priorities, shifting from a mechanism of top-down government administration to global multistakeholder governance. The political impact of these periods is impossible to characterize on objective ethical grounds, but even a brief description of each period would render different political impacts. For example, consider how the value of decentralized control differed in each moment. Crucially, assessments of the political impact of Su, Postel, and Mockapetris's design decisions would be different in 1985, 1995, and 2005, and thus the appearance of the political character of their design would differ too. Evaluations made in 1985 of the potential

64. Haigh and Priestley.
65. Cerf.

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political significance would, even with the hindsight of a mere decade, be incomplete or wrong.

In 1985, the Internet was in its infancy, users trusted one another (because they knew each other), and the US DoD successfully kept the Internet secure. Hence, the security of DNS was not engineers' main concern until years later, approximately when the Internet was commercialized in 1995 and it had scaled. The kind of trust Internet users had in the beginning was not sustainable because it was impossible for all Internet users to know one another.

### *WHOIS*

Aside from the difference in Internet scale from 1985 to 1995, the design decisions that were made early on had unpredictable effects when the Internet was expanded. Even when the potential harm of the protocols to people's rights came to the light, those protocols were not modified or updated to moderate the effect. We illustrate these two issues in the development of a protocol called WHOIS.

Sometimes even after identifying the potential harms of a protocol, the evolution and changes that might help protect human rights are ignored because of outsider political interest. When new actors become involved with the policymaking surrounding how the protocol should be implemented, because of their different incentives, they introduce new political motives. We can see this clearly in the evolution of the WHOIS protocol. WHOIS predates the DNS. In 1982, WHOIS was the directory that included the contact information of ARPANET users.[66] The Internet was a small network, and engineers created WHOIS to be able to contact each other more easily when their machines went down. It was just like recording the names and phone numbers of neighbors in case a fire broke out and began spreading in the neighborhood. It was unclear whether there were political considerations when developing WHOIS, but it is unlikely that the engineers could have predicted the political implications of WHOIS after the commercialization of the Internet.

The political impact of the implementation of WHOIS began not with the creation of the protocol but years later with policymaking institutions such as Internet Corporation for Assigned Names and Numbers (ICANN). ICANN was formed in 1998 to ensure the stable and secure

66. Harrenstein and White.

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operation of the Internet's unique identifier systems. According to its mission statement, in its Bylaws, ICANN "coordinates the allocation and assignment of names in the root zone of the [DNS] and coordinates the development and implementation of policies concerning the registration of second-level domain names in generic top-level domains."[67] ICANN also assumed responsibility for making policies that affected the implementation of WHOIS among the domain name registrars and registries.

ICANN policymaking processes included various stakeholders such as the intellectual property rights constituency, the business constituency, the Security and Stability Advisory Committee (SSAC), and even law enforcement agencies engaged through ICANN's Government Advisory Committee (GAC). The owners of intellectual property rights, law enforcement agencies, and cybersecurity researchers demanded that WHOIS be made public and that it displays every domain name registrant's personal information in the directory. This directory was accessible worldwide, with no data protection considered for the domain name registrants (measures considered later fall outside the scope of this article).

The WHOIS directory contained many data points that were valuable for businesses, security researchers, and others. Hence, each stakeholder group wanted to protect the status quo of the implementation of WHOIS, but each evidently had different incentives and political intentions. But the IETF acknowledged the problems that the opening of the WHOIS directory to the public created from the early 2000s. In 2004, it convened the Cross Registry Information Service Protocol (CRISP) working group to address some of the issues. As a result of consultations in CRISP, the CRISP requirements were issued. In 2005, the name for the new standard was updated to the Internet Registry Information Service (IRIS) Core Protocol. This protocol aimed to provide a tiered-access system to users. As a result, all the domain name registrants' information, such as mailing and e-mail addresses and other identifying information, would not have been public.

From the early 2000s, the IETF clearly made efforts to replace WHOIS and provide tiered access to personal information instead of publicly displaying all information, including sensitive private contact information. In the eyes of human rights activist, those protocols might protect the privacy of domain name registrants to some extent, so there might be some political intention behind them. But it turned out that it was not enough

67. "Bylaws for Internet Corporation for Assigned Names and Numbers."

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to just design protocols that protect human rights. IRIS, for example, was hard to implement. Although its nonadoption can simply be a technical failure, we can also attribute it to the potential political pressure by other stakeholders not to implement it. Hence, IRIS became redundant.

Another problem we face on the Internet is that not all the protocols have to be adopted by all the actors. In the case of WHOIS, the operators of country code top-level domain names (e.g., .DE, .US, .CA, and .IR) did not have to implement any specific WHOIS protocol, although some of them did so voluntarily. They also reconfigured and changed WHOIS policies for their country code top-level domain name that made using privacy-respecting protocols impossible by mandating the personal information of domain registrants to remain public. This is an approach taken even by Scandinavian countries. For example, Denmark enacted a law (the Danish Internet Domain Names Act) that makes it mandatory to publicly display personal information in WHOIS.[68]

Therefore, even if the protocol developers had human rights in mind when developing tiered-access information protocols, without a contractually binding commitment, the operators would not have implemented them. Moreover, it was only through the passage of time that the possible human rights implications of public WHOIS were revealed, as WHOIS was initially a closed directory of a close-knit community.

## Conclusion

IPs have human rights consequences, and they are political artifacts. This much is obvious, and probably uncontroversial. Studies that evaluate the specifications, actors, and processes and that consider their impact are valuable. The HRPC RG program of "data analysis and visualization of (existing) protocols in the wild to research their concrete impact on human rights" is a useful idea. However, expanding human rights considerations has the potential to harm both individual engineers and the IETF, without generating any advances in human rights.

Nevertheless, our study is limited by the fact there are numerous case-studies upon which to draw: it is possible that ours, chosen for their overall significance in Internet history, architecture, or politics, are not representative.

68. This law has been mentioned on the .DK registry website; "Danish Act on Internet Domains."

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Our arguments about why further human rights considerations may harm the IETF are hypothetical and may not happen. The study could also benefit from a quantitative analysis of the discourse about IPs.

There is a technocratic urge underpinning the HRPC RG that will not disappear solely by modifying its charter. The technocracy is an approach that involves the HRPC RG studying protocols in isolation and prescribing human rights considerations in isolation. We also note that the HRPC RG has not offered a meaningful solution to this serious problem of legitimacy. We accept that there are already many socially consequential decisions being made in the private sphere, away from public deliberation. We also note that this is a trade-off inherent in liberal democratic societies and that there exists a long history of justifications for the delineation of public and private spheres. Protocol standardization in Internet standards bodies, which are nonbinding and offered to the world only for voluntary use, is distinct from the way they are imposed on consumers.

The consideration of human rights by developers when designing an Internet specification is only one aspect of bringing into existence rights on the Internet, and it may not play any role at all. Advocating for developers to consider human rights when developing protocols without mentioning the impact of that specific protocol or without studying how the protocol has evolved and developed over time may further the discussion on human rights, but it is unclear how this will further human rights proper.

As we have shown in this article, it is extremely difficult to understand the political intention of developers before a protocol is implemented. While the economic and technical intentions might be easier to excavate, political beliefs and values cannot be discerned ex ante. Even if we can ascertain certain values and developers consider human rights in developing the protocols, the effect of the protocol in the real world cannot be predicted. In other words, we cannot encourage a human right–enabling environment by encouraging only the developers at the infrastructure level to consider human rights and by having one recommended process that can apply to all protocols.

Through the case studies, we have illustrated that each specification has its own characteristics and its own history. One can rarely identify the incentives or intent of the developers. Additionally, considering the impact of their intention after implementation might only be correlated with some event—we cannot establish a causal effect.

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Moreover, the politics of IPs change. They are not static, and they do not emerge in a stable environment. In each period, the political character of the design appears different because it is set in a different governance landscape: domestic versus transnational, top-down versus multistakeholder. The differences in characteristics would render different political impacts.

Even if we consider protocols' political consequences stable and predictable, the human rights–enabling environment might not develop if other actors, elements, or institutions go against those human rights values. Focusing solely on IP developers and encouraging them to consider human rights does not help to create a human rights–enabling environment on the Internet. Imposing lofty political considerations on the activities of protocol designers politicizes the act of creating protocols that do not necessarily have a political dimension.

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