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Digital Life in 2025

Net Threats

A canvassing of tech experts shows they hope the open structure of the Internet will prevail in the coming decade. But they anticipate battles to preserve relatively unhindered connectivity. Among their predicted threats: crackdowns by nations that will balkanize online activity; more intense surveillance that erodes trust; the loss of Net neutrality principles; commercialization pressures that crimp citizens' sharing and creativity; and overreactions to the too-much-information problem.

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About This Report

This report is the latest research report in a sustained effort throughout 2014 by the Pew Research Center Internet Project to mark the 25th anniversary of the creation of the World Wide Web by Sir Tim Berners-Lee (The Web at 25).

The report covers experts' views about the future of content creation and sharing on the Internet and focuses on the factors that might threaten the activities that have come to define the relatively free flow of information and the way it works for users. The previous reports in this series included:

- A February 2014 report from Pew Internet Project tied to the Web's anniversary that looked at the strikingly fast adoption of the Internet. It also looked at the generally positive attitudes users have about its role in their social environment.

- A March 2014 *Digital Life in 2025* report issued by Pew Internet Project in association with Elon University's Imagining the Internet Center that looked broadly at the Internet's future. Some 1,867 experts and stakeholders responded to an open-ended question about the future of the Internet by 2025. They said it would become so deeply part of the environment that it would become "like electricity"—less visible even as it becomes more important in people's daily lives.

- A May 2014 *Digital Life in 2025* report on the Internet of Things from Pew Research and Elon University that examined the likely impacts of the Internet of Things and wearable and embedded networked devices. A majority of the more than 1,600 respondents said they expect significant expansion of the Internet of Things, including connected devices, appliances, vehicles, wearables, and sensor-laden aspects of the environment.

To a notable extent, the experts agree on the technology change that lies ahead, even as they disagree about its ramifications. Most believe there will be:

- A global, immersive, invisible, ambient networked computing environment built through the continued proliferation of smart sensors, cameras, software, databases, and massive data centers in a world-spanning information fabric known as the Internet of Things.

- "Augmented reality" enhancements to the real-world input that people perceive through the use of portable/wearable/implantable technologies.

- Disruption of business models established in the 20th century (most notably impacting finance, entertainment, publishers of all sorts, and education).

- Tagging, databasing, and intelligent analytical mapping of the physical and social realms.

The reports that flow out of this canvassing of experts explore the consequences of all that technological change on such things as privacy, cybersecurity, and the companies that are building the Internet, the governments that are setting policy about the Internet, and the users of the Internet.

This report is a collaborative effort based on the input and analysis of the following individuals.

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About the Imagining the Internet Center at Elon University

The Imagining the Internet Center's mission is to explore and provide insights into emerging network innovations, global development, dynamics, diffusion and governance. Its research holds a mirror to humanity's use of communications technologies, informs policy development, exposes potential futures and provides a historic record. It works to illuminate issues in order to serve the greater good, making its work public, free and open. The center is a network of Elon University faculty, students, staff, alumni, advisers, and friends working to identify, explore and engage with the challenges and opportunities of evolving communications forms and issues. They investigate the tangible and potential pros and cons of new-media channels through active research. The Imagining the Internet Center sponsors work that brings people together to share their visions for the future of communications and the future of the world.

Table of Contents

Summary

As Internet experts look to the future of the Web, they have a number of concerns. This is not to say they are pessimistic: The majority of respondents to this 2014 Future of the Internet canvassing say they hope that by 2025 there will not be significant changes for the worse and hindrances to the ways in which people get and share content online today. And they said they expect that technology innovation will continue to afford more new opportunities for people to connect.

Still, some express wide levels of concern that this yearning for an open Internet will be challenged by trends that could sharply disrupt the way the Internet works for many users today as a source of largely unfettered content flows.

The Net Threats These Experts Fear

1) Actions by nation-states to maintain security and political control will lead to more blocking, filtering, segmentation, and balkanization of the Internet.
2) Trust will evaporate in the wake of revelations about government and corporate surveillance and likely greater surveillance in the future.
3) Commercial pressures affecting everything from Internet architecture to the flow of information will endanger the open structure of online life.
4) Efforts to fix the TMI (too much information) problem might over-compensate and actually thwart content sharing.

We call this research study a *canvassing* because it is not a representative, randomized survey. Its findings emerge from an "opt in" invitation to thousands of experts who have been identified by researching those who are widely quoted as technology builders and analysts and those who have made insightful predictions to our previous queries about the future of the Internet. (For more details on this process, please see the section at the end of this report titled "About this Canvassing of Experts." Respondents were allowed to choose to share their thoughts for credit or anonymously.

More than 1,400 people responded to the following yes-or-no question:

> **Accessing and sharing content online**—By 2025 will there be significant changes for the worse and hindrances to the ways in which people get and share content online compared with the way globally networked people can operate online today?

Thirty-five percent answered "yes" while 65% more optimistically answered "no." Yet some who answered "no" wrote in their elaboration on the question that their answer was their "hope" and not necessarily their prediction. Others wrote that they wished they could choose "yes *and* no."

Those who expressed hope or the expectation that access and sharing will weather challenges between now and 2025 often noted that it may be possible that billions more people may gain access and begin sharing online over the next 11 years thanks to the mobile Internet revolution and the massive efforts underway now to connect more people across the globe. In short, they hope that the benefits of digital expansion will outweigh the risks.

Whether they offered an optimistic or pessimistic view of the Web's future, all of the experts were asked to offer their own perspective on the threats or risks facing the Web, and their open-ended responses raise a number of key concerns. When participants in this canvassing were asked about access and sharing in 2025 they were also provided with the following additional prompts, to which some replied and some did not:

> **Please elaborate on your answer**—Describe what you believe are the most serious threats to the most effective accessing and sharing of content on the Internet. What steps are necessary to block changes that would limit people's optimal future capabilities in using the Internet? Bonus question: Describe opportunities that you expect that will help people realize the fullest potential of the Internet, or describe challenges you expect may stop people from realizing the fullest potential of the Internet.

Several themes ran through the elaborations people shared after these prompts, most of them centered on threats to the current structure and operation of the Internet:

Threat theme 1) Actions by nation-states to maintain security and political control will lead to more blocking, filtering, segmentation, and balkanization of the Internet.

The experts in this survey noted a broad global trend toward regulation of the Internet by regimes that have faced protests and stepped up surveillance of Internet users. They pointed out that nations such as Egypt, Pakistan, and Turkey have blocked Internet access to control information flows when they perceived content as a threat to the current regime. China is known for its "Great Firewall," seen as Internet censorship by most outsiders, including those in this canvassing.

Some respondents cited the Arab Spring as an example of the power of the Internet to organize political dissent and they then commented on how this prompted crackdowns by governments. Others cited governments' application of broad rules that limit the exchange of all information in order to try to halt criminal activity.

A notable number of these expert respondents also mentioned Edward Snowden's revelations about the U.S. National Security Agency's (NSA) surveillance of email and phone call records. They also cited such examples as the theft of customer account details from Target and corporate surveillance of consumers as giving ammunition to those who want to crack down on the content that flows online.

Paul Saffo, managing director at Discern Analytics and consulting associate professor at Stanford University, said, "The pressures to balkanize the global Internet will continue and create new uncertainties. Governments will become more skilled at blocking access to unwelcome sites."

Christopher Wilkinson, a retired European Union official, board member for EURid.eu, and Internet Society leader predicted, "Surveillance … at the minimum chills communications and at the maximum facilitates industrial espionage, it does not have very much to do with security."

Some participants also predicted that regional differences in politics and culture will continue to spawn efforts to hinder access and sharing online. A professor at Georgetown University and former U.S. Federal Trade Commission official wrote, "Given the global nature of data flows, national parochial interests may prove to be a bottleneck. Already access and sharing are hindered by parochial national laws. The European Union's privacy initiative can be a serious bottleneck, and the Safe Harbor regime is in jeopardy. Nationalism, and sovereign interests—for good reasons (privacy protection) or bad (economic protectionism)—are clear and present threats."

Dave Burstein, editor of Fast Net News, responded, "Governments worldwide are looking for more power over the Net, especially within their own countries. Britain, for example, has just determined that ISPs block sites the government considers 'terrorist' or otherwise dangerous. This will grow. There will usually be ways to circumvent the obstruction but most people won't bother."

The optimistic counter-arguments: Regulations promoting openness and/or innovation will trump control

Paul Jones, a professor at the University of North Carolina and founder of ibiblio.org, responded, "Historic trends are that as a communications medium matures, the control trumps the innovation. This time it will be different. Not without a struggle. Over the next 10 years we will be even more increasingly global and involved. Tech will assist this move in a way that is irreversible. It won't be a bloodless revolution, sadly, but it will be a revolution nonetheless."

Kevin Carson, a senior fellow at the Center for a Stateless Society and contributor to the P2P Foundation blog wrote, "There's a lot of work underway now in developing open-source, interoperable, and encrypted versions of social media, in response to the increasing authoritarianism and state collaboration of existing walled-garden media."

Jim Hendler, a professor of Computer Science at Rensselaer Polytechnic Institute and architect of the Web, wrote, “If anything, it is privacy that will have to give way to openness, not the other way around… Repressive governments will be working hard to stop the spread of information. As today, there will be both good and bad news continually in that area, but over time more integration, access, and sharing will be a driving force.”

Threat theme 2) Trust will evaporate in the wake of revelations about government and corporate surveillance and likely greater surveillance in the future.

A share of these experts express new urgency about surveillance. They predict that if unchecking, the monitoring of vast amounts of online activity will limit sharing and access to knowledge online.

danah boyd, a research scientist for Microsoft, responded, “Because of governance issues (and the international implications of the NSA reveals), data sharing will get geographically fragmented in challenging ways. The next few years are going to be about control.”

Peter S. Vogel, Internet law expert at Gardere Wynne Sewell, responded, “Privacy issues are the most serious threat to accessing and sharing Internet content in 2014, and there is little reason to expect that to change by 2025, particularly given the cyber terror threats confronting the Internet users and worldwide businesses.”

Raymond Plzak, former CEO of the American Registry for Internet Numbers, and current member of the Board of Directors of ICANN, wrote, “The inconsistent protection of privacy, whether private information is voluntarily provided or not as well as the inconsistent protection against exploitation will continue to be the bane of connected environment. The inability of local, regional/national and international private and public sector entities and their attendant societies to cooperate to produce a universal accepted privacy and anti-exploitation environment will increase the likelihood of the limiting of connected activities.”

Kate Crawford, a professor and research scientist, responded, "The increased Balkanisation of the Internet is a possible outcome of the Snowden revelations, as people seek to develop systems that are less accessible by the NSA/GCHQ, etc. Meanwhile, the dominant content companies may seek ever more rigorous ways to prevent the flow of copyright content within and across borders.”

The optimistic counter-argument: Innovations may provide some relief from surveillance

Oscar Gandy, an emeritus professor at the Annenberg School, University of Pennsylvania, wrote, "Regulatory limits on the uses of transaction-generated-information (TGI) that might even include fines and temporary exclusion from the marketplace might serve to reduce the amount of

cognizable harm to individuals, groups, and institutions that rely on the Web for information and interaction. The challenge, of course, lies in our ability to identify those harms with sufficient clarity so that regulation would be effective without needlessly limiting the functionality of the network."

Threat theme 3) Commercial pressures affecting everything from Internet architecture to the flow of information will endanger the open structure of online life.

A significant number of respondents predicted that increased monetization of Internet activities will hurt the ways in which people receive information in the future. Among their concerns: the fate of network neutrality; restrictions on information exchange affected by copyright protections and patent law; and governments' and corporations' general lack of foresight and capability for best enabling the digital future due to a focus on near-term gains.

Concerns over commercial influences altering the overall online experience were led by some of the architects of the Internet. **David Clark**, a senior research scientist at MIT's Computer Science and Artificial Intelligence Laboratory, noted, "Commercialization of the experience may come to bound or limit the expectation that many people have of what the Internet is for." And **Glenn Edens**, director of research in networking, security, and distributed systems at PARC, said, "Network operators' desire to monetize their assets to the detriment of progress represents the biggest potential problem. Enabling content creators to easily and directly reach audiences, better search tools, better promotion mechanisms and curation tools—continuing to dismantle the 'middle men' is key."

While there is no one definition of Net neutrality, it is generally expressed as the idea that the best public network should be operated in such a way as to treat all senders and receivers of content as equally as is technologically possible while maintaining information flows well. Corporate goals to serve customers and shareholders can be in conflict with this.

The chief counsel for a major foundation wrote, "Collusive and anti-competitive practices by telecommunications operators threaten the re-creation of an Internet controlled by people." A post-doctoral researcher wrote, "We are seeing an increase in walled gardens created by giants like Facebook and Apple … Commercialization of the Internet, paradoxically, is the biggest challenge to the growth of the Internet. Communication networks' lobbying against Net neutrality is the biggest example of this."

PJ Rey, a PhD candidate in sociology at the University of Maryland, wrote, "It is very possible we will see the principle of Net neutrality undermined. In a political paradigm where money equals political speech so much hinges on how much ISPs and content providers are willing and able to

spend on defending their competing interests. Unfortunately, the interests of everyday users count for very little."

Dennis McCann, a director of computer training in Illinois, formerly a senior technical consultant at Cisco and IBM wrote, "The policy discussions today that are about service provision are mostly with last generation's telecommunications companies. This for a network-neutral service! If we aren't ready to make the courts take ownership of the Net and its implications, then a free Internet is history, since the service providers have no interest in the free flow of information."

Others worried about the outcome of discussions among companies and governments on global trade and intellectual property and copyright in the Internet era. They complained that much of that deliberation cannot be monitored or influenced by the broad public.

Leah Lievrouw, a professor of information studies at the University of California-Los Angeles, wrote, "There are too many institutional players interested in restricting, controlling, and directing 'ordinary' people's ability to make, access, and share knowledge and creative works online—intellectual property rights holders, law enforcement and security agencies, religious and cultural censors, political movements and parties, etc. For a long time I've felt that the utopianism, libertarianism, and sheer technological skill of both professional and amateur programmers and engineers would remain the strongest counterbalance to these restrictive institutional pressures, but I'm increasingly unsure as the technologists themselves and their skills are being increasingly restricted, marginalized, and even criminalized."

Jeremy Epstein, a senior computer scientist at SRI International, responded, "The extension of copyright terms back into the near-infinite past will reduce what can be shared. Increasing power of patent trolls will slow progress and put more energy into working around solutions, instead of moving forward."

A self-employed consultant focusing on Internet policy and technology and longtime IETF leader responded, "We are headed into a really nasty period for accessibility of digital materials more than a few years old. People's current prevailing optimism on those subjects is likely to turn out to be part of the problem."

Some respondents expressed a sense of hopelessness in the face of economic and political forces.

A former chair of an IETF working group wrote, "Corporate influence on the political process will largely eliminate the public's freedom to do as they please on the Internet at least in the US. I

would like to see the Internet come to be regarded as a public utility, as broadcast spectrum was, but I think the concentration of power is too extreme for that degree of freedom to happen."

Bill Woodcock, executive director for the Packet Clearing House, wrote, "The biggest and most important challenges we face are the impediments to people 'doing for themselves.' I don't care about the 'right' to simply be someone's customer. I want the right to compete, the right to replace any service, no matter how large or important or well-connected the company that provides it is, with a better, more innovative, startup service. That means fewer monopolies, fewer lobbyists, fewer licenses, and fewer bribes. As the economy continues to slide downward, all of these abuses are getting worse rather than better."

The optimistic counter-arguments: Economic and social motivations can actually mitigate these threats

Marcel Bullinga, technology futures speaker, trend watcher, and futurist, said, "Sharing is hindered by ridiculous 19th century laws about copyright and patent. Both will die away. That will spur innovation into the extreme. That is the *real* singularity."

Matthew Henry, a CIO in higher education, wrote, "Continued redefinition of the standards and cooperation of firms that enable sharing is critical."

The principal engineer for an Internet of Things development company responded, "Access to the global Internet (with its associated content) will just keep getting better as that is how governments/industry will make money. And this will trump all other concerns."

Josh Calder, a futurist with the Foresight Alliance, expressed confidence that threats to Net neutrality will be routed around. He responded, "Splintering based on corporate control of content and pipelines appears to be the greatest danger, at least in the developed world. It seems likely that steps will be taken to avoid barriers like an end to Net neutrality and the further erection of 'walled gardens,' and to keep the dangers of cybercrime sufficiently in check so that accessing content will not be significantly hindered."

Clark Sept, co-founder and principal of Business Place Strategies Inc., wrote, "Online content access and sharing will be even better and easier by way of personal digital rights access. Sharing freely will be recognized as having greater long-term economic value than strictly limited controls over 'intellectual property.'"

Threat theme 4) Efforts to fix the TMI (too much information) problem might over-compensate and actually thwart content sharing.

Another concern is that people's attempts to cope with information overload will lead to constraints on content flows. They argue that algorithm-based filtering systems inspired by attempts to cope with large amounts of information can have as many negative consequences for the Internet as positives, especially when most companies providing filtering services have economic incentives to present information in a particular way.

Joel Halpern, a distinguished engineer at Ericsson, wrote, "While there are pressures to constrain information sharing (from governments and from traditional content sources), the trend towards making information more widely and easily reached, consumed, modified, and redistributed is likely to continue in 2025 … The biggest challenge is likely to be the problem of finding interesting and meaningful content when you want it. While this is particularly important when you are looking for scientific or medical information, it is equally applicable when looking for restaurants, music, or other things that are matters of taste. While big-data analysis has the promise of helping this, there are many limitations and risks (including mismatched incentives) with those tools."

Jonathan Grudin, principal researcher at Microsoft Research, predicted, "To help people realize their fullest potential, an industry of 'personal information trainers'—by analogy to personal trainers for fitness—will form to help people find and access information that is interesting and useful for them. Reference librarians played this role when we went to the information repository called a library. As the volume of information continues to grow exponentially, personal information trainers will help us with the much more daunting task of creating a virtual dashboard to access the information of value to us, much of which we did not know was out there."

There was no explicit counter-argument to this theme, but some respondents' answers implied that they felt algorithms and analytics and people's own search strategies would improve and produce a relatively happy equilibrium where people got what they wanted and also were exposed to new ideas and material that they would appreciate.

The Gurus Speak

Some of the most prominent and respected technology experts and analysts made far-ranging statements, encompassing many points. Their answers:

Things will get better, rather than worse

Vint Cerf, Google vice president and co-inventor of the Internet protocol, represented many people's views when he optimistically predicted, "Social norms will change to deal with potential harms in online social interactions … The Internet will become far more accessible than it is today—governments and corporations are finally figuring out how important adaptability is. AI [Artificial Intelligence] and natural language processing may well make the Internet far more useful than it is today."

A vortex of innovation and a commons-based economy could be created

Jerry Michalski, founder of REX, the Relationship Economy eXpedition, wrote, "I'm going to be an idealist here and suggest that someone leads a charge to tear down the stupid, overweening intellectual property regime in place now and replaces it with something much more shareable—an ever-improving version of the Commons. Media companies, content providers, some inventors and others will try to stop this trend, but the forces behind sharing will win. I expect we will begin to figure out how to reward creative people for sharing their creations freely. This will create a vortex of innovation that powers society out of difficult spots and into a commons-based economy. Consumer capitalism will tumble. In its place we'll figure out how to share the value we create, while improving the many Commons that we depend on. There are plenty of threats in the way of this outcome, yet I'm optimistic that we'll sort out how to mind the Commons, much as we used to a few thousand years ago."

'Government poses the greatest threat to the Net's freedoms'

Jeff Jarvis, director of the Tow-Knight Center for Entrepreneurial Journalism at the City University of New York Graduate School of Journalism, shared his in-depth point of view, writing, "Government poses the greatest threat to the Net's freedoms. Many governments, including Western regimes, threaten to control some part of Internet communication. Obviously, China, Iran, and other authoritarian states wish to control speech there. But Canada and Australia have threatened to filter all Internet content to get to child porn. Once one government is given the means and authority to filter communication, information, and content for one reason, then any government can do so for any reason. So we must protect the open architecture of the Net and assure that no government can claim sovereignty over it. At the same time, of course, the governments of the United States and the United Kingdom through their NSA and GCHQ have

trampled the public's trust in the security and privacy of net communications, bringing still untold damage to the cloud economy and opening the door for other governments—including tyrannies—to claim their right to govern the net. I don't know which force—censorship or spying—will lead to greater degradation of net freedoms. Both come from government. Nonetheless, I still hold hope that technologists and hackers can stay one step ahead of slow government and rob them of their stakes claimed in the net. Thus I also hope that technologists—programmers, mathematicians, statisticians, et al—will begin robust discussion of the ethics that govern their own power and how they will use it for public good. The best realization of the fullest potential of the Internet isn't a technology question but a human question: When given the opportunity, will we realize the benefits of sharing more information, gathering more knowledge, making more connections among ourselves? So far, we have."

The Internet must be understood as a fundamentally different paradigm

Bob Frankston, Internet pioneer and technology innovator, responded, "Today's online 'access' is hobbled by a funding model based on an owner taking a vig and denying us the ability to communicate unless we pay a carrier. We must get rid of the concept of telecommunications and understand that the Internet is a fundamentally different paradigm. See more on my opinion at http://rmf.vc/IEEERefactoringCE."

Education is the key

Hal Varian, chief economist for Google, wrote, "The biggest problem will be education. People will need to acquire various cognitive skills to use the Internet to its fullest potential."

The business model of innovators actually hurts progress and 'this will not end well'

Marc Rotenberg, president of the Electronic Privacy Information Center (EPIC), observed, "There is an enormous problem with how people obtain information today and my hope is that it will improve dramatically in the years ahead. Currently, approximately 70% of Internet users in the U.S. and 90% in Europe obtain information by going through the search services of one company. This needs to change. There should be many information sources, more distributed, and with less concentration of control. So, I am hoping for positive change. We need many more small and mid-size firms that are stable and enduring. The current model is to find an innovation with monetizing potential, incorporate, demonstrate proof of concept, sell to an Internet giant, and then walk away. This will not end well."

The biggest technical challenge is filter failure; algorithms cannot keep up

Susan Etlinger, a technology industry analyst with the Altimeter Group, responded, "With regard to content, the biggest technical challenge will continue to be filter failure; algorithms today just cannot keep up with the number and type of signals that provisionally predict what a person will want at a certain point in time. There are so many barriers: multiple devices, offline attribution and of course simple human changeability. We will continue to see a push and pull with regard to privacy. People will continue to adapt, but their expectations for control and relevance will also increase. And all this needs to be honed to an even finer point for teenagers and children, since teenagers have access to the most popular social networks. What will help us realize the fullest potential of the Internet? Becoming better students of human emotion, desire and behavior.

Look to fictional accounts like *Accelerando* and *Mother of Storms* for likely future scenarios

John Markoff, senior writer for the Science section of the New York Times, wrote, "Charlie Stross nailed it in his short story *Accelerando*. Heck, if corporations are people, then why not AIs? That will so transform the landscape of IP, that it will be impossible to think about it in terms of our current legal system. John Barnes got it right in his book the *Mother of Storms*, which described the intersection of anonymity, privacy, computer networks and pornography. If you are a parent it will make the hair on the back of your neck stand on end."

Looking forward to the Age of Collaboration among more than 8 billion people

Tiffany Shlain, filmmaker, host of the AOL series *The Future Starts Here* and founder of The Webby Awards, wrote, "By 2025, every human on the planet will be online. The collision of ideas through the sharing network will lead to explosive innovation and creativity. We are just at the precipice of collaborative tools today. By 2025, we should have around 8.1 billion people online. Just imagine all those billions of people and ideas sharing and collaborating. Please don't let me get hit by a bus. I want to live to experience this period which people will later call the Age of Collaboration."

The Internet is not a service users get from phone and cable companies

Doc Searls, director of ProjectVRM at Harvard's Berkman Center for Internet & Society, wrote:

> "John Perry Barlow once said, 'I didn't start hearing about "content" until the container business felt threatened.' I'm with him on that. 'Content" is the wrong focus here. It's just business jive for stuff that floats subscription and advertising revenue online. Sharing

knowledge matters much more. The most serious threat to sharing knowledge—and doing the rest of what the Internet is good for—is a conceptual one: thinking of the Internet as a service we get from phone and cable companies. Or worse, as a way to move 'content' moving around.

And if we think the Net is just another 'medium,' we're missing its real value as a simple and cost-free way to connect everybody and everything. This is what we meant in *The Cluetrain Manifesto* when we said 'markets are conversations.' Conversations are also not media. They are the main way humans connect with each other and share knowledge. The Internet extends that ability to a degree without precedent in human history. There is no telling how profound a change—hopefully for the better—this will brings to our species and the world we live in.

What steps are necessary to block changes that would limit people's optimal future capabilities in using the Internet? We need to understand the Internet as what it really is: a way to connect anyone and anything to anyone and anything else, with little if any regard for the means between the ends.

What Paul Baran described as a 'distributed' network in 1964, and he and other geeks built out, is a heterarchy, not a hierarchy. It was not designed for billing, or for managing scarcities. Instead it was designed to connect anything to anything, and to put all the smarts in the nodes of the network, rather than in intermediaries. Its design obeys protocols, which are manners among machines and software. Those manners are NEA: Nobody owns them, Everybody can use them, and Anybody can improve them. (Linux and other free and open software code bases are also like that, which is why they provide ideal building material for the Net and what runs on it.)

But intermediaries called ISPs—mostly phone and cable companies—bill us for access to the Net, and those monthly bills define the Net for us in the absence of a more compelling definition. For providing that definition, geeks have done an awful job. So have academics and regulators.

Nobody has yet made clear that the Internet is a rising tide that lifts all boats, producing many trillions of dollars in positive economic externalities—and that it can do so because it has no interest in making money for its owner.

The Net didn't grow over the dead bodies of phone and cable companies, but over their live ones. Those companies are just lucky that the Net used their pipes. But they have also been very smart about protecting their old businesses while turning their new one—Internet

access—into something they can bill in the manner of their old businesses. Hence 'plans' for monthly chunks of mobile data for which the first cost is approximately zero. (Operating costs are real. Ones and zeros are way different, and in many—perhaps most—cases have no real first costs.)

In the U.S., cable and phone companies are also lobbying hard at the federal, state and local levels to push through laws that prevent citizens from using local governments and other entities (e.g. local nonprofits and utilities) to offer what carriers can't or won't: fully capable Internet service. These laws are sold to legislators as ways to keep government from competing with business, but in fact only protect incumbent monopolies.

What the carriers actually want—badly—is to move television to the Net, and to define the Net in TV terms: as a place you go to buy content, as you do today with cable. For this they'll run two-sided markets: on the supply side doing deals with "content providers" such as Hollywood and big publishers, and on the demand side by intermediating the sale of that content.

This by far is the most serious threat to sharing information on the Net, because it undermines and sidelines the Net's heterogeneous and distributed system for supporting everybody and everything, and biases the whole thing to favor a few vertically-integrated 'content' industries.

The good news is that there are a few exceptions to the rule of cable/telephony duopoly, such as Chattanooga, Kansas City, and Wilson, NC, which are attracting businesses and citizens old and new to the shores of the real Internet: the one with virtually unlimited speeds in all directions, and few if any restrictions on what anybody can do with the bandwidth. There we will see the Internet's tide lift all boats, and not just those of telephony and television.

The end state we will reach is what Bob Frankston calls 'ambient connectivity.' We might have to wait until after 2025, but we will get it."

There will be continued resistance from 'the status quo people'

Marcus Cake, a network society content architect and strategist with WisdomNetworks.im, wrote:

> "There will be continued resistance from the status quo people and organizations that have derived power and profit from centralised structures. The people in influential positions may be unwilling to innovate, unable to recognise the possibilities or unwilling to

relinquish positions of influence. History suggests that collapse, crisis, or revolution is required before change.

A second challenge is governments' responses to legislate the 'Information Age' to preserve employment, influence, sovereignty or other areas they see as a concern. Hierarchies were a necessity in the last economic development stage. We needed them to scale up in all communities to organise people to achieve outcomes for economy/society and mobilise capital to invest in channels and infrastructure. The hierarchy was necessary.

It was not our natural state to seek dominance. We remain under the false assumption that hierarchies are the only way to organise. We tolerate the failures of hierarchies. With the advent of the Internet, we can now organise a different way: a shift from telecommunications (information distributed by proprietary channels between hierarchies) to telewisdom (exchange of wisdom between individuals). This is a return to hunters and gatherers—small groups pursuing very specific outcomes and probably a leader. Mega hierarchies (in any community) are at the end of their useful life. Every aspect of society and the dominant hierarchy within each of them now demonstrates that it is more concerned by hierarchies' survival or process, rather than satisfying broader community objectives. This is true of financial markets, government, education and all the major communities. The influence of a few has had a detrimental effect on community stability and achieving community outcomes. Hierarchies will resist the shift from the Information Age to the Network Society. The next stage of development will crowd-create the Network Society, with distributed contribution and distributed structures. Leadership will be dynamic, rather than entrenched.

Transparency will ensure the 'leader' always focuses on community outcomes (or is simply replaced in real-time). We will move to distributed leadership and distributed structures within community. People will only need the networks to realize their person potential and contribute to the potential of society. People have been trained to link things into books and share them by Facebook. Wisdom networks do the same thing for every other part of society. They simply need to be deployed and made available. People will know what to do with them. Wisdom networks are just a more comprehensive telephone call between people."

‘The challenges are preventing the Internet from turning into just a corporate entertainment-delivery system’

Seth Finkelstein, a programmer, consultant and EFF Pioneer of the Electronic Frontier Award winner, said:

> “Way back in 1996, when the Internet was just starting to come into general use, I literally talked myself hoarse at a conference trying to make people aware of censorware issues. Now that's well-trod ground, with everything from widespread network censorware, to the iconic Great Firewall Of China. That's the cultural and politics side.
>
> The business side is copyright. Though the general copyright conflict was well-known from the start, the money involved in recent years has simply been staggering. The lawsuit against YouTube involved billion-dollar damage claims. And that's just one battle of the copyright war.
>
> A point I've tried to make over the years is that censorware is about control. People cannot be allowed privacy and anonymity if they are to be continually monitored by authorities to make sure they aren't reading forbidden content (this applies whether that prohibition is sexual, political, or commercial).
>
> One of the strangest unintended consequences of the Snowden NSA revelations might be boosting the use of encryption and privacy-protective servers, which make such controls much more difficult. There's nothing that restricts protection from NSA spying to only protection from NSA spying (i.e. all other spying is hindered). It's similar to how the strong cryptographic protection necessary for Internet financial transactions eventually trumped all the law-enforcement arguments for limiting the public use of cryptography. That is, law-enforcement wanted weak protections so that communications could be easily monitored, but this meant financial data could also be easily stolen.
>
> Having the legal ability to protect financial data from theft in transit eventually protected all communications. Similarly, hardening communications against NSA snooping also protects against all other snooping. The opportunities and challenges that lie ahead are linked.
>
> Speaking only about the developed Western world, since I don't have experience with the innovations in developing nations, Internet speed and adoption is being heavily driven by entertainment. First it was music, now video. Netflix and YouTube are supposedly responsible for an amazing percentage of total bandwidth. The opportunities are everything swimming along in the wake of those whales (or sharks).

The challenges are preventing the Internet from turning into just a corporate entertainment-delivery system. It's a bit frightening to consider that perhaps an open Internet only continues to exist because some enormous corporations dealing in content are fighting with other enormous corporations dealing in bandwidth—the former being afraid the latter will use any constriction to, as Microsoft once infamously sought to do to Netscape, 'cut off their air supply' (this fight is called 'Net neutrality')."

Contradictory intentions: The desire to access and share vs. the desire to track and verify

Barry Chudakov, principal at Sertain Research, observed:

"As everyone becomes connected to get and share content online, the need for security protocols rises exponentially. At present it appears that people want fewer hindrances to get and share online content, but the result of this, as Bruce Schneier writes, is that the Internet becomes a 'surveillance state.'

To limit people's optimal future capabilities in using the Internet pits contradictory intentions against each other: the desire to access and share vs. the desire to track and verify. I believe humanity's essential social nature is stronger; we will opt for communication and sharing and find reasonable, secure ways to verify online identities. But behind this collective desire are powerful corporate and government forces that want to control access and online experience.

"From restrictive proprietary platform 'walled gardens' like Facebook to government censorship and rogue cyber-attacks, we will face regular threats from those who want to stifle innovation and seek to disrupt or balkanize the Web. These threats will rise and fall like tides and will continue for the foreseeable future. Our biggest challenge will be vigilance: seeing what is happening as it occurs and responding with intelligent and meaningful counter-measures.

The most serious threat to accessing and sharing content on the Internet is the notion that this should happen without conflict and tension; keeping the tension alive is healthy. Most of the draconian measures to limit freedom on the Internet happen because some party wants to control the conversation and stifle dissent or controversy. We are better served to embrace conflict and disagreement, knowing that any attempt to stifle them is counter-productive to a free and open Internet."

Market-control mechanisms will go away—slowly—and people will benefit

Mike Roberts, Internet Hall of Fame member and longtime leader with the Internet Corporation for Assigned Names and Numbers, responded:

> "You are basically asking if the war between content providers and content consumers will get worse from the standpoint of the consumer. I don't think so. The role of content provider intermediaries is in terminal decline, a fate suffered in other industries earlier. In some Adam and Eve model of authorship, every author is seamlessly connected to and compensated by every consumer.
>
> Being crude about it, this is a transaction environment and needs lots of proxies exercised—quality control, accurate marketing and distribution, preservation and curatorship, and so on. The Net has been and will continue to affect all the proxy holders. In general, the intermediaries have been harvesting too much economic reward through market control mechanisms. Those will go away—slowly—and consumers will benefit.
>
> God knows what will happen to the poor authors. John Perry Barlow says 'information wants to be free,' which pursued to the ultimate, pauperizes the authors and diminishes society thereby. There has been recent active discussion of this question on the ICANN former director list. The current geopolitical changes affecting Internet governance have raised some first principles questions. E.g., what should the future of human society be and what should ICANN and other Internet developers/providers/oversight bodies do to contribute to that future.
>
> One very short answer to that very long question goes as follows: 1) the 'network' effect of expanding Internet access is very desirable and should be aggressively promoted; 2) the range of potentially valuable applications on the Net is virtually unlimited, and economic incentives should be provided for investment in such applications; 3) continued Internet openness is essential; protecting the Net from pathological exploitation of its openness should receive a high priority; 4) nation-state abuse of the Net already is in evidence and steps should be taken to limit such state behavior."

Innovation and open content sharing will be enhanced as users defect from old telecommunications monopolies

Stowe Boyd, lead researcher for GigaOM Research, said, "The continued economic mess of the post-normal will be accelerated by the ephemeralization of work and the mounting costs of countering global warming, and governments will have too much to deal with to effectively slow

the Internet's oozing into every corner of every part of the economy. The cost pressure will be too great to slow anything. The stalling of the telephone and cable monopolies on high-speed broadband and cellular will lead to fast defection to services offered by Amazon and Google (and a few others), who will buy up or build around the telecommunications companies."

'Television provides a cautionary tale'

Peter and Trudy Johnson-Lenz. founders of the online community Awakening Technology, based in Portland, Oregon, wrote:

> "In a 1958 speech, the late Edward R. Murrow said: 'This instrument can teach, it can illuminate; yes, and it can even inspire. But it can do so only to the extent that humans are determined to use it to those ends. Otherwise it is merely wires and lights in a box. There is a great and perhaps decisive battle to be fought against ignorance, intolerance and indifference. This weapon of television could be useful.'
>
> The Internet was commercialized in 1995, opening the floodgates to e-commerce, advertising, scams, identity theft and similar crimes, pay-for-play applications, pornography and much more. According to Wikipedia, some 80 to 85% of all the e-mail on the Internet is spam, and Incapsula says that in 2013, less than 40% of Internet activity was conducted by humans. Some 30% of Internet bandwidth goes to pornography, and according to the Huffington Post in 2013, porn sites get more visitors each month than Netflix, Amazon, and Twitter combined.
>
> All of this makes it more difficult for people to get and share content online, and without social policy and technology changes, it's likely to get worse by 2025. Unless people rise up nonviolently to take charge of their local systems and demand public technology and governance oversight and universal, affordable access to the Internet as a whole, humankind will remain captive to the likes of corporations, spammers, hackers, and online criminals. What would it take to re-envision our use of the Internet by 2025 to fulfill the dreams of its early creators and pioneers? Television provides a cautionary tale."

About this Canvassing of Experts

The expert predictions reported here about the impact of the Internet over the next ten years came in response to one of eight questions asked by the Pew Research Center Internet Project and Elon University's Imagining the Internet Center in an online canvassing conducted between November 25, 2013, and January 13, 2014. This is the sixth Internet study the two organizations have conducted together since 2004. For this project, we invited more than 12,000 experts and members of the interested public to share their opinions on the likely future of the Internet and 2,551 responded to at least one of the questions we asked. More than 1,400 responded to this question about access and sharing online in 2025.

The Web-based instrument was fielded to three audiences. The first was a list of targeted experts identified and accumulated by Pew Research and Elon University during the five previous rounds of this study, as well as those identified across 12 years of studying the Internet realm during its formative years. The second wave of solicitation was targeted to prominent listservs of Internet analysts, including lists titled: Association of Internet Researchers, Internet Rights and Principles, Liberation Technology, American Political Science Association, Cybertelecom, and the Communication and Information Technologies section of the American Sociological Association. The third audience was the mailing list of the Pew Research Center Internet Project, which includes those who closely follow technology trends, data, and themselves are often builders of parts of the online world. While most people who responded live in North America, people from across the world were invited to participate.

Respondents gave their answers to the following prompts:

> **Accessing and sharing content online** – By 2025, will there be significant changes for the worse and hindrances to the ways in which people get and share content online compared with the way globally networked people can operate online today?
>
> **Please elaborate on your answer.** (Begin with your name if you are willing to have your comments attributed to you.) Describe what you believe are the most serious threats to the most effective accessing and sharing of content on the Internet. What steps are necessary to block changes that would limit people's optimal future capabilities in using the Internet?
>
> **Bonus question:** Describe opportunities that you expect that will help people realize the fullest potential of the Internet. Or describe challenges you expect may stop people from realizing the fullest potential of the Internet.

Since the data are based on a non-random sample, the results are not projectable to any population other than the individuals expressing their points of view in this sample. The respondents' remarks reflect their personal positions and are not the positions of their employers; the descriptions of their leadership roles help identify their background and the locus of their expertise. About 84% of respondents identified themselves as being based in North America; the others hail from all corners of the world. When asked about their "primary area of Internet interest," 19% identified themselves as research scientists; 9% said they were entrepreneurs or business leaders; 10% as authors, editors or journalists; 8% as technology developers or administrators; 8% as advocates or activist users; 7% said they were futurists or consultants; 2% as legislators, politicians or lawyers; 2% as pioneers or originators; and 33% specified their primary area of interest as "other."

About half of the expert respondents elected to remain anonymous. Because people's level of expertise is an important element of their participation in the conversation, anonymous respondents were given the opportunity to share a description of their Internet expertise or background.

Here are some of the key respondents in this report:

Miguel Alcaine, International Telecommunication Union area representative for Central America; **Francois-Dominique Armingaud**, formerly a computer engineer for IBM now teaching security; **danah boyd**, a social scientist for Microsoft; **Stowe Boyd**, lead at GigaOM Research; **Bob Briscoe**, chief researcher for British Telecom; **Robert Cannon**, Internet law and policy expert; **Vint Cerf**, vice president and chief Internet evangelist at Google; **David Clark**, senior scientist at MIT's Computer Science and Artificial Intelligence Laboratory; **Glenn Edens**, research scientist at PARC and IETF area chair; **Jeremy Epstein**, a senior computer scientist at SRI International; **Susan Etlinger**, a technology industry analyst with the Altimeter Group; **Bob Frankston, Internet** pioneer and technology innovator; **Seth Finkelstein**, a programmer, consultant and EFF Pioneer of the Electronic Frontier Award winner; **Jonathan Grudin**, principal researcher for Microsoft; **Joel Halpern** a distinguished engineer at Ericsson; **Jim Hendler**, Semantic Web scientist and professor at Rensselaer Polytechnic Institute**; Jeff Jarvis**, director of the Tow-Knight Center at the City University of New York; **John Markoff**, senior writer for the Science section of the *New York Times***; Jerry Michalski**, founder of REX, the Relationship Economy eXpedition; **Raymond Plzak**, former CEO of the American Registry for Internet Numbers, now a member of the board of ICANN; **Jason Pontin**, editor in chief and publisher of MIT Technology Review; **Mike Roberts**, Internet Hall of Famer and longtime leader with ICANN; **Marc Rotenberg**, president of the Electronic Privacy Information Center; **Paul Saffo**, managing director of Discern Analytics and consulting associate professor at Stanford; **Doc**

Searls, director of ProjectVRM at Harvard's Berkman Center; **Hal Varian**, chief economist for Google; and **David Weinberger**, senior researcher at Harvard's Berkman Center.

Here is a selection of other institutions at which respondents work or have affiliations:

Yahoo; Intel; IBM; Hewlett-Packard; Nokia; Amazon; Netflix; Verizon; PayPal; BBN; Comcast; U.S. Congress; EFF; W3C; The Web Foundation; PIRG: NASA; Association of Internet Researchers; Bloomberg News; World Future Society; ACM; the Aspen Institute; Magid; GigaOm; the Markle Foundation; The Altimeter Group; FactCheck.org; key offices of U.S. and European Union governments; the Internet Engineering Task Force; the Internet Hall of Fame; ARIN; Nominet; Oxford Internet Institute; Princeton, Yale, Brown, Georgetown, Carnegie-Mellon, Duke, Purdue, Florida State and Columbia universities; the universities of Pennsylvania, California-Berkeley, Southern California, North Carolina-Chapel Hill, Kentucky, Maryland, Kansas, Texas-Austin, Illinois-Urbana-Champaign, the Georgia Institute of Technology, and Boston College.

Complete sets of credited and anonymous responses to this question can be found on the Imagining the Internet site:

http://www.elon.edu/e-Web/imagining/surveys/2014_survey/2025_Internet_Looming_Threats.xhtml
http://www.elon.edu/e-Web/imagining/surveys/2014_survey/2025_Internet_Looming_Threats_credit.xhtml
http://www.elon.edu/e-Web/imagining/surveys/2014_survey/2025_Internet_Looming_Threats_anon.xhtml

Elaborations: More Expert Responses

Respondents in this canvassing note that the online environment is going through considerable change as it evolves technologically and politically.

Some point out there is a constant swing between distributed activity that is built on citizen enthusiasm about the unhindered sharing of ideas and the type of central control characterized by restrictions on the exchange of ideas—sometimes in the name of perceived cultural benefits that nevertheless reduce the dissemination of ideas.

Respondent **Robert Cannon**, a leading U.S. Internet law and policy expert with many years of experience at the federal level, argued that the Internet is now potentially entering its consolidation phase and therein lies the threat:

> "We have seen the repeat of the same pattern … seen during the introduction of telegraph, telephone, and radio services. There is the initial utopian introduction that greets the technology with claims of world peace. There is an era of competition where multiple small firms rise up and take advantage of the new market and innovation. And then there is an era of consolidation as the winners from the competitive era move to secure their position in the market and eliminate competitors. In the information era, we have moved into the era of consolidation.
>
> There are fewer and fewer owners of major media outlets online, and end-users are concentrating their traffic on fewer and fewer sites. And yet, what makes the information era different is that the means of the 'long tail' content creator to rise up and create content still exists. Unlike other cycles where the era of consolidation also raised barriers to entry, in the modern information era, the barriers to entry still remain low. But this can change as conduit becomes entangled with content or service.
>
> As networks move forward and away from end-to-end design, they can eliminate the possibilities of innovation by eliminating what is possible on the network, and curbing innovation. They can, in effect, raise the barriers of entry. This is the core concern of the Net neutrality debate: Will the Internet of the future look like the radio market or the telegraph market after consolidation, with few players controlling content—or will it continue to look like the never-ending marketplace of ideas?"

David Weinberger, senior researcher at Harvard's Berkman Center for Internet and Society, put the future possibilities more succinctly: "The future challenge: The Internet gets owned and

packaged as a set of content and we treat it like cable TV. The future opportunity: Free culture becomes ever more lively, and people are enjoying content that they recognize was created by people like them."

The optimists have their say about the future of content sharing: More people, more access, more mobile, more relevant material

There are many optimists in this canvassing who believe that Weinberger's upbeat possibility can be realized. Many also make positive predictions that acknowledge threats:

Charlie Firestone, executive director of the Aspen Institute Communications and Society Program, responded, "There are two levels of hindrance I foresee, but I expect both will not happen. The first is technological, but I believe more people will have greater access to the Internet or online equivalent in 2025, i.e., more and better broadband access. Second, would be hindrances from governments. While there will be a period of greater governmental hindrance between now and 2025, I believe this will be resolved in the opposite direction by 2025—that is, greater access even in countries that currently restrict access."

Jonathan Grudin, principal researcher at Microsoft Research, observed, "Today, people in some countries are hindered from accessing online information, but smaller mobile devices have made it more difficult to censor. I am guardedly optimistic that information providers and consumers will continue to elude government censorship. Information does seem to want to be free, and technology has made that easier on balance. I do not see a potent threat looming, and the commercial interest in disseminating information should not be underestimated."

Jim Leonick, a director of new product development for Ipsos Interactive Services, predicted, "Content will be easier to access, share and find, more personalized and relevant, and aspects of sharing and downloading will be more secure, which will be the catalyst for change in people wanting to sell their personal data to pay for the things they cannot today and choose to pirate."

Jim Harper, director of information policy studies at the Cato Institute, responded, "People are going to get what they want, and they want to share content."

Marina Gorbis, executive director at the Institute for the Future, a non-profit research organization, noted young people will continue to drive Internet expansion, writing, "The amount of open information online has been growing exponentially. The younger generations are growing up in an environment in which they see themselves as a part of a larger whole; they see others as a part of their extended brain. They can pose a question online and someone will have an answer,

they can collaborate easily with others, and they can find online resources to learn almost anything."

Miguel Alcaine, International Telecommunication Union area representative for Central America, responded, "The Internet ecosystem will evolve, technically, politically, socially as to allow people to share all the content online they want to share. Although, there will be national borders being drawn in cyberspace, interoperability and connectivity will be crucial for all countries around the world. The challenges lie in the balance between sovereignty and connectivity and interoperability, between intellectual property and common use, between anonymity, privacy, and security."

Francois-Dominique Armingaud, a retired computer engineer for IBM now teaching security at universities, wrote, "We will have better control of personal information, including published on social networks: who accesses it, users being warned every time someone accesses it (who, when, why), consolidation. We can probably expect our homes' network-attached storage (NAS) devices to become more and more our personal secretaries and to coordinate with many other NAS-secretaries according to privacy zones: close family and intimate friends, interest groups, commercial offers. Google has clearly already understood that with Google Agenda and the new Gmail. Future opportunities: we can fluidify information to free us from tedious information housekeeping (hopefully!) Future challenges: the authentication of people and information."

John Wilbanks, chief commons officer for Sage Bionetworks, sees a mixed future emerging from today's trends, observing, "I'd prefer to answer this as both yes and no. The power of the activated individual to get and share content will be extreme, and free software tools and encryption will be sufficiently powerful to do damn near anything. But the vast majority of the population will access the network infrastructure through connected devices and applications that restrict sharing of content to propagate the culture of content control."

Bryan Alexander, senior fellow at the National Institute for Technology in Liberal Education, predicted, "In 2025 1) Intellectual property continues to cramp content creation, sharing, and consumption. 2) National governments in intense security mode will block all kinds of movement. 3) Uneven technological deployment breaks up audiences. 4) Economic stress seems to lead us into conservativism, not openness. The opportunities that lie ahead include 1) Younger generations not wedded to 20th-century experience, and rendered skeptical by the global recession. 2) Commoditization of technologies make it easier to make stuff."

The remainder of this report will expand upon the content shared in the Summary, including additional expert comments organized under the theme headings that identify some of the overarching threats they foresee.

Threat theme 1) Actions by nation-states to maintain security and political control will lead to more significant blocking, filtering, segmentation, and balkanization of the Internet.

Barbara Simons, a highly decorated retired IBM computer scientist, former president of the ACM, and current board chair for Verified Voting, wrote, "Already countries are putting up walls to prevent their citizens from accessing websites that the leadership does not want them to see. I fear this will only increase."

A senior policy adviser for a major U.S. Internet service provider said, "The biggest threat to the realization of the Internet's fullest potential will be authoritarian and protectionist governments. The balkanization of the Internet, threatened by some of the world's leading nations and fueled by the behavior of the NSA, poses a major threat to maximizing the Internet's global social and economic value."

David Allen, an academic and advocate engaged with the development of global Internet governance, observed, "Balkanization is already well underway. Totalitarian states particularly are driven to ring themselves about. Unfortunately, the supposed beacons of democracy in the West have all too often also proven they too can violate the basic norms. The only serious prospect for better outcomes is a truly democratic global regime, for global Internet governance. See, for instance, the NETmundial meeting in Brazil.[1] Of course that is only one small step—the future is more than uncertain."

An anonymous Internet engineer predicted, "The whack-a-mole nature of the Internet will continue unabated."

Lyman Chapin, co-founder and principal of Interisle Consulting Group, observed, "Popular access to information is the biggest threat to the maintenance of political tyranny, and governments of every stripe will therefore continue to search for economic, technical, and administrative mechanisms of Internet content and access control. They will undoubtedly succeed within limited temporal and spatial domains, but they cannot succeed on any large scale, because

[1] NETmundial was an April 2014 gathering of global representatives from civil society, businesses, governments, and the technology sector for discussions about the future of Internet governance organized by the government of Brazil.

the Internet is by definition a voluntary agreement that cannot be 'governed' regardless of how stringently any of the pieces from which it can be assembled is regulated."

Jillian C. York, director for international freedom of expression for the Electronic Frontier Foundation, responded, "While surveillance is the most often discussed threat these days, censorship still poses a major threat to communications worldwide. More than one-third of those who access the Internet are accessing a censored version of it and that number continues to grow. We need to continue the development of circumvention tools, and also ensure that those tools provide security."

Threat theme 2) Trust will evaporate in the wake of revelations about government and corporate surveillance and likely greater surveillance efforts in the future.

Jari Arkko, Internet expert for Ericsson and chair of the Internet Engineering Task Force, wrote, "We will move to an easier world. However, excessive surveillance, data gathering, and privacy violations can endanger the will of the world's citizens to employ global innovations."

A 25-year veteran of technology research and entrepreneurship now holding the titles of both professor and CEO urged, "We need to stop applying commercial rules (copyright, patents) to private lives … Participants in commercial service offerings must retain unalienable rights that can't be signed over to a corporation; there needs to be strong oversight of commercial and government uses of information. Only if these uses can be trusted can people be expected to fully participate."

The principal software architect for a large Internet company predicted, "Governments will increasingly attempt to manage content sharing, which will make it harder for people to communicate and share online. People will increasingly demand privacy improvements."

The president of a technology consulting company wrote, "The most significant threat to content sharing is perceptions of privacy and security. Dummy policies and/or policies with loopholes will be created to address this perception of the general population and ensure that content is shared and what is shared is accessible by governments."

Alf Rehn, chair of management and organization at Abo Akademi University in Finland, wrote, "The main threat to sharing is the sharers themselves. Call it the meme-ocalypse."

Stuart Chittenden, founder of the conversation consultancy Squishtalks, recommended, "Read Eli Pariser's *The Filter Bubble*, which captures many of my concerns. The Internet is a controlled environment, where the product online is the data about the people that are using it. Governments want to gather and control that information to and about its citizenry, companies want to exploit it and direct us secretly for profit, and military/espionage entities want to snoop."

Threat theme 3) Commercial pressures affecting everything from Internet architecture to the flow of information will endanger the open structure of online life.

A significant number of respondents said they fear that economic pressures of every variety will diminish many aspects of information sharing and access by 2025. Among the topics most mentioned in this category are: Network neutrality; copyright, intellectual property, and patent law; and governments' and corporations' general lack of foresight and capability for best enabling the digital future due to a focus on near-term gains. Some even expressed fears that the Internet will be forced into the subscription-television model.

Leigh Estabrook, dean and professor emerita at the University of Illinois, shared three economics-based issues that were commonly expressed by many survey respondents, writing, "The biggest threats right now are 1) the FCC [Federal Communications Commission] policies on Net neutrality in the US; 2) the ways in which ISPs [Internet service providers] are policing users and use; and 3) the policies of the World Trade Organization globally."

Following is a closer look at some of the commonly expressed concerns over economic pressures.

Commercial pressures subtheme 1: Net neutrality might not survive, negatively impacting the future of access and sharing: 'What the carriers want—badly—is to move television to the Net.'

Since the 1990s, independent scholars, among them Lawrence Lessig, Barbara van Schewick, Brett Frischman, Tim Wu, and Mark Lemley, have developed research and arguments in favor of the economic and social benefits of neutral networks—public networks that operate in such a way as to treat all senders and receivers of content as equally as is technologically possible while operating the network well.[2] Opponents to Net neutrality as a hard and fast concept say differentiated services can be useful and fairly applied in a public network, depending upon the needs of users, the will of operators, and the capability of technology.

[2] A compilation of some of the most important thinking and analysis in favor of Net neutrality has been collected here by Prof. Tim Wu of Columbia University (the person who coined the term): http://www.timwu.org/network_neutrality.html

A number of the experts canvassed in this survey say they expect that if corporations are permitted to operate differentiated services online it will lead to such threats as the blocking of some content, the favoring of some content over other material, and monopoly-style pricing.

An anonymous respondent wrote, “The loss of Net neutrality changes all. No more information freeway, it will be an information toll road.”

Some who wish to protect the principles represented by Net neutrality said they fear the invocation of the television model. For instance, as noted earlier, **Doc Searls** of Harvard University warned, “What the carriers actually want—badly—is to move television to the Net, and to define the Net in TV terms: as a place you go to buy content, as you do today with cable … This by far is the most serious threat to sharing information on the Net, because it undermines and sidelines the Net’s heterogeneous and distributed system for supporting everybody and everything, and biases the whole thing to favor a few vertically-integrated ‘content’ industries.”

An Internet pioneer and author wrote, “The states and industries that were taken by surprise when the radically decentralized control structure of the Internet enabled billions of people to have printing presses and broadcasting stations on their desktops and in their pockets have been acting successfully to take back the centralization of power that they used to have. Copyright extension into the digital realm, ubiquitous state surveillance, the rollback of Net neutrality, the narrowing of choices for access providers all point to a recentralization of power. Citizens who use the Internet have to be both technology geeks and policy wonks to even understand what Net neutrality is about. The advantage is to the indefatigable lobbyists.”

A researcher based at Harvard University's Kennedy School of Government predicted, “We will probably see modification of Net neutrality, with the consequence that some types of high-quality video and other applications will be reserved for people with means. But that is largely already the case, and so the trend will not significantly change our social and economic situation. Information/knowledge inequality will increase, exacerbating inequality, but not by an order of magnitude.”

Some say that unfettered Internet access should be a guarantee to all. An associate professor at Concordia University in Montreal, Canada, argued, “To realize its full potential, the Internet, as a medium and infrastructure (cables, etc.), has to be redefined, legislated, and maintained as a public domain where freedom of speech operates fully. Access to the Internet should be guaranteed globally in the same way as education, healthcare, food, and housing are guaranteed now in some countries.”

Dennis McCann, a director of computer training in Illinois, formerly a senior technical consultant at Cisco and IBM, provided a suggestion for change: “The Internet community, which has labored in the shadows of the network providers, needs to erupt with technical solutions and engage more widely in advocacy…. One hopeful sign is the Internet of Things, which is poised to overwhelm provider capacity and to usher in a new era, leapfrogging today's service-delivery model as the Internet always has, and creating demand for more open service with the dollars involved driving the change.”

Commercial pressures subtheme 2: Copyright protections and patent law will negatively influence online life

Disputes over the future of copyright and intellectual property regulation in the digital age and problems with patent regulation were pointed out as threats to knowledge sharing in the future by a large number of respondents.

Bill St. Arnaud, a self-employed green Internet consultant active in the Internet Society, said, “The most serious threat to accessing and sharing content on the Internet in North America and Europe will be the music and film copyright Gestapo and their partners in crime, the broadband oligopoly. People in countries that live in the post-copyright era like China and Korea will reap the benefits of being free from DMCA and other such nonsense. Unfortunately the powers that be are so entrenched I see very little probability of anything changing by 2025, even if China and other countries race ahead with compelling content and sharing. The two biggest challenges that are stopping people to fully realize the benefit of the Internet are our third-world broadband and copyright cartels.”

A director of a futures-oriented program based at the Georgia Institute of Technology wrote, "The increasing assertion of intellectual property rights is a major barrier to innovation.”

Andrew Bridges, a partner and Internet law litigator and policy analyst at Fenwick & West LLP, wrote, "Governments and powerful incumbent-business groups will seek to limit the power of individuals that arises from new technologies and communications platforms, because they fear that power as a threat to established interests… The most significant challenges are the increasing efforts by certain business, political, and government sectors to isolate individuals, to fragment groups, to repress speech and publications, to stifle innovation, and to treat as property all knowledge and information.”

Luis Hestres, a graduate research assistant at American University, responded, “The technological architectures of corporate online intermediaries are increasingly all that govern what

sort of content users can post online. These … reflect the interests of corporations and do not necessarily align with the best interests of a vibrant online public sphere."

Linda Rogers, the founder of Music Island in Second Life and grant writer for Arts for Children and Youth in Toronto, wrote, "People are not worried enough. Governments and copyright organizations are fighting hard to restrict the flow of information and content. While I don't believe they will ultimately be successful in pulling the plug on connectivity, they will likely have made it harder for the average citizen unless there is increased fight-back. So far I don't see that happening. People's fear of spying by governments may stop them from using the Internet for political and social organizing."

Elizabeth Albrycht, a senior lecturer in marketing and communications at the Paris School of Business, responded, "Right now the knowledge of the 20th century is essentially barred from use online, which is scandalous. Revisions in IP law must occur, and if they don't, people will essentially take this into their own hands and share at will."

A self-employed consultant focusing on Internet policy and technology and longtime IETF leader responded, "We are headed into a really nasty period for accessibility of digital materials more than a few years old. People's current prevailing optimism on those subjects is likely to turn out to be part of the problem."

Tim Bray, an active participant in the Internet Engineering Task Force and technology industry veteran, wrote, "The major obstacles to progress at this moment are the patent trolls, the intellectual-property behemoth copyright-abusers, and the customer-abusive telephone-company leviathans."

A networking engineer employed by a large cable television company, wrote, "Intellectual property rights need to be overhauled by a generation that understands the Internet—one that grew up using it. The focus needs to be on attribution of the original artist so that credit (and money, where applicable) flows where credit is due, while still allowing for fair use. The large content providers (TV, movie production houses, music production) are still fighting to preserve their monopoly on content creation, distribution, and profit. That model is going to break, it's just a question of when, and how much DRM and wrong-headed anti-piracy legislation will have to be broken first."

Clifford Lynch, executive director for the Coalition for Networked Information (CNI) and adjunct professor at the University of California-Berkeley, responded, "The mixture of horrible copyright laws, seemingly endless copyright term extension, and the continuing rise of monitoring information consumption in great detail both by states and commercial entities will all continue to be problems that will complicate and discourage the use and sharing of content online. Over the

next decade we will see consumers really engaging with issues about long-term 'ownership' of valuable and extensive collections of content (music, e-books, etc.) that they think that they have acquired. Imagine if Amazon just decided to discontinue the Kindle without a migration path for content. A final nasty development is the creation of new national censorship firewalls (such as has happened in the UK recently)."

An anonymous respondent observed, "If governments are successful in their attempts to control the Internet then it will be more locked down and harder to share content. The Trans Pacific Partnership (TPP) is the current incarnation of US and other government's attempts to exert state control and ensure pre-eminence of corporations over and above individuals."

The vice president of research and consumer media for a research and analysis firm responded, "It will get worse. Every indication is that corporations and government are bent on increasing IP rights and locking them down with DRM and legal infrastructure. Citizens are insufficiently motivated to secure fair use and other rights. Open- source, Creative Commons, and other forms of IP will flourish at the margins."

Commercial pressures subtheme 3: Governments and corporations focus mostly on near-term gains, missing opportunities to advance the best digital future

A U.S.-based policy advisor predicted, "American information industries along with their lackeys in the copyright office and Congress will effectively throttle the potential of the Internet. Instead of thinking of new ways of encouraging innovation, they will lock into stone the pre-existing business models. Content distribution should be almost costless, but content owners will have successfully implemented legal and technical schemes that make access to and sharing of information impossible without paying them first. They will have been able to impose on a world of electrons the same kind of controls that they had when distributing content in the physical world of atoms. An even bigger challenge: We should have high-speed and ubiquitous WiFi Internet at low cost across the country. But in reality, the ability of major telecommunication companies to throttle Internet deployment will mean that the US remains an Internet backwater. And I suspect that these companies may extend their control (and limitations) overseas."

Mikey O'Connor, an elected representative to the GNSO Council at ICANN, wrote, "Failures of policy and leadership are already undermining the ability to retain a single, open, accessible Internet. It is almost impossible to imagine a 2025 scenario where there is the same low-level blocking of content or access that there is today. There is simply no contest between the forces of 'open' and the forces that will implement selective blocking. Among the forces, governments—of course—for all the usual reasons. The proponents for 'open' in Internet governance fora have had their legs cut out from under them by the recent Snowden revelations. Expect considerable

movement on this front. Corporations, ISPs, and network operators will get a taste for blocking if there is a widespread failure caused by name-collisions as new gTLDs roll out. If this scenario plays out, the *capability* to selectively block content will be much more widespread—and it will be used. Individuals will be the victims. Fewer and fewer tools will be available for open, unrestricted, private conversation with anybody in the world as the forces of surveillance get a handle on things."

David Orban, the CEO of Dotsub, commented, "Entrenched interests, especially in the financial sector, are going to keep lobbying globally for protective legislation which will slow down the deployment of innovative solutions for allocating resources based on skill, and demonstrated capability to execute and sustain initiative.

Celia Pearce, an associate professor of digital media at the Georgia Institute of Technology, wrote, "The challenges or hindrances will be corporate and government control, and—more important—the growing merger of the two. At this point it's very clear that corporations own the US government. As long as this persists we are going to have a problem. We have less and less regulation to protect the people, and more and more laws that favor corporations. It's ironic that the government is poking around in our business with NSA spying and such, allegedly to 'protect' us while at the same time, completely failing to protect us from the biggest domestic threat to democracy, the overthrow of the government by big corporations. To me this is the biggest threat to freedom in America in general, and on the Internet in particular."

John Mitchell, a self-employed lawyer who focuses on antitrust, copyright, trade associations, and free speech, responded, "The key is to protect 'the Internet' as a neutral means of communication and prevent its corporate and governmental capture and balkanization into a number of interconnected intranets. Every person on the planet should be free to communicate with every other person on the planet at any time, from/to anywhere, about anything."

There are those who foresee changes that will solve many of the problems presented by today's economic concerns.

The chief counsel for a major foundation wrote, "Although corporate lobbyists, including those employed by government, are currently intent on reducing access to knowledge and information through intellectual property laws and trade agreements, by 2025 the struggle will be over. The business models of the content intermediary incumbents will be extinct. The intermediaries will either have developed new business models not reliant on suing their own customers or they will have disappeared. No educated person younger than 30 today accepts the claims made by content intermediaries as justification for laws to prop up their business model. There will be a struggle in

the period between today and 2025. Those countries in which the content intermediaries are able to retain their capture of the state longest will be abandoned by innovators. Free and open source software that enables people to create and run their own distributed hoc networks, email, and message servers, and encryption without anything more than simple connectivity will enable people to realize the fullest potential of the Internet."

Threat theme 4) Efforts to fix the TMI (too much information) problem might over-compensate and actually thwart content sharing.

A commonly expressed complaint about the digital age is that an ever-growing sea of information forces us into the automated "personalization" of information-seeking. Among the complaints: algorithms often categorize people the wrong way and do not suit their needs; they do not change as people change; search algorithms are being written mostly by corporations with financial interests that could sway the ways in which they are being written; search algorithms can be gamed by certain outside interests to sway searches to their advantage; algorithms remove the blessings of serendipity in knowledge finding; and algorithms individualize what people see so they no longer have a commonly felt experience when they seek something, thus creating a sort of loss of "universal knowledge."

A portion of survey participants expressed concerns over seeking and finding knowledge in and among the expansive amounts of it available online.

Rajnesh Singh, regional director in the Asia-Pacific region for the Internet Society, wrote, "The amount of content generated every day is mind-boggling and will continue to increase exponentially as more come online or able to interact better online using tools and applications. The first issue is how do we navigate this content? Even search engines today are struggling to identify relevant content (leaving aside for the moment the fact that search results can also be 'gamed' to some extent). There is some great content out there, but finding it can be painful (or impossible) if you don't know where to look and as more content appears, this issue will also impact the possible monetization opportunities of content creators."

Michael Starks, an information science professional, wrote, "If society continues to value devices and connectivity (containers and plumbing) over content, the growth in access to more content will do little to improve the lives of individuals or societies. It will continue to become easier for people around the world to exchange ever greater amounts of content. Bandwidth, cloud storage, and even storage on personal devices will all continue to grow and become less expensive—in some countries faster than in others, but the overall trend will apply everywhere. The challenge will be in separating the wheat from the chaff. Will people who can create, edit,

judge, find and curate content for others become valued for those skills? If so—and if that value is reflected in the salaries those people receive—then highly networked populations will have greater access to better content as well as more content."

Lillie Coney, a legislative director specializing in technology policy in the U.S. House of Representatives, predicted, "The Internet is already reshaping how people retain knowledge--memory is not being used like it once was to retain facts. The power of the Internet to remember is growing in importance so the ability to keep the Internet honest about the past and the present will require the establishment of trusted institutions to make sure that certain sources of information are kept at the highest level of authoritative and academic rigor. It may also mean that regional repositories of original books and documents are always available to confirm or support primary research."

Pamela Rutledge, PhD and director of the Media Psychology Research Center, responded, "The biggest threats are governments' attempts to regulate in response to technophobia and lack of recognition by government and society that media literacy and digital citizenship—the ability to access, search and evaluate information, produce and distribute content, understand ethical and interpersonal boundaries in a digital environment—is key to using the Internet's capabilities, not a computer in the classroom. As the physical digital divide shrinks due to expanding access and mobile devices, the functional digital divide grows. The skills of media literacy and digital citizenship will be increasingly essential to realize the potential of the Internet and participate in the social, educational, economic, and political benefits of society. We have great potential and freedom because of the Internet, but only if we also accept the responsibility of teaching people the skills they need to use it well."

Ed Lyell, a college professor of business and economics and early Internet policy consultant dating back to ARPANET, responded, "The biggest challenge to more positive Internet use is in creating better intellectual and questioning skills starting in school and beyond. Lazy people can opt to just entertain themselves and permit others to dumb them down and exploit them. We need a far more robust formal education system at all levels. Yet in America our schools more often hinder new ways of learning rather than utilizing and expanding them."

Cathy Davidson, a co-director of the PhD Lab in Digital Knowledge at Duke University, now at City University of New York, and co-founder and principal administrator of the MacArthur Foundation Digital Media and Learning Competition, wrote, "We have to transform education to help people see what the Internet is and does—Kindergarten to lifelong. It's happened so fast its invisible. If it is invisible, we cannot take full advantage of its full potential. We need a massive campaign to make people aware that their devices are opportunities and responsibilities."

Stephen Abram, a self-employed consultant with Lighthouse Consulting Inc., wrote, "The real challenge is building an information-fluent (not merely literate) population. This fluency divide is already showing in the manipulation of truth and facts as evidenced by Fox News and their cohort. Critical thinking needs to be more widely spread as the gatekeepers no longer control access and offer interpretation for their own reasons."