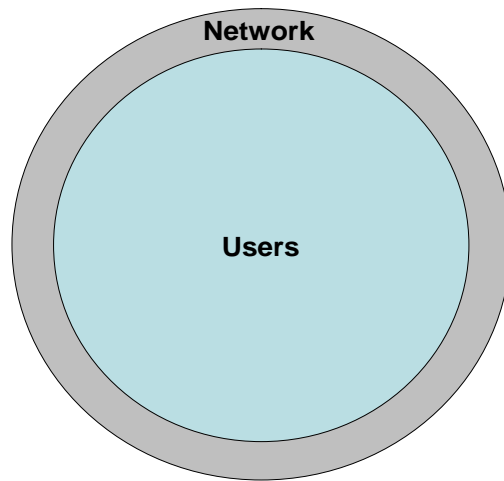


LIVING ON THE DEEP EDGE

**The Nature of Innovation,
The Emerging Internet-Based Ecosystem,
And Some Implications for U.S. Broadband Policy**



Richard S. Whitt, Esq.

February 2006 (DRAFT)

**(*Please note that this white paper is only an initial draft,
and not yet in final, publishable form)**

LIVING ON THE DEEP EDGE

“If there is a constant in the history of the Internet, it is surprise.”¹

This past year marks the tenth anniversary of Netscape’s initial public offering. Many believe that August 9, 1995 signifies the true beginnings of the commercial Internet, and the rise of the dotcom boom. Of course, five years later came the dotcom bust, when conventional wisdom deflated any pretensions about a brave new World Wide Web that would reshape dramatically the lives of billions around the globe. In many ways we still live in the long shadows cast by the dotcom bust, only now beginning to peer out hesitantly at the virtual landscape around us for any signs of sustainable life.

It is a truism that we humans tend to overestimate the short-term, and to underestimate the long-term. As a result, while we all have been waiting impatiently for the more immediate promise of the Web to commence, the beginnings of the longer-range future suddenly are upon us.

This myopia seems to be especially prevalent today in the telecommunications services sector. Indeed, even as industry players and analysts busy themselves with plans revolving about “triple play” and “home run” network convergence at the consumer level, there are growing signs that this provider-centric approach is ignoring a larger emerging picture. With the advent of always-on broadband connections, significant computing power and storage, and personal mobile devices, human ingenuity is finding novel ways for computer software to provide information and entertainment and – most importantly – connectivity. From all corners of the Internet, and in myriad ways, millions of innovative entrepreneurs and ordinary people are adopting applications and creating content as part of their daily lives. The rapid growth of innovative user activities at the proverbial edge of the network, leading to the emergence of a user-powered Web, pose difficult challenges for those invested in present-day business models. In other words, those in legacy industries may be so entranced with their own images in the mirror that they may well be missing both the forest and the trees.

This paper discusses some of these thus-far overlooked market and technology developments, occurring in what I term the “deep edge” of the Internet. In particular, these developments collectively are helping give rise to a growing emergent phenomenon best described as a user-powered Web. We will examine how exploding innovation in the rich and expansive edges of the network (the upper layers) portends future conflict with many of the command-and-control assumptions of the incumbent providers of first-mile connectivity (the lower layers). The paper also lays out some tentative thoughts about how U.S. government policymakers should approach, and seek to reconcile, this seeming divide between those operating in the network core and those living at the applications edge.

¹ Janet Abbate, Inventing the Internet (1997), at 218.

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	5
Part I. The Deep Roots of the User-Powered Web	7
A. Key Elements of Internet Architecture	7
1. Code and Layers	8
2. IP: Ubiquity, Simplicity, and Transparency	9
3. E2E	10
4. “NetVergence” And The Layered Approach	13
5. Overlooked Components: The Social, Economic, and Legal Backdrop	15
B. The Web As an Edge-Based Phenomenon	15
1. An Unlikely Child	15
2. The Pre-Web	18
3. The Web 1.0	18
C. The Edgy Nature of Innovation	20
1. Innovation and the Net	20
a. What is innovation?	21
b. What is the link to the Internet?	22
c. Where do innovations come from?	23
2. Complexity and the Net	28
3. Evolution and the Net	31
4. The (Kenneth) Arrow of Uncertainty	36
D. The Tangible and Intangible Value of the Edge	36
1. The Economic Benefits	36
2. Other Net Values	39
Part II. The Emerging Ecosystem of the Deep Edge	41
A. An Evolving Internet	41
1. A Tale of New Platforms	44
2. A Tale of New Connectivity	45
3. A Tale of New Ubiquity	45
B. Now Enters the User-Powered Web	47
C. An Interlude: Replacing Our Mental Furniture	49
1. The Powers and Limits of Human Perception	49
2. Replacing Our Metaphors	51
a. From Core to Edge	52
b. From Edge to Deep Edge	53
c. From Consumers to Users	57
d. From Intermodal to Transmodal Competition	59
3. Some Cautionary Notes	60

	<u>Page</u>
D. The Ecosystem of the Deep Edge	61
1. The Players	63
2. The Tools	64
3. The Applications	65
4. The Operational Models	68
E. The Inevitable (and Evitable) Constraints	72
1. The Personal and Social Factors	72
a. Too many couches	73
b. Too much data	73
c. Too much “me”	74
d. Too much technology	74
e. Too much complexity	75
f. Too much danger	75
2. The Economic and Technology Factors	77
a. Follow the money trail	77
b. Incumbent providers strike back	77
c. The Microsoft example	78
3. The Legal and Public Policy Factors	79
4. So What’s The Bottom Line?	80
Part III. When Atoms and Bits Collide: The Broadband Conundrum	81
A. Net Managed versus Net Commons	81
B. The Prevailing Dogmas of Telecom	82
C. Broadband Markets on the Edge: The Intelligent Incumbent’s Response	88
D. Public Policy on the Edge: The U.S. Government’s Options	93
1. Ensuring User Access to Broadband	94
a. Consumer net neutrality	95
b. ISP open access	96
c. Balancing the factors	97
2. A Fresh Look at the Access Question	98
a. Ex ante safeguards	99
b. Ex post remedies	102
CONCLUSION	103

INTRODUCTION

The story of the Internet largely is the story of innovation, flourishing among end users operating at the proverbial edge of the “network of networks.” As we shall see, creativity and ingenuity find a natural home in the welcoming environment created by the Net. The reason is straightforward: the crux of the Internet is innovation without permission.

In order to promulgate his protocol creation, Tim Berners-Lee didn’t need to file a tariff, or submit a certificate, or pay a licensing fee. He was not required to file a petition seeking authorization to use the network. Nor did he hire outside lobbyists to insert legislative language enabling a particular business model.

The Internet is a political creation, one imbued with certain values. Market players and government policymakers have the power to alter those values serve other objectives, which in turn has major consequences for how we experience the Net.

In some respects, this paper is a natural follow-on to my previous publication discussing the layered nature of the Internet, and highlighting some important implications for U.S. Internet and telecommunications public policy.² [summarize layers paper]

Here I seek to extend the analysis [more]

Of course, as John Naughton puts it, writing about the Net is “like skating on quicksand.”³ While some writings about the Internet have stood up well in the short years since it first emerged into public consciousness, many others in retrospect come off seeming wildly optimistic, unduly pessimistic, and/or flat out wrong. My aim here is to present a moderated view, one that strikes a balance between the promises and the perils on online life in the early 21st Century.

In Part I,

The nature of innovation [more]

In Part II,

The emerging Internet-based ecosystem [more]

² Richard S. Whitt, *A Horizontal Leap Forward: Formulating A New Communications Public Policy Framework Based on the Network Layers Model*, 56 FED. COMM. L.J. 587 (2004).

³ John Naughton, *A Brief History of the Future: The Origins of the Internet* (1999), at 267.

Finally, in Part III, I present a somewhat contrarian view of “convergence.” I will attempt to find a pathway between the mindsets of the Net Commons and the Net Managed. This pathway could have significant implications for U.S. public policy, namely how to approach the issue of end user access to broadband platforms.

[more]

Whether these potentially immense marketplace changes ultimately will prove harmful or helpful to the bottom line of legacy telecommunications service providers, and how in turn policymakers should react, is a story very much unwritten.

Part I. The Deep Roots of the User-Powered Web

“All of us are interested in the future, for that is where we will be spending the rest of our lives.”⁴

A. Key Elements of Internet Architecture

For starters, it is important to understand that the “network of networks” we call the Internet is not some neutral, value-free assemblage of routers and servers and fiber optics. Generally speaking, technology may be viewed from a certain perspective as “neutral,” but how we design and use it reflects a distinctive social and psychological bias. As an artifact of human ingenuity, technology expresses deep-seated desires, wants, needs, and fears. While component parts may be used for a variety of purposes – think for example, of the assemblage of mechanical systems into either exploratory rocket-ships or atomic weapons – the design and assembly and uses of those components inevitably reflects very human impulses.

In the case of the present-day Internet, that built-in bias is reflected in the key elements of its architecture and infrastructure. As Lawrence Lessig already has shown us, Code is Law,⁵ or rather that computing technologies are products of human design. Those who struggled to bring forth the Internet did so in the full knowledge that they were imbuing it with specific characteristics that reflected their personal and professional value systems. Those values include openness, flexibility, and the lack of any pervasive authority.⁶ The Net is also oriented towards user activities at the so-called “edge” of the network, as opposed to network activities at the network’s “core.”⁷

At the same time, the Internet has no fixed, inherent nature, except for what we build into its architecture. In a very real sense, the Net is what we make it. The “network of networks” certainly can continue to be what it has been: simple, transparent, modular, interconnected, decentralized. Indeed, many of its more enthusiastic backers seem to assume that it will always be the case. Like any human-made construct, however, the Net also can be built to be something else – including something complex, proprietary, integrated, and centralized. The TCP/IP protocols do have some real magic inherent in them, but only when conjured up as a matter of deliberate choice and considerable effort. One can hope and even presume that the characteristics we desire will remain, or become further enhanced, but such presumptions alone can do nothing to advance the cause. We must wrest from the Internet what we will.

As will be discussed in more detail below, the Internet is a distributed, small-world network that follows a “power law” of ordered links. The World Wide Web is another

⁴ “Plan Nine from Outer Space” (19), directed by Ed Wood.

⁵ Lawrence Lessig, *Code*, at __.

⁶ Naughton, *The History of the Future*, at 277-280.

⁷ [cite]

small-world network, similar in structure to the Internet.⁸ At the same time, the Internet looks like a hierarchical decentralized network, which has evolved through innumerable accidents and reflects the decisions of countless individuals, businesses, universities, and so on, which would lack any common theme.⁹ However one chooses to define it, “the Web’s large-scale topology -- that is, its true architecture – enforces more severe limitations on our behavior and visibility on the Web than government or industry could ever achieve by tinkering with the code.”¹⁰

1. Code and Layers

Put simply, the Internet is comprised of Code, stacked in Layers.¹¹ One can view Code, the software and hardware components of the network, as the bricks and mortar.¹² Writ large, code is “a set of procedures, actions, and practices, designed in particular ways to achieve particular ends in particular contexts. Code = praxis.”¹³

In contrast, layers constitute the architectural features of the Internet, in this case its modular structure. The layers are what we build, using the raw materials of code as the building blocks.

As I indicated in my previous paper:

Engineers use multiple protocols that partition a communication problem into disparate sub-problems and organize the software into modules that handle the sub-problems. Functions are allocated to different protocol layers or levels, with standardized interfaces between layers. The flexibility offered through the layering approach allows products and services to evolve by accommodating changes made at the appropriate layer, rather than having to rework the entire set of protocols. In other words, layering allows changes to implementation of one layer without affecting others, as long as the interfaces between the layers remain constant.¹⁴

Layers create a degree of “modularity,” which allows for ease of maintenance within the network. This modularity, or independence, of each layer creates a useful level of abstraction as one moves through the layered stack. As shown above, applications or protocols at higher layers can be developed or modified with little or no impact on lower layers. This can result in tremendous efficiencies when one seeks to upgrade an existing

⁸ Buchanan, Nexus, at 83.

⁹ Mark Buchanan, Nexus (2002), at 80-81.

¹⁰ Barabasi, Linked, at 175. As one example of this principle, Barabasi estimates that we can only reach about 24 percent of all the documents on the Web; the rest are invisible to us, unreachable by surfing. This is because the links of the Web are directed, following disjointed paths, while most true webs are nondirectional. Linked, at 175.

¹¹ See generally Whitt, *A Horizontal Leap Forward*, at 601-609.

¹² Albert-Laszlo Barabasi, Linked (2003), at 174.

¹³ Alexander R. Galloway, Protocol (2004), at xii.

¹⁴ Whitt, *A Horizontal Leap Forward*, at 602 (citation omitted).

application (higher layer) that makes extensive use of underlying physical infrastructure (lower layer).¹⁵

Noted communications theorist Yochai Benkler has crafted a model of the different layers of the Internet, which helps reveal the inner workings that often are hidden from the view of the average user.

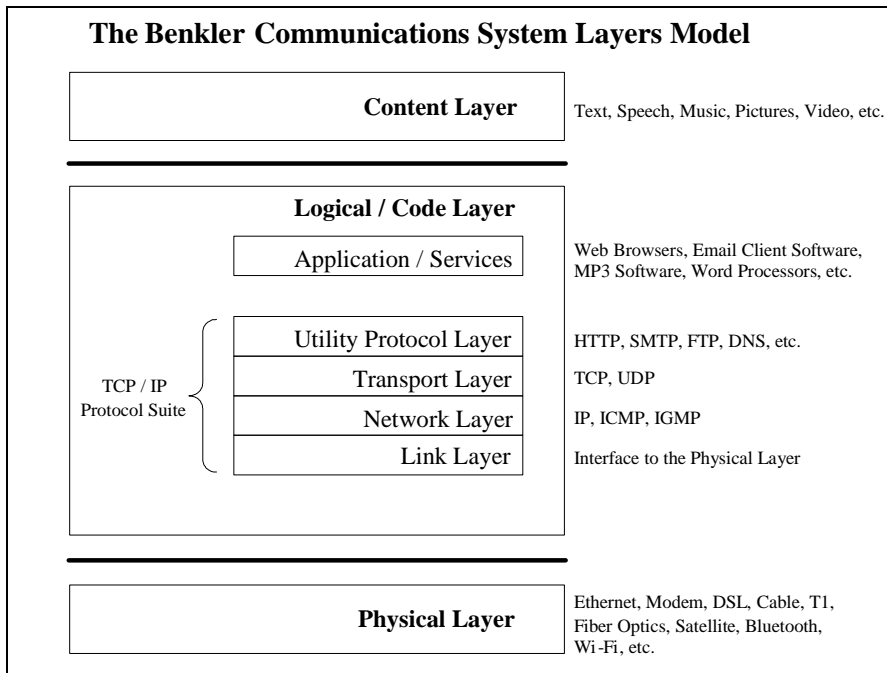


Figure 1

2. IP: Ubiquity, Simplicity, and Transparency

In 1974, Vint Cerf and Robert Kahn issued their seminal paper on the TCP/IP protocol suite, in which the authors “present a protocol design and philosophy that supports the sharing of resources that exist in different packet switching networks.”¹⁶ Based in large part on how Cerf and Kahn designed that protocol suite (plus more than a little help from the U.S. Government to ensure its ubiquitous use on the networks), the Internet Protocol (IP) has become the common “bearer” protocol at the heart of the Internet.¹⁷

An important design attribute of IP is its completely agnostic and transparent nature. In particular, IP does not care what underlying transport is used (such as fiber, copper, cable,

¹⁵ Whitt, *A Horizontal Leap Forward*, at 604.

¹⁶ Vinton G. Cerf and Robert E. Kahn, *A Protocol for Packet Network Intercommunication*, IEEE Trans. on Comms, Com-22, No. 5 (May 1974), available at <http://cs.mills.edu/180/reading/CK74.pdf>.

¹⁷ See Whitt, *A Horizontal Leap Forward*, at 629; see also 605-09 (general overview of IP).

or radio waves), what application it is carrying (such as browsers, e-mail, Instant Messaging, or MP3 packets), or what content it is carrying (text, speech, music, pictures, or video).¹⁸ Thus, IP enables any and all user applications and content. It does so by (1) decoupling the content and applications from the underlying transport, and (2) not interfering with, or discriminating against, any user applications.

The Internet was one of the first steps in the separation of the services layer from the physical layer of the network. Further penetration of IP will enable a separation of the traditional, formerly necessary relationship between the transport provider and the service provider.¹⁹

The “layers principle” as articulated by Professor Lawrence Solum amounts to creating a behavioral norm that tracks the actual operation of IP in the Internet. Thus, in Solum’s principle, the transport layer is not allowed to discriminate against any of the three levels above.²⁰

3. E2E

The “End-to-End Principle” (E2E) stands for the general proposition that the Core of the Internet (the network itself) tends to support the Edge of the Internet (the end user applications, content, and other activities).²¹ Some have translated this as dumb networks supporting smart applications.²² The more precise translation is that a class of functions can only be completely and correctly implemented by the applications at each end of a network communication.

The end-to-end arguments constitute a set of design principles concerning how application requirements should be met in a communications system. “The end-to-end arguments suggest that specific application-level functions usually cannot, and preferably should not, be built into the lower levels of the system—the core of the network.”²³ The E2E principle suggests that communications – information – ideally should not be filtered or change or operated on by the network itself, but only by the edges, at the level of client applications that individuals set up and manipulate.²⁴

Of course, the E2E principle can be prone to exaggeration. One cannot have a modern data network without a core (physical infrastructure at the lower layers of the protocol stack) and an edge (physical and virtual applications at the upper layers of the protocol stack). The core includes the transport functionality to connect together the myriad constituents of the edge, as well as the widespread distribution of the applications and

¹⁸ Whitt, *A Horizontal Leap Forward*, at ___.

¹⁹ Clayton M. Christensen, Scott D. Anthony, and Erik A. Roth, *Seeing What’s Next* (2004), at 241.

²⁰ Lawrence B. Solum and Minn Chung, *The Layers Principle: Internet Architecture and the Law*, 79 Notre Dame L. Rev. 815 (2004).

²¹ Whitt, *A Horizontal Leap Forward*, at 604-5.

²² [cite David Weinberger, others]

²³ David D. Clark & Marjory S. Blumenthal, *Rethinking the Design of the Internet: The End to End Arguments vs. the Brave New World*, TPRC Paper 1 (dated Aug. 8, 2000).

²⁴ Susan P. Crawford, *Someone to Watch Over Me* (September 2005 draft), at 21.

content and services provided by the edge. In a very real sense, in order to have a fully-functioning network, the edge and the core need each other.

In its essence, the E2E principle is about the extent to which end users are in control of their activities using the Internet. “The end-to-end architecture of the Internet is designed to be fairly simple, open and stable at the network level while allowing users the freedom to develop innovative applications to run on top of it”²⁵ Thus, users remain the driving force in the system.²⁶ As several joint commenters note, “rather than relying upon the creativity of a small group of innovators who might work for the companies that control the network, the end-to-end design enables anyone with an Internet connection to design and implement a better way to use the Internet.”²⁷

As related to the Internet, the end-to-end argument is transformed into a principle “to make the basic Internet protocols simple, general, and open, leaving the power and functionality in the hands of the application.”²⁸ Professor Phil Weiser indicates that the end-to-end network design “allows for diversity of the modes of physical access as well as a plethora of applications and content developed to work with the TCP/IP standard.”²⁹ The resulting explosion of innovative applications on the Internet likely would never have happened but for the incorporation of the end-to-end design into the network.³⁰ In Wu’s words, “The Internet’s layered architecture and embedded end-to-end design have created an Internet where coding power resides among the designers of applications.”³¹ Thus, Innovation and creativity become decentralized.

Lee McKnight: “Most Internet businesses operate on the edge of the Internet, which is where the intelligence and processing power resides by design.”³²

“By allowing the ‘intelligence’ of the network to be placed at the user level – in applications rather than in the network itself – the Internet has enabled individual creativity to emerge and flourish in unprecedented ways.”³³

Even in the converging world of telecommunications, intelligence is migrating from the center of the network out toward the user’s access device.³⁴

²⁵ David Bollier, Silent Theft (2002), at 102.

²⁶ *Id.*

²⁷ Ashish Shah, Douglas Sicker, and Dale Hatfield, *Thinking About Openness in the Telecommunications Policy Context*, TPRC Paper (September 20, 2003), at 6.

²⁸ Timothy Wu, *Application-Centered Internet Analysis*, 85 Va. L. Rev. 1163 (1999), at 1164-65.

²⁹ Philip J. Weiser, *Law and Information Platforms*, 1 J. on Telecomm. & High Tech. L. 1 (2002), at 4-5.

³⁰ See, e.g., Mark A. Lemley & Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era* 14 (Stanford Law School, Working Paper No. 207) (2000), available at http://cyberlaw.stanford.edu/e2e/papers/Lemley_Lessig_e2epaper.pdf (explaining role of “e2e” design in producing the “extraordinary innovation” of the Internet).

³¹ Wu, *Application-Centered Internet Analysis*, at 1193.

³² Lee W. McKnight, *Internet Business Models: Creative Destruction As Usual*, in Creative Destruction: Business Survival Strategies in the Global Internet Economy, Lee W. McKnight, Paul M. Vaaler, and Raul L. Katz eds. (2001), at 47.

³³ David Bollier, Silent Theft: The Private Plunder of our Public Wealth (2002), at 99.

³⁴ Steven Shepard, Telecommunications Convergence (2000), at __.

Jonathan Zittrain:

“The Internet’s framers intended an hourglass design, with a simple set of narrow protocols in the middle, anchored by the Internet Protocol, resting on a large collection of physical carriers at the bottom and innumerable applications on the top. Such a design kept the network simple. Indifferent to the physical media on which it is dependent and of the nature of the data it is passing, the network need not care whether the data consisted of chunks of e-mail, instant messages, Web pages, Webcams, or Kazaa music files. This so-called end-to-end architecture enabled the Internet of today: a flexible metanetwork capable of subsuming existing networks. End-to-end is a technical rule of thumb, suggesting that features that might be tempting to install in the middle could more beneficially be located at the ends and handled by individual applications.”³⁵

“End-to-end is also lately a political rallying cry – voiced with growing frequency as worries surface about ‘the end of end-to-end’ for nontechnical reasons.... The ability to throttle traffic on an application-by-application basis presents the emerging broadband world with a thorny issue. More importantly, though, is the thought that the default rule of the network engineers’ hourglass could be inverted: ISPs might be induced to offer Internet connectivity only for approved and certified applications.... Whether for security purposes or to funnel users to particular activities and Web sites, Internet access can be limited to a highly circumscribed set of tasks....”³⁶

“Such systematic barriers are deeply offensive to the values of the Internet designers, and they represent a drastic transformation of today’s Net from an engine of innovation to little more than interactive cable television.”³⁷

The managed network counterparts to the unmanaged Internet – cell phone networks, cable-TV networks, satellite systems – are both less inspired in their range of uses and far more enticing to publishers as vehicles for reaching their markets precisely because of their consumer limitations.”³⁸

“If anything, it is surprising that routing has remained dumb for so long – that the grace period during which the Internet has developed unencumbered has been more than a fleeting honeymoon once the power of the Net was appreciated by mainstream governments and private firms. That grace period has ended, and what will come next is entirely up for grabs.”³⁹

³⁵ Jonathan Zittrain, *The Balkanization of the Broadband Internet*, in *The Broadband Explosion*, Robert D. Austin and Stephen P. Bradley, eds. (2005), 337, 350.

³⁶ Zittrain, *Balkanization*, at 351.

³⁷ Zittrain, *Balkanization*, at 351.

³⁸ Zittrain, *Balkanization*, at 352.

³⁹ Zittrain, *Balkanization*, at 353.

4. **“NetVergence” And The Layered Approach**

The end result: IP helps fashion the “virtuous hourglass” from disparate activities at the different network layers.

Convergence at the IP (middle) layer

Divergence at the physical networks (lower) and applications/content (upper) layers

The Internet is emergent and self-organizing, so that its architecture is much richer than the sum of its parts.⁴⁰

[cite layers paper]

What I call “NetVergence” (converged protocols, diverged platforms and diverged applications/content)

Technology platforms such as the Internet are both open (accessible) and communal (adaptable).⁴¹

Layers framework

While there are several different ways to think of the modular components of the Internet, perhaps the model that best combines simplicity and veracity is a four layered approach.

My previous paper spelled out the pros and cons of such a layered model.⁴² I also suggested that, by way of balancing the desire for simplicity with the need for precision, a modified version of this layered model should be adopted.⁴³ This four-layer version is reproduced below.

⁴⁰ Barabassi, *Linked*, at 174.

⁴¹ Kenichi Ohmae, *The Next Global Stage* (2005), at 127-130.

⁴² Whitt, *A Horizontal Leap Forward*, at 614-21.

⁴³ Whitt, *A Horizontal Leap Forward*, at 621-24.

Proposed Network Layers Model

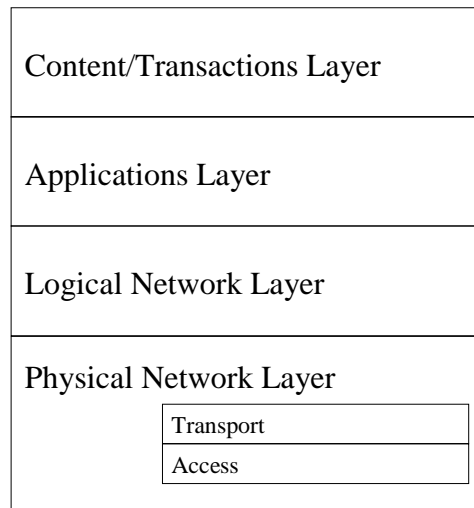


Figure 2

The top two layers of the model, applications and content, are what is in the end user's control and visibility, while the lower two layers, physical and logical, are what is in the network's control and visibility. As one commenter has pointed out, the upper layers are not global at all, but deployed by individuals and entrepreneurs to make use of the lower layers.⁴⁴

This four layer approach can be modified in several ways, to highlight the ways that different players and activities can affect the other modular components of the network.

[Respond to criticism]

[Respond to, and adapt, some suggest modifications to the framework via Werbach, Wu, Marcus, Thierer, etc.]

⁴⁴ Susan P. Crawford, *Shortness of Vision* (2005 draft), at 7.

5. **Overlooked Components: The Social, Economic, and Legal Backdrop**

In describing the essential architectural and modular ingredients that make up the Internet, many tend to neglect some of the most critical elements: namely the social, economic, and legal environment within which the Internet operates. Some have referred to a technology's "context of use," which describes the society and the web of other artifacts within which technologies are always embedded.⁴⁵ A technology is not severable from the culture in which it is embedded. "Material artefacts encode, embody, convey, or transmit whole systems of immaterial ideas and behavioural patterns."⁴⁶

Technology evolves with us, with our human capacities and our culture and our environment. Susan Crawford helpfully has called it the "code/law background medium,"⁴⁷ but it actually involves a richer and more complex mix of elements. One cannot divorce the Net from its social, economic, and legal context. The ecosystem of the Internet is but a part of the larger ecosystem of human life.

Larry Lessig declared that Law is Code, but the fact is that code can be regulated by an assortment of individuals and collectives (such as corporations, courts, and legislatures).

Because of this rich backdrop, government officials and policymakers potentially have an enormous role in shaping the architecture of the Internet, and how it can be used. As we shall see, the U.S. Government in particular can and will regulate the Internet.⁴⁸

B. **The Web As an Edge-Based Phenomenon**

1. **An Unlikely Child**

It has become a truism that the commercial Internet, and particularly the World Wide Web, is a phenomenon built largely by end users operating at the periphery of the network. This paper is premised on that very thesis. Nonetheless, surprisingly few bother to stop to ponder exactly what that truism may mean, or what specific implications can be drawn for the future.

Certainly the Internet did not start out that way. After all, despite some of the more extreme rants of self-proclaimed "cyberlibertarians," the Internet is a creature born not in the rich soil of the valleys around San Jose, but at the Pentagon with the aid of government-sponsored academia. It is the case that much of the Internet's early direction initially came from those at the "core" of the network. In particular, government, military, and academia provided the structure and financial support for the nascent

⁴⁵ Nelly Oudshoorn and Trevor Pinch, *Introduction*, in How Users Matter: The Co-Construction of Users and Technology (2005), at 2.

⁴⁶ John Ziman, *Evolutionary models for technological change*, in Technological Innovation as an Evolutionary Process, John Ziman ed. (2000), 3, 8.

⁴⁷ Susan P. Crawford, *Biology and the Broadcast Flag* (2004), at 606.

⁴⁸ Leibowitz, at 107.

network. As a result, “the Internet was born at the unlikely intersection of big science, military research, and libertarian culture.”⁴⁹

Indeed, “the real history of the Internet reaches back to that terribly traditional, often-reviled institution of our collective aspirations: government.”⁵⁰ The “gift culture of the ARPANET” became a prolific incubator of many innovations.⁵¹

“The whole history of very large-scaled integrated circuits, computation, computer science, artificial intelligence, encryption, and even the Internet and World Wide Web is driven by the Defense Advanced Research Projects Agency (DARPA) and assuredly would not have evolved in the direction it did without the military’s interests and lavish support.”⁵²

The Internet required three decades of subsidies to reach commercial market introduction. “Only government can afford to be that patient.”⁵³

It is unclear whether the free market alone would have created such a thing as the Internet. Networking pioneer and entrepreneur Charles Ferguson, for one, claims that the private online companies were no match for the government-backed Internet. In an entertaining account of his high-tech exploits in the 1990s, Ferguson observed that new technologies like the Internet typically come from neither the venture capital industry nor from the free market. Instead, he shows how “virtually all the critical technologies in the Internet and Web revolution were developed between 1967 and 1993 by government research agencies and/or in universities.”⁵⁴ During that same time period, a \$10 billion commercial online services industry arose in the free market. The comparison between the two, he argues,

is extremely clear and extremely unflattering to private markets. The commercial industry’s technology and structure were inferior to that of the nonprofit Internet in every conceivable way, which is the primary reason that they were so rapidly destroyed by the commercial Internet revolution. Internet technology was around and available for more than twenty years, continuously evolving under the noses of companies like AT&T, IBM, CompuServe, AOL, and even Microsoft. But somehow these companies managed not to notice. Neither, by the way, did most VCs.⁵⁵

⁴⁹ Manuel Castells, *The Internet Galaxy* (2001), at 17.

⁵⁰ Bollier, *Silent Theft*, at 101.

⁵¹ Bollier, *Silent Theft*, at 103.

⁵² Edward Constant, *The Evolution of War and Technology*, in *Technological Innovation as an Evolutionary Process*, John Ziman ed. (2000), 281, 287.

⁵³ McKnight, *Internet Business Models*, at 59.

⁵⁴ Charles H. Ferguson, *High Stakes, No Prisoners: A Winner’s Tale of Greed and Glory in the Internet Wars* (1999), at 13.

⁵⁵ Ferguson, *High Stakes, No Prisoners*, at 13.

“Users played a crucial part in making the ARPANET more than an elaborate experiment in packet switching.”⁵⁶

Some of the best-known examples of user-led innovation emerge from the public sector, such as the development of the Internet. It is true that almost none of the users of the Internet were present at the very beginning, when the Internet first began to take shape.⁵⁷ However, the values certainly were there from the beginning.⁵⁸

The Net reflects an open, collaborative culture.

From the 17th to mid-20th centuries, “constitutive choices” about the modern media – the press, postal and telecommunications networks, cinema, and broadcasting – took place in the context of larger political and economic transformations.⁵⁹ In particular, U.S. government policymakers undertook supremely political objectives with important economic consequences.⁶⁰ In short, politics created our media world, from the emergence of the first newspapers and postal systems to the rise of the mass press, telecommunications, motion pictures, and broadcasting in the 20th century. Critical choices about freedom of expression, ownership of media, the architecture of networks, secrecy, privacy, and intellectual property have made the modern media as much a political as a technological invention.⁶¹

The Internet is no different. Now that the post-industrial, information society has come, what kind of society it proves to be will ultimately be a political choice. One of the themes of this paper is that the Net is subject to the very same social and economic and political forces that affect any other part of the world, real or virtual. A related theme is that the creation and sustenance of the Internet have been, and remain, profoundly political acts, and those who care for the future of the Internet must be politically engaged.

“Architecture is politics.” (after Lessig)

As Carl Shapiro and Hal Varian warned us in 1999, no executive in the tech sector can ignore the government’s role in the information economy. We should not expect the government’s role to diminish, in antitrust or Internet regulation.⁶²

Further historic points:

Where Wizards Stay Up Late⁶³

⁵⁶ Abbate, at 219.

⁵⁷ Constansinus C. Markides and Paul A. Geroski, Fast Second (2005), at 24.

⁵⁸ Naughton, Brief History of the Future, at 273-280.

⁵⁹ Paul Starr, The Creation of the Media (2004), at 2.

⁶⁰ Starr, Creation of the Media, at 3.

⁶¹ Starr, Creation of the Media, at __.

⁶² Carl Shapiro and Hal Varian, Information Rules (1999), at 317.

Inventing the Internet⁶⁴

The Internet's Coming of Age⁶⁵

2. The Pre-Web

Pre-Web: email, bulletin boards, chat rooms, and “walled garden” commerce

[cite BroadNet paper]

Neil Randall, The Soul of the Internet⁶⁶

In the mid-1990s, the primary driver of TCP/IP-based internetworking was communications – in particular, e-mail, public newsgroups, and mailing lists.⁶⁷

Rag Tomlinson, working for BBN in Cambridge, Massachusetts, figured out how to modify the file transfer protocol to carry mail messages. The interesting aspect of the story is that he wasn't even supposed to be working on such a project.⁶⁸ From such hidden and personal motivations do innovations like e-mail spring forth into the world.

3. The Web 1.0

As the 1990s dawned, and the Web began to stir to life, the “edge” of the network (the end users themselves) began increasingly to take control.

Digital Crossroads⁶⁹

Not coincidentally, the Internet grew from a small band of computer-literate programmers to a vast community of users, with the introduction of new protocols such as FTP and HTTP.⁷⁰

⁶³ Katie Hafner and Matthew Lyon, Where Wizards Stay Up Late: The Origins of the Internet (1996).

⁶⁴ Janet Abbate, Inventing the Internet (1997).

⁶⁵ National Research Council, The Internet's Coming of Age (2001).

⁶⁶ Neil Randall, The Soul of the Internet: Net Gods, Netizens, and the Wiring of the World (1999).

⁶⁷ Jerry Allaire and Robert D. Austin, Broadband and Collaboration, in The Broadband Explosion (2005), at 24. The authors note that these activities were driven by the desire to collaborate and communicate. *Id.*

⁶⁸ [cite]

⁶⁹ Jonathan E. Nuechterlein and Philip J. Weiser, Digital Crossroads: American Telecommunications Policy in the Internet Age (2005).

⁷⁰ Terry Bossomaier and David Green, Patterns in the Sand (1998), at 160-161.

- The Web (WWW) itself:

Sir Tim Berners-Lee, Weaving the Web⁷¹

Tim Berners-Lee developed the Web as a lead user working at CERN.⁷²

- The Web browser (Mosaic/Netscape)

- IM (Yair Goldfinger to ICQ)

- Search engines (Yahoo!/Excite/Lycos)

- IP telephony (VocalTec/Net2Phone)

- Peer-to-peer file-sharing networks (Napster/Kazaa)

In early 1999, Shawn Fanning, a 19 year old student at Northeastern University, designed a piece of code to help a friend download MP3 music files from the Internet.⁷³

None of these individuals or entities, and their incredible innovations, reasonably can be associated with the core of the network, but rather with the “mere periphery” of the edge. As we shall see, this is no surprise, as network theory and analysis bears out the simple truth: innovation typically is born of the many at the edge, and not of the few at the core.

Moreover, these examples highlight what Elliot Noss, the head of Tucows, Inc., has called “innovation without permission.”⁷⁴ Noss believes this to be the chief attribute of

⁷¹ Tim Berners-Lee, with Mark Fischetti, Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web By Its Inventor (1999).

⁷² von Hippel, Democratizing Innovation, at 145.

⁷³ Duncan J. Watts, Six Degrees (2003), at 247.

the Internet revolution, responsible for allowing scalable innovation and the ability to “disassociate[] the economics of innovation from the economics of signal transport.”⁷⁵ Put somewhat differently, everything not prohibited is permitted.⁷⁶

Duncan Watts lauds the “innovators and revolutionaries who acted out of conscience, ideology, inventiveness, and passion are an essential component of a global cascade, forming the seed as trigger from which the cascade can propagate.”⁷⁷ However, he also points out that success depends almost entirely on the nurturing qualities of the substrate on which the seed lands.⁷⁸ An often underappreciated part of this equation is those who actually end up using the innovations, and thereby make them useful to all. Watts calls them the “real engine” that powers an application like Napster and transforms it from a mere idea to a phenomenon.⁷⁹ So, just as the Net enables those who devise and distribute the applications, it also enables the millions, or the few, or the one, who find them useful in their lives. In a real sense, the innovators, their innovations, and their intended audience cannot thrive one without each other.

Still, the United States Government gifted us with the Internet – and it can just as easily take it back.

C. The Edgy Nature of Innovation

If there is any one business lesson of the last decade that has acquired near-universal empirical support and expert agreement, it is this: innovation is a good thing. The creation of new and different objects, processes, and services are at the heart of any rational conception of economic growth and the fulfillment of human potential. No matter what you call – creativity, entrepreneurship, novelty, ingenuity – the global economy feeds on the constant infusion of the products of innovation. And in the case of the Internet, as we have seen, users operating at the so-called edge of the network are responsible for much, or not most, of the key innovations that we enjoy today. This is no surprise, for the Internet in fact is an innovation-fostering platform.

1. Innovation and the Net

The 20th Century will be credited by many as the century of innovation.⁸⁰ However true, that statement raises a number of critical questions: what exactly is innovation? How did

⁷⁴ Comments of Tucows, Inc. to the Telecommunications Policy Review Panel Secretariat, August 15, 2005, at 3. See also Weinberger, Small Pieces, at 82 (The Web is profoundly “permission-free and management-free”).

⁷⁵ Comments of Tucows, at 3.

⁷⁶ Crawford, [], at [].

⁷⁷ Watts, Six Degrees, at 248.

⁷⁸ Watts, Six Degrees, at 248.

⁷⁹ Watts, Six Degrees, at 248.

⁸⁰ Gerard H. (Gus) Gaynor, Innovation by Design: What It Takes to Keep Your Company on the Cutting Edge (2002), at 1.

we manage to get a lot of it recently? And how can we ensure more of the same in the future? Like the Roman god Janus, the proper approach to innovation is two-faced – one looking backward and the other gazing intently toward the future.⁸¹ This section briefly addresses some of the important attributes of innovation as they pertain to the Internet.

a. What is innovation?

Innovation is a much-admired concept, yet in many ways still rather mysterious and elusive. It has been defined in some quarters as invention plus implementation.⁸² More specifically, innovation involves the process of taking a raw idea and developing it into a concept, which yields some type of invention, which is finally implemented and commercialized.⁸³ In one analysis, the existence and extent of innovation depends on four major elements: resources, infrastructure, culture, and process.⁸⁴ However one chooses to define it, “innovation is the key factor enabling growth and change in capitalist economies,”⁸⁵

Clayton Christensen placed the concept of innovation squarely before the general public in his acclaimed trilogy.⁸⁶ His writings focus on what he calls sustaining innovations – those allowing firms to provide better and more profitable products to their customers – as opposed to disruptive innovations – those offering initially poorer performance along the dimension that existing customers care the most about. His theories can be summed up by three overarching concepts:⁸⁷

The disruptive innovation theory

Existing companies have a high probability of beating new entrants when the contest is about sustaining innovations, but almost always lose to attackers armed with disruptive innovations. Sustaining disruptions appear to established companies to be much more attractive than disruptive ones, even though disruptive innovations often ultimately drive more long-term growth.

The resources, processes, and values (RPV) theory

An organization’s strengths and weaknesses can be defined by its resources (what a firm has), processes (how a firm does its work), and values (what a firm wants to do). Incumbent firms fail in the face of disruptive innovations because their values will not prioritize disruptive innovations, and the firm’s existing processes do not help them get

⁸¹ Ohmae, The Next Global Stage, at 247.

⁸² Gaynor, Innovation by Design, at 3.

⁸³ Gaynor, Innovation by Design, at 3, 7.

⁸⁴ Gaynor, Innovation by Design, at 2-3.

⁸⁵ Lee W. McKnight, *Internet Business Models: Creative Destruction As Usual*, in CREATIVE DESTRUCTION: BUSINESS SURVIVAL STRATEGIES IN THE GLOBAL INTERNET ECONOMY (2001) at 39-41 (Lee W. McKnight, Paul M. Vaaler, & Raul Katz eds.).

⁸⁶ Clayton M. Christensen, The Innovator’s Dilemma (1997); Clayton M. Christensen, The Innovator’s Solution (); Clayton Christensen, Scott D. Anthony, and Erik A. Roth, Seeing What’s Next (2004).

⁸⁷ See generally Christensen, Anthony, and Roth, Seeing What’s Next, at 275-290.

done what they need to get done. An example here is Microsoft's struggle to contend with Linux and open source software.

The value chain evolution (VCE) theory

Companies can choose either to integrate (executing most activities themselves) or to specialize (focus on narrow range of activities and relying on suppliers and partners for other elements in the value chain). Integrated architectures tend to be relatively inflexible, and integrated companies tend to react relatively slowly.

Modular architectures that facilitate (or permit) disintegration sacrifice raw performance in the name of speed to market, responsiveness, and convenience. This sacrifice allows companies to customize their products by upgrading individual subsystems without having to redesign an entire product. They can mix and match components from best-of-breed suppliers to respond conveniently to individuals customers' needs.⁸⁸

[more]

b. What is the link to the Internet?

Christensen believes that the Internet's decoupling of services and transport creates innovative new business models across customers and markets. In his words, "IP is the ultimate modular interface."⁸⁹ Modularity has a profound impact on industry structure, because it enables independent, nonintegrated organizations to sell, buy, and assemble components and subsystems. In a modular world, firms can prosper by outsourcing or by supplying just one element.⁹⁰

Lee McKnight posits that the Internet facilitates rapid development and diffusion of innovations by network users. The Internet Protocol acts as a "bearer service"—the general purpose platform technology linking technologies, software, services, customers, firms, and markets—so that the Internet is "an innovation engine that enables creation of a remarkable range of new products and services."⁹¹ Thus, "the Internet works its magic through rapid development and diffusion of innovations."⁹² Others agree with the analogy that the Internet serves as a uniquely suitable platform for innovations.⁹³

How the Internet spreads innovation is another question. Yochai Benkler has concluded that the flat, widely distributed Internet allows individual expressive freedom for a wide range of innovative users. Susan Crawford: "IP network design is flat and highly decentralized, allowing substantial innovation to occur at the edges of the network," with

⁸⁸ Christensen, Anthony, and Roth, *Seeing What's Next*, at xx.

⁸⁹ Clayton Christensen and Scott D. Anthony, *Disruption, Disintegration, and the Impact of New Telecommunications Technologies*, in *The Broadband Explosion* (2005), 91, 104.

⁹⁰ Christensen and Anthony, *Disruption*, at 99.

⁹¹ McKnight, *Internet Business Models*, at 40 (citation omitted).

⁹² McKnight, *Internet Business Models*, at 41 (citation omitted).

⁹³ Phil Weiser, *Law and Information Platforms*, 1 J. ON TELECOMM. & HIGH TECH. L. 1, 22 (2002).

end users.⁹⁴ Professor Solum discusses how “nearly all user functions are implemented at the upper application layer.”⁹⁵ Solum continues, “Thus, innovation is decentralized and placed in the hands of individual innovators,” and the Internet can become an “innovation commons.”⁹⁶

The Internet is that rare breakthrough innovation.⁹⁷

Lessig: The Web provides the most powerful and diverse spur to innovation of any in modern times.

“The Internet may be considered a disruptive innovation, but in essence it’s a new way of doing business – a new tool to accomplish the same result.”⁹⁸

The “central presumption of internet innovation” is that “everything not prohibited is permitted.”⁹⁹

ITAA: Innovation at the Edge program¹⁰⁰

c. Where do innovations come from?

The easily-stated facts about innovation and creativity fostered by end users operating at the edge of the network is bolstered by the observations and analyses of many of the leading economists and technologists of the day. Indeed, while several theories are prevalent concerning the source and nature of innovation, all point to the same conclusion: the talents and determination of the disaggregated many outweigh those of the aggregated few.

More to the point, innovation tends to flow from the users, not the consumers or providers; from the many, not the few; from the connected, not the isolated; from individuals and small groups, not larger organizations; from the upstarts, not the established; from the decentralized, not the concentrated; from the flat, not the hierarchical; from the autonomous, not the controlled. Innovation flows from those users motivated by profit and pride and personal fulfillment. Individual innovations tend to be minor and incremental, but collectively create technical progress.

Obviously these observations amount to a generalization, one not true for all times and places and people. Certainly there are many innovative large, entrenched organizations, and uncreative small ones. If nothing else, however, the concept of “innovation from the edge” provides a useful corrective to present-day presumptions about how the markets

⁹⁴ Crawford, *Someone to Watch Over Me*, at 21.

⁹⁵ Solum, at 27.

⁹⁶ Solum, at 27.

⁹⁷ Gaynor, Innovation by Design, at 34.

⁹⁸ Gaynor, Innovation by Design, at 31.

⁹⁹ Crawford, *Someone to Watch Over Me*, at 36.

¹⁰⁰ www.ita.org

work in a capitalist society, and highlights the importance of the edge of the Net to the rest of us.

The individual users

The leading theorists all agree: innovation flourishes between and among end users at the edge of a decentralized, modular Internet.

Odlyzko: A large fraction of innovations comes from users at the edge of the Internet.

Users are co-designers and co-makers of modern technological society.¹⁰¹

The work of Professor Yochai Benkler expands further on the idea of the Internet as an innovation commons. Professor Benkler describes how the Internet helps disrupt the traditional producer/consumer model by empowering the rise of end users who can play both roles as part of a continuing conversation and exchange of information. The “Great Shopping Mall” can be transformed into the “Great Agora,” featuring unmediated conversation of the many with the many.¹⁰²

The “co-construction of users and technology” sees users and technology as two sides of the same phenomenon.¹⁰³

Innovators from the beginning are very interested in their future users and inscribe their hypotheses about users into the technical content of the new object.¹⁰⁴

Eric von Hippel: Users of products and services – both firms and individual consumers – are increasingly able to innovate for themselves.” A user-centered innovation process.¹⁰⁵ Users develop many innovative new products in a widely distributed fashion.

The traditional pattern of concentrating innovation-support resources on a few individuals is hugely inefficient. Users can create, produce, diffuse, provide field support for, update, and use complex products by and for themselves in the context of user innovation communities.¹⁰⁶

User innovation improves market success rates for manufacturers. The major reason for commercial failure of manufacturer-developed products is poor understanding of users’ needs. User innovation helps to reduce information asymmetries between user and manufacturer and so increases the efficiency of the innovation process.¹⁰⁷

¹⁰¹ Johan Schot and Adri Albert de la Bruhze, *The Mediated Design of Products, Consumption, and Consumers in the Twentieth Century*, in *How Users Matter* (20), at 203.

¹⁰² Yochai Benkler, *From Consumers to Users: Shifting the Deeper Structures of Regulation Toward Sustainable Commons and User Access*, 52 FED. COMM. L.J. 561, 565 (2000).

¹⁰³ _____, *Introduction*, in *How Users Matter*, at 3.

¹⁰⁴ Jessika van Kammen, *Who Represents Users*, in *How Users Matter*, at 152 (citation omitted).

¹⁰⁵ Eric von Hippel, *Democratizing Innovation* (2005), at 1.

¹⁰⁶ von Hippel, *Democratizing Innovation*, at 14.

¹⁰⁷ von Hippel, *Democratizing Innovation*, at 109.

Users are the first to develop many and perhaps most new industrial and consumer products, a contribution growing steadily largely as a result of continuing advances in computer and communications capabilities.¹⁰⁸

In the early stages, individuals do drive innovation, although teams are required as the project progresses.¹⁰⁹

The many

Innovation by users tends to be widely distributed in innovation communities, rather than concentrated among just a very few very innovative users.¹¹⁰

(the decentralized)

Innovation from the edge also is not surprising because of the newfound “wisdom of the crowds” phenomenon. According to this theory, large groups of people are smarter than an elite few. They are better at solving problems, fostering innovation, coming to wise decisions, and even predicting the future. In turn, collective intelligence requires diversity, independence, and decentralization,¹¹¹ the very qualities provided by the Internet.¹¹²

The disparate

“Innovations come in all sizes and shapes, from all geographical centers, and with very specific requirements. One size does not fit all.”¹¹³

The socially connected

Andrew Hargadon has examined how innovation typically is the result of synthesizing, or “bridging” ideas from different domains, so that one is simultaneously thinking in multiple boxes. His research shows that innovation is about creatively recombining ideas, people, and objects from past technologies, in ways that spark new technological revolutions. These breakthrough “recombinant inventions” depend on “building” communities, so that in the end innovation is as much social as technical.¹¹⁴ In his view,

¹⁰⁸ von Hippel, Democratizing Innovation, at 2.

¹⁰⁹ Gaynor, Innovation by Design, at 22.

¹¹⁰ von Hippel, Democratizing Innovation, at 10-11.

¹¹¹ James Surowiecki, The Wisdom of Crowds (2004), at 22.

¹¹² See also Howard Rheingold, Smart Mobs (2002) (The next major technological and cultural shift will yield “smart mobs” as a fundamentally new form of connectivity).

¹¹³ Gaynor, Innovation by Design, at 22.

¹¹⁴ Andrew Hargadon, How Breakthroughs Happen: The Surprising Truth About How Companies Innovate (2003), at 3-30.

entrepreneurs and inventors are no smarter or more tenacious than the rest of us – they are simply better connected.¹¹⁵

Thackara states that innovation is a social process that involves complex interactions among individuals, communities of practice, and customers.¹¹⁶ After the physicist Murray Gel-Mann, he sees innovation as an “emergent phenomenon” that happens when a person or organization fosters interaction between different kinds of people and disparate forms of knowledge.¹¹⁷ To Thackara, anything that impedes the free flow of interactions among individuals hinders innovation.¹¹⁸

In discussing Linux as an example, Boru Douthwaite says that “Technologies develop more rapidly when there are a lot of novelty-generators who are able to communicate quickly and easily with each other and who are highly motivated to pass improvements on.”¹¹⁹

The upstarts

Innovation flourishes when companies have both the motivation and ability to innovate.¹²⁰ Where motivation is lacking, innovation cannot occur.

“In almost all cases, established firms are slow to adopt radical technologies as they appeared.”¹²¹ Established, profitable firms are almost invariably more conservative and risk averse than are fledgling competitors.¹²²

Innovation destroys traditional industry structures, leading to blurred and fluid industry borders, rapidly shifting interfirm alliances, and unremitting introduction of cost-reducing products and process innovations.¹²³

Michael Katz believes that “[t]he hourglass architecture allows innovations to take place at the application and transport layers separately. This ability for independent innovation, speeds the rate of innovation, and increases the ability of entrepreneurs to take advantage of new opportunities.”¹²⁴

¹¹⁵ Hargadon, How Breakthroughs Happen, at 11.

¹¹⁶ Thackara, In the Bubble, at 99.

¹¹⁷ Thackara, In the Bubble, at 99.

¹¹⁸ Thackara, In the Bubble, at 100.

¹¹⁹ Boru Douthwaite, Enabling Innovation (2002), at 105.

¹²⁰ Christensen, Anthony, and Roth, Seeing What’s Next, at 21.

¹²¹ James M. Utterback, Mastering the Dynamics of Innovation (1994), at 180.

¹²² Utterback, Mastering the Dynamics of Innovation, at 223.

¹²³ See generally McKnight, Vaaler & Katz, Introduction to Creative Destruction, in Creative Destruction (2001), at 3-17.

¹²⁴ Michael L. Katz, Thoughts on the Implications of Technological Change for Telecommunications Policy, in TRANSITION TO AN IP ENVIRONMENT, A REPORT OF THE FIFTEENTH ANNUAL ASPEN INSTITUTE CONFERENCE ON TELECOMMUNICATIONS POLICY (2001), at 26.

“The new, the unconventional, and the off-the-wall proposals that alter the status quo of an organization are not amenable to conventional wisdom. The voices of conformity and conventional thinking are not the voices of innovation.”¹²⁵

Invention and innovation need people with some level of dissatisfaction with the status quo, namely new pathfinders with the ability to move the status quo.¹²⁶

Innovation does not occur in an organization that supports the status quo and denigrates the forward thinkers.¹²⁷

Innovation is about the courage to introduce change. “People who cannot live without change become the innovators. Innovators do not live in the organization’s comfort zone.”¹²⁸

Getting an innovation to market involves two thresholds that the innovation must cross on its path to impact. The first occurs at the status quo, the situation that the innovation is trying to improve; the second is at the new outcome that the innovation seeks to create, where a significant portion of its adopters are made better off. The slower pace of adoption is because the affected market participants must dismantle a preexisting equilibrium and recoordinate a new one.¹²⁹

The autonomous

Larry Lessig describes how the “end-to-end principle renders the Internet an *innovation commons*, where innovators can develop and deploy new applications or content *without the permission of anyone else*.”¹³⁰ Lessig also claims that “[t]o those who argue that control is necessary if innovation is to occur, and that more control will yield more innovation, the Internet is the simplest and most direct reply.”¹³¹

Innovation will not thrive in an organization with a command-and-control mentality, nor an organization that believes in total freedom. There must be a balance between levels of freedom and levels of discipline.¹³²

The incremental

Most innovations from any source are minor, but are cumulatively responsible for much or most technical progress.¹³³

¹²⁵ Gaynor, *Innovation by Design*, at 6.

¹²⁶ Gaynor, *Innovation by Design*, at 17.

¹²⁷ Gaynor, *Innovation by Design*, at 20.

¹²⁸ Gaynor, *Innovation by Design*, at 5.

¹²⁹ Bhaskar Chakravorti, *The Slow Pace of Fast Change* (2003), at 3- ____.

¹³⁰ LARRY LESSIG, *THE FUTURE OF IDEAS*, at 40 (emphasis in original).

¹³¹ LARRY LESSIG, *THE FUTURE OF IDEAS*, at 14.

¹³² Gaynor, *Innovation by Design*, at 18.

Most innovation takes place incrementally.¹³⁴

Most attempts to produce new innovations end in failure.¹³⁵

Innovations generally are not planned, and usually cannot be planned.¹³⁶

Most innovation does not reach the public eye; it is taken for granted, and seldom recognized.¹³⁷

The modular

[more]

Of course, innovations are not limited to the content and applications layers, or to consumer-facing retail offerings. Innovation also happens deep in the logical and physical infrastructure of the network. Indeed, layering with IP at the center allows for significant network innovation below, as well as above, the IP layer. And recent history shows that much of that innovation comes not from established incumbents guarding legacy market positions, but from hungry, eager competitors.¹³⁸

2. Complexity and the Net

Innovation aside, the architectural elements of the present-day Internet are well worth preserving and extending into the broadband era.

Many have misunderstandings about information as formal, abstract, and immaterial. As Mark Taylor makes clear, however:

“The opposition between form and content, or information and matter ... is no more defensible than the opposition between speech and writing. It is becoming increasingly obvious that information is, in important ways, material, and matter is informational.... Thus, the movement into the Information Age should not be conceived in terms of growing abstraction and increasing dematerialization, but as the complication of the relation between information and the so-called material conditions of life. As the line

¹³³ von Hippel, at 21.

¹³⁴ Gaynor, Innovation by Design, at 5; 24-25; 30.

¹³⁵ Markides and Geroski, Fast Second, at 24.

¹³⁶ Gaynor, Innovation by Design, at 5.

¹³⁷ Gaynor, Innovation by Design, at 3.

¹³⁸ Whitt, *A Horizontal Leap Forward*, at ___.

between the material and the informational becomes permeable, information processes become considerably more extensive.”¹³⁹

“The parameters of the current Information Age become clear when we understand the information revolution not only as a major sociocultural change but also as something like an orbital movement in which information revolves in such a way that it begins to act on itself. The information revolution occurs when information turns on itself and becomes self-reflexive. This turn has been made possible by new electronic and telematic technologies, through which information acts on information to form feedback loops that generate increasing complexity. This is why the information revolution issues in the moment of complexity.”¹⁴⁰

“The complexity of human interactions has been fostered throughout the ages by communications technology, which facilitates the exchange of information on all levels, from individuals to governments. The more information is exchanged, the more feedback processes occur, and thus, in general, the more complexity. Computer networks are now transforming the nature and speed of such communications, and the sheer volume of accessible information.”¹⁴¹

The Internet “is evolving, highly distributed, and lacking any central control, but it has the capability to support emergent phenomena in terms of the structures that can result from information exchange.”¹⁴²

Susan Crawford has done some interesting work in explaining how the Internet is an evolving complex adaptive system, or CAS.¹⁴³ She has demonstrated how the Internet is a complex system, made up of many interacting agents whose dynamic engagements produce elaborate permeable membranes regulating information flows.¹⁴⁴ For optimal results, complex systems should be divided into competing, co-evolving (and sometimes selfish) patches, or sets of rules.¹⁴⁵ Centralized control attempts for any moderately complex environment are likely to be less complex than that environment, and thus are likely to fail.¹⁴⁶ The Internet has given rise to an explosive growth in information flows, prompting the emergence of a richly varied, closely-connected, and highly-structured social, cultural, and intellectual online world.¹⁴⁷

“All complex networks function between fixity and flux.”¹⁴⁸

¹³⁹ Mark C. Taylor, *The Moment of Complexity: Emerging Network Culture* (2001), at 106.

¹⁴⁰ Taylor, *The Moment of Complexity*, at 106.

¹⁴¹ Peter Coveney and Roger Highfield, *Frontiers of Complexity* (1995), at 338.

¹⁴² Coveney and Highfield, *Frontiers of Complexity*, at 338.

¹⁴³ See generally Crawford, *Shortness of Vision*, at 55-60.

¹⁴⁴ Crawford, *Shortness of Vision*, at 55.

¹⁴⁵ Crawford, *Shortness of Vision*, at 60.

¹⁴⁶ Crawford, *Shortness of Vision*, at 56.

¹⁴⁷ Crawford, *Shortness of Vision*, at 9.

¹⁴⁸ Taylor, *The Moment of Complexity*, at 227.

Rather than longing for a spirituality achieved through disembodiment (Kurzweil), we need a more radical style of “incarnational thinking and practice.”¹⁴⁹

Emergence is not some mystical force that comes into being when agents collaborate.¹⁵⁰

The Web is a tremendously disorganized space, a system where the disorder grows right alongside the overall volume. The Web is not becoming more organized as it grows, so it is unlikely to blossom into something like intelligence.¹⁵¹

The Internet provides many examples of emergent properties. The Internet is an “emergent phenomenon,” a protocol for linking together many separate networks.¹⁵²

Hargadon: The Internet is an example of a complex technical system emerging from combinations of smaller technologies.¹⁵³

Thackara: Complex systems are shaped by all the people who use them.¹⁵⁴

Mark Ward: “There is a Zipf-like pattern to the way that people search and surf the Internet.”¹⁵⁵

The Web is a small world that displays a peculiar pattern in its anatomy. The shape of the distribution of pages connected by hyperlinks is not the familiar bell curve, but more like the distribution of incomes, “with a monstrously long tail extending to the right.” Such a distribution is called “scale free,” meaning that it is not dominated by any single, representative scale. The tail decays at a much slower rate than a normal bell curve. It tapers off according to a “power law” with an exponent of 2.2. Pages with 10 times more links will be 158 times less likely. This arcane pattern holds across the entire Web. There was no reason to expect any pattern at all, in the unregulated, unruly labyrinth of the Web. Barabasi believes the power law is a natural consequence of network growth. The Web is not static.¹⁵⁶

¹⁴⁹ Taylor, *The Moment of Complexity*, at 223-24.

¹⁵⁰ Steven Johnson, *Emergence* (2001), at 116.

¹⁵¹ Johnson, *Emergence*, at 117. Johnson sees Yahoo and Google functioning as man-made antidotes to the Web’s natural chaos, an engineered attempt to restore structure to a system that is incapable of generating structure on its own. *Id.* at 117.

¹⁵² See generally Terry Bossomaier and David Green, *Patterns in the Sand* (1998), at 159-174.

¹⁵³ Hargadon, *How Breakthroughs Happen*, at 9.

¹⁵⁴ Thackara, *In the Bubble*, at 7.

¹⁵⁵ Mark Ward, *Universality* (2001), at __.

¹⁵⁶ Steven Strogatz, *Sync* (2003), at 253-56.

Open computational systems become self-organizing systems which are different from their individual program-controlled components and seems to have a nonlinear dynamics.¹⁵⁷

“The idea of a self-organizing worldwide network of software and hardware systems has become reality.”¹⁵⁸

3. Evolution and the Net

Some have also extended the mental of biological evolution to human-created technology, and in particular the Internet.

Biological systems are a subcategory of complex adaptive systems.

Kurzweil: “technology is the continuation of evolution by other means.”¹⁵⁹

“It is easy enough to think of innovation as a kind of mechanical evolution.”¹⁶⁰

Vast numbers of people are online and are participating in evolving and value-creating information exchanges of all kinds.¹⁶¹

Evolution is adaptation to the environment, and not necessarily progress and directionality. The same is true of the Net. Its evolution is in no particular direction, or to map a particular progress, or serve a particular design – except to match and mirror human demands upon it.

Although the process of natural selection is supposed to make organizations more fit for their environment, evolution does not result in an increase of the fitness of life to the external world. There is no general progress because the environments in which particular species live are themselves changing and, relative to the organism, are usually getting worse. “So most of natural selection is concerned with keeping up,” and “despite natural selection, things are not getting any better over the long run.”¹⁶²

The Net evolves by adapting to its context: our human wants and needs.

The Net theoretically can adapt much faster to its environment – human activities – than other human-made constructs.

¹⁵⁷ Klaus Mainzer, *Thinking in Complexity* (3rd ed. 1997), at 299-300.

¹⁵⁸ Mainzer, *Thinking in Complexity*, at 301.

¹⁵⁹ *Quoted in* Taylor, *The Moment of Complexity*, at 221.

¹⁶⁰ Crawford, *Broadcast Flag*, at 605.

¹⁶¹ Crawford, *Shortness of Vision*, at 61.

¹⁶² Richard Lewontin, *The Wars Over Evolution*, in *The New York Review of Books*, October 20, 2005, at 52.

Information flow membranes will get better by “co-evolving” – adapting, through feedback and continuous change, to a world filled with other complex systems with which they have to interact.¹⁶³

John Ziman: “Evolutionary models for technological change”

Joel Mokyr, “Evolutionary phenomena in technological change”

“Attention should be paid to the evolutionary ecosystem of the law as the background medium in which innovation occurs, business models evolve, and social factions grow and prosper.”¹⁶⁴

“Adaptation is the key to innovation, resilience, and sustainability in any complex system.”¹⁶⁵

Evolution and innovation: contingency, context, and chance.¹⁶⁶

Crawford also discusses the “sweet spot” between randomness and order, providing a rich background medium of ecological niches, or “petri dishes,” in which innovation can take place.¹⁶⁷

“Structurally, the Internet is closer to an ecosystem than to a Swiss watch.”¹⁶⁸

The Internet “has all the characteristics of a complex evolving system, making it more similar to a cell than to a computer chip.”¹⁶⁹

“To say that the Web is organic is to under-appreciate organisms. The Web works because it is broken.”¹⁷⁰

Of course, evolution is not necessarily, or even logically, the same thing as progress. To evolve is to adapt successfully to one’s environment.

Cycle of user activities feeding back into the Net?

In August 2003, Timothy Wu and Larry Lessig told the FCC:

¹⁶³ Crawford, *Shortness of Vision*, at 63.

¹⁶⁴ Crawford, *Broadcast Flag*, at 605.

¹⁶⁵ Crawford, *Broadcast Flag*, at 622.

¹⁶⁶ Crawford, *Broadcast Flag*, at 621-29.

¹⁶⁷ Crawford, *Broadcast Flag*, at 606.

¹⁶⁸ Albert-Laszlo Barabasi, *Linked* (2002), at 145.

¹⁶⁹ Barabasi, *Linked*, at 149.

¹⁷⁰ Weinberger, *Small Pieces*, at 83.

In the academic literature, the Commission has endorsed the evolutionary, or competitive model of innovation. It holds that the process of technological innovation proceeds most rapidly through a survival-of-the-fittest competition between new technologies, and it encourages policies to ensure a fair fight among competing innovations. If this “Darwinian evolution” is the best path of innovation, it follows that the most promising path of development will be difficult to predict in advance. Hence despite the “waste” generated by a competitive process, the results will be superior to planned innovation directed by a single prospect holder, however well-intentioned. That entity will suffer from cognitive biases (such as a predisposition to continue with current ways of doing business) that make it unlikely to come to the right decisions, even if it means well.¹⁷¹

Adherents to this evolutionary model view the innovation process as a survival-of-the-fittest competition among developers of new technologies. “They are suspicious of models of development that might vest control in any initial prospect-holder, private or public, who is expected to direct the optimal path of innovation, minimizing the excesses of innovative competition.”¹⁷² The most promising path of development is difficult to predict in advance. Some evolutionary theorists view a communications network like the Internet as a platform for a competition among application developers. “It is therefore important that the platform be neutral to ensure the competition remains meritocratic.”¹⁷³ Backers of an evolutionary approach to innovation take the Internet as evidence of the superiority of a network designed along evolutionary principles.¹⁷⁴

The development of computer and information technologies is a quasi-evolutionary process. The replicators of this process are any of the information patterns that make up a culture and spread with variation from human to human. As humans have their own intentionality, the spreading process of information patterns is realized not via mechanical imitation but via communication.¹⁷⁵

The development of a worldwide communication network can be interpreted as the evolution of complex systems for aiding the spread of memes (ideas, beliefs, habits, morals, fashions, techniques, etc.) among humans and for establishing a memetic ecosystem.¹⁷⁶

¹⁷¹ Letter from Timothy Wu, Associate Professor, University of Virginia Law School, and Lawrence Lessig, Professor, Stanford Law School, to Marlene H. Dortch, Secretary, Federal Communications Commission, CS Docket No. 02-52, at 5 (Aug. 22, 2003).

¹⁷² Timothy Wu, *Network Neutrality & Broadband Discrimination*, 2 J. ON TELECOMMS. & HIGH TECH. L. 4-5 (2003).

¹⁷³ Wu, *Network Neutrality*, at 5

¹⁷⁴ Wu, *Network Neutrality*, at 5-6.

¹⁷⁵ Klaus Mainzer, *Thinking in Complexity* (3rd ed. 1997), at 298.

¹⁷⁶ Mainzer, *Thinking in Complexity*, at 299.

Mark Taylor: “Life is lived on the shifting margin, boundary, edge between order and chaos, difference and indifference, negentropy and entropy, information and noise. The interplay of noise, which is informative, and information, which is noisy, creates the conditions for emerging complexity, which is the pulse of life.”¹⁷⁷

“Fitness is measured by the capacity to connect and interrelate effectively and creatively.”¹⁷⁸

Complex systems must be understood as energy flow structures organized by thermodynamic principles, and “global business is part of thermodynamic biology.”¹⁷⁹

Nature abhors a gradient (a difference across a distance) and technological innovation outside human bodies tends to reduce the gradient of individuality between humans, allowing us to form groups, tribes, nations, and other sorts of superorganisms.¹⁸⁰ The ability to recognize a gradient drives the evolution of intelligence and perception – and of new business.¹⁸¹

Biological ecosystems provide a powerful analogy and insights to the functioning of business networks. Just as “keystone species” in nature play central roles in their ecosystems, companies such as Wal-Mart, Microsoft, and Li and Fung deploy “keystone strategies,” using effective collaboration to actively shape and regulate the workings of their business ecosystems.¹⁸²

Geerat Vermeij shows how processes common to all economic systems – competition, cooperation, adaptation, and feedback – govern evolution.¹⁸³

Economic Ecosystem (John Sviokla, Fast Company): Ultimately, no one company can out-innovate the market. An ecosystem beats a product (even the iPod) because its collective of competitors can explore and innovate and invest in many more ideas than any single company can muster.

Some have taken the “evolutionary” model of the Internet quite literally.¹⁸⁴

One need not go quite far still to gain some useful insights from Darwin’s legacy. If nothing else, we can appreciate how the Net is embedded in its environment – indeed, is a process emanating from that environment – and vice versa. The Internet is a product and

¹⁷⁷ Taylor, *Moment of Complexity*, at 123.

¹⁷⁸ Taylor, *Moment of Complexity*, at 197.

¹⁷⁹ Eric P. Schneider and Dorion Sagan, *Into the Cool: Energy Flow, Thermodynamics, and Life* (2005), at 293.

¹⁸⁰ Schneider and Sagan, *Into the Blue*, at 291.

¹⁸¹ Schneider and Sagan, *Into the Blue*, at 291.

¹⁸² Marco Iansiti and Ray Levien, *The Keystone Advantage* (2004), at ___.

¹⁸³ Geerat J. Vermeij, *Nature: An Economic History* (2004).

¹⁸⁴ For example, Howard Bloom talks about how each human being constitutes a module of a multiprocessor intelligence, which fuses every living thing into the planet’s interspecies mind. See Howard Bloom, *Global Brain* (2000), at 219.

process of human culture writ large, and as such is intensely sensitive to changes in the social, economic, and legal landscape.

4. The (Kenneth) Arrow of Uncertainty

History is littered with examples of people who guess wrongly about the future of technology.¹⁸⁵

Kenneth Arrow's "information paradox," as read through subsequent commentators, is that we cannot know the innovation costs of damaging the transparency of the Internet, but we must consider those costs when the government is formulating regulatory policy.¹⁸⁶ In essence, we cannot know the benefits of innovation until they are realized.

Lawrence Solum has described the many factors at play in such an analysis of uncertainty, including identifying the innovative applications that may be affected, the costs imposed, and the value provided by the innovations.¹⁸⁷ He also notes that our public institutions, such as courts, legislatures, and administrative agencies, have only a limited capacity to understand and deal with these uncertainties, especially in the context of the Internet.¹⁸⁸

Larry Lessig has stated that "the very premise of the Internet is that no one can predict how it will develop."¹⁸⁹

Lessig states that "the network is open to adopting applications not originally foreseen by the designers."¹⁹⁰ When the future is uncertain (when future uses of a technology cannot be predicted), leaving the technology uncontrolled is a better way of facilitating the right sort of innovation. Plasticity—the ability of a system to evolve easily in a number of ways—is optimal in a world of uncertainty.¹⁹¹

Uncertainty swirls around "the curious mixture of idealism, insularity, and creative energy that drives the very front end of the innovation process."¹⁹² On net, choices made by individuals connected to one another produce unexpected results when they add up.¹⁹³

In connected systems, cause and effect are related in a complicated and often quite misleading way.¹⁹⁴ Most of the time, we are only in a position to judge the significance of things in retrospect, and in retrospect it is easy to be wise.¹⁹⁵

¹⁸⁵ Frances Cairncross, The Death of Distance (2001), at ix.

¹⁸⁶ Kenneth Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in THE RATE AND DIRECTION OF ECONOMIC ACTIVITY (Nat'l Bureau Comm. for Econ. Res. Eds., 1962), at 609-26.

¹⁸⁷ Solum, *The Layers Principle*, at 857-58.

¹⁸⁸ Solum, *The Layers Principle*, at 856.

¹⁸⁹ LAWRENCE LESSIG, *THE FUTURE OF IDEAS* (2001), at 7.

¹⁹⁰ LESSIG, *THE FUTURE OF IDEAS*, at 37.

¹⁹¹ LESSIG, *THE FUTURE OF IDEAS*, at 39.

¹⁹² Bhaskar Chakravorti, The Slow Pace of Fast Change (2003), at xi.

¹⁹³ Chakravorti, Slow Pace of Fast Change, at 186.

¹⁹⁴ Watts, Six Degrees, at 301.

¹⁹⁵ Watts, Six Degrees, at 301.

Mainzer: “The force of consumer choice can make computational market ecosystems serve human purposes better than any programmer or control processor could plan or understand. The reason is the enormous complexity and diversity of computational ecosystems linked to the human market.”¹⁹⁶

D. The Tangible and Intangible Value of the Edge

1. The Economic Benefits

As a result of all this innovation coming from all corners of the Web – tied in directly to the architecture of the Internet – consumers and providers gain substantial economic benefits. In short, information networks create significant positive economic value.

In the years before the Internet bubble burst, there were sunny pronouncements almost daily about how the Internet had changed everything, including the very fundamentals of economics. One now-notorious example was the collaborative effort entitled “The Cluetrain Manifesto,” consisting of 95 Martin Luther-like “theses” nailed virtually to the door of capitalism. Later turned into a book, the Manifesto boldly proclaimed the end of business as usual, because in large part the free market (“markets are conversations”) is getting smarter faster than most companies.¹⁹⁷ One can argue whether the Cluetrain folks were premature, overblown, or simply wrong, but the fact remains that the Internet has been, and increasingly can be, a platform for significant economic benefits.

The Internet creates many economic benefits, including increased productivity, creation of jobs, higher wages, and economic growth.¹⁹⁸

Producers and end users (as opposed to providers and consumers)

Producers:

First and foremost, the architecture of the Internet lowers barriers to entry. This happens in several ways.

- Minimizes investment costs
- Facilitates innovation in individual components

¹⁹⁶ Mainzer, *Thinking in Complexity*, at 302.

¹⁹⁷ Rick Levine, Christopher Locke, Doc Searle, and David Weinberger *The Cluetrain Manifesto* (2000), at

¹⁹⁸ Crawford, *Shortness of Vision*, at 58.

“Modularity greatly reduces the costs of experimenting with new designs,” so that designs “become flexible and capable of evolving at the module level. This in turn creates new options for designers, and corresponding opportunities for innovation and competition in the realm of module designs.”¹⁹⁹

In a later article co-authored with Joseph Farrell, Weiser observes that modular industry structures like the Internet “enable independent firms to introduce innovations into an established environment,” and can “facilitate innovation in individual components, spur entry, and result in lower prices.”²⁰⁰ “Modularity thus allows for a smooth dissemination of the best of breed in each level or layer, as users mix-and-match components.”²⁰¹ *Id.*

- Creates tremendous efficiencies when modifying application

Second, the Internet places power and functionality in the hands of entrepreneurs.

Third, the Internet allows rapid development and diffusion of the “best in breed.”

“Given enough eyeballs, all bugs are shallow.” [software debugging].²⁰²

“The give-and-take of thought stages a struggle for survival in which only the fittest images, concepts, ideas, and schemata survive.”²⁰³

Fourth, the Internet enables “long tail” offerings for numerous market niches.

Users’ needs for new products and services often is highly heterogeneous.²⁰⁴

The Long Tail (Chris Anderson) – stores and catalogs have limited shelf space and storage capacity, which means merchants control what you can buy. The infinite space of the Internet returns control to the customer.

¹⁹⁹ Carliss Y. Baldwin and Kim B. Clark, *Design Rules: The Power of Modularity*, Volume 1 (2000), at 6.

²⁰⁰ Joseph Farrell & Philip J. Weiser, *Modularity, Vertical Integration, and Open Access Policies: Towards a Convergence of Antitrust and Regulation in the Internet Age*, 17 *Harvard Journal of Law and Technology* 85, __ (2003) (footnote omitted).

²⁰¹ Farrell and Weiser, *Modularity*, at __.

²⁰² von Hippel, *Democratizing Innovation*, at 94.

²⁰³ Taylor, *The Moment of Complexity*, at 197.

²⁰⁴ von Hippel, *Democratizing Innovation*, at 33.

The Internet is “a beast with a very, very long tail.” The head – eBay, Amazon, Yahoo – may get all the attention, but the real story is in the tail.²⁰⁵

The search function: there are a few queries that have very high frequency, but quickly the graph flattens out into a massive tail that is extraordinarily long. Google claims that nearly 50 percent of the searches coming in on any given day – more than 100M – are unique.²⁰⁶

Fifth, an open, modular, decentralized network scales far better than an “intelligent” network.

End users:

First, the Internet maximizes customer choice.

Users’ needs for products are highly heterogeneous in many fields, in contrast to the “a few sizes fits all” strategy of mass manufacturers.²⁰⁷

Second, the Internet greatly expands the sources of new, innovative products and services.

Third, the Internet reduces purchase costs.

Only requires investment in new application.²⁰⁸

Fourth, and perhaps most importantly for this analysis, the Internet allows “consumers” to become “users” as well.

IP-based platforms will result in natural benefits to consumer and society at large in terms of improved economics (lower prices), faster innovation (new products and services), and improved customer service quality.²⁰⁹

Esther Dyson telegraphed this theme back in 1998, when she urged her readers to “be producers.” As she put it:

²⁰⁵ John Battelle, The Search: How Google and Its Rivals ReWrote the Rules of Business and Transformed Our Culture (2005), at 154.

²⁰⁶ Battelle, The Search, at 27-28.

²⁰⁷ von Hippel, Democratizing Innovation, at 5.

²⁰⁸ Crawford, Shortness of Vision, at 8.

²⁰⁹ McKnight, Vaaler & Katz, Introduction to Creative Destruction, in Creative Destruction, at 6.

Being a consumer is fine; it helps the economy, and it lets you get the products you want. But don't let the real promise of the Net pass you by: to be a producer without all the overhead that used to accompany producing – factories, printing presses, broadcast stations, government infrastructure. On the Net, you have the choice of all the things that are offered – and the choice to make and offer your own.”²¹⁰

Thackara: “Most of us are potentially both users and suppliers of resources.”²¹¹

Bruce Abramson states that the Internet conferred an immense benefit upon users: it reduces the cost of exchanging information.²¹²

The end result: a vibrant “innovation engine.”

In addition, the line between “providers” and “consumers” is blurred.

2. Other Net Values

Of course the Internet is not just about reducing costs and increasing the supply of goods and services. To many people, the Net is about the non-tangible values.

The existence of a social layer (Crawford) promoting diversity and democracy.²¹³

Innovation by users: they get precisely what they want, which in turn increases social welfare.²¹⁴ Social welfare is very probably increased by the presence of innovations freely revealed by users.²¹⁵ This does not count innovations made available in commerce.

“Social welfare is likely to be higher in a world in which both users and manufacturers innovate than in a world in which only manufacturers innovate.” Social welfare equals the total income of a society.²¹⁶

Government policy makers generally wish to encourage activities that increase social welfare, and to discourage activities that reduce it. Thus, policymaking should support user innovation, or at least not favor manufacturers at the expense of user-innovators.²¹⁷

²¹⁰ Esther Dyson, Release 2.1 (1998), at 145.

²¹¹ Thackara, In the Bubble, at 6.

²¹² Abramson, Digital Phoenix, at 3.

²¹³ Crawford, *Shortness of Vision*, at 7, 9; *Someone to Watch Over Me*, at 22.

²¹⁴ von Hippel, Democratizing Innovation, at 2-3.

²¹⁵ von Hippel, Democratizing Innovation, at 11-12.

²¹⁶ von Hippel, Democratizing Innovation, at 107.

Creativity and self-expression

Philip Weiser points out that “70 percent of the three billion or so web pages are built by individuals from their desire to share ideas, rather than to make money.”²¹⁸

Research suggests that computer programmers working for money are likely to be less creative than those programming as a hobby in their own time.” There is an inverse relationship between creativity and external reward.²¹⁹

Volunteer contributors of code to widely used software products are often strongly motivated to innovate by the joy and learning they find in their work.²²⁰

Susan Crawford sums it up nicely:

Treating the internet like just another proprietary, competing network that is no different from the telephone network will cause as-yet-unborn technologies, applications, collaborations, human creativity, devices, growth, economic development, and innumerable other intangible and tangible valuable and interesting things never to come into existence.²²¹

²¹⁷ von Hippel, *Democratizing Innovation*, at 12, 107.

²¹⁸ Philip Weiser, *Law and Information Platforms*, 1 J. ON TELECOMM. & HIGH TECH L. 1, 33 n.147 (quoting Kevin Kelly, *The Web Runs on Love, Not Greed*, WALL ST. J. (Jan. 3, 2003), at A8).

²¹⁹ Boru Douthwaite, *Enabling Innovation* (2002), at 125.

²²⁰ von Hippel, *Democratizing Innovation*, at 8.

²²¹ Crawford, *Someone to Watch Over Me*, at 58.

Part II. The Emerging Ecosystem of the Deep Edge

Some ten years ago, Don Tapscott hailed the coming “New Economy” as the product of the convergence of the computing, communications, and content industries.²²² Thanks to new technologies, and their adoption by end users in creative ways, we now are there.

We have enabled a deeper and richer edge of the network.

People at the leading edges of important trends will be experiencing needs today (or this year) that the bulk of the market will experience tomorrow (or next year).²²³

People tend to overestimate the impact of innovation in the short run and underestimate it in the long run.²²⁴

Frank Feather has commented that “The Internet isn’t dead; it has passed from its initial hype to its realism phase.”²²⁵

We tend to project the future from what’s fashionable at present. The latest heroic savior is the information, communications, and entertainment complex. However, communication is not just a sector of the economy; it is the economy.²²⁶

A. An Evolving Internet

As the architecture of the Internet has changed over the past few years, it has enabled a wider and deeper assortment of functionalities. In turn,

Some two-thirds of all American adults are now online.²²⁷

[more stats]

The Flat World (Thomas Friedman) (2005)

[shorten this up considerably]

²²² Don Tapscott, The Digital Economy (1996), at __.

²²³ von Hippel, Democratizing Innovation, at 22-23.

²²⁴ Chakravorti, The Slow Pace of Fast Change, at __.

²²⁵ Frank Feather, Future Living (2003), at 57.

²²⁶ Kevin Kelly, New Rules for the New Economy (1998), at __.

²²⁷ Pew Internet and American Life Project, May 18, 2005, at __.

While one can quibble with the specifics of his “flattening” global analysis, and some of the resulting policy prescriptions, Friedman does seem to grasp the essential changes wrought by the Internet. In particular, he explains that a new platform began to emerge dating back to 1995, when Netscape went public. The resulting activities included moving from PC-based platforms to Internet-based platforms. Digital content plus the killer app of the Web browser that made the Internet accessible to all; Mosaic was funded by the National Science Foundation.

Work flow software – new applications and interoperability through the XML standard; Joel Cawley, IBM: “Standards don’t eliminate innovation, they just allow you to focus it.”

He also saw a new form of collaboration emerging that includes open-sourcing and in-forming. Open-sourcing is the self-organizing, collaborative communities; Apache as share-ware for Web servers; the intellectual commons movement (Brian Behlendorf); the free software movement (Richard Stallman); Linus Torvalds (Linux) and the Mozilla Foundation (Firefox).

In-forming – the Google search engine = the ability to build and display your own personal supply chain of information, entertainment, and knowledge; self-collaboration; Yahoo!, TiVo, and Amazon.com thrive by building collaborative systems that enable customers to pull on their own, rather than pushing products and services.

What he calls “The Steroids” are the Digital, Mobile, Personal, and Virtual. Storage capability, file sharing (Napster), multipurpose devices (laptop, cellphone, PDAs, handheld organizers), VoIP (Skype) and SoIP (services over IP), videoconferencing, and wireless as the natural state communications (NTT DoCoMo)

Globalization 3.0 – 2000 onward; built around convergence of ten flatteners and the combination of the PC, microprocessor, Internet, and fiber optics – connecting and collaborating horizontally

The Triple Convergence:

New playing field – more horizontal means of creating value

New processes and habits – more horizontal collaboration

New players – China, India, and former Soviet Union bring 3 billion more people liberated to plug and play with everyone else

The Great Sorting Out

Moving from vertical (command and control) value-creation system to horizontal (connect and collaborate) creation model may threaten cherished institutions, habits, cultures, and traditions. Some sources of friction and inefficiency are worth protecting.

The Wall Party and the Web Party

Knowledge workers produce idea-based goods.

Wants today are needs tomorrow.

The “self-directed consumer”

The next layers of value creation are becoming so complex that no single firm or department is going to be able to master them alone. Thus, the best companies are the best collaborators.

McNamee: The hype behind Web services and “B2B” applications ignored the significant holes in the underlying technology of the Internet. Now those holes have been filled, and the promise of Web services is just beginning.²²⁸

E-commerce disappointed in 2001 not because it was revolutionary, but because it was not revolutionary enough. The dot-coms exploited a new technology medium to service the same old enterprise logic.²²⁹

Now we are in a different place. Sophisticated design tools have become available to users – software, electronics, and personal computers for them to run on.²³⁰

Because of the loose nature of the Web, “the user is a much more active player in what the Web actually constitutes. In other words, users through their interactivity produce the Web.”²³¹

Or as David Weinberger put it, we are the true “small pieces” of the web, and we are loosely joining ourselves in ways that we’re still inventing.²³²

Tony Liu: Technological convergence is now evolving in the 2000s into a further stage that might be called “ubiquitous” or “total environment” computing, with broadband networks complemented by peer to peer and wireless or small-device networking.²³³

Because the costs of diffusing information are getting steadily lower as computing and communications technologies improve, information communities are getting steadily more pervasive.²³⁴

²²⁸ McNamee, *The New Normal*, at ___.

²²⁹ Shoshana Zuboff and James Maxmin, *The Support Economy* (2002), at ___.

²³⁰ von Hippel, *Democratizing Innovation*, at 121-28.

²³¹ Robert Burnett & P. David Marshall, *Web Theory: An Introduction* (2003), at 200-201.

²³² David Weinberger, *Small Pieces Loosely Joined* (2002), at x.

²³³ Tony Liu, *The Laws of Cool* (2004), at ___.

²³⁴ von Hippel, *Democratizing Innovation*, at 165.

Only the new digital medium can meet the demands of the individuation of consumption – with the Internet’s embrace of complexity, connection, detail, intelligence, ubiquity, immediacy, transparency, lightness, and plasticity.²³⁵

There are at least three interrelated reasons for the increase in end user activities on the Internet: new platforms, new connectivity, and new ubiquity.

1. A Tale of New Platforms

The salient elements of the Internet mentioned above are enhanced further by new first-mile digital technologies at the edge of the network – namely, the advent of broadband connections, greater personal mobility, and massive computer storage and processing power. Taken together, these advances have bequeathed to end users larger bandwidth – always on, tethered and mobile -- numerous consumer devices, and computer-based software applications. These additional elements have enabled the richness and depth of the Web’s edge as the 21st Century begins.

Overcoming technical and market constraints

- “Broadband” (more than narrowband)²³⁶

Broadband as a bottleneck – until quite recently, bandwidth availability to the majority of computers was quite limited.²³⁷

- “Wireless” (not wired)²³⁸
- More computing power and capabilities

The Fifth Wave (Business 2.0):

1960s – mainframe computers
1970s – minicomputers
1980s – personal computers
1990s – networking and the Internet

²³⁵ Zuboff and Maxmin, *The Support Economy*, at 290.

²³⁶ Digital Economy Fact Book, at 36-41.

²³⁷ Allaire and Austin, *Broadband and Collaboration*, at 29.

²³⁸ Digital Economy Fact Book, at 24-27.

2000s – coalescence of three powerful technological forces (perfect storm of technology): cheap and ubiquitous computing devices, low-cost and omnipresent bandwidth, and open standards

2. A Tale of New Connectivity

The First Net -- One-to-One (1980s): email as the enabler
Communications analog: telephone
First generation Internet

The First Web (Web 1.0) -- One-to-Many (1990s): WWW and web browser as the enabler; accessing static documents
Communications analog: broadcast
Second generation Internet

The Third Web (Web 2.0) -- Many-to-Many (2000s): sharing and creating content; the Web as a computing platform for myriad applications
Communications analog: there isn't one (yet)
Third generation Internet

The Web challenges our traditional model of communications composed of source-medium-audience. The Web offers increased choices of sources such as the technology itself, individuals, and other users, and interactivity, which can be seen as a form of source.²³⁹ The Web enables the transformation of the reader/viewer/listener into the researcher.²⁴⁰

“The success of the Web as a cultural phenomenon is dependent on its difference from television and film precisely because of its accessibility to actually produce new content. The millions of personal Web sites are a testament to the persistent will to production, the desire to remake and restate the world for others to peruse in contemporary culture.” As part of this environment, images can be retooled, music can be altered, and writing can be a collaborative process.²⁴¹

3. A Tale of New Ubiquity

In addition, this “Web 2.0” lives in the user’s world in two capacities.

The Visible Web – user-enabled and user-powered applications and devices

²³⁹ Burnett and Marshall, Web Theory, at 161.

²⁴⁰ Burnett and Marshall, Web Theory, at 161.

²⁴¹ Burnett and Marshall, Web Theory, at 201.

The Invisible Net – the unconscious network, woven unseen into our material world like oxygen; eventually it will become our environment, rather than thought of as a separate set of things. Billions of net-connected devices and connections will blend into our surroundings. “Situated networked devices.” Smart homes with security monitoring, healthcare applications, personal sensors, location-based information services, biometrics, and people-tracking sensors.

Mark Weiser: “ubiquitous computing” as a means of “activating the world.”

David Norman: computer appliances

MIT’s Project Oxygen

Europe’s “Disappearing Computer”

“Pervasive computing” environments are populated by mobile, wireless, and sensor networks. (NSF Global Environment for Networking Investigations); a proposed new network designed to better handle traffic from the edge of the network.

MIT’s “Things that Think” consortium

Continuous Computing (MIT’s Technology Review) – uninterrupted and continuous with our lives. A kind of invisible, portable “information field,” based on cooperation between (1) digital devices, (2) wireline and wireless networks, and (3) the Internet and its growing collection of Web-based tools for finding information and communicating and collaborating with other people. This allows people to both pull and push; an emergent phenomenon’ “a complex pattern of social behaviors that arises from the use of a variety of simpler digital tools.”

Some have predicted that by 2010 there will be about 10,000 telemetric devices for each human on the planet.²⁴²

At the turn of the century, Neil Gershenfeld documented the coming trends in pervasive computing. In his book When Things Start to Think, Gershenfeld showed how information had begun to move out of traditional computers and into the world around us, a change of greater significance than the arrival of multimedia or the Internet because it touches on so much more of human experience.²⁴³ He argues that we need to dismantle the real barrier between digital information and our physical world. All of the bits of the world are of no use unless they can meet us out here on our own terms.²⁴⁴

Rather than replace our world, we should first look to machines to enhance it.

²⁴² Barabasi, Linked, at 158.

²⁴³ Neil Gershenfeld, When Things Start to Think (1999), at xi.

²⁴⁴ Gershenfeld, When Things Start to Think, at 5.

The revolution so far has been for the computer, not the people. The essential division in the industry between hardware and software represents the organization of computing from the system designer's point of view, not the user's. In successful mature technologies it's not possible to isolate the form and the function. We need to bring so much technology so close to people that it can finally disappear.²⁴⁵

Benkler cites four attributes of the "pervasively networked information economy"

- (1) information is quirky as an object of economic analysis
- (2) cheap computer networks have lowered capital costs of information production
- (3) the primary human input, creative talent, is highly variable
- (4) cheaper and more efficient exchange of communication and information across space and time.²⁴⁶

Metaverse (Neal Stephenson's Snow Crash): totally immersive world

B. Now Enters the User-Powered Web

With the advent of IP, broadband connections, and digital technology, the stage now is set for something new and different to emerge from the edge of the network: the user-powered Web.

In short, consumers now have the tools to become users, collaborators, creators, and producers themselves.

Mass collaboration, cooperation, and competition across space and time is now economically and technically viable.

A wide range of "social software" tools is emerging to enable the work of groups.

What is affected? Communications, information, entertainment, publishing, advertising – pretty much everything tangible.

--Any and all information products, services, and content

It's a small world

²⁴⁵ Gershenfeld, When Things Start to Think, at 7-8. Examples of things that think include: books that can change into other books; musical instruments that help beginners engage and virtuosi do more; shoes that communicate through body networks; printers that output working things instead of static objects; and money that contains behavior as well as value.

²⁴⁶ Yochai Benkler, *Coase's Penguin* [full cite], at 175-76.

There are more than 24 M small businesses in the United States, representing more than 99 percent of all employers in America, and creating 80 percent of all new jobs.²⁴⁷

Innovation – and everything else – moves to the edges.²⁴⁸

“Growth in the innovation economy comes from small- and medium-sized business, rather than large corporations or governments.”²⁴⁹

Users are shaping technology industry growth. There has been a shift from a supplier- to a customer-led IT industry.²⁵⁰

Watts: vertical integration versus flexible specialization, and a “third way” of multiscale connectivity based on research on small-world networks.²⁵¹

Some see an analogous situation brewing on the corporate enterprise side as well. As one example, Shoshana Zuboff and James Maxmin have discussed how the history of managerial capitalism, and the rise of what they call “the individuation of consumption,” is characterized by markets for deep support. New markets (deep support) combine with new technologies (digital media) and a new enterprise logic (aligned with individuals) to make economic revolutions.²⁵² In their view, outsiders and novices are best positioned to invent wholly different organizational structures and new commercial purpose.²⁵³

To their thinking, the new enterprise logic of distributed capitalism will reinvent the purpose and organization of commerce.²⁵⁴

User innovations help create a rich, dynamic market ecology, extending well beyond the typical consumer/provider relationship.

--Yochai Benkler: “From Consumers to Users” – the Great Agora

“Technology now makes possible the attainment of decentralization and democratization by [more to quote]....”²⁵⁵

--Janice Fraser: “The demise of ivory-tower specialization and the rise of integrative thinking.”

²⁴⁷ The New Normal, Roger McNamee (2004), at 143.

²⁴⁸ McNamee, The New Normal, at 83-100.

²⁴⁹ Tapscott, The Digital Economy, at 62.

²⁵⁰ David Muschella, Customer-Driven IT (2003), at ___.

²⁵¹ Watts, Six Degrees, at 260-270.

²⁵² Zuboff and Maxmin, The Support Economy, at 142-174.

²⁵³ Zuboff and Maxmin, The Support Economy, at 285-86.

²⁵⁴ Zuboff and Maxmin, The Support Economy, at 320-23.

²⁵⁵ Benkler, From Consumer to Users, at 562.

Tapscott predicted in 1996 that the new digital economy would produce “presumption,” so that the gap between consumers and producers blurs. Mass customization will replace mass production; consumers become involved in the actual production process; and organizations will shift from being only consumers of information and technology to the point at which they are infotech producers.²⁵⁶

The activities of the deep edge collectively create an emergent phenomenon.

As we shall see, what these users create collectively could aptly be called a user-powered Web, here called the “uWeb.”

The “social protocol” layer is now evolving, and involves group interactions of all kinds: one-many-few to one-many-few.²⁵⁷

Before we explore this new world, we should check some of our primary linguistic and philosophic preconceptions at the door.

C. **An Interlude: Replacing Our Mental Furniture**

1. **The Powers and Limits of Human Perception**

Assumptions are fossilized opinions. Our mind-sets usually lag behind reality. The issue is not merely to re-arrange our pre-existing mental furniture; it is to replacing it altogether, more akin to an “Extreme Makeover.”

Mental models can be defined as the deeply ingrained assumptions, generalizations, or images that influence how we understand the world, and how we take action.²⁵⁸ In brief, these mental models inside our heads define our world.

Clayton Christensen: “Whenever we attempt to see into the future, we consciously or subconsciously employ a theory or model or cause and effect.”²⁵⁹

The human bandwidth of the human brain.

Reality is how we perceive it.

²⁵⁶ Tapscott, *The Digital Economy*, at 62-63.

²⁵⁷ Crawford, *Shortness of Vision*, at 7, 9; see also Crawford, *Someone to Watch Over Me*, at 22.

²⁵⁸ Yoran (Jerry) Wind and Colin Crook, with Robert Gunther, *The Power of Impossible Thinking* (2005), at 244.

²⁵⁹ Christensen and Anthony, *Disruption*, at 114.

Cognition is not merely a passive process of seeing the world, but rather an active process of creating our world of experience.²⁶⁰

What we see is what we think.²⁶¹

“Your own mind creates the fences that you live in.”²⁶²

“Reality is a story the brain and world work out together.”²⁶³

A number of “nurture” forces shape and reshape our mental models, including education, training, the influence of others, rewards and incentives, and personal experience.²⁶⁴

We need to cultivate the ability to think in new directions.

Our “mental models” or “mindsets” are the brain processes we use to make sense of the world.²⁶⁵

The ways we make sense of our world are determined to a large extent by our internal mind and to a lesser extent by the external world. The mental model inside our human brains is our representation of our world and ourselves.²⁶⁶

Our mental models are mismatched with the current environment

“Today’s experience quickly becomes tomorrow’s theology.”²⁶⁷

Innovation is the capacity to change reality; creativity is the capacity to change one’s perceptions of reality.²⁶⁸

The innovations of the Internet (the changed reality) still outstrip our creativity (our capacity to change our perceptions of reality).²⁶⁹

“You don’t see the world as it is, you see it as you are.”²⁷⁰

²⁶⁰ See, e.g., Humberto Maturana and Francisco Varela, The Tree of Knowledge: The Biological Roots of Human Understanding (1987) (summary).

²⁶¹ Wind and Crook, The Power of Impossible Thinking, at I.

²⁶² Wind and Crook, Power of Impossible Thinking, at 237.

²⁶³ Wind and Crook, Power of Impossible Thinking, at 243.

²⁶⁴ Wind and Crook, Power of Impossible Thinking, at 12-13.

²⁶⁵ Wind and Crook, Power of Impossible Thinking, at xviii.

²⁶⁶ Wind and Crook, Power of Impossible Thinking, at xviii.

²⁶⁷ Wind and Crook, Power of Impossible Thinking, at 14.

²⁶⁸ Luc De Brabandere, The Forgotten Half of Change (2005), at 10.

²⁶⁹ Brabandere, The Forgotten Half of Change, at ___.

An Example: From Silos to Layers

There is a parallel problem with moving away from vertical “silos” thinking, and towards adoption of a horizontal “layered” approach to regulation. As I alluded to in my earlier paper, one of the challenges facing a legal framework premised on a network layers model is that it represents to some an extreme change that will be unable to garner the political support to make the necessary legal and regulatory revisions.²⁷¹ A senior FCC official at the time expressed the view that “it all really comes down to an issue of educating people,”²⁷² but of course a successful education relies on an open mind, relatively free of preconceptions.

2. Replacing Our Metaphors

As George Lakoff has instructed us, language matters.²⁷³

If we change the language and the concepts underlying them, we can change the focus.

Consciously and deliberately changing our language is a start, but only that.

This discussion is intended as a corrective to what I see as the distorted and misleading uses of language, concepts, and metaphors that prevail in the current policy debates surrounding the Internet and telecommunications issues.

From silos to layers, from core to edge, from control to autonomy – the shift from old and comfortable to new and disquieting concepts require a real persistence and patience.

The situation is complicated immensely by those who will resist any such conceptual changes because it is in their perceived self-interested stake (personal or professional) in the status quo.²⁷⁴ As a result, the voices of real end users – the entrepreneurs, the innovators, the technologists, the educators, the early adopters – get all but lost in the policy debates of Washington, D.C.

Jessica Littman makes a similar point regarding the choice of metaphors in Digital Copyright. She explains that the evolution in metaphors in the copyright industry “conceals an immense sleight of hand” that recreates copyright as extensive control over

²⁷⁰ Brabandere, The Forgotten Half of Change, at 59.

²⁷¹ Whitt, A Horizontal Leap Forward, at 619.

²⁷² Whitt, A Horizontal Leap Forward, at 620 (quoting Robert Pepper, then-Chief of Policy Development at the Federal Communications Commission).

²⁷³ George Lakoff and Mark Johnson, Metaphors We Live By, (1980).

²⁷⁴ In his own entertaining fashion, Charles Ferguson provides one example, as he rails against what he sees as the difficulty of breaking through the lobbying and economic barriers surrounding the FCC and Congress. Ferguson, High Stakes, No Prisoners, at 345-48.

property.²⁷⁵ Under the normative understandings of copyright, the resulting dichotomy constrains the choices you are likely to make.²⁷⁶ The dominant metaphor no longer is that of a bargain balanced equitably between the author and the public. “If we forget that the model is just a useful thought tool, and persuade ourselves that it straightforwardly describes the real world, then we’re trapped in a construct in which there’s no good reason why copyrights shouldn’t cover everything and last forever.”²⁷⁷

a. **From Core to Edge**

The metaphoric language of the “core” and the “edge” is an interesting case in point. The network core of fiber and routers, and the edge of servers and PCs and applications, is modeled after the Internet.²⁷⁸ However, the labels connote something more. This construct obviously treats the core as of large and central importance, while the edge is a thin slice of inconsequential periphery. A hierarchy is assumed, one where the core has prominence as a source of strength and stability, in contrast to the shallow nature of the edge.

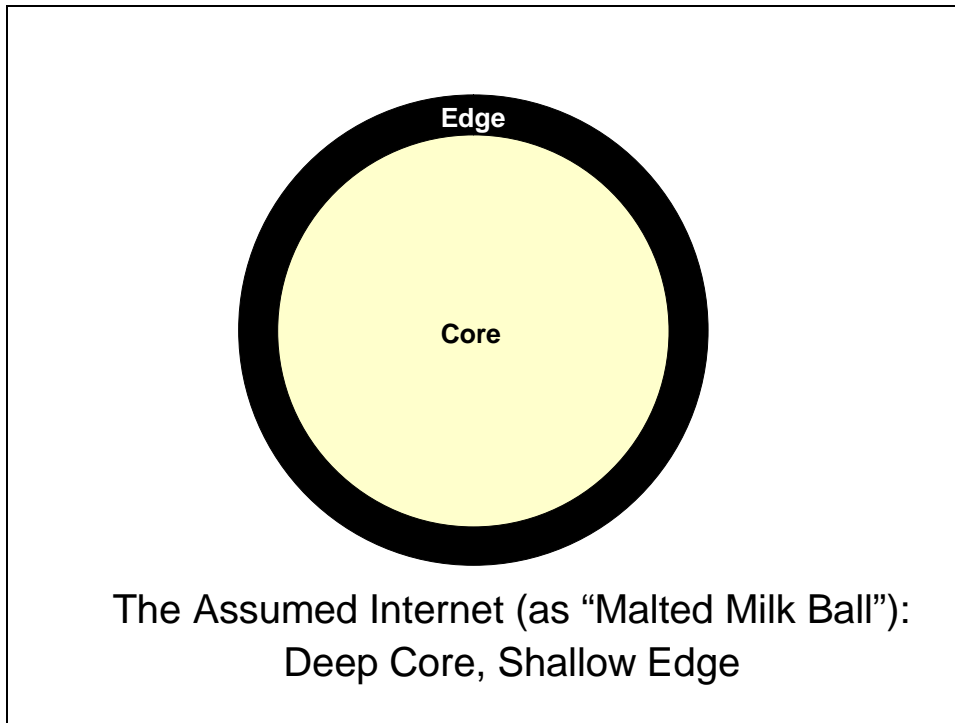


Figure 3

As we have seen, of course, the truth is something much different, and more complex. While there can be doubt that those who construct and operate the “plumbing” of the

²⁷⁵ Jessica Littman, *Digital Copyright* (2001), at 77.

²⁷⁶ Littman, *Digital Copyright*, at 77-86.

²⁷⁷ Littman, *Digital Copyright*, at 80.

²⁷⁸ Watts, *Six Degrees*, at 282.

Internet provide tremendous value to those who use the network, at the same time the physical networks would be all but worthless without those users. In many ways, then, it is the edge of the network that provides the source of strength and stability, not the core.

Lakoff has shown us that these constructs, at least as interpreted by many, are no accident. Indeed, based on years of empirical research, it is now well-founded that, for example, humans perceive that More is Up and Less is Down (based on vertical orientation), Happy is Up and Sad is Down (based on bodily orientation), and Control is Up (based on vertical orientation).²⁷⁹

Admittedly, a network entailing routers and servers and thousands of miles of fiber seem far more real and tangible than neutral, disembodied phrases like “applications” and “content.”

It also does not help that for years the traditional picturegram of the Internet shows a large “cloud” to represent the complexity of the physical network. The “cloud” tends to obscure (if not deliberately mask) the detailed yet relatively shallow network operations, while providing no comparable representation of the users and their Internet-based activities.

How do technologists define the edge? Usually it is seen as part of the physical network itself, as well as the software applications and hardware employed by those using the physical network. This paper will focus on this latter category of “users” of the network.

b. From Edge to Deep Edge

We should be open to a new set of metaphors to describe the burgeoning world of user-enabled and user-powered applications and devices and services, as opposed to the architectural plumbing that makes it all work together. In short, while the core is critical to the success of any activities on the Internet, the edge is what most people see as the primary, and not fringe, source of value from the Web. We live from the core, but we live in and on the edge.

If in fact we decide to retain the core/edge dichotomy for ease of use, one suggestion is to use a modifier to provide the proper connotation of the richness and depth available from those not at the network level. As we shall see, the term “deep edge” is a more appropriate way to describe the user activities that serve as the primary basis for the growing and emergent phenomenon of a user-based Web.

²⁷⁹ George Lakoff and Mark Johnson, Philosophy in the Flesh (1999), at ___.

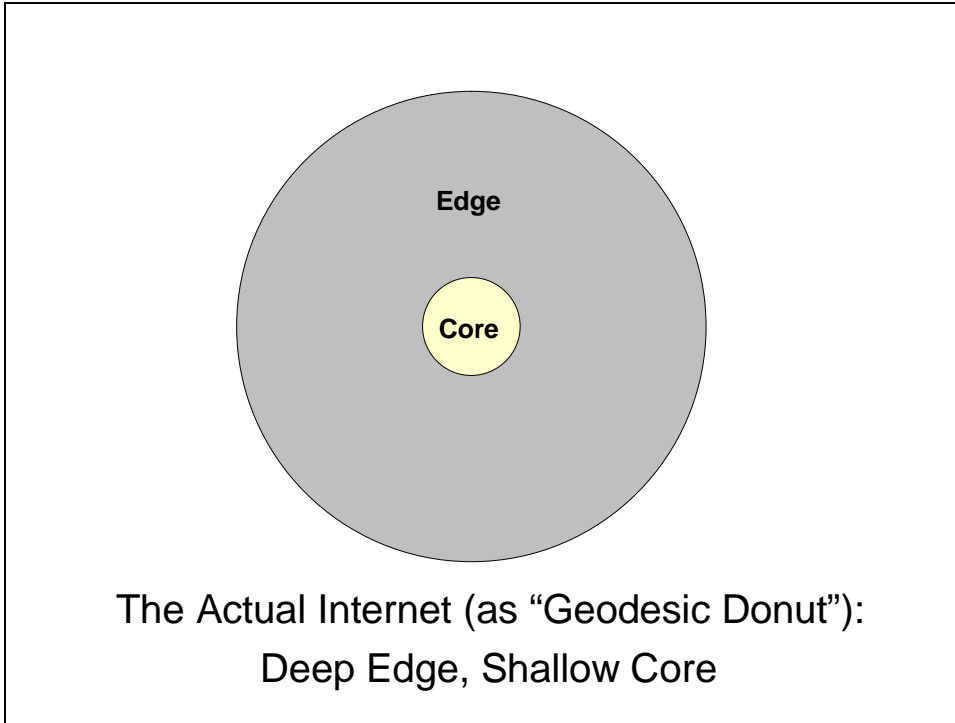


Figure 4

Other views of the Internet are possible as well, such as those that turn the model inside-out so that the network is at the periphery and the end users are at the core.

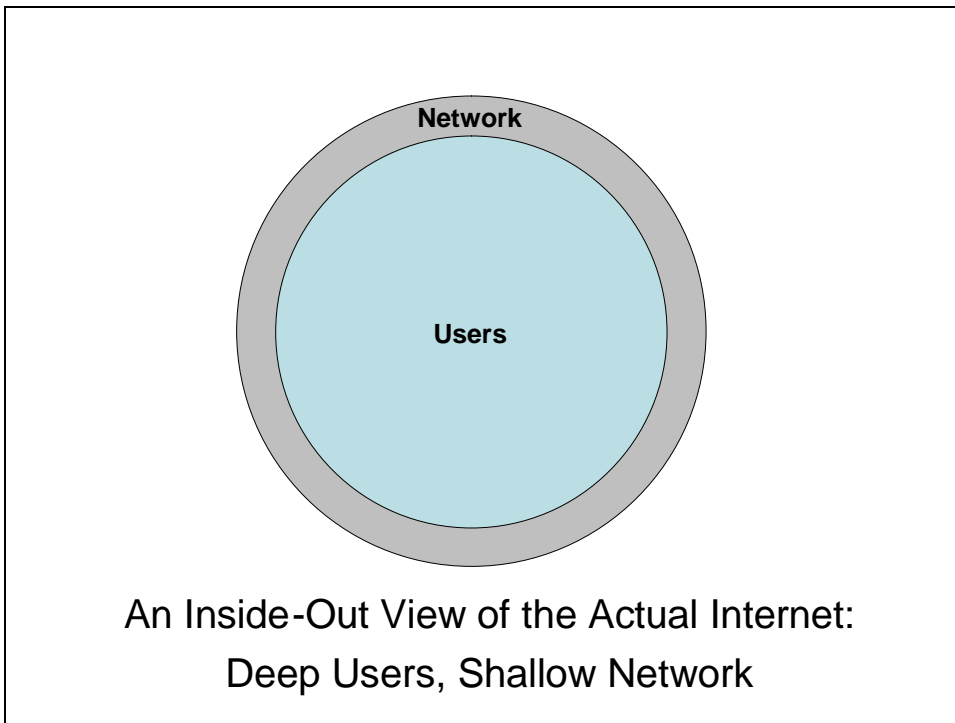


Figure 4

If one were to look at the Net as seen through the so-called virtuous “hourglass” of protocols, here is yet another way to picture it.

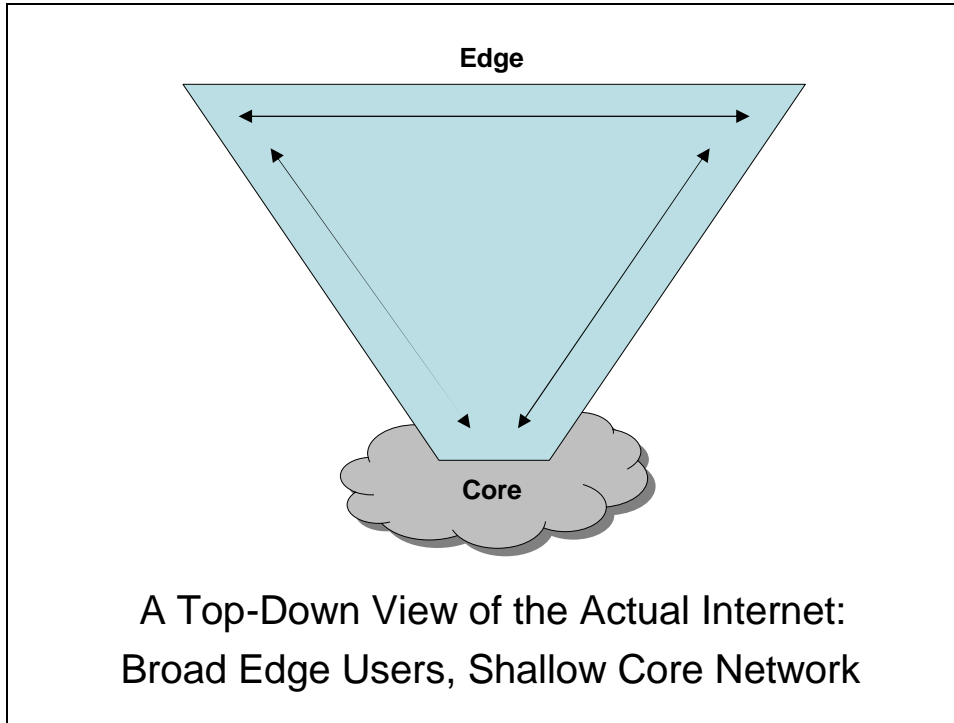


Figure 5

From One-to-One to Many-to-Many:

Finally, as described earlier, the one-to-one and one-to-many model remains fixed in the minds of many, if not most, providers and users on the Internet today.

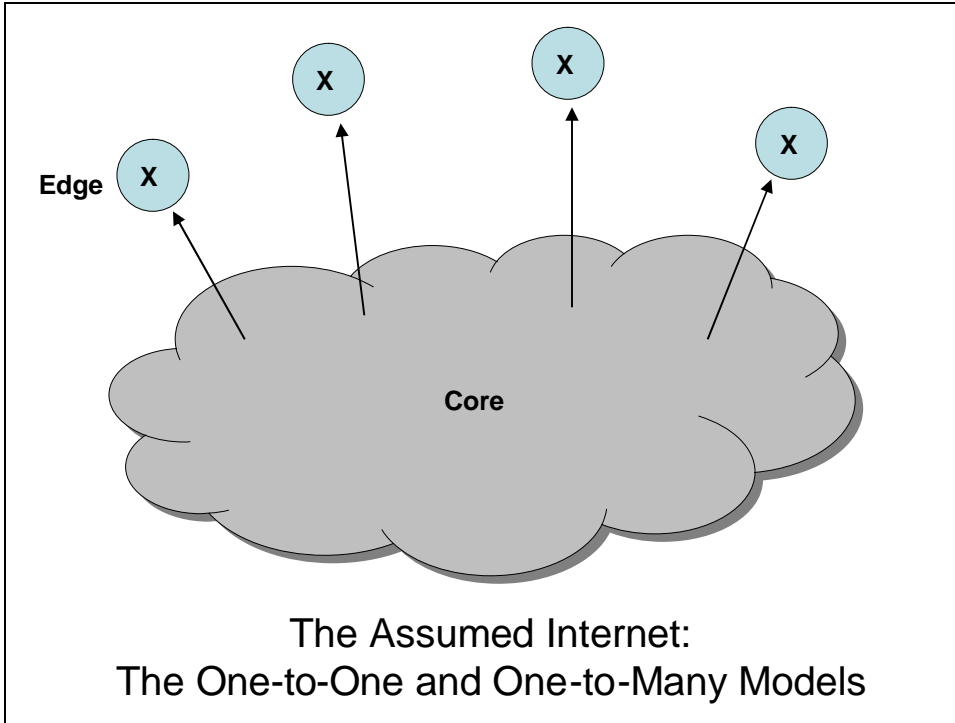


Figure 6

The reality, of course, is that the Net is evolving into a many-to-many construct, where the users increasingly are in control, and both send and receive packets to each others across the network.

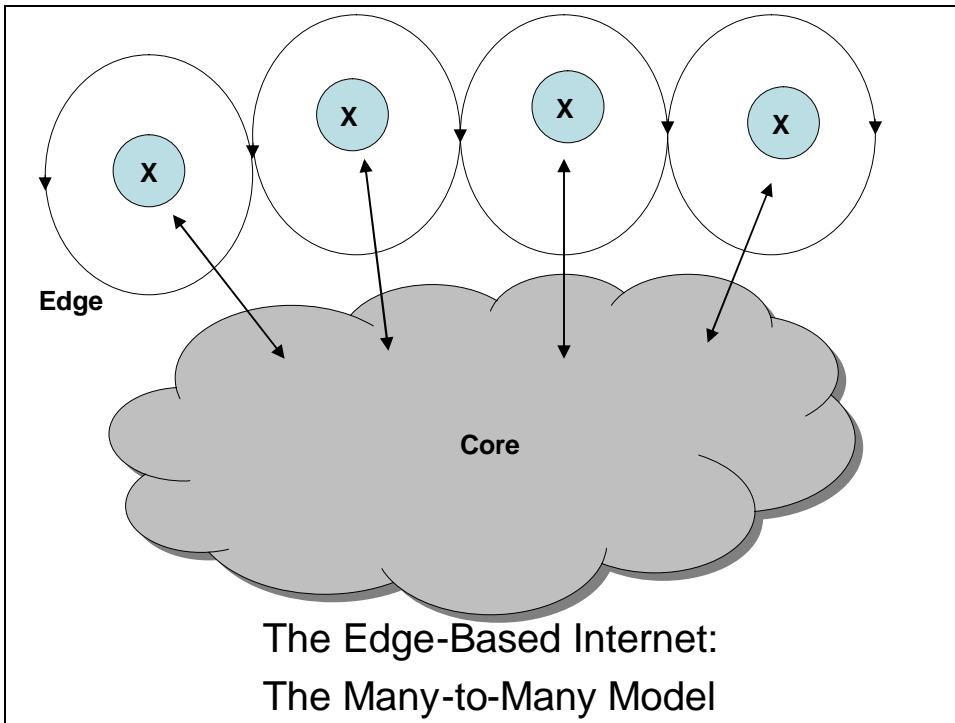


Figure 7

The point here decidedly is not to downplay or denigrate the contributions of the network providers. Rather, it is to shake up the thought patterns that have dominated the Internet since its inception, and have made it more difficult for people to recognize and conceptualize the singular achievements of the edge.

A preliminary sketch of the topography of the deep edge:

Node to hub to niche to locus

Each user constitutes a single node in an immensely complex and rich web of connectivity and interactions. Many will be no more than that, although that likelihood is not in any way intended as a denigration of their crucial role in the ecosystem.

Self-organizing and emergent

Some nodes will grow in terms of the quality and quantity of connectivity, until they become a hub in the ecosystem.

The larger hubs can become a niche, and then a locus.

--Nodes, hubs, niches, peaks

--Spokes, links, substrate, valleys

c. **From Consumers to Users**

To my mind, one can no longer talk intelligently about “providers” and “consumers” when describing activities taking place on the Internet. Instead, one should acknowledge a new type of ecosystem that has sprung up over the past few years, that constitutes the deep and expansive edge.

The standard take is that the edge of the network is where one finds those who “consume” the technology products and services provided by those at the network core. In some more nuanced versions, some of those on the edge include software and hardware developers who lack their own control over physical network assets. But both of these providers miss the richness and depth of the user experiences now exploding outside the network provider environment. An entire ecosystem of interdependent entities is emerging, one comprised of a considerable range of activities occurring collectively on the user’s side of the Internet.

Prosumption (Alvin Toffler) – both providing and consuming at same time

Yochai Benkler:

We are making regulatory choices at all layers of the information environment—the physical infrastructure, logical infrastructure, and content layers—that threaten to concentrate the digital environment as it becomes more central to our social conversation. . . . At all these layers, the wrong decisions could enable a reproduction of the mass media model, with all its shortcomings, in the digitally networked environment. Avoiding making these mistakes should be the focus of the efforts we have traditionally focused on structural media regulation.²⁸⁰

Benkler: Regulatory choices that “assume a producer/consumer model often perpetuate this model by regulating in a manner that increases the costs of becoming a producer of information.”²⁸¹ Professor Benkler asserts that this scenario leads inevitably to:

Concentration—because the cost of becoming a professional provider of the type whose activity is facilitated by the regulation creates an entry barrier;

Commercialization—because of the high cost providers must adopt a strategy that relies on sale of their information and cultural products;

Homogenization—because most producers must be commercial, their reasons to produce are similar, and their need to attract wide audiences leads to convergence of the content towards the mainstream and the inoffensive.²⁸²

There is also a certain denigrating aspect to the word “consumer.”

As Jerry Michalksi puts it, to the typical provider of services and products, “all I am is a wallet with a gullet and eyeballs.”²⁸³

In the traditional model, a user’s only role is to have needs, which manufacturers then identify and fill by designing and producing new products.²⁸⁴

The conventional term for an individual end user – “consumer” – “implicitly suggests that users are not active in product and service development.” Nonetheless, there is very strong empirical evidence that product development and modification by both end user firms and users as individual consumers is “frequent, pervasive, and important.”²⁸⁵

²⁸⁰ Benkler, *From Consumers to Users*, at 568.

²⁸¹ Benkler, *From Consumers to Users*, at 575-76.

²⁸² Benkler, *From Consumers to Users*, at 576.

²⁸³ *Quoted in Crawford, Someone to Watch Over Me*, at 22 n.94. One variation on this observation culminates with the phrase “and craps cash.”

²⁸⁴ von Hippel, *Democratizing Innovation*, at 2.

²⁸⁵ von Hippel, *Democratizing Innovation*, at 19.

[] Weber: “The conventional language of industrial-era economics identifies producer and consumer, supply and demand. The open source process scrambles these categories. Open source software users are not consumers in the conventional sense.”²⁸⁶

User is a metaphor that differentiates people’s engagement with the Web from their status as viewers, listeners, readers, and audience members of other media.²⁸⁷

Conceptualizing the user: “production is so central to the meaning and use of the Web.”²⁸⁸

Another way to look at it:

Enabled users are the “active consumers,” utilizing the latest applications (wikis, blogs, mash-ups, etc.) to create their own Web experiences.

Productive users are those who actually create the applications and services and content, typically in an entrepreneurial or small company setting.

Users that innovate can develop exactly what they want, rather than relying on third parties to act as their (often very imperfect) agents.²⁸⁹

d. From Intermodal to Transmodal Competition

There are other metaphoric distinctions created by the legacy providers, intended to elevate certain preferred conditions and denigrate others. The notion that “facilities-based” providers (offering “intermodal competition”), somehow can be on the same par with “non-facilities-based” providers, is an illusion sought to dispel.

The incumbents offer us the bundled physical platform of “intermodal competition” – telephone companies versus cable companies versus satellite companies -- as if anything else is a mere chimera. It is to be supposed that the incumbents look to Microsoft as their model, where the Windows operating system has been used with enormous success over the past decade to create a lucrative revenue stream incorporating other bundled innovations such as (with more constantly on the horizon).

In contrast to the supposed benefits of “intermodal” competition, the edge community offers us the world of “transmodal” competition. Look to Google and Yahoo as the examples here, with their virtual platforms enabled to operate over any physical network connection.

²⁸⁶ Cited in von Hippel, Democratizing Innovation, at 169.

²⁸⁷ Burnett and Marshall, Web Theory, at 210.

²⁸⁸ Burnett and Marshall, Web Theory, at 70-78.

²⁸⁹ von Hippel, Democratizing Innovation, at 1.

It is conceivable that the future of the Internet will be dictated more by the transmodal platform providers, and not the intermodal world of incumbent telephone companies and cable companies. Such a possibility should factor into any discussions about the future of U.S. telecommunications policy.

3. Some Cautionary Notes

Several cautionary notes are in order at this juncture.

First, what I am calling the deep edge is not a single, distinct, easily-defined entity. It is not a noun (person, place, or thing), but rather a shorthand term for a range of behaviors and activities with certain collective tendencies towards decentralization, openness, and user-based approaches. We should not let our natural thirst for black-and-white, all-explanatory concepts blind us to the blurriness and messiness of reality.

The deep edge is intended to be seen as a handy conceptual tool of a blended, still-emerging phenomenon— nothing more, and nothing less.

Not a monolithic certainty etched in stone

Nor is the deep edge something that now is replacing, or will replace, the existing Internet. For now, at least, it is a supplementary phase in the evolution of the myriad actions that comprise the Internet. Indeed, in many respects, we have little idea whether and how the patterns of behavior exhibited online will change further, or devolve to previous incarnations.

An emerging phenomenon, not a resting place

Finally, the deep edge should not be mistaken for a unique break in the history of humanity. Much of the hype and hyperbole of the 1990s surrounding the Internet took the view that the Web was something wholly and completely different from the mundane world of economics and politics and sociology. To some, the Web existed in a timeless and spaceless environment that foretold of the crumbling of mere atoms before the awesome power of bits.

My thesis is a more humble, and hopefully well-grounded one: that the deep edge represents the latest advancement in the ability of ordinary people to use various technological tools to better their lives. In other words, bits are made to serve the interests of atoms. By tapping into pre-existing sources of creativity and passion and beliefs, people themselves at the deep edge are fashioning the “uWeb” as an emergent phenomenon. While it is yet too soon to know whether and how far the deep edge, and

the uWeb phenomenon, will survive in the coming years, at least it appears to be something of value worth protecting in the near term.

On the other hand, I do not necessarily agree with those such as Stan Leibowitz who reduce the impact of the Web to its ability to reduce the costs of transmitting information. He claims that this single advantage “does not change the law of economics,” and that “the laws of supply and demand are not so fragile as to be overcome by anything so small as a new method of communicating with each other.”²⁹⁰ I see the Internet’s role, not as supplanting economic principles, but rather [more]

D. The Ecosystem of the Deep Edge

Over 600 B Web pages today, with 100 B pages clicked every day

Users are searching, trading, linking – connecting.

There are 50 million blogs, with a new one every 2 seconds.

[Pew Internet and American Life project stats; PFF stats; others]

Much of this activity is fueled by passion rather than profit (about 40 percent of Web activity is commercial, and 60 percent is personal interest or duty)

It is a world manufactured in large measure by fellow users – individuals and small companies – and not just large corporate interests. And certainly not the incumbent telecom and cable and wireless and satellite providers.

People do not receive “content,” but “interact – communicate – and build content and communities of their own.”²⁹¹

In the future, more content could come from users than from the content industry.

The uWeb facilitates, magnifies, and enhances human interactions. Human reality does not become more virtual; instead, virtual reality becomes more human. The Net bends to accommodate real human needs and aspirations.

²⁹⁰ Stan Leibowitz, *Rethinking the Network Economy* (2002), at 9, 211.

²⁹¹ Crawford, *Someone to Watch Over Me*, at 17.

It is not a utopia. The Net faithfully reflects the full range of human activities and thoughts in all their glory, from poetry to porn. This only emphasizes how the Net is becoming more and more a reflection of its users.

Prescient United States Government reports are beginning to acknowledge the innovative activities building in the applications world.²⁹²

Experts, consultants, and others:

A variety of academic and technology experts have converged on deep edge activities, and the emerging user-powered Web phenomenon, in just the past few years. While the analyses and explanations differ in certain ways, it is clear that they are describing one and the same thing.

Web 2.0

Participatory Culture (Participatory Culture Foundation)

Personal Broadband (MIT Communications Futures Program)

WeMedia – participatory journalism

Individuation (Adaptive Path consulting)

Object-Centered Sociality (Jyri Engestrom)

The Cultural Production Thesis (Burnett and Marshall)

Even some in the “mainstream” press has picked up on the phenomenon.²⁹³

The Recombinant Web (ZDNet)

Do-It-Yourself Economy (Fortune)

Mass Collaboration (Harvard Business Review, Business Week, Wired)

The Amateur Economy (Fortune)

²⁹² See, e.g., Charles B. Goldfarb, Congressional Research Service, Telecommunications Act: Competition, Innovation, and Reform, CRS Report for Congress, August 12, 2005, at 17 (acknowledging the Internet tradition that the innovation process is a survival-of-the-fittest competition among developers of new technologies).

²⁹³ See, e.g., Newsweek, September 26/October 3, 2005 (cover story on “The Future of Entertainment – Coming Soon: A World Where All Content Is At Your Fingertips”); Business Week, September 26, 2005, at 76-90 (“It’s A Whole New Web, and this time around it will be built by you”); Business Week, June 20, 2005, at 73-118 (“The Power of Us: Mass collaboration on the Internet is shaking up business.”).

Whatever you call it, and however you describe it, the fundamental components are there, and appear to be growing fast.

1. The Players

It must be stressed that the lines drawn to demarcate these different constituencies of the deep edge ecosystem necessarily are blurred and provisional, much like the human activities they represent.

In addition, the lines are not that certain between the deep edge and the core of the network. One could plausibly place the retail aggregators, for example (and the “creative content” community) in the core, given their significant control over distribution mechanism and considerable resources.

First, we have the developers and providers of software tools.

RSS, XML, BitTorrent, SIP, Linux, etc.

Second, we have the developers and providers of software applications built from those tools.

Blogging software, mash-ups software, podcasting software, Grokster, etc.

Third, we have the developers and providers of user devices.

Fourth, the developers and providers of content, both for commercial and non-commercial uses.

From the largest Hollywood studio to the smallest blogger

Commercial mass media content versus personal information content (?)

Fifth, the retail aggregators and distributors of the previous activities – these are the heavyweights of the Web, such as Microsoft, Google, Yahoo, Skype, Sony, and more.

Ex, Google seeks the “virtual home run” platform of voice, data, and video, on a fixed and mobile basis. (NY Times)

“edge aggregators” (as opposed to core aggregators)

Sixth, the providers of network connectivity (retail ISPs), using wired and wireless broadband connections. They are of the network, but operate largely at the edge.

Those inextricably linked to the underlying broadband network provider, and those independent ISPs such as Earthlink

Seventh, and finally, we have the “end users” themselves, typically labeled as the “consumers.” While consumers still represent the bulk of the current uses of the Web, the range of activities carried out by end users is decidedly broad.

They can act as any or all of the other six categories, providing further software tools, applications, devices, content, and aggregation functions.

They can also take part in a user community of common interests.

2. The Tools

XML (Extensible Mark-Up Language) – born in the late 1990s. It is a machine-to-machine data interchange format that enables applications at the edge to communicate with each other and with legacy computer applications.

Two other standards are related to XML: SOAP and REST

UDDI

WSDL

RSS (Real Simple Syndication) – a Web-programming hack that allows the user to package Web items such as blog entries into a stripped down, XML-based format so they can be imported into other Web pages; useful method for delivering audio files, saving and annotating Web links, and subscribing to RSS feeds.

A content syndication tool

Even the Democratic National Committee has added RSS to its official website for each of its constituency groups, so that users can subscribe to content from select parts of the site. (Tech Daily, 8/17/05)

SMS (Short Messaging System) – handles text messaging

MMS (Multimedia messaging System) – handles text, video, audio, and pictures

BitTorrent – peer to peer technology optimized for downloading files
(now supplanted by eDonkey)

3. The Applications

The deep edge is what the user does. The following are some of the major applications that have been adopted by users for myriad reasons.

“What are some emerging opportunities in the online world (such as blogs and wikis)? How can you tap into these developments and use them to rethink your business models and underlying mental models?”²⁹⁴

Voice over IP (VoIP), gaming, search, and peer-to-peer exchange of music files are three well-known applications best suited to a broadband environment.²⁹⁵

Gaming is another significant use of broadband connectivity.²⁹⁶

Search: Google is king, with Yahoo! still a major player

File Sharing: tens of millions of worldwide users of P2P software, representing 50 to 70 percent of all traffic on the Internet.²⁹⁷

There are many other user applications as well.

Linking

Creating connections to other Web sites or documents; countless billions in existence

²⁹⁴ Wind and Crook, *The Power of Impossible Thinking*, at 219-220.

²⁹⁵ Digital Fact Book, at 34-35.

²⁹⁶ Digital Fact Book, at 54-55.

²⁹⁷ John Borland, CNET, dated 8/28/05.

Tagging

Categorizing Web posts and links; countless millions in existence, including folksonomies

Tags and metatags – adding descriptive words to existing content

“Tags enable a huge amount of user-produced organizational value, at vanishingly small cost.”²⁹⁸

Folksonomies – knowledge structures that emerge when groups of people tag digital data; coined by Thomas Vander Wal

Bruce Sterling

Social bookmarking

Wikis

Modifiable user-created content; Wikipedia has 715,000 articles in English alone, and more than 1.5M articles overall in 200 languages.

The online encyclopedia Wikipedia is one example of an open information community.²⁹⁹ (user innovation communities are a subset of information communities).

Wikis – web pages that allow users to add content or edit existing content

Blogging

15M blogs and 40M readers in US

50M Americans have visited a blog.³⁰⁰

²⁹⁸ Clay Shirky, “Ontology is Overrated,” at __.

²⁹⁹ von Hippel, *Democratizing Innovation*, at 17.

³⁰⁰ Digital Economy Fact Book, at 58-59.

Blogspot's 19M unique visitors amounted to more visitors than the New York Times, USA Today, and Washington Post websites.³⁰¹

Blogs have replaced mainstream media as sources of news and information for many people.³⁰²

The first blogs occurred in early 1999.³⁰³

Poliblogs – commentary on politics

blogosphere

TypePad – personal weblogging service

audiobloggers: post songs and explain their likes and dislikes

music.for-robots.com
saidthegramophone.com

Podcasting: doubling each year through 2010

Podcasting – amateur radio shows in MP3 format; term was invented by Ben Hammersley in Feb. 12, 2004 article in “The Guardian” newspaper

Podcasting may replace traditional broadcast radio.³⁰⁴

Odeo
ipodder.org

Ringtones

The global market exceeds \$4B in 2005

Ringtones, calltones, callbacks (?)

Modding: customizing PCs, to software, to websites

Website modding by Greasemonkey

³⁰¹ Information Week, August 8, 2005.

³⁰² Hugh Hewitt, Blog (2005), at __; *see also* Crawford, *Shortness of Vision*, at 9.

³⁰³ Hewitt, Blog, at __.

³⁰⁴ Crawford, *Shortness of Vision*, at 9.

Mash-ups: mixing together software such as Google Maps to suit specific needs; the “programmable Web”

Greasemonkey mash-ups

Eric von Hippel: “the availability of user-developed add-ons can have a positive effect: it can increase the value of the platform to users, and so allow manufacturers to charge higher margins on it and/or sell more units.”³⁰⁵

4. **The Operational Models**

Here are a few examples of the new operational models, whether for business purposes or otherwise, and user-based ecosystems. Each of these presents adaptive tools designed to match up with our personal preferences, location, and schedules. This Web revolves around us and our needs, and not the other way around.

Peer-to-peer networking

Kazaa (music files)

BitTorrent (video files)

Yahoo! (radio stations): 3 B song ratings, that create personalized net radio stations

Podcasting (audio files)

Skype (voice service): 150 M downloads, and 20 M daily users; sale to eBay

Open Media Network (public television programming)

Kontiki and Red Swoosh (video and computer games)

BitTorrent

Peer production

Wikipedia (group-edited encyclopedia) – 1.8 M article by 51,000 contributors in 109 languages; may be the largest collaborative library in history

Blogger (individual web logs)

³⁰⁵ von Hippel, Democratizing Innovation, at 111.

Marketocracy (roisserie league of stocks)

Wikinews (journalism)

Rocketboom (video blog)

Del.icio.us (tagging/bookmarking): “social bookmarking” – Joshua Schachter is the creator; users can store URLs, personal comments, and descriptive tags that will help them identify Web page they want to locate later

Freecycle (giving away items)

News aggregators

NetNewsWire

Newsgator

Bloglines

Topix

Grassroots networks

MoveOn (political networking)

MeetUp (local group formation)

User validation/niche marketing

Google (pretargeted ads)

eBay (feedback system)

Amazon.com (customer reviews/recommendation engine)

Social networks

(social knowledge management, or self-created walled gardens)

LinkedIn (job prospecting through acquaintances) (3 M users)

Yahoo Groups

Orkut

Friendster

Jobster

Personalized content

Greasemonkey (mash-ups and site mods)

Odeo (podcasting)

On-demand services

Flickr (movies rental)

Slingbox (TV-on-the-go)

Virtual reality

Neopets (virtual pets)

Second Life (virtual online ecosystem)

Others

Salesforce.com (customer rental of enterprise software)

Alibaba.com (matches entrepreneurs with Chinese factories to manufacture products)

Epocrates (drug data delivered to doctors)

iFabricate (tentative) (DIYers trade ideas, collaborate on designs, and access suppliers)

About.com

Flickr (community photo album)—allows people to derive their own value from sharing photos without any enforced control; sale to Yahoo!

Upcoming.org (collaborative calendar)

Mappr.com

Technorati (search engine built by David Sifry that scans millions of blogs and displays the most recent post relating to any given keyword or tag)
Craigslist (blogging; 10 M blogs read by 32 M Americans)
Half-Life (gaming)
CinemaNow (on-demand movie downloads)
Iowa Electronic Markets (group forecasting)
Backfence (independent citizen-media effort)
Ambient Devices (wireless devices display Net data as colors or graphics)
MythTV
Woot.com (sells supply of one product from one company per day)
Akimbo (video on-demand library)
Mash-ups (combining old songs into new ones)
Photoblogging with camera phones
Ryze
Podcasting.com – Adam Curry’s new podcasting network
Ruby on Rails
Consumating.com (dating and community site where members write their own self-describing metatags)
Socialtext – sells web-based collaboration software based on wikis
Ourmedia.org (free repository for digital media)
Backpack (backpackit.com) (Web-based information organizer)
Dodgeball (friend-finder service mediated by text messages) (acquired by Google in May 2005)
Rojo.com (hybrid news aggregator, social network, and social bookmarking service)
Eurekster.com (social search engine)
EVDB (evdb.org) (Events and venues Databases; free searchable repository for noticing of events taking place around the world)

Another area worth mentioning is “personal fabrication.” Neil Gershenfeld has written recently on this ability to design and produce your own products, in your own home, with a machine that combines consumer electronics and industrial tools.³⁰⁶ Personal fabricators (PFs) are machines that make machines; one can download or develop the description of a product, supplying the fabricator with designs and raw materials. The vanguard of an era of “post-digital literacy,” a self-reproducing machine. What is being personalized, of course, is our physical world of atoms rather than the computer’s world of bits.³⁰⁷ Still, the notion of “fab” extends the theme of personal innovation and decentralized user activities beyond the computing and connectivity environment that is the focus of this paper.

³⁰⁶ Neil Gershenfeld, *Fab* (2005).

³⁰⁷ At the intersection of physical science and computer science, programs can process atoms as well as bits, digitizing fabrication in the same way that communications and computation were earlier digitized.

E. The Inevitable (and Evitable) Constraints

Of course, the picture painted by the biggest boosters of the new user-based Internet cannot be all there is. As discussed previously, one cannot examine the activities of the Net without appreciating and accounting for the complicated web of social and economic and legal factors that are infused into its very fabric. Despite the immense promise and the inevitable hype surrounding the rise of the uWeb, there are countervailing factors that may well serve to limit, or even stunt, this growing revolution. In both subtle and not-so-subtle ways, those factors can act as real constraints, pulling against the forward momentum of the user-powered Web.

Social, economic, and legal constraints

In the words of Mark Taylor, a noted expert on complexity theory:

One of the perennial promises of visionaries is that in the future, all things will be possible. Whatever constraints we suffer in this world will disappear and we will be able to enjoy a freedom now barely imaginable. Such promises, however, are always cruel because they cannot be fulfilled. Possibilities are inevitably limited by constraints that can never be overcome. The only viable freedom is not freedom *from* constraints but the freedom to operate effectively *within* them.... Constraints provide the parameters within which thinking and acting must occur.³⁰⁸

It would be most unfortunate if at least some of these potential constraints should come to pass. Deep edge activities foster maximum innovation and consumer choice, and should be encouraged, not discouraged. As Taylor points out, however, some constraints are simply inevitable. In those cases, we would be wise to understand and act within the inherent limitations of human endeavors. Nonetheless, we should continue to fight against those constraints raised by some out of fear or ignorance, and which would be most harmful to the values of the Net. Here are a few examples of each.

1. The Personal and Social Factors

Human nature is not infinitely malleable. We all possess certain traits and tendencies that, while modified by experience and act of will, make us human beings. Some of those traits – the desire to be creative and unique – argue in favor of a continuation and even expansion of the uWeb phenomenon. Others do not.

As Steve Smith puts it, is Web 2.0 just for those in the 6 sigma curve, or does everyone want it?³⁰⁹

³⁰⁸ Mark Taylor, The Moment of Complexity, at 224.

³⁰⁹ Steve Smith, Steve's Tech Journal, [blog] [cite].

a. **Too many couches**

First and foremost, our couch potato realities may return, as the “consumer” re-asserts itself over the active end user.

It is assumed by telephony traditionalists that the public is largely passive.³¹⁰

The average TV watcher enjoys it passively as a form of relaxation (“LOP” – least objectionable programming)

Is it too much to expect that audiences will continue to make their own entertainment?

On-demand programming (pay-per-view movies) are seen by many as enhancing but not replacing the traditional TV viewing experience.

Under this theory, demand will not shift appreciably.

At present it takes time, effort, and expertise to navigate the Web to locate the desired application or content, download it, and learn how to interact with it. Few may be willing to do so.

From the side of the producers, the issue comes down to a matter of incentives. If the user sees little or no economic gain from his or her activities, is it unsustainable? Benkler believes that “people are creative beings,” and the pleasure of creation (“intrinsic hedonic rewards”), along with reputation gains and individual appropriation, is enough in many cases.³¹¹

b. **Too much data**

Second is the somewhat related phenomenon of “continuous partial attention.” Linda Stone uses that phrase to describe how constant information overload results in mental blurriness. Will people rebel against the constant demands on their time and attention from the uWeb?

“data smog” and “information pollution”

David Shenk argues that data smog is a permanent new feature of our social landscape. We must act responsibly to limit our exposure to information.³¹² He claims that we need to return to an equilibrium between the three basic elements of our information ecology: production, distribution, and processing. It is difficult to maintain and even increase ready access to reliable communication and useful information, without compromising a

³¹⁰ Crawford, *Someone to Watch Over Me*, at 5.

³¹¹ Yochai Benkler, *Coase's Penguin, Or, Linux and the Firm* [cite], at 179-180.

³¹² David Shenk, *Data Smog* (1997), at 181-82.

certain social serenity or allowing society to disintegrate into a fragmented, fractious electronic tower of babel.³¹³

The “Infocloud”(Thomas Vander Wal) (aggregate of one’s personal digital data, residing on networks and in storage media.

c. Too much “me”

Third, and relatedly, is the concept of the “daily me.” Some commenters bemoan the fact that the prospect of users forming tight-knit communities of interest by limiting access to conflicting viewpoints may encourage segregation and social fragmentation.³¹⁴ Professor Cass Sunstein has dubbed this the “daily me.”³¹⁵

d. Too much technology

Neil Postman talks about the surrender of culture to technology, and the ideology of computer technology.³¹⁶ He believes that the computer has usurped powers and enforced mind-sets that a fully attentive culture might have willed to deny it. Computer technology has served to strengthen the hold of “Technopoly,” to make people believe that technological innovation is synonymous with human progress.³¹⁷

Writing before the advent of the commercial Internet, Kenneth Gergen decried the rising tide of social saturation. Electronic innovation and the proliferation of relationships, including the accelerating growth in social connectedness from innovative developments in computers, e-mail, faxes, and the coming digitization of all the major media.³¹⁸

The “computer trap” is “the elaborate, long-term, collective effects of the possibly irreversible and largely unexamined drive to computerize and network everything and anything whose efficiency or economic performance might thereby be improved.”³¹⁹
(217)

The complacent acceptance of the desktop “personal” computer in almost every aspect of modern life is masking the degree to which computerization and computer networking are transforming not just the activities and instruments of human affairs, but also their

³¹³ Shenk, Data Smog, at 182-83.

³¹⁴ Barabassi, Linked, at 169-170. The author notes that such social and political isolation is a self-reinforcing mechanism which, by altering the Web’s topology as well, segregates the online universe. *Id.* at 170.

³¹⁵ Cass Sunstein, [cite].

³¹⁶ Neil Postman, Technopoly (1992), at 107-122.

³¹⁷ Postman, Technopoly, at 117.

³¹⁸ Kenneth Gergen, The Saturated Self (1991), at 57-61.

³¹⁹ Gene I. Rochlin, Trapped in the Net (1997), at 217.

structure and practice. Our history has been shaped by the form and use of our tools in ways totally unanticipated by their inventors.³²⁰ (5)

See also Edward Tenner, Why Things Bite Back, (1996) (the computerized office, and the revenge of the body (206-267)

The gap between digerati hype and end-user gloom is largely due to the failure to acknowledge and understand the critical social networks of which individuals and information are always a part.³²¹

Barry Schwartz states that the opportunity to choose is essential for well-being, but choice has negative features, which escalate as the number of choices increases.³²²

The bottom line is that not everyone, or even most people, needs to be a producer of content and applications and Internet-dependent activities, or even participate as part of the online experience at all. It is enough that those who choose to remain consumers can form a natural audience for those who choose to become producers. But will it be enough to form a “tipping point” between a temporary fad and a pervasive trend?

e. Too much complexity

End users (both “producers” and “consumers”) are put off by complex technical and legal aspects of the Web.

A rebellion against complex interfaces (end users) and technical limitations (producers)

QoS standards, privacy, security, content and application filtering, addressing/naming/numbering resources, digital rights controls, patent issues, etc.

The connective “interfaces” between the different layers of the Internet also can become “chokepoints” of control.³²³

f. Too much danger

End users are put off by the dark side of the Web.³²⁴

Forces of “informational destabilization,” such as spam, viruses, hacking, terrorism, fraud, and (to some) peer-to-peer filesharing.³²⁵

³²⁰ Rochlin, Trapped in the Net, at 5.

³²¹ John Seely Brown and Paul Duguid, The Social Life of Information, (2000, 2002), at ___.

³²² Barry Schwartz, The Paradox of Choice (2004), at 222.

³²³ Kevin Werbach, Breaking the Ice (2005 draft), at ___.

³²⁴ Adam N. Joinson, Understanding the Psychology of Internet Behavior (2003), at 85-114.

From the deep edge also comes other, less attractive and even threatening activities: pomography and gambling and general hucksterism, as well as all manner of cyber-maladies: spoofing, spam, spyware, identity theft, viruses, DOS attacks, cyber attacks, etc.

Barry Schwartz has written about the the dark side of freedom, autonomy, and self-determinism on the Web. In his view, the Internet is a resource that is democratic to a fault; an avalanche of electronic information, with an absence of filters.³²⁶

Malcom Gladwell adds:

“Belonging to a large network may be a wonderful thing, and the larger networks are, theoretically, the more powerful they are. As a network grows in size, however, it is also the case that the time and nuisance borne by each member of the network grow as well. That’s why people don’t talk to telemarketers anymore, and why most of us have answering machines and caller I.D. that lets us screen calls. The phone network is so large and unwieldy that we are increasingly only interested in using it selectively. We are getting immune to the telephone.”³²⁷

On the other hand, James Gleick insists that we actually crave the connectedness. Our speedy, in-touch lives feel good in their own way. Our need for information on demand is as primitive an instinct as any animal can have. After all, he says, we were born connected. Solitude comes with maturity.³²⁸

The Internet did not put an end to coercion, but instead served as an inestimably powerful new weapon for direct marketing.³²⁹

Digital Economy Fact Book (16-17) on online threats

Consumer Reports (9/05): Home Internet users have a one in three chance of suffering computer damage, and/or financial loss because of a computer virus or spyware.

“DarkNet” – 60 to 80 percent of all traffic on the Internet is considered “illegal” in some way.

Cachelogic and darknet.com

A ready excuse for the intelligent network

³²⁵ Crawford, [cite paper], at 61-62.

³²⁶ Schwartz, *The Paradox of Choice*, at 55.

³²⁷ Malcolm Gladwell, *The Tipping Point* (2000/2002), at 273.

³²⁸ James Gleick, *Faster* (1999/2000), at 92-93.

³²⁹ *Coercion*, Douglas Rushkoff (1999), at 230-264.

Senator Graham: “Your days of the lawless Internet are over.” [cite?]

2. The Economic and Technology Factors

a. Follow the money trail

The traditional content producers (Hollywood and the “creative content” community) and aggregators (broadcast and cable networks) have the ability (if not yet the economic incentives) to adopt the technological innovations, and package, price, and market them in consumer-friendly ways.

In addition to their presence in the market, the network providers and content industry have the wherewithal to impose constraints of their own, in part through creating a complex and heavily-regulated Net (see below).

Negotiating clout

Centralized mode of distribution

DRM mechanisms

The ILECs and cable companies command last-mile and middle mile infrastructure.

b. Incumbent providers strike back

The incumbents have many tools at their disposal to attempt to ward off the uWeb, from the seemingly innocuous (QoS measures, security measures, authentication, privacy, network bandwidth control) to the blatant (port blocking). Absent legal or regulatory limitations, they will be able to employ them.

Adopting an intelligent, next generation network (NGN) design could move more of the intelligence away from the control of the user and out of reach in the fabric of the network itself.

IMS as a controlling protocol?

As Phil Weiser has pointed out, it should be in the natural economic self-interest of the incumbents to want to provide their end users with access to the Web-based services and applications and devices provided by third parties.³³⁰

However, that fact does not guarantee that outcome. Weiser has identified several reasons why an incumbent would act against its own economic interest, including the observation that “incompetent incumbents” caught in the various mythologies of the past simply may not be able to help themselves.³³¹ In other words, while it may well be in the incumbent’s best interest to support and encourage an ecosystem of users not limited to the integrated offerings of its own broadband network, it may be trapped in its own limited thinking to want to allow such activities to happen.

On the other hand, Intel, Google, eBay, Nokia, Cisco, CEA, and others with significant investments at the “edge” have every incentive to use their combined leverage to help prevent total network blockages by the incumbents. Most are eager to cut the “walled garden” carriers out of the content loop.

c. The Microsoft example

Imitation, and “he who controls the bundle,” rules.

Microsoft achieved its current position of dominance in the Internet space not by being an innovator, but instead by controlling an essential input no other entities could replicate – the Windows operating system – and adding to it the innovations created by others.

It isn’t often the First Mover, but rather the Fast Second, who benefits most from adoption of an innovation. (Alta Vista versus Google)

Those who were late to the Internet party were among the bigger winners. They did thoughtful analysis and exploitation of market opportunities.³³²

Netscape as a sobering lesson

Of course, Microsoft combined this course of action with the strategy of providing the computing platform for others to innovate on. In concert, these twin factors propelled Microsoft to an enviable position of dominance or near-dominance in many interrelated product markets.

³³⁰ Joseph Farrell and Philip J. Weiser, *Modularity, Vertical Integration, and Open Access Policies: Towards A Convergence of Antitrust and regulation in the Internet Age*, 17 Harvard J. Law. & Tech. 85 (2003).

³³¹ Farrell and Weiser, *Modularity*, at 114-117.

³³² McNamee, *The New Normal*, at ___.

Regardless of any net neutrality measures, the mere fact that incumbents control what is now deemed an essential input – broadband – means they control the bundle itself. This control enables a wide variety of pricing and marketing strategies that can be used – inadvertently or otherwise – effectively to shut out the edge-based providers from the market.

Is VoIP the first uWeb application fated to succumb to the incumbents' untouchable broadband bundle in this new world?

3. The Legal and Public Policy Factors

All the other factors become subsumed in the legal framework within which the various personal and social and economic and technology battles are waged.

The regulated Web

The Internet exists in a highly political environment, and the uWeb certainly is no exception. If anything, the threat to existing business models posed by a nation or planet of active, self-reliant people may encourage a backlash against such activities by larger incumbent players and their policymaking allies.

Regulators (at the behest of incumbents) could well impose legacy requirements on the new content and applications providers, such as network access charges, universal service fees, access for emergency services, and digital wiretapping rules.

Such a trend already has developed at the Federal Communications Commission, where new Chairman Martin is engaging in what can only be called a “contra-layers” campaign. In late 2005, Martin appears to be standing on the dubious premise that the Supreme Court’s June 2005 decision in the Brand X litigation blesses as legally and technically the Powell Commission’s tentative conclusion that broadband-based Internet access is an information service without an underlying telecommunications service component.

E911 for VoIP; CALEA is next

Legacy regulatory burdens

The author attempted to dismantle that reasoning in his previous paper,³³³ and will not belabor those points here.

The important point is that the FCC is moving to turn the layers framework on its head, by (1) conflating the different layers together (in this case, the application and physical

³³³ Whitt, *A Horizontal Leap Forward*, at 653-62.

layers); (2) regulating as far away from the problem as possible; and (3) deregulating the relatively less competitive layers (the physical broadband platforms) while regulating, for the first time, the more competitive market activities (VoIP and other services in the applications and content layers).

In addition to the burdens of regulation, certain policies adopted by Congress and/or the regulatory agencies actually can benefit the Internet generally, and the uWeb specifically.

Two oft-discussed and controversial policies are open access and net neutrality.

“As the digitally networked economy matures, regulatory choices abound that implicate whether the network will be one of peer users or one of active producers who serve a menu of prepackaged information goods to consumers whose role is limited to selecting from this menu. These choices occur at all levels of the information environment: the physical infrastructure layer – wires, cable, radio frequency spectrum – the logical infrastructure layer – software – and the content layer.”³³⁴ Actions by parties in those layers to raise the costs of becoming a user – rather than a consumer – of information “undermines the possibility of becoming a producer/user of information for reasons other than profit, by means other than sales.”³³⁵

Benkler believes those policies could limit the scale and scope of end users activities, all by raising the costs of becoming a user of information.

4. So What’s The Bottom Line?

Increasingly it is the user in command and control of the Internet experience, and not the legacy service providers or retail aggregators. Of course, this reality is cause for no small consternation among that established and well-connected crowd. Precisely how deep edge activities, and the resulting uWeb phenomenon, both challenge and bolster the legacy order, is the subject of the next section.

³³⁴ Benkler, *From Consumer to Users*, at 562.

³³⁵ Benkler, *From Consumers to Users*, at 562-63.

Part III. When Atoms and Bits Collide: The Broadband Conundrum

A. Net Managed versus Net Commons

The growing success of user empowerment and the “uWeb” presents difficult challenges for those invested in the *status quo* political, social, and business models.

For example, the nature of the user-powered Web – open, decentralized, heterogeneous, collaborative – conflicts with many legacy business models of the telecom service providers.

At a fundamental level, many of the assumptions underlying the current business models are based on conventional wisdom that may be wrong, or at least getting there fast. We have a clash of operating models of reality, and there appears to be room for only one of them. Or is there?

Susan Crawford has noted the oppositional philosophies of two different groups related to the Internet: internet exceptionalists, who tend to possess a utopian vision of a wild and unfettered Net; and telephony traditionalists, who tend to possess their own vision of centralized control and network intelligence.³³⁶ Others have styled these two disparate outlooks as Netheads versus Bellheads.³³⁷

I prefer to think of it in somewhat more neutral terms, as Net Managed versus Net Commons.

Alan Liu has talked about the convergence in underlying computing and communication networking technologies, leading to a divergence in understanding the “philosophy” of these technologies. The two contesting (diverging) philosophies of networks are (1) Decentralization, which believes that networks are innately anti-hierarchical, empowering to the individual user, and democratic, and that servers really do “serve” their client populations, with control reverting to the individual worker; and (2) Distributed centralization, which believes that the new technologies provide an opportunity for more pervasive forms of control, a form of centralized management.³³⁸

Crawford believes there is a middle ground between these two groups, one that may provide the basis for some pragmatic solutions to the regulators’ problems, while fully taking into account the realities of online life.³³⁹ I agree. Between the hard-core cyberlibertians (what I call Net Commons) and the command-and-control telephonists (what I call Net Managed) exists a vast middle ground that involves some give-and-take

³³⁶ Crawford, *Someone to Watch Over Me*, at 3-7.

³³⁷ [cites]

³³⁸ Alan Liu, *The Laws of Cool* (2004), at ___.

³³⁹ Crawford, *Someone to Watch Over Me*, at 7.

from both sides. Perhaps somewhere in this middle ground we can craft a Net Balanced approach, optimized for all comers within those constraints we cannot wish away.

Those users on the edge know full well that they rely on those in the core of the network for the clear and clean connectivity they need to perform their activities.

That reliance interest means that the edge wants and expects the core to invest in their networks, and to succeed in making them better. They have no desire to hamstring the core players unnecessarily.

Based on game theories, one proposed new mindset combines competition and cooperation. This “co-opetition” model talks about creating a “Value Net” of customers, suppliers, competitors, and complementors.³⁴⁰ The business-as-usual mindset is unable to see that complementarity allows the entire market to grow.³⁴¹

In addition to the dance between the edge and the core, there are the larger background elements, such as the social, economic, and legal realities, that provide context to this debate as well. These elements provide structure and, inevitably, constraints, on whether and how edge-based activities can advance and flourish.

[one option is to use the scenario approach from Peter Schwartz’s The Art of the Long View (1991), so that there are three scenarios: The Flawed Dogmas, The Big Constraints, and the Humble Opinion (in the middle)]

“Any scenarios for technologies must include an understanding of the political and social systems around it.”³⁴²

The prevailing dogmas of telecom (the Net Managed model) boil down to a single overriding imperative: how can a network provider secure, control, and monetize its assets?

In each case, the user-powered Web (the Net Commons model) offers a well-grounded alternative viewpoint.

(1) Maintain a centralized, command-and-control management system.

Connect and collaborate.

³⁴⁰ Adam M. Brandenburger and Barry J. Nalebuff, Co-opetition (1996), at 23-27.

³⁴¹ Brandenburger and Nalebuff, Co-opetition, at 29-32.

³⁴² Peter Schwartz, The Art of the Long View (19), at 149.

The very name “service provider” betrays a certain fundamental way of looking at the marketplace. Telecommunications companies are accustomed to being the active provider of a pre-packaged set of offerings to a passive consumer.

One example of this thinking is providing asymmetrical bandwidth to end users, under the assumption that consumers merely will engage in Web surfing, and will download far more content than they will upload to the network. The network pushes content to the consumer. That may have been true at first, but signs are growing of an uptick in upload demand.

Broadband providers tend to favor client-server applications, and disfavor home networking, P2P applications, and home telecommuting.³⁴³

In the world of uWeb users, the contrasting concept to “command-and-control” is to allow end users to “connect-and-collaborate.”

(2) Engage in zero sum thinking, by protecting any current advantage, at any cost.

See a win-win scenario of a growing pie.

The uWeb may well stand for a “win-win” proposition of more and better connectivity, powering more and better applications and content, demanding more and better connectivity, in a virtuous cycle.

The acceleration of capability building will shift our individual and collective mind-sets from a worldview that focuses on static, zero-sum relationships to one that emphasizes dynamic, non-zero-sum relationships.³⁴⁴

(3) Employ a walled garden to control the end user’s access to content and services.

Look at the history of CompuServe and Prodigy versus the early Net.

(AOL and DoCoMo as obvious historical examples)

Is the iPod inevitably doomed as a closed system? (John Sviokla, Fast Company)

(4) Seek vertical integration.

Seek horizontal collaboration, by growing your own ecosystem.

³⁴³ Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 *Journal on Telecomm. and High Tech Law* (2003), at 158-168.

³⁴⁴ John Hagel III and John Seely Brown, *The Only Sustainable Edge* (2005), at 2.

The alternative is horizontal collaboration and modular processes.

The “keystone advantage” is to grow your own ecosystem.

Susan Crawford observes that one assumption of telephony traditionalists is that telephone companies have to create vertically-integrated network uses so as to sell more services.³⁴⁵

Such a business model is presented by Amazon, Google, and eBay, which opened their proprietary databases, their APIs (Application Programming Interfaces) to software developers and other users, in order to encourage further participation by those users as developers, vendors, constructive critics, and devoted fans. This approach should foster decentralized creativity and innovation.

(5) Remember that content is king.

Connectivity is king.

More specifically, the conventional wisdom is to move up the value chain, and the protocol stacks, by providing value-added content and applications to customers. This may not be an accurate assessment.

Andrew Odlyzko discusses a number of misleading telecom dogmas. In his view, the primary falsehood is the idea that content is king. He argues that the Internet is primarily a tool for person-to-person communication, not a content delivery system. Content is not king – connectivity is. Wireless telephony revenues are greater than broadcast radio and television revenues combined. Annual movie revenues (\$10 B) equal just two weeks of voice telephony revenues. This suggests not embracing business models and networks designed just for content delivery.³⁴⁶

Thackara: “Content” is something we do, not something we are sold.³⁴⁷

In addition, content on the uWeb will be generated increasingly by ordinary end users and small entrepreneurs, not the large professional “creative content” community geared to the mass market.

The JibJab example

³⁴⁵ Crawford, *Someone to Watch Over Me*, at 6.

³⁴⁶ Andrew Odlyzko, [cite], at ___.

³⁴⁷ Thackara, In the Bubble, at 8.

(6) Develop innovative new services and applications for end users (the killer app).

Grow or fertilize a thousand killer apps in your ecosystem.

There is no one killer app in the uWeb environment, but rather a thousand different applications, each of varying importance to the short tail and long tail of users.

In some sense, connectivity to the Web itself is the ultimate killer app.

Moreover, the telecom industry has a poor track record at creating innovative new applications. As mentioned earlier, the uWeb itself is a product largely of edge-based ingenuity, with little additional in value added by the network providers save connectivity.

As Andrew Odlyzko puts it: “In spite of many attempts, the established service providers and their suppliers have an abysmal record in innovation in user services. They have done very well in terms of improving the basic-transport technologies.... But in terms of services as provided to users or that require user involvement, the record is dismal. ATM, QoS, RSVP. Multicasting, congestion pricing, active networks, WAp, and 3G, have all been duds, not because they failed to work, but because they failed to satisfy user demands. The real ‘killer apps,’ such as email, the Web, browsers, search engines, IM, and Napster, have all come from users. Is there any reason to expect the future to be any different?”³⁴⁸

(7) Bundle it all together and make it sticky.

Interest is its own stickiness.

Bundling supposedly creates “stickiness” as a way to discourage customers from leaving your services.

As David Weinberger notes, companies tend to think about their websites in terms of “stickiness,” getting their visitors to stick around for as long as possible. Ironically, customers will find the site not sticky but repellant and claustrophobic. The real stickiness on the Web isn’t inconvenience but interest. And interest in the web is, like the Web space itself, “explosive, out-bound, digressive.”³⁴⁹

Christensen and Bradley: when to bundle and when not.³⁵⁰

(8) Go for the triple play or (better yet) the home-run.

³⁴⁸ Andrew Odlyzko, [cite], at ___.

³⁴⁹ David Weinberger, Small Pieces Loosely Joined, at 54-56.

³⁵⁰ Christensen and Bradley, *Disruption*, at 111.

Who needs 1,000 channels of the same stuff from the same players?

The ILECs' most pressing concern appears to be to mirror the video offerings of the cable companies.

Similarly, the cable companies are eager to add VoIP services to their mix, as well as a wireless component.

All of this is well and good – the more modalities one can control or utilize, the more platforms are available to your customers.

However, there is a danger that the legacy uses of these modalities are being adopted in toto without much thought.

For example, who needs another cable company? Who needs another wireless reseller?

Further, these mirrored business models do little from the perspective of the end user customer. Aside from the useful price competition, two or three broadband bundles serving each home do very little in terms of advancing new products and services.

(9) Deliver convergence.

Deliver divergence in applications, content, and devices.

By one definition, technological convergence is the coming together of different technologies to provide similar services.³⁵¹ Certainly the Internet, combined with digital technology, creates comprehensive technological convergence.³⁵²

Convergence is assumed to mean that all signals will enter our lives through a single box, as bundled sets of services, controlled by one provider (telco, cableco, wireless, satellite providers). In other words, we will have converged devices leading to a walled-garden Web.

The market actually is trying to take us to a very different world, where each device is a different window into the same personalized Web. In other words, end users seem to prefer diverged devices and a converged Web.

(10) Don't become a dumb pipe.

Embrace the dumb pipe – but not exclusively.

³⁵¹ John Nuechterlein and Philip Weiser, Digital Crossroads (2005), at 24.

³⁵² Nuechterlein and Weiser, Digital Crossroads, at 24.

Above all else, the incumbents are warned not to become a “dumb pipe” a mere commodity player, where the only value added is the raw bandwidth that comprises but a small financial component of the end user experience. Beyond bandwidth, certainly it is conceivable that a “network operator” adds no further value. Even if true, however, the value of a dumb pipe may be significant, and in any event the incumbents should not pin their hopes on being much more than that.

First, as it turns out, the dumb pipe may well become the money pipe.

As Needham Equity reports, cable TV companies and local telephone companies should embrace their future roles as dumb pipes, because “it will be a highly profitable future for them.” Those companies “can make solid profits by charging for the bandwidth that enables all sorts of services.”³⁵³

The Needham report explains further:

There is an intrinsic value in the content that will not be shared by the distribution mechanism, as long as there is a competitive environment for video content distribution.... The cable TV operator will merely aggregate the content and deliver it over his bandwidth pipe. With the aggregation function commoditizing, what remains? Today, it is the bandwidth itself. While the mantra goes that the “dumb pipe” is “just a commodity,” it turns out that it is the least commoditized factor in the value food chain, except for the content of course.... Content + bandwidth = total TV service. Content value goes to the creators of content, and bandwidth value goes to the pipe owner.³⁵⁴

As a result, “we believe that ‘PipeCo’ could be an extremely profitable kind of company, whereas ‘ServCo’ would have to fight in a potentially much more competitive landscape and rely on a trusted brand name, established aggregation contracts, and inertia.”³⁵⁵

Diversity and innovation on the Internet are coming from millions of nodes, craving outlets and eating up bandwidth.”³⁵⁶

Metcalf’s Law (Bob Metcalfe, inventor of Ethernet): the value of a network increases as the square of the number of nodes in the network.

³⁵³ Anton Wahlman and Brian Coyne, Needham Equity Research Note, *The Dumb Pipe is the Only Money Pipe* (December 15, 2003), at 1.

³⁵⁴ Wahlman and Coyne, *The Dumb Pipe is the Only Money Pipe*, at 3, 4.

³⁵⁵ Wahlman and Coyne, *The Dumb Pipe is the Only Money Pipe*, at 6.

³⁵⁶ Wahlman and Coyne, *The Dumb Pipe is the Only Money Pipe*, at 5.

Moreover, as we have seen, incumbents have a very poor track record in developing and providing innovative services for end users. Again, Needham points out that consumers “expect services such as what we do on the Internet to be very innovative and give access to an open world of richness in supply and applications. We doubt that cable TV operators are well-suited to compete against specialized applications providers in this new landscape.”³⁵⁷

From all of this, the burning question remains: is the network function devalued in this new uWeb environment? Are network providers doomed to become merely “dumb pipes”? Are they even relevant in this new world?

There is a middle ground here (Net Balanced?), one that recognizes as valid the viewpoints of both sides, but not as the single right answer. We should seek to reconcile them in a balanced fashion. Each side needs the other.

C. Broadband Markets on the Edge: The Intelligent Incumbent’s Response

The rise of deep edge activities, and the emergence of the user-powered Web, is not just a fad – it represents a fundamental and pervasive shift in the market that cannot be ignored. However, certain of the potential constraints mentioned in the previous section, taken in the aggregate and in as-yet unforeseen ways, likely will prevent the uWeb from becoming the predominant or only Internet.

In the process, it will not necessarily marginalize the role of underlying network providers. If anything, the role of network service providers will be strengthened, not marginalized.

As a result:

--There will always be room for the One-to-One (telephony) and One-to-Many (broadcast) connectivity models, for those end users who value those experiences.

--The network will become more important, not less.

--“Dumb pipes” may well be where the real money is.

--More likely, it will be a combination of “fat pipes,” either dumb or smart (combined with intelligence to enable security and simplicity from the end user perspective).

--It often pays to be a Fast Second to market, where possible.

Pioneers usually die off.³⁵⁸

³⁵⁷ Wahlman and Coyne, *The Dumb Pipe is the Only Money Pipe*, at 3.

³⁵⁸ Fast Second, at 121-122.

Racing to be first.³⁵⁹

So how should telecom service providers respond to this situation? Seek out the direct and indirect rewards.

Direct: economic value of your own innovations reach your customers

Indirect: edge providers want to use you to create and distribute their innovations, and in turn receive them

One author believes that a good beginning for telecom companies is to try to insinuate themselves into the forward march of the new technologies.³⁶⁰ Other strategies include: (1) trying to become a content distributor; (2) setting up “devil’s advocate” units within the organization to speak in favor of the potentially destructive technologies; (3) being adaptable by copying and adopting answers from elsewhere in the market; (4) using multi-disciplinary teamwork; and (5) listening to the strong desires expressed by cutting-edge consumers.³⁶¹

A recent paper issued by PriceWaterhouseCoopers illustrates the difficulty in attempting to marry the Net Commons and Net managed mindsets.³⁶² The paper describes how incumbent providers should adopt the “open-but-owned-and-controlled” approach, or OBOC. The PWC paper explains that this approach includes embracing third party innovation, evolving the network and the ecosystem in parallel, loosely coupling the applications and the network, and creating an IP-based integrated service delivery environment.³⁶³ All of these suggestions certainly have the ring of the Internet world, not the telephony world. On the other hand, the paper stresses how the incumbent providers should seek to monetize as many packet flows as possible, including through such means as owning interface specifications as intellectual property, so that both innovators and end user customers are locked into compensating the network owner.³⁶⁴ In short, network owners are guided to redefine their built-in advantages of scale in an IP environment. While promising in tone, the paper ultimately seems to lean more heavily towards the Net Managed world.

Need if possible to reconcile the two communities of interest: the network core and the applications edge (the tie should go to uncertainty, which means trusting the innovations of the edge)

³⁵⁹ Leibowitz, at 25-57.

³⁶⁰ Kenichi Ohmae, *The Next Global Stage* (2005), at 235.

³⁶¹ Ohmae, *The Next Global Stage*, at 236-38.

³⁶² PriceWaterhouseCoopers, *IP Transformation: Beyond the Triple Play* (2005).

³⁶³ PriceWaterhouseCoopers, *IP Transformation*, at 6.

³⁶⁴ PriceWaterhouseCoopers, *IP Transformation*, at 23-24.

It is the natural defense mechanism of every large, well-entrenched player with much to lose, and seemingly less to gain, to hang onto what made it successful, and ignore or denigrate the rest. Among other things, that worldview assumes that “consumer” preferences are a given. In the early to mid 1990s, while the Internet was quietly assuming critical mass, that worldview in the telephony space brought us video dialtone and the Minitel directory and picture phones.

Wired magazine suggests that network providers have a bipolar approach to innovation: either protect the old stuff, or embrace all innovations.³⁶⁵

A new slogan is making the rounds among the ILECs: “Don’t Get Skyped”

To that, Geoffrey Moore has a succinct rejoinder: “Innovate or Die.”³⁶⁶

However, trying to kill off the edge-based applications and content providers is probably too little too late at this point. End users have become accustomed to open, nondiscriminatory access to all that the Web has to offer.

Moreover, if the incumbents successfully hold off the edge-based applications, such a strategy would amount to killing the goose that lays the golden eggs -- of high-bandwidth user demands, and of innovations best to imitate.

Legacy providers must recognize and accept the benefits of modularity, and incorporate it into their business models.

The role of the service provider has changed dramatically. Not just providing access and transport; “the ultimate goal of players in telecommunications should be to become a full-service provider, offering a spectrum of services that combine universal access, transport, as wide a range of service quality levels, and diverse content.”³⁶⁷

Marco Iansiti and Ray Levien have developed what they call the “keystone advantage” which seeks to leverage the power of business networks for success, through effective collaboration. Using biological ecosystems as an analogy, they show how companies can work to connect a large and distributed network of companies to their customers, and

³⁶⁵ Wired, [cite]

³⁶⁶ Geoffrey Moore, Inside the Tornado (1995, 2005), at ___.

³⁶⁷ Steven Shepard, Telecommunications Convergence (2000), at xxxii.

provide “platforms” that other firms can leverage to increase productivity, enhanced stability, and spur innovation.³⁶⁸ The “keystone” is a pattern of behavior that improves the performance of an ecosystem and, in so doing, improves individual performance.³⁶⁹ In a similar vein, network connectivity providers can and should create, manage, and evolve their own powerful business ecosystems.

Ironically, convergence leads not to a single unified business model, but several possible, and overlapping, ones.

I would suggest that network providers adopt a “divergence” business plan, based on a three-pronged approach – (1) build big, dumb, low-cost pipes (primarily for the uWeb), (2) build intelligent and secure pipes (for your own customer and for the uWeb), and (3) develop creative applications and services (primarily for your own customers).

In each of these three cases, the end user of the service or application could be either a “retail” customer paying directly for a bundled offering, or a “wholesale” customer paying for pieces of the bundle.

Not an either/or proposition.

This “NetVergence” strategy takes advantage of the incumbent’s unique role as first/last-mile providers, and also the unique characteristics of the uWeb. It allows network providers to maximize their customer coverage and revenue streams, while still fostering the openness and creativity at the edge that leads to both increase user demand and new innovations to adopt and/or copy.

In the manufacturing space, Eric von Hippel advises that firms can and should respond to the market realities of decentralized innovation by (1) producing user-developed innovations, (2) selling product-design tools and platforms to users, and (3) sell products or services that are complementary to user-developed innovations. Firms should systematically search for and further develop innovations created by end users, thereby tapping into the distributed innovation process.³⁷⁰ The same should hold true for those firms providing broadband platforms to and from the Internet.

First, build a big dumb connectivity platform.

Symmetric fat bandwidth (upstream and downstream)

“best efforts” Internet connectivity

³⁶⁸ Marco Iansiti and Ray Levien, *The Keystone Advantage* (2004), at __.

³⁶⁹ Iansiti and Levien identify Microsoft, Yahoo, and AOL as examples of successful keystones within their respective industry segments. *The Keystone Advantage*, at 113-115.

³⁷⁰ von Hippel, *Democratizing Innovation*, at 15.

Bandwidth providers can compete along at least four metrics that do involve the always-possible factor of price: speed, reliability, ubiquity, and openness.³⁷¹

Second, build a big smart connectivity platform. Reinvent yourselves as managers of intelligent, ubiquitous, reliable, and secure networks, and facilitators of user-based “edge” applications and content.

After all, those who profited most during the gold rush were those who supplied the picks and shovels and mules.

Lee McKnight: “To use the gold rush analogy, the suppliers of the Internet’s picks and shovels – the infrastructure to support business on the Internet – will be the big winners in the long run. Whichever service or application or content types turn out to be successful, somehow the bits must be stored and forwarded across the Internet.”³⁷²

Get away from the static, zero-sum worldview of the past. That focus on allocating a finite supply of existing resources is not applicable to the edge-based economy. Focus instead on creating new value, rather than protecting what you have. Grab more slices of the ever-growing pie.

Third, create applications. Build the attractive walled garden for those who want it -- but leave the gates wide open for those who prefer the applications and content of the World Wild Web. In fact, rely heavily on the “best of breed” developed in the uWeb, and adopt them yourselves. Enable innovation by the world community of end users, and incorporate what is most successful.

Learn to relinquish control to your customers – give them the tools they want and need to control their own experiences, and you can reap the direct and indirect financial rewards.

Thus:

The best response is to ignore your initial instincts, and instead align yourself with the innovative side of the equation.

Reinvent yourself as a manager of intelligent, ubiquitous, and secure networks, and a facilitator of user-based applications and content.

Employ a “NetVergence” business plan, which incorporates both the Net Managed and Net Commons models. Thus:

³⁷¹ Wahlman and Coyne, *The Dumb Pipe is the Only Money Pipe*, at 5.

³⁷² McKnight, Creative Destruction, at 42,

Shallow Core: provide big dumb pipes
Deep Core: provide big smart pipes
Deep Edge: encourage creative user applications

In a nutshell:

Embrace and innovate (where you can)

Partner (where you choose)

Co-opt (where you must)

D. Public Policy on the Edge: The U.S. Government's Options

In a sense, the United States Government always has had a strong hand in shaping the Internet and digital technology. As indicated earlier, certainly the birth of the Internet, and its first early steps towards maturity, came about thanks to discrete actions by committed politicians and government employees. The FCC in particular has shown clear signs in recent years of extending and deepening its reach to applications and devices at the edge of the network.³⁷³

Contrary to the wishes of some, there is no realistic possibility that “government” in general, and the USG in particular, will not be involved in the Internet. The question comes down not to whether the USG is involved, but in what ways and at what costs.

As mentioned above, we need a synthesis of the government-sponsored spirit behind the Internet – open, decentralized, inclusive – and the commercial imperatives of the marketplace – nimble, market-driven, competitive.

Andrew Shapiro made a similar plea in The Control Revolution, where he discussed how new technology is allowing individuals to take power from large institutions such as government, corporations, and the media. While observing that powerful entities are trying to limit our new digitally enabled autonomy, he also indicated that individual control can be pushed too far. We may lose sight of the need for trusted intermediaries, and unintentionally narrow our horizon, depriving ourselves of opportunities.³⁷⁴ Thus, we must achieve a balance of power for the digital age, between self-interest and public interest, the market and government, personal control and shared power, personal liberty and communal obligation.³⁷⁵

The larger transmodal players – Google, Yahoo!, Microsoft, AOL, eBay/Skype – perhaps as well as the incumbents themselves, may well obviate the need for any regulation in the broadband space. It had been long promised that lower layer-based intermodal

³⁷³ See Kevin Werbach, *The Federal Computer Commission* (2005).

³⁷⁴ Andrew L. Shapiro, The Control Revolution (1999), at xi-xii.

³⁷⁵ Shapiro, The Control Revolution, at 233.

competition would be sufficient to discipline the broadband connectivity market. As it turns out, the transmodal competition coming from the upper layers may well have an equal or greater disciplinary effect.

Caution is warranted here, where the future is uncertain.

In addition, as the recent demise of many local competition policies at the FCC has demonstrated, the players should not rely on the USG to preserve and promote competitive options. If we have learned anything since 1996 in the sphere of U.S. telecom policy and regulation, it is that entities should not build business models that depend on the actions of legislators and regulators. No matter which side of the debates you occupy – incumbent or new entrant, free marketer or public interest junkie – any business model that relies on active government intervention is a sure loser.

Uncertainty is the real killer of investment.

Net neutrality is the Internet's version of the UNE wars. No one truly wins in a world of net neutrality.

The uWeb phenomenon could challenge – and change -- existing public policies and institutions in various ways. Susan Crawford has identified three “very powerful forces” that have used the reigns of governmental authority to promote their interests: telecommunications companies, the content industry, and law enforcement.³⁷⁶ In turn, each of those forces is focused on a particular public policy issue: access to broadband networks, intellectual property protections, and digital wiretapping, respectively.

All three groups have very legitimate aims, revolving around maximizing infrastructure investments, protecting intellectual property, and catching the bad guys. On the other hand, in Crawford's words, these players have a shared interest in “blocking particular bits online.”³⁷⁷

Rather than dismiss the motivations of these players, we should accept them as legitimate (whether or not they are), and turn to how best to satisfy them with minimally intrusive measures.

1. Ensuring User Access to Broadband

As I discussed in my previous paper, the absence of full-blown broadband competition suggests the need for policymakers to consider instituting certain nondiscrimination measures to protect end users from anticompetitive and unfair activities from the network service providers.³⁷⁸ In this particular case at least, the edge may well need to be defended from the core.

³⁷⁶ Crawford, _____, at 61.

³⁷⁷ Crawford, _____, at 61.

³⁷⁸ Whitt, *A Horizontal Leap Forward*, at ___.

We first need to agree on the optimal outcome as a normative matter, before determining whether and how to fashion and enforce safeguards or other remedies in the market. Here is a suggested roster of outcomes for the three sets of players in the deep edge ecosystem:

- Facilities-based providers are compensated by their end users for their varying uses of the broadband networks. They also are able to build integrated “intraNets,” and to bundle together services and content and applications and devices in whatever manner they see fit.
- User-consumers can pay for the use of multiple integrated Nets, as well as the public Net.
- User-producers can create, produce, and distribute their innovations utilizing the public Net.

The primary objective of any policymakers should be to ensure that the user is in control of his or her virtual environment, with the ability to delegate that control to a trusted third party if desired.

The key issue of course is how to get there from here. There are several different ideas about the need for prophylactic safeguards (ex ante regulation), as well as enforcement remedies (ex post regulation). Here we will focus on two generally recognized solutions for dealing with discrimination concerns: net neutrality and open access. Net neutrality traditionally has been aimed at consumers at the applications and content layers, while open access is aimed at Internet service providers at the logical layers.

a. Consumer net neutrality

The premise of “consumer net neutrality” (as defined by the High Tech Broadband Coalition, and the FCC’s four freedoms principles) is that providers of content and applications need protection from the underlying broadband network providers who otherwise would discriminate against them in favor of their own upper layer offerings.

Unfortunately, consumer net neutrality fails to capture the depth and complexity of the deep edge ecosystem.

Deep edgers are not merely passive consumers, or bits conduits. Instead, they are active and interactive users of the network, in every conceivable way.

Consumer net neutrality attacks the right problem – relative lack of competitive options at the physical broadband layer -- at the wrong place – the applications and content layers. The result in this instance is a policy that potentially can harm the different players in the value chain. Broadband platform providers could find their every move scrutinized, and

subject to challenge as an illegitimate attempt to prop up their own offerings and/or degrade the offerings of others. With their current (in my mind, flawed) mindsets, the incumbents may well attempt just that. However, there are many other technology and business choices that are designed to help the end user – privacy, security, service quality, etc. Putting a regulator in the middle of these day-by-day choices is a recipe for confusion, and will only deter both core and edge investments that users want and need.

Further, as mentioned above, some discrimination is a useful thing in the market. A blanket policy against discrimination will end up forbidding many of these legitimate practices as well.

The consuming end user is harmed as well, because he or she will be denied those legitimate broadband-based offerings. There will be less investment in robust and secure “smart pipes.”

Even the other end users, such as ISPs and multimodal competitors, will be harmed as well. Given the necessary vagueness of the regulations -- intended to cover every possible discriminatory activity by the broadband providers -- and the resulting uncertainty and delays of investigations and enforcement, there is no simple, straightforward mechanism that will act to safeguards their interests.

A never-ending battle.

Net neutrality intrudes into the supposedly unregulated Internet space, and puts public officials in the awkward position of judging and second-guessing the business decisions of the platform providers and their affiliated ISPs.

The FCC’s current policy is an unenforceable suggestion, not an enforceable right. If that takes away some of the downside, it also removes most of the upside.

The problem that consumer net neutrality seeks to solve is a very real one: discriminatory conduct by broadband providers with market power. One possible solution is to promote (or at least do not deter) both dumb pipes and smart pipes. Perhaps the optimal policy to create that outcome is ISP open access.

b. ISP open access

Unlike net neutrality, at least open access (or “naked DSL”) attempts to attack the root of the problem: the relative lack of competition at the broadband platform level.

I believe that of the two options, open access may well be the better approach, in terms of minimal regulatory oversight and intrusion into the business decisions of the broadband platform providers.

Physical and logical layers

Raw broadband capacity, without voice and/or ISP service attached

Reestablishing the Computer Inquiry rules

The focus on ISPs is misplaced here as well.

c. Balancing the factors

Lee McKnight has written about how an open communications infrastructure policy framework is best suited to foster innovation and growth, although “legal and political forces may intentionally or inadvertently foster innovation—or suppress it.”³⁷⁹

Von Hippel: Control over distribution channels creates problems. A firm that owns both a channel and content may have strong incentives to shut out or discriminate against content developed by users or others in favor of its own content.³⁸⁰

Carl Shapiro and Hal Varian: There is no one right choice between control and openness. The ultimate goal is to maximize the value of your technology, not your control over it. Your reward = total value added to the industry times your share of industry value.³⁸¹

The Net Commons and Net Managed mindsets

Absent some regulatory intervention, it appears that the “Net Commons” is heading towards becoming a world of the “Net Managed,” with the public Net breaking down into a number of separate private Nets, each vying for the attention and dollars of the consuming public. In short, the Internet slowly is becoming a cable system.

We should want to allow for both kinds of Internets, if possible – “Net Balanced.” But how to do it?

The incumbent broadband platform providers raise several public policy arguments against the imposition of a net neutrality/open access regime. First they cite the need for appropriate financial incentives to invest in and deploy advanced broadband facilities.

The virtues of “intermodal competition”

Our world view should include incentives to invest in applications and content and devices as well.

The broadband platform providers’ characterization is too limited and self-serving. Our ultimate goal should be upper layer competition that is “transmodal” in nature.

³⁷⁹ McKnight, *Creative Destruction*, at 42 (citation omitted).

³⁸⁰ von Hippel, *Democratizing Innovation*, at 118.

³⁸¹ Shapiro and Varian, *Information Rules*, at ___.

Users must have the opportunity to create and use virtual platforms (Google, Yahoo, others).

Second, the incumbent broadband platform providers argue that allowing unfettered access to their broadband networks creates a “free rider” problem.

In some sense, the broadband connectivity is free-riding on the applications and content, which are the true end goal of the typical user.

However, the end user already has paid for the broadband connection, and much of its monetary value resides in the ways that users can use it to reach and send content and applications to others on the public network. The connection is worth little by itself.

Policies aimed only at promoting integrated physical platforms, to the exclusion of all other business models, necessarily are anti-innovation.

Microsoft and the Windows OS platform

ILECs and cable companies and the broadband platform

Google, Yahoo, Skype, and Amazon: the search engine/Web portal/peer-to-peer voice connectivity/online market as the attempted platform applications and technologies.

The middle ground would allow both types of business models to go forward.

Some forms of discrimination are healthy in a competitive market.³⁸² One observes that price discrimination avoids turning the Net into a “middle class ghetto” of the lowest common denominator. If a consumer/user is willing to pay more to send or receive their bits, they should be allowed to do so.³⁸³ A simple pricing tier based on the customer’s differential use of bandwidth should suffice. The trick is to allow this form of service to go forward, without at the same time denigrating the lower-end services used by other end users.

What we really want is competition from every conceivable source – intramodal, intermodal, and transmodal. It should not be a policymaker’s job to rank and sort these government priorities. This is especially true where the technology and the markets are uncertain, which is always the case in the Internet environment.

Still, if it is determined that safeguards are needed, they should align to the standards of being straightforward, minimally intrusive, and maximally effective.

³⁸² Wu, *Network Neutrality*, at ___.

³⁸³ [cite]

2. A Fresh Look at the Access Question

The single best answer to the problem of not enough platform-based competition is to find ways to encourage or create more of it across the board – more intramodal competition from ISPs and CLECs, more intermodal competition from cable and wireless and powerline and satellite, more transmodal competition by larger players like Google and Yahoo! Such a dynamic mix of modalities would go a long way – perhaps even all the way – to resolving concerns about discrimination and the stifling of user-based innovation. Absent such a reality -- which may be inevitable, but not at least in the short-term – user safeguards should be explored.

a. Ex ante safeguards

Each of these safeguards represents what users should expect to experience in a competitive, free market for goods and services.

All users of the Internet should expect, in an open and competitive marketplace, to retain the ability freely to utilize broadband connectivity to send, receive, and interact with any and all combinations of applications and content, through any and all interoperable devices.

Something akin to a deep edge user’s “rights of choice.”

The ends (and beginnings) of the network should be in control.

To the extent one or more of these safeguards is not found in the broadband market, it suggests that the USG should institute such safeguards to protect user interests.

Should users be limited, denied, or otherwise constrained in their ability to exercise fully their rights of choice in the marketplace, policymakers must presume that such marketplace is not adequately open or competitive to serve the needs of innovation and entrepreneurship.

In such a situation, policymakers should take regulatory action to preserve the workings of the deep edge ecosystem and the uWeb phenomenon.

Expanded net neutrality

For starters, the net neutrality principle should be expanded, so that the consumer model becomes the user model.

The user should be able to reach, and provide, applications, content, and devices of his or her choosing. This would capture both the user-as-consumer and the user-as-producer.

Receive, interact with, and provide

Ideally symmetrical bandwidth would be made available as well, for the same reason.

Broadband user rights

Another idea is a set of broadband user rights that combines user net neutrality and ISP open access in a single paradigm aimed at ensuring full and fair choice.

The best approach, however, may be to heed the warnings of public choice theory, and devise a remedy that is simple and relatively impervious to regulatory capture by deep-pocketed and well-connected incumbents. Here are a few new ideas about ways to accommodate that.

A few new ideas

Transparency: A full disclosure policy

An end user right to know all the pertinent rates, terms, and conditions of service, and claims about its features, including the speed, bandwidth, and availability of service, in clear and conspicuous language. The model for this approach could be the federal labeling requirement for prepared food.

The platform provider would be required to state unequivocally what and why it blocks, limits, or degrades any particular packets, and what and why it promotes, enhances, or prioritizes certain other packets.

Could also include a right to pursue regulatory or civil action against any provider that violates those rates, terms, and conditions.

Reserved user capacity

The end user is entitled to receive access to a certain minimum portion of symmetric capacity from the broadband platform provider. The amount could be measured by raw amount, or preferably as a discrete percentage (say, 30 percent) of the total available amount. This right could be specified as a legal warranty that comes with the broadband service. Of course, the remaining capacity would be at the complete discretion of the platform provider.

Cable PEG channels as the model?

Nondiscrimination certification process

Integrated broadband platform provider would be required to file regular reports with the FCC detailing specific ways that users are able to send and receive IP packets without undue interference – and preferably with the active assistance from – the platform provider.

Internet Users Advisory Council

Group chartered by USG and private parties to reach agreement on ways to ensure input from the user community on ensuring adequate connectivity through broadband platform providers.

Small Business Administration

Do nothing

The final potential option is where we are now: do nothing, and trust the forces of change.

- Technology change
- Market discipline
- Incumbents gain wisdom
- Users gain a voice
- The bully pulpit threat from the FCC and elsewhere

In all these cases, is the FCC the appropriate agency to implement and monitor any safeguards program?

Regulatory capture and public choice theory

How about the FTC? NTIA? the SBA?

b. **Ex post remedies**

What is the best venue for redressing complaints of unfair actions by the broadband platform providers?

Private right of action

Any user of broadband connectivity – consumer or producer – would have legal standing to file a civil lawsuit alleging violation of the pertinent ex ante safeguard, and/or general standards of fair competition.

FCC/FTC complaint process

Actual damages

Punitive damages

Formal or informal complaint

FCC/FTC investigation process

Fines

Basis for antitrust case?

Conclusion

This paper argues that deep edge activities and the uWeb phenomenon provide material economic and social benefits to society, and that it is in the best business interest of the underlying providers of broadband connectivity, and their own current and would-be future customers, to accept and accommodate such activities.

The uWeb likely will not take over the world, or take the place of the real world.

Nor will it automatically transfer the country into a land of peace and democracy and prosperity.

However, the value it can offer are real, in monetary terms and in the ways it can enhance, improve, and enrich the connectivity and content of people's lives.

The optimal future is one where users have choices, and the freedom to innovate, while service providers would have the appropriate incentives to invest and innovate in and over their networks. The concerns of the Net Commons and the Net Managed communities would be reconciled, at least in large measure.

Perhaps we can even achieve a Net Balance, between the public Web of the smaller players – the innovators, the early adapters, the long tails – and the private Nets of the larger players – the integrated content/applications/connectivity platforms, serving “mass market” audiences.

It won't be an easy existence, but rather an uneasy coexistence between two different mindsets, each serving particular segments of the marketplace.

Ideally each mindset would want the other to exist, and even flourish, as well.

- We would have a Deep Edge, as well as a Deep Core.
- We would have modularity and integration, convergence and divergence.
- We would have competition and cooperation.

In short, “NetVergence” would rule in an all-broadband, all-connected world.

Key concepts to reiterate:

NetVergence: converged protocols, diverged platforms and diverged applications

Deep Edge: the evolving ecosystem of users operating at the edge of the Internet, enabled by broadband and mobile connectivity to fashion deeper, richer, and more complex activities and content.

uWeb: the user-powered Web, the emergent phenomenon created by the deep edge ecosystem, characterized by greater user control over activities and content, peer-to-peer networking, online communities of interest, etc.

All should proceed with caution and humility.

In a nutshell, policymakers should recognize the true value of the deep edge, and do all they can to protect and preserve the emergent u-Web phenomenon.

Albert Einstein: “In the middle of every difficulty lies opportunity.”

Rich Karlgaard, publisher of Fortune magazine (8/9/05 WSJ): “For the nimble and quick, thrilling days lie ahead.”

Good luck to all of us, living on the deep edge.