Histories of Networking vs. the History of the Internet

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Abstract

In this paper I describe the difference between "the history of the Internet" and "histories of networking." The former phrase often describes a linear success story, one that starts with Sputnik (1957) and then moves to the creation of the Arpanet (1969), Cerf and Kahn's Transmission Control Program (1974), the commercialization of the Internet (early 1990s), and the global adoption of the World Wide Web (late 1990s). I argue that there is an opportunity now for historians to talk more about the latter category, "histories of networking," which includes both the Arpanet and Internet as only part of the story. Histories of networking also include developments in data networking, telecommunications, and wireless transmission that took place in other countries or that do not fit neatly into the narrative of the Internet's success—in other words, projects that are not necessarily part of the established linear history of the Internet but are nevertheless important to describe and to understand. The goal for this paper, therefore, is to destabilize the American-centric, triumphalist, and teleological narrative of linear success—from Arpanet to Internet to global information society—that is so pronounced in the existing popular accounts of the history of the Internet.

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There has been a striking amount of controversy lately over an apparently simple question: Who invented the Internet? I would rather not spend the brief amount of time I have here explaining why the recent ideologically-charged explorations of this question (from Gordon Crovitz in the *Wall Street Journal* and Steven Johnson in the *New York Times*) are inept and reflect poorly on their authors and the institutions that published them. And of course, there is no need with a SIGCIS audience to recap the clear accounts, offered by Janet Abbate and others, of the TCP/IP Internet's historical origins. I think we all know how the story goes: it starts with Sputnik (perhaps earlier) and then moves to the creation of the Arpanet, Cerf and Kahn's Transmission Control Protocol and Internet Protocol, the commercialization of the Internet, and the global adoption of the World Wide Web. Additionally, I think we all have a good sense for how Crovitz and Johnson, each in their own way, have distorted the Internet's origins to serve ulterior motives. Here, as elsewhere, the temptation to "teach the controversy" is a waste of time for those of us who want to do real historical (or, in other cases, scientific) work.[1]

Instead, I will argue that the simple question itself—"Who invented the Internet?"—is poorly conceptualized and therefore unlikely to lead to any new research or useful discussions amongst professional historians. We can ask better questions—and find more meaningful answers—only when we recognize that linear tales of "invention"

[1] Gordon Crovitz, "Who Really Invented the Internet," *The Wall Street Journal*, July 23, 2012, A 11; Steven Johnson, "The Internet? We Built That," *The New York Times* September 21, 2012, available from http://www.nytimes.com/2012/09/23/magazine/the-internet-we-built-that.html. For an earlier, ideologically-driven "controversy" about the Internet's origins, see the materials at Seth Finkelstein, "Al Gore 'invented the Internet' – resources," last updated April 28, 2006, available from http://sethf.com/gore.

cannot account for the past 50 years of innovation, cooperation, and competition in data networking.

To clarify my position, I will describe the differences that I see between two different ways of conceptualizing the topic at hand: the "History of the Internet" and "Histories of Networking." Both terms aim to explain the technologies, politics, and cultural aspects of the age of networked devices that constitute the foundations of the "Network Society" that Manuel Castells and others have studied in great depth. In my view, to frame our inquiry as the "History of the Internet" is a category error. My quibble is not merely with terminology, but also with the conceptual problems that the term "History of the Internet" presents and with the underlying historical developments that the "History of the Internet" encourages us to explain. I hope that my discussion may have some value for other scholars who study the recent past—as well as those of us who study the history of computing and the history of information more generally.

I perceive at least 3 problems with the "History of the Internet."[2] First, the category tempts historians toward Whiggism and teleology, those sins of historiography that we try to beat out of our students. Whiggism (or "Whig history") is often invoked as a derogatory term for histories that celebrate present conditions as the best possible outcome: Whig histories look to the past only to explain progress that has culminated in

[2] For a defining early overview of the "History of the Internet," see Roy Rosenzweig, "Wizards, Bureaucrats, Warriors & Hackers: Writing the History of the Internet," *American Historical* Review 103 (1998): 1530-1552. I want to make it clear that I admire both Rosenzweig's work and Janet Abbate's *Inventing the Internet*, which presents an astonishingly clear and sophisticated account of the Arpanet and the Internet. My goal here is not to criticize their work, but instead to insist that we continue traveling down the path they cleared. If it will help readers to imagine more specific straw men, they should look on the Web for a few "Internet history timelines."

the present.[3] Since the Internet is today both pervasive and somewhat beloved, "Internet history" fits all too comfortably with a Whiggish interpretation that tells the heroic story of where the Internet came from and what qualities make it so beloved. In fact, we already have enthusiastic Whig histories of the Internet that fit this pattern: they look to ARPA as a model for the organization of scientific research, to the chaotic organization of Internet standards as a model for international ("multistakeholder") governance, and to the design principles of the Internet's architecture for inspiration for other types of technological innovation.[4]

Teleology is related, insofar as historians use the term to denigrate explanations that start with the present and then reach into the past so that they can conclude "and that's the reason why things are the way they are today." The very form of the simple question "Who invented the Internet?" invites teleological responses. They may not have the same celebratory tone as Whig histories, but teleological explanations—and debates over "invention"—tend to ignore missteps and paths not taken, and generally cleanse their neat narratives of contextual factors that are presumed to be extraneous. Because they ignore the messiness of the past, they badly misconstrue its complexity and thus ignore insights from historians of technology, such as John Staudenmaier and Kenneth

[3] See for example Ernst Mayr, "When is Historiography Whiggish?" *Journal of the History of Ideas* 51 (1990): 301-309; Nick Jardine, "Whigs and Stories: Herbert Butterfield and the Historiography of Science," *History of Science* 41 (2003): 125-140.

[4] See for example A. Michael Froomkin, "Habermas@Discourse.Net: Toward a Critical Theory of Cyberspace," *Harvard Law Review* 16 (2003): 749-873; Jonathan Zittrain, *The Future of The Internet—and How to Stop It* (New Haven: Yale University Press, 2008); Gralf-Peter Calliess and Peer Zumbansen, *Rough Consensus and Running Code: A Theory of Transnational Private Law* (Portland, OR: Hart Publishing, 2010). To use the Internet as a model in the ways that these works prescribe is, as I argue elsewhere, both misguided and potentially dangerous.

Lipartito, who embrace contingency, see failure as historically significant, and study innovation as a social process rather than as a chronology of inventions.[5]

My second objection to the category of "Internet history" is that it is too narrow, arbitrarily defined, and unnecessarily exclusionary. "Internet history," by definition, fails to capture the diversity of non-TCP/IP networks such as Fidonet, Usenet, Minitel, and hundreds of other computer networks that proliferated in Europe, Asia, and North and South America in the 1970s and 80s—networks whose users developed formative skills, norms, and expectations about life online. At the same time, "Internet history" largely omits the hulking presence of telecommunications monopolies, and fails to account for the ways that telecommunications technologies, political economies, and user cultures shaped the new, hybrid cultures that emerged with the convergence between two previously distinct sectors and practices—communications and computing—around digital processing and transmission technologies between the 1970s and the 1990s.[6] (The favored rendering of my undergraduates, "internet," has the opposite problem: for them, "internet" means everything online but has no specific referent—hence its reclassification from a proper to a common noun.)

The deeply contested process of telecom-computer convergence provides a good example of what "Internet history" tends to miss. Abbate's *Inventing the Internet* (along with Schmidt and Werle's *Coordinating Technology*) sketches the general outlines of the politics of X.25 and related international standards in the 1980s, but only scratches the

[5] John M. Staudenmaier, S.J., "Rationality, Agency, Contingency: Recent Trends in the Historiography of Technology," *Reviews in American History* (2002): 168-181; Kenneth Lipartito, "Picturephone and the Information Age: The Social Meaning of Failure," *Technology and Culture* 44 (2003): 50-81.

[6] See for example Valerie Schafer, *La France en Reseaux* (Paris: Nuvis, 2012); and Ignacio Siles, "Establishing the Internet in Costa Rica: Co-optation and the Closure of Technological Controversies," *The Information Society* 28 (2012): 13-23.

surface of the intense and sophisticated strategies deployed by telecom monopolies, national regulators, incumbent firms such as IBM, entrepreneurs and clever individuals of all sorts, and opportunistic niche competitors such as Honeywell and Digital Equipment Corporation. No one in the 1980s contested that it was this strategic battle—rather than the marginal experiments conducted in the TCP/IP Internet—that would determine the future of data communication. The amazing part of the story, of course, is that the Internet emerged from the margins: it was never designed to be the foundation of a global public and private information infrastructure, and most observers in the 1970s and 80s thought of it as little more than an interesting, and well-funded, American (military) experiment. This fact alone should remind us to pay more attention to what was going on at the center of the action in the data networking scene of the 1970s and 1980s, and not just the developments on the periphery that were more enduring.

"Internet history" also suffers from a third, methodological, problem: it tends to be too close to its sources. Many Internet pioneers are alive, active, and eager to shape the histories that describe their accomplishments. Many museums and historians are equally eager to interview the pioneers and to publicize their stories. In the process, it is normal for everyone involved to leave out unsavory or unflattering aspects of the past—thus leading popularizers like Steven Johnson to the mistaken conclusion that the history of the Internet is a story of decentralized collegial, open, peer-to-peer innovation. Professional historians, especially those of us who do recent history and oral history, should know better than to mistake the accounts and memories of interview subjects for the objective and honest truth. Here, as elsewhere, history is being written (or rather

narrated, shaped, and blogged) by the victors—and, to no one's surprise, this history flatters them and denigrates the work of their vanquished rivals.[7]

To sum up my case against the category of "Internet history": its definition encourages Whiggish and teleological narratives; it is unnecessarily narrow and exclusive; it misses or at best misconstrues the broader outlines of a bigger and more interesting story, the digital (and global) convergence of computing and telecommunications; and it is insufficiently critical of the "pioneers" who historians and museum professionals see as heroes rather than as humans.

The alternative that I propose to the "history of the Internet" is a broader category, "histories of networking," that can better capture the diversity of technologies and experiences that fall outside and across the margins of Internet history (and "Internet history").[8] Because it is conceptualized in broader terms, "histories of networking" has room for a wider range of network technologies (wireless, modems, satellite, etc), network industries (radio, telecom, TV, etc), network politics (US Cold War R&D funding, European "national champions," etc) and network user identities and cultures ("social networking," open vs. closed user interfaces, etc). There are countless numbers

[7] For my own views on oral histories and some links to standard texts on the complicated relationships between interviews, memory, and truth, see IEEE Computer Science History Committee, "Five Perspectives on Interviewing: A Roundtable Discussion," February-April 2011, available from http://www.computer.org/portal/web/cshc. Paradoxically, and despite scores of awards, public speeches, and oral history and video interviews, the central people in the history of the Internet do not have high-profile public personas. It is an unscientific sample, but I have found that very few of my colleagues, relatives, and friends know anything about the central figures of Internet history such as Cerf, Kahn, Postel, Roberts, Licklider, etc.

[8] Here I am following the lead of Michael S. Mahoney, "The Histories of Computing(s)," *Interdisciplinary Science Reviews* 30 (2005). See also Michael S. Mahoney (Thomas Haigh, ed.), *Histories of Computing* (Boston, MA: Harvard University Press, 2011).

of historical studies, personalities, technologies, and so on that fit into this broader rubric—far too many to list.[9]

As a category, "histories of networking" therefore has the potential to bring a variety of specialized sub-fields (communication history, telecom policy, history of computing, Internet history, radio history, diplomatic history, histories of neoliberalism and capitalism, and so on) into conversation with one another. Thus conceived, there is no *a priori* reason why "histories of networking" would take the IPv4 Internet technologies as the most advanced accomplishments of data networking: in human societies, that which survives is not necessarily the fittest, best, or most deserving. Indeed, framing our inquiry more broadly as "histories of networking" would de-center the Internet's privileged position in the literature and therefore prepare historians to cast a more critical eye on the Internet's own history. We would thus be able to shed new light on how Internet engineers and advocates weathered the persistence of controversy and dissent—topics that tend to be missing from "Internet history" and that have no bearing on the simple question from the beginning of the paper, "Who invented the Internet?"[10]

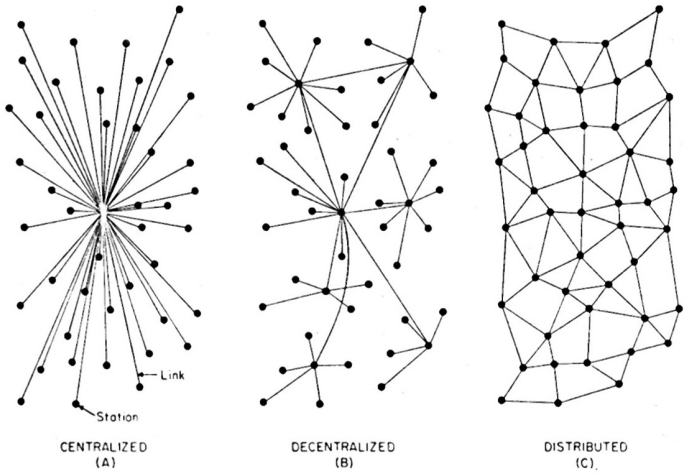
For a brief example of what we can gain from a broader conception of "histories of networking," consider two neologisms of the 1970s—"compunications" and "*télématique*"—that were coined in attempts to describe the convergence between telecommunications and computing. These (now quaint) terms remind us of the novelty and contingency of discourses, categories, and technologies that we today assume to be

[9] Mariann Unterluggauer's Project NetAffair, http://www.netaffair.org, is a notable example of what a "history of networking" might accomplish, both as history and as a guide for innovations in technology and policy.

[10] Dissenting voices include John Day and his colleagues in the Pouzin Society, http://www.pouzinsociety.org/; and a book that I have not read but looks promising: James Curran, Natalie Fenton, and Des Freedman, *Misunderstanding the Internet* (Routledge, 2012).

stable.[11] They help us remember that the celebrated innovators who worked across the boundaries of computers and communications—people such as JCR Licklider, Robert Kahn, Remi Despres, and Louis Pouzin—worked in conditions of persistent instability, and always needed to describe and justify their designs with respect to the technological and jurisdictional status quo. They tell us that the "history of the Internet" is but one thread in a much bigger and more complex tapestry of the history of networking that dates from at least the 1960s and still continues to unfold today.

Consider (or reconsider) also the famous drawing from Paul Baran's *On Distributed Communications* (1964):



I can't resist using Baran's key distinctions between centralized, decentralized, and distributed networks to reflect on some of the historiographical distinctions I have been discussing. It occurs to me that the category "Internet history" resembles the centralized approach—centralized, that is, around accounts that explain the invention of the TCP/IP

[11] Anthony Oettinger, "Compunications in the National Decision Making Process," in Martin Greenberger, ed., *Computers, Communications and the Public Interest* (Baltimore, MD: The Johns Hopkins University Press, 1971); Daniel Bell, "Introduction," in Simon Nora and Alain Minc, *The Computerization of Society: A Report to the President of France* (Cambridge, MA: The MIT Press, 1981), vii.

Internet and its technical precedents. I am advocating "histories of networking" as a category that would more closely resemble the decentralized approach—able to accommodate diversity but still retain an essential connection around a single point, which is in this case the convergence of computers and communications around digital technologies.

I am wary of what happens when we stretch the discussion to include Baran's third, "distributed" approach. In my understanding, this theoretical network map looks more like an experimental "mesh" network than it does the architecture of the IP networks that are operational today as the Internet. On the surface, the historiographic equivalent of Baran's "distributed" network model appears to be something like the flat, postmodern, all-nodes-are-equally-powerful interpretation that animates, for example, Steven Johnson's recent *New York Times* piece "The Internet? We Built That." Johnson's choice of pronoun immediately exposes the weakness of his position—read literally, it suggests that both he (the writer) and you and I (the readers) built the Internet. This, from a historical vantage point, is madness—equally maddening as the disingenuous column written by Gordon Crovitz and published by the *Wall Street Journal* that somehow credited Xerox with the invention of the Internet. We owe it to ourselves, to the public, and the thousands of people who actually did build digital networks—including, of course, the TCP/IP Internet—to tell these stories with more accuracy and more sophistication.

This history revolves around four distinct aspects. There is the technological evolution that began with early research on packet switching and the ARPANET (and related technologies), and where current research continues to expand the horizons of the infrastructure along several dimensions, such as scale, performance, and higher-level functionality.Â The Internet as we now know it embodies a key underlying technical idea, namely that of open architecture networking. In this approach, the choice of any individual network technology was not dictated by a particular network architecture but rather could be selected freely by a provider and made to interwork with the other networks through a meta-level â€œInternetworking Architectureâ€.