

NETWORKS AND AMERICA'S FUTURE*

TOM WHEELER**

Silicon Flatirons Center
Boulder, Colorado
February 13, 2017

The headlines in the past few weeks have been somewhat daunting when it comes to the fate of the activities of the Federal Communications Commission (FCC) over the last few years. Today, however, is a time to look forward, not backward.

We have all been consumed by the impact of the Internet, but in our excitement, we have failed to also pay attention to the limitations of that impact. To paraphrase one economist's observation, you can see the Internet everywhere but in the productivity statistics.¹ That is a pretty damning statement, since it is productivity that drives long-term economic growth.

Northwestern University economist Professor Robert Gordon detailed this reality in his masterful book *The Rise and Fall of American Growth*.² In it, he quantifies how productivity powered America's growth up until 1970 when it tailed off.³

Gordon is particularly dismissive of the Internet. He observes that the Internet provided a spurt in productivity growth for about a decade beginning in the mid-1990s, but has since fallen back.⁴ Gordon argues that the benefits of information technology are already in the bag and that, while it had an interesting impact on consumer-facing businesses, it failed to lift productivity in the more economically

* This speech has been edited for publication.

** Tom Wheeler, now a Senior Fellow at The Aspen Institute, served as the 31st Chairman of the Federal Communication Commission from November 2013 to January 2017. Prior to joining the FCC, Wheeler was Managing Director of a venture capital firm focused on investing in early stage IP-based companies. Previously, he led the largest trade associations for both the cable and wireless industries, in addition to starting or assisting to start multiple businesses in the communications sector. Wheeler delivered these remarks at the 17th annual Silicon Flatirons Center Digital Broadband Migration Conference on February 13, 2017. Video of this speech can be found under "Closing Keynote Presentation" at <https://siliconflatirons.org/events/the-digital-broadband-migration/> [<https://perma.cc/NMT7-RSMY>].

1. Robert Solow, Book Review, *We'd Better Watch Out*, N.Y. TIMES, July 12, 1987, at 36.

2. See ROBERT J. GORDON, *THE RISE AND FALL OF AMERICAN GROWTH* (2016).

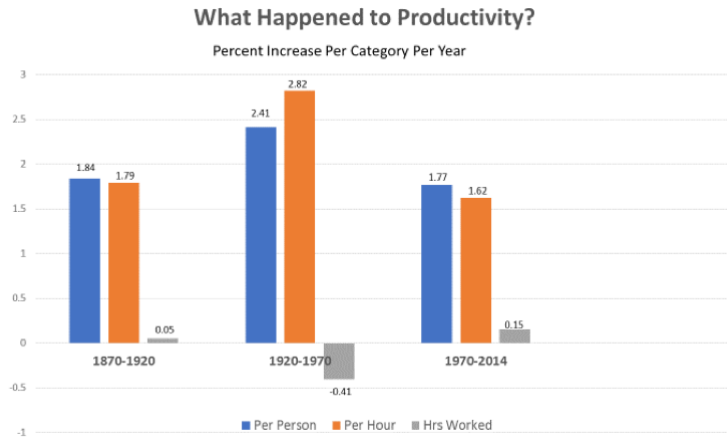
3. *Id.*

4. See generally *id.*

essential business-industrial sector as much as had earlier innovations.⁵

Here is what Gordon found: American productivity since 1970 has been growing at a rate significantly below 1920-1970, and even below the post-Civil War period.⁶

Figure 1: American Productivity between 1870-2014



Gordon sums things up this way:

[E]conomic growth since 1970 has been simultaneously dazzling and disappointing. This paradox is resolved when we recognize that advances since 1970 have tended to be channeled into a narrow sphere of human activity having to do with entertainment, communications, and the collection and processing of information. For the rest of what humans care about . . . progress slowed down after 1970, both quantitatively and qualitatively.⁷

That's pretty harsh stuff, particularly to the kind of people represented in this room who see ourselves as part of a technical revolution that drives an economic and cultural revolution.

The question is whether there can be any true economic revolution if there isn't transformation at the heart of the productive economy. Such a transformation occurred in the mid-19th century with the first high-speed network, i.e., the railroad, and the first electronic network, i.e., the telegraph. It continued in the 20th century with other

5. *Id.*

6. *Id.*

7. *Id.* at 2.

networks: electricity; telephones; sewer and water; radio and television; and airways and highways.

What I would like to propose today is agreement with Gordon's analysis of the current situation, but dissent from his conclusion as to the future—specifically, the future role of the Internet in increasing productivity.

And I know you won't be surprised when I submit that this future is in jeopardy absent the new paradigm of regulation that we have developed over the last several years. In other words, the Internet holds the key to future growth, but only if the nature of our networks is determined by innovation and consumer choice resulting from enlightened public policy, rather than the self-interested wishes of a few network owners. I will return to this point at the end of my remarks. But first, let's review how we got to today.

We talk about the Internet, but it was the World Wide Web that set the Internet free and stimulated the growth we have seen thus far. When Tim Berners Lee developed the Web in 1990, it changed the nature of the Internet by making it usable by mere mortals.

The Web has changed billions of lives. But to date, the Web's impact has principally been in the consumer-facing space. We use the Web to find things, exchange information, and deliver video.

Web 1.0's breakthrough made it possible to find things on the Internet and to display them in a common format. It allowed the Internet to step out of the world of computer science to become useful to all of us.

Web 2.0 came along around the turn of the millennium, in 2002. It democratized the Web by making it easy for individuals to post their own content. Social networks, blogs, and video services like YouTube are the outgrowths of Web 2.0.

And there we have lived for the last decade and a half—both in terms of innovative services and our policy discussions.

It is the activities of Web 2.0 that have shaped the discussion of public policy. In 2005, shortly after Web 2.0 created new opportunities for companies using the network, Ed Whitacre, CEO of AT&T's predecessor SBC, defined the debate that continues today.⁸ He lamented that what edge services "would like to do is use my pipes for free, but I ain't going to let them do that . . ."⁹

There we have the entire open Internet debate in nineteen words. Our Open Internet decision, fifteen years into the Web 2.0 experience,

8. 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/QC2T-VY9G].

9. *Id.*

was that indeed networks sought to behave like gatekeepers, controlling access or exacting tribute, and such behavior by half-a-dozen companies imperiled the virtuous cycle of Internet development across the entire economy. We further recognized that the pipes weren't "free" and that Internet Service Providers (ISPs) should have the freedom to set consumer connection rates without *ex ante* approval.

Now we are beginning to see the emergence of Web 3.0. It is this new Web that holds the promise to rebut Gordon with productivity gains beyond the consumer space. Web 3.0 is not just the delivery of documents and video—it is also the delivery of intelligence as a product. Some call this the Semantic Web because it exchanges data that describes the relationship among information-generating objects. It is through the exchange of such intelligence that 21st century productivity increases will grow.

The Internet of Things (IoT) is one manifestation of Web 3.0. But we need to think bigger than some of our current IoT examples. Web 3.0 is about connecting intelligence in all forms—data, ideas, apps, and ultimately people.

And here's the big effect of Web 3.0: it will change the business model of the Internet from push to pull.¹⁰

The new creation of value becomes *using* information, not *pushing* information. The business model of Web 3.0 moves from monetizing information by targeting things at consumers, to realizing value through pulling information from billions of connected sources to create new activities built on new information products, and to increase the productivity of existing activities.

For example, delivering a movie over the Web is the *transportation* of a decision the consumer made. Web 3.0, in comparison, is the *orchestration* of information drawn from a Web in which everything is intelligent and online. That orchestration is itself a new product (think the orchestration of autonomous vehicles), and a boost to productivity (think of the effects of intelligently-managed roadways).

Beyond the development of Web 3.0 itself, and its heavy reliance on networks, are a set of ancillary activities necessary for its success—activities that further increase our reliance on open networks.

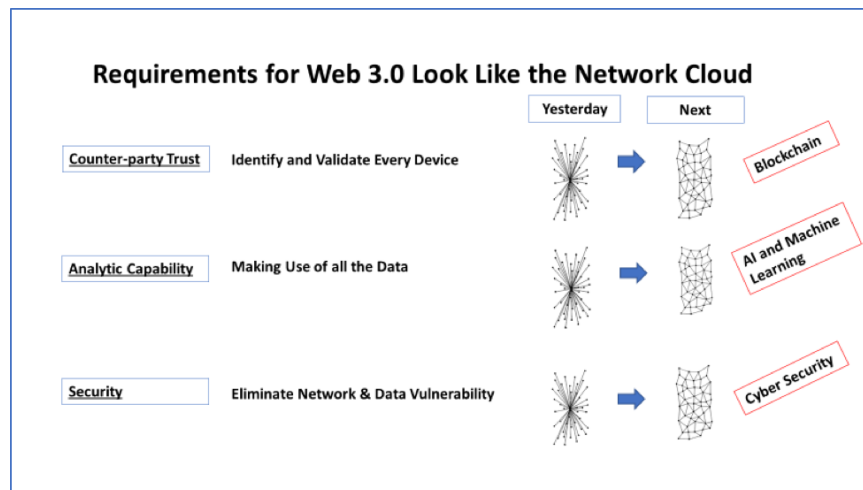
Will Web 3.0 come into existence and be the boost to productivity the nation needs? I believe that rests on three core requirements:

10. I first heard this concept from Bill Coleman, CEO of Veritas.

1. Web 3.0 is going to require counter-party trust—the ability to identify and validate every source of information.
2. Web 3.0 is going to require analytic capability—with data being created and dispatched from tens of billions of sources, the process will drown without machine learning and artificial intelligence.
3. Web 3.0 is going to require security—network and data storage vulnerabilities will have to be eliminated.

Each of those activities looks like and depends on a distributed network.

Figure 2: Requirements for Web 3.0



The new platform for trust, for instance, is Blockchain—essentially a distributed ledger. But if the pathways that enable Blockchain to provide trust can be abused by network gatekeepers, the new generation of trust is imperiled.

The new platform for analytic capability—machine learning and artificial intelligence—is nothing more than the connection of multiple intelligent end points. But if the pathways that enable artificial intelligence can be abused by network gatekeepers, the analysis necessary for Web 3.0 is imperiled. And absent cyber security to protect both the storage and the transmission of Web 3.0 intelligence, the promise of Web 3.0 will not be fulfilled.

The same tools that enabled earlier iterations of the Web are already at hand for moving to Web 3.0: ubiquitous networks (principally wireless), the common language of Internet Protocol, and constant expansion of processing power exemplified by Moore's Law.

But—and I believe this firmly—the policies of open networks, protection of information, and cybersecurity are *essential* if this migration is going to take place.

That’s why, instead of rehashing Ed Whitacre’s twelve-year-old frustration, I’ve focused on the future.

The tendency for policy makers at the FCC or in Congress is to define tomorrow by the experiences of today. But Web 3.0 is taking us into a different reality. Policy makers need to ponder—and protect—this future.

It’s one thing to control access to videos, like ISPs are doing now by favoring their content over others. But allowing a network to make similar selections about how connected devices—and ultimately connected individuals—exchange data, ideas, and applications to provide a new level of productivity guts Web 3.0 and that promise of productivity.

Similarly, Web 3.0 will be imperiled if ISPs are permitted to spy on the consumer’s information that passes over the network in order to sell that consumer something. But moving from a push Web economy to a pull Web economy reinforces that information belongs to its owner, not the network.

It is bad enough that Russia can use hacks of our networks to influence our democracy. But porous networks, in which emails are vulnerable, are incompatible with the level of security required to protect the flow of semantic information.

Web 3.0 means the Internet is the most important asset of the 21st century. The networks necessary to deliver that future are, for the most part, undisciplined by competition—a situation that will be made worse if the predicted new wave of FCC-authorized network consolidation comes to pass. Even President Trump has warned of “too much concentration of power” in the “hands of too few.”¹¹

Risking the openness, privacy, and security of the networks risks our future. Does anyone really believe that government has no role to play?

The response from those seeking to cut back on that oversight has always been that regulation is bad for broadband investment. The facts show otherwise.

AT&T recently explained to the Securities and Exchange Commission (SEC) and shareholders their plan for consistent, not decreased, capital spending: “As we look out over the next 3 years, we anticipate that our capital spending will continue to run around 15%

11. Brian Fung, *Why Trump might not block the AT&T-Time Warner merger, after all*, WASH. POST (Nov. 11, 2016), https://www.washingtonpost.com/news/the-switch/wp/2016/11/11/trump-may-have-a-harder-time-blocking-the-massive-att-time-warner-merger-than-he-thought/?utm_term=.d64a213adfc2 [<https://perma.cc/9GJ4-KCP2>].

of our revenues.”¹² Nary a word about the Open Internet slowing investment.

And, to put this in context, the economics of technology is making the expansion of broadband less expensive. Last summer, AT&T's President of Network Operations explained the economic impact of networks going digital: “In 2015/16 we're going to deploy about 250% of the capacity that we did in 2013/14, and we're going to do it for 75% of the cost.”¹³

What a joyous development that is for our country! As the cost of expanding network capacity decreases, the ability to build more and better networks increases. And this is happening at the same time when the marginal cost of adding traffic to existing networks is approaching zero.

It is also something to keep in mind as ISP lobbyists and their surrogates bring out the tired old shibboleth of the regulatory impact on network-investment decisions. Any investment decision made other than on the basis of generating a return on that investment is nuts—but that's where the good news is. AT&T has told us that at reduced investment there are still huge gains in capacity, thus increasing the opportunity for a return on that investment.

While we're talking about network investment, it is worth repeating how AT&T explained to the SEC and shareholders their plan for consistent, not decreased, capital spending: “As we look out over the next 3 years, we anticipate that our capital spending will continue to run around 15% of our revenues.”¹⁴ Nary a word about the Open Internet slowing investment.

That statement about continued investment is important. Not only will Web 3.0 require open connectivity, but also the technologies that will enable Web 3.0 are distributed across the network and will require fast, fair, and open access.

We dealt with this through a process we called the New Regulatory Paradigm. It's a simple concept: the need for regulatory oversight has not gone away, but how it is administered must change as a result of the rapid technological and market innovation of the Internet.

The New Paradigm is similar to the practices in agile software development. In times of slower-developing technology, regulators—and software developers—could engage in top-down linear

12. Randall Stephenson, CEO of AT&T, *Letter to Shareholders*, in SEC FORM 10-K, ANNUAL REPORT FOR 2016, at 6 (2016).

13. Bill Smith, President AT&T Tech. Operations, *Wells Fargo Convergence & Connectivity Symposium* (June 21, 2016).

14. See Stephenson, *supra* note 12.

micromanagement. Today, such an approach would not only slow innovation, but also be impossible to implement.

Like software development in which requirements and solutions evolve, today's regulation must be agile. That means it should avoid excessive *ex ante* prescriptions in favor of the articulation of essential principles and their *ex post* enforcement if and as necessary.

But credit should go where it is due. This concept isn't really new. It started when legal and economics scholars began to think about the Internet's impact on regulation. One of those scholars was a then-Associate Professor at the University of Colorado named Phil Weiser. We hijacked Phil's idea, first with the Obama-Biden Transition Team, and then at the FCC.

Our three headline activities—open Internet, consumer privacy, and cybersecurity—all put the new paradigm to work. In the Open Internet decision, for instance, we took care to avoid anything like *ex ante* regulation, particularly, *ex ante* rate regulation, and to make sure that ISPs are free to continue to evolve with technological opportunities, new business concepts, and changing consumer preferences . . . all without asking permission. And we instituted a General Conduct Rule that allowed oversight to continue as technology and markets evolved.

Although those who own networks today object to this plan, it is the same policy construct that the wireless industry asked for in 1994—common-carrier classification with heavy forbearance. That formula has been successful in wireless for the twenty-three years since and I see no evidence that the same won't be true in regard to broadband.

And I do believe that it is always important to point out the imbalance in the debates about these topics and how fewer than half-a-dozen network owners seek to be unleashed irrespective of the impact on the rest of the economy and millions of consumers.

Let's just remember: There isn't enough broadband competition in America. Wireless broadband is not yet a substitute for fixed and there aren't many choices among fixed providers. The FCC found at the end of 2016 that in about three-quarters of the country consumers have either no choice or only one choice for a broadband connection at 25/3 Mbps or better.

As we look to the future of the American economy and the necessary increases in productivity, the Internet will be the key. When we left office, there was in place an Internet that was fast, fair, and open—the qualities that will be essential for American economic growth beyond the current era.

The new regulatory paradigm is working well. Investment at the edge is up. Investment in the network is stable as a percent of revenue, even as network costs decline. Fiber to the premises is up. ISP

revenues—and stock prices—are up. And, most importantly, consumers, competition, and the Web of tomorrow are being protected.

Those who would seek to change policies at the request of half-a-dozen network owners have a heavy burden to establish how this would help our nation move forward to realize the full economic potential of the network that is the most important asset of the 21st century.

Let's step out of the micro-focus of telecom policy for a moment and consider the broader national economic effects that are delivered by these networks. If we want economic growth, rather than the slow-growth analysis described by Gordon, we need open networks, privacy-protecting networks, and secure networks.

