The Future of the Internet II

A survey of technology thinkers and stakeholders shows they believe the internet will continue to spread in a "flattening" and improving world. There are many, though, who think major problems will accompany technology advances by 2020

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Summary of findings

Technology thinkers and stakeholders assess the future social, political, and economic impact of the internet.

Hundreds of internet leaders, activists, builders and commentators were asked about the effect of the internet on social, political and economic life in the year 2020. The views of the 742 respondents who completed this survey were varied; there is general agreement about *how technology might evolve*, but there is less agreement among these respondents about the *impact of this evolution*.

Reacting to several scenarios constructed by the Pew Internet & American Life Project, the respondents struck on several themes and emergent problems in their answers:

- **The deployment of a global network:** A majority of respondents agreed with a scenario which posited that a global, low-cost network will be thriving in 2020 and will be available to most people around the world at low cost. And they agreed that a tech-abetted "flattening" of the world will open up opportunities for success for many people who will compete globally.

  Still, a vocal and sizeable minority of respondents say they are unsure that the policy climate will be favorable for such internet expansion. The center of the resistance, they say, will be in the businesses anxious to preserve their current advantages and in policy circles where control over information and communication is a central value. In addition, a significant number of these dissenters argued that the world will not flatten enough to wipe away persistent social inequities.

- **Human control over technology:** Most respondents said they think humans will remain in charge of technology between now and 2020. However some fear that technological progress will eventually create machines and processes that move beyond human control. Others said they fear that the leaders who exercise control of the technology might use this power inappropriately.

- **Transparency vs. privacy:** There is a widespread expectation that people will wittingly or unwittingly disclose more about themselves, gaining some benefits in the process even as they lose some privacy. Respondents split evenly on whether the world will be a better place in 2020 due to the greater transparency of people and

institutions afforded by the internet: 46% agreed that the benefits of greater transparency of organizations and individuals would outweigh the privacy costs and 49% disagreed.

■ **Luddites, technological "refuseniks," and violence:** Most respondents agreed that there will people who will remain unconnected to the network because of their economic circumstances and others who think a class of technology refuseniks will emerge by 2020. They will form their own cultural group that lives apart from "modern" society and some will commit acts of violence in protest to technology. But many respondents argue that violence arising from conflicts over religion, economics, and politics, will be more prevalent.

■ **Compelling or "addictive" virtual worlds:** Many respondents agreed with the notion that those who are connected online will devote more time to sophisticated, compelling, networked, synthetic worlds by 2020. While this will foster productivity and connectedness and be an advantage to many, it will lead to addiction problems for some. The word "addiction" struck some respondents as an inappropriate term for the problems they foresaw, while others thought it appropriate.

■ **The fate of language online:** Many respondents said they accept the idea that English will be the world's lingua franca for cross-cultural communications in the next few decades. But notable numbers maintained English will not overwhelm other languages and, indeed, Mandarin and other languages will expand their influence online. Most respondents stressed that linguistic diversity is good and that the internet will allow the preservation of languages and associated cultures. Others noted that all languages evolve over time and argued that the internet will abet that evolution.

■ **Investment priorities:** Asked what their priority would be for future investments of time and money in networking, 78% of the respondents identified two goals for the world's policy makers and the technology industry to pursue: building network capacity and spreading knowledge about technology to help people of all nations.

Respondents react to seven scenarios about the future.

In the survey, participants were asked if they agreed or disagreed with seven scenarios about the future. They were given the opportunity to elaborate on their answers.

The scenarios – woven from material collected in recent industry and research reports and predictive statements by leaders in science, technology, business and politics – were layered with overlapping elements to spur discussion and elicit nuanced views of the future. They were constructed in a way to provoke responses and conversation. They were not written to reflect the views of the Pew Internet Project or Elon University about the most likely or desirable future. Neither Pew Internet nor Elon takes positions on the policy matters or forecasts the likely impact of technological change.

In many cases, respondents' written answers indicate that they agreed with one part of the scenario and disagreed with another, so their final answer was often a qualified "agree" or "disagree" – with elaboration that sometimes reflected the respondents' challenges to the nature of the scenario we drafted.

How Respondents Assessed Scenarios for 2020			
Exact prediction language, presented in the order in which the scenarios were posed in the survey	Agree	Disagree	Did not respond
A global, low-cost network thrives: By 2020, worldwide network interoperability will be perfected, allowing smooth data flow, authentication and billing; mobile wireless communications will be available to anyone anywhere on the globe at an extremely low cost.	56%	43%	1%
English displaces other languages: In 2020, networked communications have leveled the world into one big political, social and economic space in which people everywhere can meet and have verbal and visual exchanges regularly, face-to-face, over the internet. English will be so indispensable in communicating that it displaces some languages.	42%	57%	1%
Autonomous technology is a problem: By 2020, intelligent agents and distributed control will cut direct human input so completely out of some key activities such as surveillance, security and tracking systems that technology beyond our control will generate dangers and dependencies that will not be recognized until it is impossible to reverse them. We will be on a "J-curve" of continued acceleration of change.	42%	54%	4%
Transparency builds a better world, even at the expense of privacy: As sensing, storage and communication technologies get cheaper and better, individuals' public and private lives will become increasingly "transparent" globally. Everything will be more visible to everyone, with good and bad results. Looking at the big picture - at all of the lives affected on the planet in every way possible - this will make the world a better place by the year 2020. The benefits will outweigh the costs.	46%	49%	5%
Virtual reality is a drain for some: By the year 2020, virtual reality on the internet will come to allow more productivity from most people in technologically-savvy communities than working in the "real world." But the attractive nature of virtual-reality worlds will also lead to serious addiction problems for many, as we lose people to alternate realities.	56%	39%	5%
The internet opens worldwide access to success: In the current best-seller *The World is Flat,* Thomas Friedman writes that the latest world revolution is found in the fact that the power of the internet makes it possible for *individuals* to collaborate and compete *globally*. By 2020, this free flow of information will completely blur current national boundaries as they are replaced by city-states, corporation-based cultural groupings and/or other geographically diverse and reconfigured human organizations tied together by global networks.	52%	44%	5%
Some Luddites/Refuseniks will commit terror acts: By 2020, the people left behind (many by their own choice) by accelerating information and communications technologies will form a new cultural group of technology refuseniks who self-segregate from "modern" society. Some will live mostly "off the grid" simply to seek peace and a cure for information overload while others will commit acts of terror or violence in protest against technology.	58%	35%	7%

Source: Pew Internet & American Life Project Survey, Nov. 30, 2005-April 4, 2006. Results are based on a non-random Web-based survey sample of 742 internet users recruited via email. Since the data are based on a non-random sample, a margin of error cannot be computed.

Respondents say building network capacity and technological knowledge should be top priority.

We asked a separate question about setting priorities for future investments in communications technology. Most respondents identified building network capacity and technological literacy as the first or second priority for policy makers and technology

leaders to pursue. Another top priority was the creation of a "legal and operating environment that allows people to use the internet the way they want, using the software they want."

Setting Priorities for Development of Global Information & Communication Technologies						
Respondents were asked: If you were in charge of setting priorities about where to spend the available funds for developing information and communications technologies (predominantly the internet) to improve the world, how would you rank order the following international concerns? Please number these from 1 to 4, with 1 being the highest priority.						
	First Priority	Second Priority	Third Priority	Fourth Priority	Did Not Respond	Mean Rank
Building the capacity of the network and passing along technological knowledge to those not currently online	51	27	11	4	7	1.67
Creating a legal and operating environment that allows people to use the internet the way they want, using the software they want	32	32	21	8	7	2.05
Establishing an easy-to-use, secure international monetary microcredit system	8	21	36	28	7	2.90
Developing and "arming" an effective international security watchdog organization	8	12	23	50	7	3.25
Source: Pew Internet & American Life Project, Internet Issues 2020, Nov. 30-April 4, 2006. Results are based on a non-random sample of 742 internet users recruited via email. Since the data are based on a non-random sample, a margin of error cannot be computed.						

Internet sociologist **Howard Rheingold** expressed the consensus of the respondents reflecting on the setting of priorities: "Without affordable access, knowledge of how to use the technology, and the legal and operating environment that permits innovation, we won't see the creative explosion we saw with personal computers and the internet." Another summary thought came from Internet Society board chairman and Internet Engineering Task Force member **Fred Baker**: "Education is key to internet deployment and use … I therefore placed it first."

Thinking ahead to 2020: Some revealing quotations and predictions from the thousands of answers that were submitted to open-ended questions in the survey.

<u>**New social interactions:**</u> "In 2020, it may no longer be 'screens' with which we interact. What I mean by 'screen time' in 2020 is time spent thinking about and interacting with artificially-generated stimuli. Human-to-human non-mediated interaction counts as 'face time' even if you do it with a telephone or video wall." – ***Glen Ricart**, Internet Society board member, formerly of DARPA*

"There is a strong likelihood that virtual reality will become less virtual and more reality for many. However, I see this as an addiction phenomenon that will likely inspire us to understand unexplored dimensions of being human." – *Barry Chudakov, principal, The Chudakov Company*

"While area codes might still define geographic locations in 2020, reality codes may define virtual locations. Multiple personalities will become commonplace, and cyberpsychiatry will proliferate." – *Daniel Wang, principal partner, Roadmap Associates*

"Corporation-based cultural groupings may actually be one of the most destructive forces if not enough cultural, relational and bottom-up social forces are built up. This does not detract from the prediction that a lot more people than today will have a good life through extensive networked collaboration." – *Alejandro Pisanty, vice chairman of the board for ICANN and CIO for the National University of Mexico*

The future of privacy: "Privacy is a thing of the past. Technologically it is obsolete. However, there will be social norms and legal barriers that will dampen out the worst excesses." – *Hal Varian, University of California-Berkeley and Google*

"We are constructing architectures of surveillance over which we will lose control. It's time to think carefully about 'Frankenstein,' The Three Laws of Robotics, 'Animatrix' and 'Gattaca.'" – *Marc Rotenberg, executive director of the Electronic Privacy Information Center*

"Before 2020, every newborn child in industrialized countries will be implanted with an RFID or similar chip. Ostensibly providing important personal and medical data, these may also be used for tracking and surveillance." – *Michael Dahan, a professor at Sapir Academic College in Israel*

The evolution of smart machines: "Fear of enslavement by our creations is an old fear, and a literary tritism. But I fear something worse and much more likely – that sometime after 2020 our machines will become intelligent, evolve rapidly, and end up treating us as pets. We can at least take comfort that there is one worse fate – becoming food – that mercifully is highly unlikely." – *Paul Saffo, forecaster and director of The Institute for the Future*

"The more autonomous agents the better. The steeper the 'J curve' the better. Automation, including through autonomous agents, will help boost standards of living, freeing us from drudgery." – *Rob Atkinson, Information Technology and Innovation Foundaton*

"Until testing, bug fixing, user interfaces, usefulness and basic application by subject-matter experts is given a higher priority than pure programmer skill, we are totally in danger of evolving into an out-of-control situation with autonomous technology." – *Elle Tracy, president of The Results Group*

The fate of language: "English will be a prominent language on the internet because it is a complete trollop willing to be remade by any of its speakers (after all, English is just a bunch of mispronounced German, French, and Latin words). … That said – so what? Chinese is every bit as plausible a winner. Spanish, too. Russian! Korean!" – ***Cory Doctorow****, blogger and co-founder of Boing Boing*

How information disseminates: "Profit motives will impede data flow … Networks will conform to the public utility model, with stakeholders in generation, transmission, and distribution. Companies playing in each piece of the game will enact roadblocks to collect what they see as their fair share of tariff revenue." – ***Peter Kim****, senior analyst, Forrester Research*

The fate of nation-states: "There will be a bigger push for both 'national walled gardens' and international cooperation." – ***Robert Shaw****, internet strategy and policy adviser, International Telecommunication Union*

"The information age needs the flow of ideas, the political form always follows the economic need. We will see a flattening of the nation-state in Western society. In third-world countries and networks of ethnic grouping such as the Arab world, we will see a desperate attempt to hold onto the framework as is." – ***Amos Davidowitz****, Institute of World Affairs*

Greater social fragmentation: "These technologies allow us to find cohorts that eventually will serve to decrease mass shared values and experiences. More than cultural fragmentation, it will aid a fragmentation of deeper levels of shared reality." – ***Denzil Meyers****, founder and president of Widgetwonder*

The allure of virtual reality: "A human's desire is to reinvent himself, live out his fantasies, overindulge; addiction will definitely increase. Whole communities/subcultures, which even today are a growing faction, will materialise. We may see a vast blurring of virtual/real reality with many participants living an in-effect secluded lifestyle. Only in the online world will they participate in any form of human interaction." – ***Robert Eller****, technology consultant*

Greater global opportunities: "Behavior is the function of learning, and the networks shall be the common source of learning, a common platform where all netizens stand equal." – ***Alik Khanna****, Smart Analyst Inc., India*

Violent acts: "By becoming a valuable infrastructure, the internet itself will become a target. For some, the motivation will be the internet's power (and impact), for others it will just be a target to disrupt because of potential impact of such a disruption." – ***Thomas Narten****, IBM and the Internet Engineering Task Force*

"Random acts of senseless violence and destruction will continue and expand due to a feeling of 21st century anomie, and an increasing sense of lack of individual control." – ***Martin Kwapinski****, FirstGov, the U.S. Government's official Web portal*

A role for watchdogs: "We really need a series of well-supported, lower-level watchdog organizations to ensure that ICTs are not utilized by those in power to serve the interests of profit at the expense of human rights." – ***Lynn Schofield Clark**, director of the Teens and the New Media @ Home Project at the University of Colorado*

(Many additional thoughtful and provocative comments appear in the main report.)

Some words about methodology and interpreting the findings.

This is the second specific canvassing of internet specialists and analysts by the Pew Internet & American Life Project.[1] While a wide range of opinion from experts, organizations and interested institutions was sought, this survey should not be taken as a representative canvassing of internet experts. By design, this survey was an "opt in," self-selecting effort. That process does not yield a random, representative sample.

This survey was conducted online and is our best effort to prompt some of the leaders in the field to share their thoughts and predictions. Experts were located in two ways. First, about 200 longtime internet experts were identified in an extensive canvassing of scholarly, government, and business documents from the period 1990-1995. They were invited to respond to a survey of predictions conducted by Pew Internet and Elon in 2003 and they were encouraged to invite other experts to take the initial survey; some 304 did. Those same 304 participants were invited to take this survey and, again, invite respected colleagues join them.

Second, we invited the active members of several noted internet and technology organizations to respond to the survey: The Internet Society, The World Wide Web Consortium, the Working Group on Internet Governance, ICANN, Internet2, and the Association of Internet Researchers.

In the final sample, more than half of the respondents are internet pioneers who were online before 1993. Roughly one quarter of the respondents say they live and work in a nation outside of North America. While many respondents are at the pinnacle of internet leadership, some of the survey respondents are "working in the trenches" of building the Web. Most of the people in this latter segment of responders came to the survey by invitation because they are on the email list of the Pew Internet & American Life Project. They are not necessarily opinion leaders for their industries or well-known futurists, but it is striking how much their views were distributed in ways that paralleled those who are celebrated in the technology field. More detail regarding the respondents is included in the "Introduction" section of the report, and a section with extra biographical data appears at the end of this report.

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[1] The results of the first survey can be found in Fox, Susannah, Janna Anderson, Lee Rainie, "The Future of the Internet." January, 2005. Available at: http://www.pewinternet.org/pdfs/PIP_Future_of_Internet.pdf. A more extensive review of all the predictions and comments in that survey can be found at the website for "Imagining the Internet" at http://www.elon.edu/predictions/default.html.

This report presents the views of respondents in two ways. First, we cite the aggregate views of those who responded to our survey. These answers strike us as most interesting for the fact that there is such disagreement in their views about whether the general direction of technological change will be helpful or harmful to people. Second, we have quoted many of their opinions and predictions in the body of this report, and even more of their views are available on the Elon University-Pew Internet Project website: http://www.elon.edu/predictions/. Scores more responses to each of the scenarios are cited on specific web pages devoted to each scenarios. Those urls are given in the chapters devoted to the scenarios.

This report builds on the online resource *Imagining the Internet: A History and Forecast*.

At the invitation of Lee Rainie, director of the Pew Internet & American Life Project, Elon University assistant professor Janna Quitney Anderson began a research initiative in the spring semester of 2003 to search for comments and predictions about the future impact of the internet during the time when the World Wide Web and browsers emerged, between 1990 and 1995. The idea was to replicate the fascinating work of Ithiel de Sola Pool in his 1983 book *Forecasting the Telephone: A Retrospective Technology Assessment*. Elon students, faculty and staff studied government documents, technology newsletters, conference proceedings, trade newsletters and the business press and gathered predictions about the future of the internet. Eventually, more than 4,000 early '90s predictions from about 1,000 people were amassed.

The early 1990s predictions are available in a searchable database online at the site *Imagining the Internet: A History and Forecast* and they are also the basis for a book by Anderson titled *Imagining the Internet: Personalities, Predictions, Perspectives* (2005, Rowman & Littlefield).

The fruits of that work inspired additional research into the past and future of the internet, and the *Imagining the Internet* Website (http://www.elon.edu/predictions/) – now numbering about 6,000 pages – includes results from 2004 and 2006 predictions surveys, video and audio interviews showcasing experts' predictions about the next 20 to 50 years, a children's section, tips for teachers, a "Voices of the People" section on which anyone can post his or her prediction, and information about the recent history of communications technology.

We hope the site will continue to serve as a valuable resource for researchers, policy makers, students, and the general public for decades to come. Further, we invite readers of this report to enter their own predictions at the site.

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Acknowledgements

Introduction

Predictions inspire lively discussion about the future, and help stakeholders prepare for adjustments associated with technological change.

Those who think about the future are best poised to influence it. The visionary 20th century engineer, mathematician and architect R. Buckminster Fuller argued that, "We are called to be architects of the future, not its victims." One of his eminent successors, Alan Kay, a prolific and thoughtful digital innovator, added a practical epigram to Fuller's thought: "The only way you can predict the future is to build it."

Those sentiments guide this effort. Many futurists, scientists and long-term thinkers today argue that the acceleration of technological change over the past decade has greatly increased the importance of strategic vision. Technology innovations will continue to impact us. The question is whether this process will reflect thoughtful planning or wash over us like an unstoppable wave. If the developmental record of 20th century computing continues for only another 30 years, we will rapidly and permanently move to a different world. Are we prepared to react in ways that will make that world a good one?

This survey is aimed at gathering a collection of opinions regarding the possibilities we all face because, as Robert Louis Stevenson put it in 1885: "Sooner or later, we sit down to a banquet of consequences."

How the survey originated and was conducted.

This research project got its start in mid-2001, when Lee Rainie, the director of the Pew Internet & American Life Project, approached officials at Elon University with an idea that the Project and the University might replicate the work of Ithiel de Sola Pool in his 1983 book *Forecasting the Telephone: A Retrospective Technology Assessment*. Pool and his students had looked at primary official documents, technology community publications, speeches given by government and business leaders and marketing literature at the turn of the 20th Century to examine the kind of impacts experts thought the telephone would have on Americans' social and economic lives.

The idea was to apply Pool's research method to the internet, particularly focused on the period between 1990 and 1995 when the World Wide Web and Web browsers emerged. In the spring semester of 2003, Janna Quitney Anderson, a professor of journalism and communications at Elon, led a research initiative that set out to accomplish this goal. More than 4,200 predictive statements made in the early 1990s by 1,000 people were logged and categorized. The fruits of that work are available at: the online site *Imagining the Internet: A History and Forecast* (http://www.elon.edu/predictions).

We reasoned that if experts and technologists had been so thoughtful in the early 1990s about what was going to happen, why wouldn't they be equally as insightful looking

ahead from this moment? Thus, began an effort to track down most of those whose predictions were in the 1990-1995 database. In 2004, they and other experts since identified by the Pew Internet Project were asked to assess a number of predictions about the coming decade. Their answers were codified in the first report of this effort, "The Future of the Internet" (http://www.pewinternet.org/pdfs/PIP_Future_of_Internet.pdf).

In late 2005 and the first quarter of 2006, the Pew Internet Project issued an email invitation to a select group of technology thinkers, stakeholders and social analysts, asking them to complete a new, scenario-based quantitative and qualitative survey about the future of the internet. We also asked the initial group of respondents to forward the invitation to colleagues and friends who might provide interesting perspectives.

Some 742 people responded to the online survey between November 30, 2005 and April 4, 2006. More than half are internet pioneers who were online before 1993. Roughly one quarter of the respondents say they live and work in a nation outside of North America.

The respondents' answers represent their personal views and in no way reflect the perspectives of their employers. Many survey participants were hand-picked due to their positions as stakeholders in the development of the internet or they were reached through the leadership listservs of top technology organizations including the Internet Society, Association for Computing Machinery, the World Wide Web Consortium, the UN's Working Group on Internet Governance, Internet2, Institute of Electrical and Electronics Engineers, Internet Corporation for Assigned Names and Numbers, International Telecommunication Union, Computer Professionals for Social Responsibility, Association of Internet Researchers and the American Sociological Association's Information Technology Research section.

About the survey participants

Many top internet leaders, activists and commentators participated in the survey, including David Clark, Gordon Bell, Esther Dyson, Fred Baker, Scott Hollenbeck, Robert Shaw, Ted Hardie, Pekka Nikander, Alejandro Pisanty, Bob Metcalfe, Peng Hwa Ang, Hal Varian, Geert Lovink, Cory Doctorow, Anthony Rutkowski, Robert Anderson, Ellen Hume, Howard Rheingold, Douglas Rushkoff, Steve Cisler, Marilyn Cade, Marc Rotenberg, Alan Levin, Eugene Spafford, Veni Markovski, Franck Martin, Greg Cole, Paul Saffo, Thomas Narten, Alan Inouye, Seth Finkelstein, Teddy Purwadi, Luc Faubert, John Browning and David Weinberger, to name a few.

A sampling of the workplaces of respondents includes the Internet Society, VeriSign, BBN Technologies, Fing, Yahoo Japan, France Telecom, the International Telecommunication Union, Nanyang Technological University, the Electronic Frontier Foundation, TDCLA Chile, AfriNIC, Qualcomm, Wairua Consulting, Electronic Privacy

Information Center, Universiteit Maastricht, RAND, IBM, the Austrian Academy of Sciences, Sony, Google, Telematica Instituut, Habitat for Humanity, Cisco, Greenpeace, the University of Haifa, AT&T, Unisinos, Goteborg University, Jupiter Research, Sheffield University, CNET, Microsoft, the University of Sao Paulo, Intel, ISTOE Online, NASSCOM, Amazon.com, Wal-Mart.com, Universidad Nacional Autonoma de Mexico, Sprint, Intuit, HP Laboratories, the Centre for Policy Modelling, ICT Strategies, Bipolar Dream, the Benton Foundation, Semacode, Widgetwonder, Curtin University of Technology, the Hearst Corporation, Imaginova, CNN, Adobe Systems, Forrester Research, the Community Broadband Coalition, Universidad de Navarra, The Center on Media and Society, the Association for the Advancement of Information Technology, Massachusetts Institute of Technology, the Institute of Network Cultures, The Institute for the Future, O'Reilly, Yomux Media, Nortel, Radboud University Nijmegen, Disney, Harvard University, the London School of Economics, Geekcorps, Polaris Venture Partners, InternetPerils, Consumer's Union, the University of Copenhagen, the University of California-Berkeley, the Singapore Internet Research Center, Princeton University, the federal government of Canada, the U.S. Congress, several technology policy divisions of the U.S. government and many dozens of others.

Participants described their primary area of internet interest as "research scientist" (19%); "entrepreneur/business leader" (12%); "technology developer or administrator" (11%); "author/editor/journalist" (10%); "futurist/consultant" (9%); "advocate/voice of the people/activist user" (8%); "legislator/politician" (2%); or "pioneer/originator" (1%); the remainder of participants (29%) chose "other" for this survey question or did not respond.

The scenarios were built to elicit deeply felt opinions.

The Pew Internet & American Life Project and Elon University do not advocate policy outcomes related to the internet. The predictive scenarios included in the survey were structured to inspire the illumination of issues, not because we think any of them will necessarily come to fruition.

The scenarios themselves were drawn from some of the responses about the future that were made in our 2004 survey. The scenarios were also crafted from predictions made in reports by the United States National Intelligence Council, the United Nations Working

Group on Internet Governance, The Institute for the Future, Global Business Network and other foresight organizations and individual foresight leaders.[2]

The 2020 scenarios were constructed to elicit responses to many-layered issues, so it was sometimes the case that survey participants would agree with most of a scenario, but not all of it. In addition to trying to pack several ideas into each scenario, we tried to balance them with "good," "bad" and "neutral" outcomes. The history of technology is full of evidence that tech adoption brings *both* positive and negative results.

After each portion of the survey – each proposed scenario and the request to rank priorities for the future of the internet – we invited participants to write narrative responses providing an explanation for their answers. Not surprisingly, the most interesting product of the survey is the ensuing collection of open-ended predictions and analyses written by the participants in response to our material. We have included many of those responses in this report. A great number of additional in-depth responses are included on the *Imagining the Internet* site, available at: http://www.elon.edu/predictions.

Since participants' answers evolved in both tone and content as they went through the questionnaire, the findings in this report are presented in the same order as the original survey. The respondents were asked to "sign" each written response they were willing to have credited to them in the Elon-Pew database and in this report. The quotations in the report are attributed to those who agreed to have their words quoted. When a quote is not attributed to someone, it is because that person chose not to sign his or her written answer. To make this report more readable and include many voices, some of the lengthier written elaborations have been edited. Many full elaborations are included in the dozens of extra pages of detail included on the *Imagining the Internet* online site.

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[2] Among the reports consulted as background for scenario construction were: Various documents from the UN/ITU World Summits on the Information Society and from their Working Group on Internet Governance, 2005; The U.S. National Science Foundation's "National Science Board 2020 Vision," issued December 2005; The Asia-Pacific Development Information Programme of the United Nations report "Internet Governance: A Primer," by Akash Kapur, 2005; British Telecom's "2005 BT Technology Timeline," released by Ian Neild and Ian Pearson in August 2005; The U.S. National Intelligence Council's "Mapping the Global Future: A Report of the 2020 Project," December 2004; The Institute for the Future's "2005 Ten-Year Forecast Perspectives"; The American Council for the United Nations University Millennium Project's "2005 State of the Future"; The Oxford Interrnet Survey "The Internet in Britain," May 2005; The British Computer Society's "Grand Challenges in Computing Research," 2004; The Da Vinci Institute's "Top 10 Trends in Innovation," September 2004; The Internet Society's 2004 Annual Report; the Global Business Network report "What Will be the Role of the Internet in People's Lives in 2011?," August 2005.

Scenario One

A global, low-cost network thrives

Prediction: By 2020, worldwide network interoperability will be perfected, allowing smooth data flow, authentication and billing; mobile wireless communications will be available to anyone anywhere on the globe at an extremely low cost.

Respondents' reactions to this scenario	
Agree	56%
Disagree	43%
Did not respond	1%

Because results are based on a non-random sample, a margin of error cannot be computed.

An extended collection of hundreds of written answers to this question can be found at:
http://www.elon.edu/e-web/predictions/expertsurveys/2006survey/globalnetworkthrives.xhtml

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An overview of respondents' reactions to the scenario: A great deal of innovation, investment of resources and successful collaboration will have to be accomplished at the global level over the next 15 years for the elements of this proposed scenario to unfold in a positive manner. A majority of respondents agree with this optimism, while there is vocal disagreement among a significant minority.

A majority of those who chose to "agree" with this scenario did so while expressing some reservations about parts of our formulation of it. Some suggested that government and/or corporate control of the internet might limit some types of access in certain parts of the world, and others noted a likely lack of "perfected" interoperability in a world of changing technology. Some who supported this scenario presumed that certain technology innovations, such as mobile computing, would accelerate and solve problems that are tough to address now.

"The advances in wireless technologies are pretty much a natural consequence of Moore's law," wrote **Christian Huitema**, a longtime Internet Society leader and a pioneering

internet engineer.[3] "Better computers mean more advanced signal processing, and the possibility to harness higher frequencies. More frequencies mean an abundant 'primary resource,' thus natural competition increasing service availability and driving down prices."

Bob Metcalfe, internet pioneer, founder of 3Com and inventor of Ethernet, now of Polaris Venture Partners, chose to reflect on the arrival of "IP on everything," the idea that networked sensors and other devices using an internet protocol (IP) will proliferate. "The internet will have gone beyond personal communications," by 2020, he wrote. "Many more of today's 10 billion new embedded micros per year will be on the internet."

Louis Nauges, president of Microcost, a French information technology firm, sees mobile devices at the forefront. "Mobile internet will be dominant," he explained. "By 2020, most mobile networks will provide 1-gigabit-per-second-minimum speed, anywhere, anytime. Dominant access tools will be mobile, with powerful infrastructure characteristics (memory, processing power, access tools), but zero applications; all applications will come from the Net."

Mobile devices are a key to global connection.

Hal Varian, dean of the School of Information Management & Systems at the UC-Berkeley and a Google researcher, generally agrees with the scenario. "I think this could easily happen," he wrote. "Of course, some of the mobile access could be shared access (a la Grameen Phone)[4] but, even so, I would guess that most people in the world could get on the network if they really wanted to by 2020."

John Browning, co-founder of First Tuesday and a writer for The Economist, Wired and other technology/economics publications, sees many improvements in networking and devices in the next 15 years. "[The system won't be] perfected and perfectly smooth, but certainly more, better and deeper than today," he wrote. "The biggest change will come from widespread and reliable identification in and via mobile devices. The biggest source of friction will be copyright enforcement and digital rights management. There will be much innovation in devices to match form and function, media and messages."

Michael Reilly of Globalwriters, Baronet Media LLC, predicted that "mobile technologies facilitated by satellite" will reach out to all people. "Sat-nets will be

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[3] A section with more complete biographical data on most respondents who took credit for their remarks can be found at the end of this report. Some respondents who "signed" their names to their responses did not provide enough biographical data to serve as a complete identifier of their background and expertise; these respondents are not included in the biography section of the report.

[4] As of June 2006, Grameen Phone was the largest mobile phone company in Bangladesh, with more than 8.5 million subscribers. Grameen Phone is GSM-based – the Global System for Mobile Communications (GSM) is the most popular standard in the world as of 2006. It is used by more than 2 billion people in more than 210 nations and territories. Its ubiquity makes international roaming possible. Use of mobile phones is exploding; most don't have internet capabilities yet, but they offer many levels of connectedness. The Chinese Ministry of Information Industry reported that the number of mobile phone users in that nation totaled at 431.8 million by July of 2006, and the Telecom Regulatory Authority of India reports 111.2 million users by that date, with the U.S. number at 218.2 million, according to the Cellular Telecommunications and Internet Association.

subsidized by the commercial lines of interest that promote all kinds of brand expansion," he predicted. "Non-profits also will use these technologies to provide services and support as well as to help bridge divides such as the Islamic and Judeo-Christian worlds. The Rockefeller Brothers Fund, to name one, is working on the first stages of this now."

Respondents argue that internet carriers and regulators must work together to make a low-cost network to come to fruition.

Rajnesh Singh of PATARA Communications, GNR Consulting and the Internet Society for the Pacific Islands, qualified his agreement with the proposed scenario. "The issue governing whether this happens completely and really 'worldwide,'" he wrote, "will depend on the various telecom carriers and regulators around the world taking the necessary steps to effectively relinquishing control of their in-country networks. This may not be completely practical in developing countries, as it will severely impact the revenue model of the incumbent carrier that is typically government-owned. For the 'developed' world, this prediction is indeed a reality we may end up experiencing."

Andy Williamson, managing director of Wairua Consulting in New Zealand, agreed: "The technical and social conditions for this will most likely exist … my hesitation is that I do not see a commitment from national legislatures and from international bodies to control commercial exploitation of networks. For your prediction to come true, global regulation of networks that privileges public good over commercial reward must occur."

Alik Khanna, of Smart Analyst Inc. in India, sees a low-cost digital world ahead. "With growing data-handling capacity, networking costs shall be low," he wrote. "The incremental efficiency in hardware and software tech shall propel greater data movement across the inhabited universe."

Some experts express doubts about a "networking nirvana."

A vocal minority disagreed with the positive scenario for network development, most of them questioning the ideas of interoperability and global access at a low cost. They also noted the necessity for government and corporate involvement in worldwide development and the political and profit motives that usually accompany such involvement.

"Companies will cling to old business models and attempt to extend their life by influencing lawmakers to pass laws that hinder competition," argued **Brian T. Nakamoto**, Everyone.net. And these views were echoed by **Ross Rader**, director of research and innovation for Tucows Inc. and council member for the Generic Name Supporting Organization of the Internet Corporation for Assigned Names and Numbers, the international body tasked with assigning internet domain names and IP addresses: "By 2020, network communications providers will have succeeded in Balkanizing the existing global network, fracturing it into many smaller walled gardens that they will leverage to their own financial gain."

Scenario One: A global, low-cost network thrives

"While society as a whole would be likely to benefit from a networking nirvana, the markets are unlikely to get there by 2020 due to incumbent business models, insufficient adoption of new cost-compensation methods, and insufficient sociotechnical abilities to model human trust relationships in the digital world," wrote **Pekka Nikander** of Ericcson Research, the Internet Architecture Board and the Helsinki Institute for Information Technology.

Ian Peter, Australian leader of the Internet Mark II Project, wrote: "The problem of the digital divide is too complex and the power of legacy telco regulatory regimes too powerful to achieve this utopian dream globally within 15 years."

Peter Kim, senior analyst with Forrester Research, agrees. "Profit motives will impede data flow," he wrote. "Although interconnectivity will be much higher than ever imagined, networks will conform to the public utility model with stakeholders in generation, transmission, and distribution. Companies playing in each piece of the game will enact roadblocks to collect what they see as their fair share of tariff revenue."

Will there be a new or different network by then?

Fred Baker of Cisco Systems, chairman of the board of the Internet Society, posed the possibility that "other varieties of networks" might "replace" the current network, "So, yes," he wrote, "I suspect there will be a global low-cost network in 2020. That's not to say that interoperability will be perfect, however. There are various interests that have a vested interest in limiting interoperability in various ways, and they will in 2020 still be hard at work."

One of the key actors in the development of another "variety of network" is **David Clark** of MIT. Clark is working under a National Science Foundation grant for the Global Environment for Networking Investigations (GENI) to build new naming, addressing and identity architectures and further develop an improved internet. In his survey response, Clark expressed hope for the future. "A low-cost network will exist," he wrote. "The question is how interconnected and open it will be. The question is whether we drift toward a 'reintegration' of content and infrastructure."

Bruce Edmonds of the Centre for Policy Modelling at Manchester, UK, expects that continuous changes wrought by the evolution of internet architecture will remove any chance for a "perfected" or "smooth" future. "New technologies requiring new standards," he predicted, "will ensure that (1) interoperability remains a problem, and (2) bandwidth will always be used up, preventing smooth data flow. Billing will remain a problem in some parts of the world because such monetary integration is inextricably political."

Many see corporate and government restrictions in the future.

Many of the elaborations recorded by those who disagreed with the 2020 operating environment scenario express concerns over the possibility that the internet will be forced into a tiered-access structure such as those now offered by cellular communications providers and cable and satellite television operators. **Mark Gaved** of The Open University in the UK sees it this way. "The majority of people will be able to access a seamless, always-on, high-speed network which operates by verifying their ID," he predicted. "However there will be a low-income, marginalised population in these countries who will only have access to limited services and have to buy into the network at higher rates, in the same way people with poor credit ratings cannot get monthly mobile phone contracts but pay higher pay-as-you-go charges." He also predicted that some governments will limit citizen access in some less-democratic states.

Scott Moore, online community manager for the Helen and Charles Schwab Foundation, wrote: "New networks will be built with more controllable gateways allowing governments and corporations greater control over access to the flow of information. Governments will use the excuse of greater security and exert control over their citizens. Corporations will claim protection from intellectual property theft and 'hacking' to prevent the poor or disenfranchised from freely exchanging information."

Internet Society board of trustees member **Glenn Ricart**, a former program manager at DARPA now with Price Waterhouse Coopers, predicts a mix of system regulation. "A few nations (or cities) may choose to make smooth, low-cost, ubiquitous communications part of their national industrial and social infrastructure (like electrical power and roads)," he predicted. "Others (and I'd include the United States here) will opt for an oligopoly of providers that allows for limited alternatives while concentrating political and economic power. Individuals and businesses will provide local enclaves of high quality connectivity for themselves and their guests. A somewhat higher-cost 'anywhere' (e.g. cellular) infrastructure will be available where governments or planned communities don't already include it as an amenity. I believe that the Internet will not be uniform in capability or quality of service in 2020: there will be different tiers of service with differentiated services and pricing."

Stewart Alsop, writer, investor and analyst, commented that there's a chance for innovations to make a world-changing difference in the next 15 years. "This depends on technology standards exceeding the self-interest of proprietary network owners, like mobile operators, cable and telephony network owners, and so forth," he explained. "So timing is still open, but most likely by 2020."

There is also a theme in some answers that focuses on the technical complications of making big systems work together. This is what **Mikkel Holm Sorensen,** a software engineer and intelligence manager at Actics Ltd., argued: "Patching, tinkered ad hoc solutions, regional/national/brand interests and simple human egoism in general is the order of technology and design. This will never change, unless suppressed by some kind of political regime that takes control in order to harmonize technology, protocols and

formats by brute force. Does anybody want that in order to attain compatibility and smooth operation (even if possible)? No, of course not."

A notable group says it will continue to be difficult to bridge digital divides.

Another issue raised by respondents was the difficulty involved in bringing technology to remote regions and to people living in the poorest conditions. **Craig Partridge**, internet pioneer and chief scientist at BBN Technologies, wrote: "We tend to overestimate how fast technology gets installed, especially in third-world countries. One is tempted to say yes to this idea, given the tremendous profusion of cellular over the past 20 years or so. But it is far too optimistic. If one limited this to first- and second-world countries, the answer would be more clearly 'yes it will happen.'"

The Internet Society's **Fred Baker's** answer included a similar point. He wrote: "Mobile wireless communications will be very widely available, but 'extremely low cost' makes economic assumptions about the back sides of mountains in Afghanistan and the behavior of entrepreneurs in Africa."

Adrian Schofield, head of research for ForgeAhead, an information and communications consulting firm, and a leader with Information Industry of South Africa and the World Information Technology and Services Alliance, pointed out the fact that there may always be people left behind. "Although available," he wrote, "not everyone will be connected to the network, thus continuing the divide between the 'have' and 'have not.'"

And **Matthew Allen,** president of the Association of Internet Researchers and associate professor of internet studies at Curtin University in Australia, echoed many respondents' sentiments when he wrote: "Fundamental development issues (health, education, basic amenities) will restrict the capacity of many people to access networks." **Alejandro Pisanty** – CIO of the National University of Mexico, a member of the Internet Governance Forum Advisory Group, and a member of ICANN's board of directors – boiled it down to numbers. "At least 30% of the world's population will continue to have no or extremely scarce/difficult access due to scarcity of close-by services and lack of know-how to exploit the connectivity available," he predicted. "Where there is a network, it will indeed be of moderate or low cost and operate smoothly. Security, in contrast, will continue to be a concern at least at 'Layer-8' level."

Jonathan Zittrain, the first holder of the chair in internet governance and regulation at Oxford University, an expert on worldwide access and co-founder and director of Harvard University's Berkman Center for the Internet and Society, also boiled it down to numbers. "'Anywhere on the globe to anyone' is a tall order," he responded. "I think more likely 80% of the bandwidth will be with 20% of the population."

Author, teacher and social commentator **Douglas Rushkoff** summed up the opinions of many respondents regarding the proposed operating environment scenario for 2020 when he wrote: "Real interoperability will be contingent on replacing our bias for competition

with one for collaboration. Until then, economics do not permit universal networking capability."

And **Marilyn Cade** of the Information Technology Association of America and the Generic Names Supporting Organization of ICANN, expressed a common theme when she wrote, "I wish this [optimistic scenario] were TRUE. And I want it to be true, and I want all of us to work very hard to make it as true as possible! First of all, we are at 2006, and we need to address connectivity and affordable access still for vast numbers of potential users on the planet Earth."

In responding to this survey's optimistic 2020 operating system and access scenario, foresight expert **Paul Saffo**, director of the Institute for the Future, wrote: "My forecast is that we will see neither nirvana nor meltdown, but we will do a nice job of muddling through. In the end, the network will advance dramatically with breathtaking effect on our lives, but we won't notice because our expectations will rise even faster."

Here is the current state of play in the network's global development.

The continued innovation of the architecture of the internet to support the flow of more data efficiently and securely to more people is no small order, but it is a given in most technology circles. The most-often-mentioned hurdles to a low-cost system with access for all are not technological. The survey respondents nearly unanimously say the development of a worldwide network with easy access, smooth data flow, and availability everywhere at a low cost depends upon the appropriate balance of political and economic support.

The battle over political and economic control of the internet is evident in the loud debate in the U.S. Congress in the spring and summer of 2006 over "network neutrality" (with internet-dependent companies such as Microsoft and Google facing off against the major telecommunications corporations such as AT&T that provide the data pipelines) and in the appearance of a newly formed world organization that grew out of the UN's World Summit on the Information Society – the Internet Governance Forum (http://www.intgovforum.org/), which will meet for the first time in October 2006.

The technology to make the internet easy to use continues to evolve. World Wide Web innovator Tim Berners-Lee and other internet engineers in the World Wide Web Consortium are working on building the "semantic Web," which they expect will enable users worldwide to find data in a more naturally intuitive manner. But at the group's May WWW2006 conference in Edinburgh, Berners-Lee also took the time to campaign against U.S. proposals to change to an internet system in which data from companies or institutions that can pay more are given priority over those that can't or won't. He warned this would move the network into "a dark period," saying, "Anyone that tries to chop it

into two will find that their piece looks very boring … I think it is one and will remain as one."[5]

The problem of defeating the digital divide has captivated many key internet stakeholders for years, and their efforts continue. Nicholas Negroponte of MIT's Media Lab has been working more than a decade to bring to life the optimistic predictions he made about an easily accessible global information network in his 1995 book "Being Digital." He hopes to launch his "one laptop per child" project (http://www.laptop.org/) in developing nations later in 2006 or in early 2007, shipping 5 to 10 million $135 computers to China, India, Thailand, Egypt and the Middle East, Nigeria, Brazil and Argentina. Partners on the project include the UN, Nortel, Red Hat, AMD, Marvell, Brightstar and Google. The computers will be equipped with Wi-Fi and be able to hook up to the internet through a cell phone connection. The developers hope to see the price of the computers drop to $100 by 2008 and as low as $50 per unit in 2010. "We're going to be below 2 watts [of total power consumption]. That's very important because 35% of world doesn't have electricity," Negroponte said. "Power is such a big deal that you're going to hear every company boasting about power" in the near future. "That is the currency of tomorrow."[6]

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[5] *Web Inventor Warns of 'Dark' Net*, BBC News, May 23, 2006, http://news.bbc.co.uk/2/hi/technology/5009250.stm
[6] *The Lessons of the $100 Laptop*, eWeek.com, April 4, 2006, http://www.eweek.com/article2/0,1895,1945967,00.asp?kc=ewnws040506dtx1k0000599

Scenario Two

English displaces other languages

Prediction: In 2020, networked communications have leveled the world into one big political, social, and economic space in which people everywhere can meet and have verbal and visual exchanges regularly, face-to-face, over the internet. English will be so indispensable in communicating that it displaces some languages.

Respondents' reactions to this scenario	
Agree	42%
Disagree	57%
Did not respond	1%

Because results are based on a non-random sample, a margin of error cannot be computed.

An extended collection hundreds of written answers to this question can be found at:
http://www.elon.edu/e-web/predictions/expertsurveys/2006survey/englishtoplanguage.xhtml

An overview of respondents' reactions to the scenario: English will be the world's lingua franca for cross-culture communications for at least the next 15 or 20 years; Mandarin and other languages will continue to expand their influence, thus English will not 'take over'; linguistic diversity is good, and the internet can help preserve it; all languages evolve over time.

Until translation technology is perfected and pervasive, people must find other ways to communicate as effectively as they can across cultures. A lingua franca is a common language for use by all participants in a discussion. At this point, the world's lingua franca is English – for example, it has been accepted as the universal language for pilots and air-traffic controllers. But English-speaking nations have an estimated population of just 400 million out of the 6 billion people in the world. If the pendulum swings to a different dominant language, or two or more overwhelmingly dominant languages, it would bring powerful change.

Thomas Keller, a member of the Registrars Constituency of ICANN and employee of the Germany-based internet-hosting company Schlund,[7] spoke for many with this prediction: "The net of the future will very likely evolve more into a big assembly of micro webs serving micro communities and their languages."

Another common view was captured by **Mark Rotenberg,** executive director of the Electronic Privacy Information Center: "Two powerful trends will collide: English will become more prevalent as American culture and technology flow out across the world, but critical mass will also be achieved for global communications in Spanish, Mandarin, Japanese and Arabic as new internet protocols which support International Domain Names are more widely adopted."

Many who disagreed with domination by English in this 2020 scenario generally acknowledged that English is a common "second-language" of choice but said they expect many users of the internet will mostly use the language of their own cultures in online communications. Many expressed enthusiastic support of another language – such as Mandarin Chinese – supplanting English within the next 15 years, while others agreed that English will be important but not dominant. Some speculated that by 2020 innovators will build some sort of translating function into the internet to make it technologically possible for everyone to speak and write in their native languages while being easily understood by people across the globe.

"English will not, alone, predominate. However, many smaller language groups will give way to a general reliance on one of several large languages such as English, but also Spanish, French, and variations on Chinese," argued **Matthew Allen,** Curtin University, Australia, president of the Association of Internet Researchers.

Fred Baker, chairman of the board of trustees for the Internet Society, wrote, "To assert that we will therefore have a large English-only world doesn't follow; Mandarin, German, Spanish and many other languages will continue to be important." And **Seth Finkelstein**, anti-censorship activist and author of the Infothought blog, wrote that this scenario is "much too ambitious. There will still be plenty of people who will have no need for global communications in other languages, or who choose to communicate only within their local community."

"First the premise that networked communications will have developed to this point is false," maintained **Robin Lane**, educator and philosopher, Universidade Federal do Rio Grande do Sul, Brazil. "Second it is a fact that English has been indispensable for international communications for the last century – a fact that has not led to English displacing other languages. It is, and will continue to be, layered on top of the native language of the user of intercultural communications."

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[7] A section with more complete biographical data on most respondents who took credit for their remarks can be found at the end of this report.

Never has there been a language spoken by so many.

Linguist David Crystal has estimated in his research that the world has 140 languages in use by at least a million people each. He says there has never in the history of the world been a language spoken by so many people as English is today, adding that as many as 1.5 billion people speak English as a first or "added" language, and the number could exceed 2 billion by 2020.[8]

The respondents who agreed with the survey's 2020 language scenario generally noted that English is already a pervasive "second" language – used as a tool of diplomacy, education and business around the world – and it is also the language of the originators of the internet, and is thus most likely to continue to dominate.

"English will be well on the way to being the world's most popular second language (by 2020)," wrote **Hal Varian**, dean of the School of Information Management & Systems at UC-Berkeley and a Google researcher. "Mandarin is a contender, but typewriter keyboards will prevent it from really taking over from English."

"The leveling effect is already quite visible," wrote **Glenn Ricart**, Internet Society board member employed by Price, Waterhouse Coopers; formerly of DARPA. "It seems paradoxical that the Internet can be a powerful force for memorializing and evangelizing local languages and cultures and differences and still lead to a great homogenization as the thirst for knowledge leads one invariably into Chinese and English. In 2020, many more people will be bilingual, with working web-interaction knowledge of English to go with their native tongue."

Jim Warren, founding editor of Dr. Dobb's Journal and a technology policy advocate, agreed that the issue of interface construction plays a role. "English has already become the mandated standard language … most keyboards around the world are the ASCII character set," he wrote. "The accent characters of other Western languages require special finger contortions, and it seems certain that the world will NOT standardize on any of the more complex character sets of the East, much less the pictograms of Asia … it's only 15 years to 2020."

Language choices will be context-specific, much as they are today.

There was a suggestion in some answers that language preferences might shift and accommodate, even as English was sweeping the internet. A typical iteration of this idea came from **Esther Dyson**, former chair of ICANN, and now of CNET Networks: "Yes, English will 'displace' some languages, but there will be, for example, much more Chinese. People pick their language according to whom they want to communicate with, and there will be many different communities with (still) many different languages."

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[8] Crystal, David. *English as a Global Language*, Second edition. Cambridge: Cambridge University Press, 2003.

Scenario Two: English displaces other languages

Paul Saffo, forecaster and strategist for the Institute for the Future, responded that the scenario is actually a "present-tense description." He added: "Badly-accented English is to global society today what Latin once was to Western society long ago. English will continue to advance, BUT the real question is whether this trend will peak in the next two decades, and I believe it will. English's acceptance will reach a certain high-water point not terribly larger than its penetration today. Then things will get interesting."

"English is going to be the common language," wrote internet pioneer **David Clark** of MIT, "but we will see an upsurge in use and propagation of local languages. For many users, their local language will still be the only language they use on the Internet. And of course, for low-complexity uses, we will see more translation."

Internet growth in non-English-speaking countries will affect the language used online.

While internet-usage demographics are inexact, most measurement experts agree that North American dominance in regard to Web-content-building and total usage of the internet ended a while ago, with only about one-fourth of internet users hailing from the U.S. or Canada at this point in time.

While there are other nations in which English is a dominant language, including the United Kingdom and India (where Hindi *and* English are officially used), the nations where internet growth will see the most progress in the next few years are situated primarily in Asia; the expectation is that China will have the world's largest internet population within the next five years.

"Sure, English will displace some languages," wrote **Howard Rheingold,** the internet sociologist and author. "But as the century advances, Chinese becomes more dominant, strictly because of demographic drivers." Former InfoWorld editor **Stewart Alsop** wrote: "English will not displace or replace the other major languages in the world, including French, Spanish, Japanese, Germanic, Hindu, etc." And communication technologies researcher **Mark Poster** wrote: "Chinese might be emerging as the new lingua franca."

International Domain Names will change the landscape.

The Internet Corporation for Assigned Names and Numbers has been urged for years to find a way to initiate the use of non-English top-level domain names – at this point in time, roots (such as .com, .org, .net) are only used in English (and the Roman character set). ICANN was established in 1998 to oversee technical details regarding web addresses – the Domain Name System. It is an international body working at sorting out worldwide networking details for a technology established by English-speaking people. There has been some fear that other nations, frustrated with ICANN's slow progress toward opening its system to other languages, might split off into nation-state networks with their own naming schemes rather than staying tied to the global network. ICANN

officials agreed in March to begin to test the use of international domain names written in local character sets in July of 2006.[9]

Scott Hollenbeck, IETF director and a leader for internet infrastructure-services company VeriSign, reflected the politics of root addresses in his survey response. "While I do believe English will continue to be the predominant language used for 'across-the-network' human communication," he wrote. "I do not believe that it will be ubiquitous by 2020. In 2006 there are efforts to localize Internet protocols in a way that will likely create islands of non-English communication capabilities. These efforts will continue and will gain traction in communities where English is not spoken by a large portion of the population."

Bret Fausett, a partner with a U.S. law firm and producer for ICANN.Blog, wrote, "In 2005, we're at the peak of the English language on the internet. As internationalized domain names are introduced over the next few years, allowing users to conduct their entire online experience in their native language, English will decline as the central language of the internet."

Alan Inouye, a U.S. internet policy analyst, agreed. "I would say 'displace' is not likely. English will continue in its role as the de facto international language. However, there are countervailing forces against English language dominance on networks. Networks such as the internet facilitate the development of communities of common interests and languages among people who may be widely dispersed geographically. Also, we will see a dramatic increase in Chinese-language content."

Many expect translation technology to improve greatly.

At this point, computer-based translation is still in early development, and despite improvements it lags far behind the ability of a good human translator. Some respondents who questioned the likelihood of the 2020 language scenario did so because of their belief that technology innovators will have found a way to bridge the gaps in intercultural communication.

One person with such confidence is pioneering internet engineer and Internet Architecture Board and Internet Society leader **Christian Huitema,** who wrote, "Computer technology increases the frequency of communication, which creates a desire to communicate across boundaries. But the technology also enables communication in multiple languages, using various alphabets. In fact by 2020 we might see automatic translation systems."

Marilyn Cade, of the Information Technology Association of America and the Generic Names Supporting Organization of ICANN, wrote, "English may be the default 'universal' language, but we will see a rise of other languages, including Chinese, French (francophone Africa) and other languages supported by technological translation – at last!"

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[9] http://www.icann.org/topics/idn.html

The internet can help preserve languages and cultures.

Many survey respondents pointed out that the internet is actually helping to halt the complete disappearance of some languages and it is even being used to revive those that were considered to be "dead."

Previous 20th century communications technologies were principally responsible for what researcher Michael Krauss of the Alaska Native Language Center said in 1992 is "electronic media bombardment, especially (by) television – an incalculably lethal new weapon which I have called 'cultural nerve gas'."[10] But today the internet is being used for "RLS" – reversing language shift – projects. For instance, the Tlingit language of the Inuit people in southeast Alaska has been preserved in an online database used by schoolchildren in Glacier Bay. More places are seeing the development of indigenous-language projects and databases online. Broadband allows the use of richly detailed audio and video files on such sites – allowing depth of detail in pronunciation and in facial and other physical movements associated with the languages to become a part of the record.

Survey respondent **Steve Cisle**r, a former senior library scientist for Apple now working on public-access internet projects in Guatemala, Ecuador and Uganda, wrote: "Indigenous languages will have a hard time changing to accommodate the impact of popular media languages, though more people will use ICT to try to revitalize some languages or spread the use of them outside of local places."

Michel Menou, a professor and researcher in information science who was born in France and has worked in nearly 80 nations, replied that while linguistic diversity is increasing on the internet, the challenges to their survival still remain. He added what the internet will do is "offer new options for their preservation, teaching and use."

And **John Quarterman**, president of InternetPerils Inc. and the publisher of the first "maps" of the internet, wrote: "Internet resources will permit some languages to thrive by connecting scattered speakers and by making existing and new materials in those languages available."

Internet influences might create new dialects in the English language.

Several respondents noted that English itself is likely to see some changes in the next 15 years, as globalization and new communications-content delivery systems alter cultural needs.

Bruce Edmonds of the Centre for Policy Modelling in the United Kingdom observed, "1) Technology will allow considerable interoperability between

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[10] Krauss, Michael, *The World's Languages in Crisis*, 68 Language 4, 7, 1992.

languages, making a single language less necessary. 2) As in all evolutionary systems, very successful, dominant species spawn subspecies; English will continue to fragment into many sublanguages."

Bob Metcalfe, inventor of Ethernet, founder of 3Com, and now with Polaris Venture Partners, wrote, "Of course, a lot of 2020 English will sound Mandarinish." **Paul Saffo** of the Institute for the Future wrote: "Mandarin will of course grow dramatically, but I believe we will also see the rise of divergent English dialects."

Michael Gorrell, senior VP and CIO for EBSCO, wrote, "Some internationalized variation of English will evolve. Internet and instant messenger-based acronyms will grow into everyday use, fwiw. This new slang will be combined with new words and concepts – like blog, wiki, chat – to form a new 'net dialect' of English."

Scenario Three

Autonomous technology is a problem…

Prediction: By 2020, intelligent agents and distributed control will cut direct human input so completely out of some key activities such as surveillance, security and tracking systems that technology beyond our control will generate dangers and dependencies that will not be recognized until it is impossible to reverse them. We will be on a 'J-curve' of continued acceleration of change.

Respondents' reactions to this scenario	
Agree	42%
Disagree	54%
Did not respond	4%

Because results are based on a non-random sample, a margin of error cannot be computed.

An extended collection hundreds of written answers to this question can be found at:

http://www.elon.edu/e-web/predictions/expertsurveys/2006survey/autonomoustechnolgy.xhtml

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An overview of respondents' reactions to the scenario: Those who disagreed with this scenario generally said the humans who design technology will have no difficulty controlling it – but some noted a fear of _the people_ who could control new technology. Those who agreed with the scenario often cited the increasing complexity of human-made systems and decreasing oversight of technology. They urged "human intervention."

Of course the responses to this scenario, as with all on the survey, were shaped by the experiences participants have had. Many respondents – those who disagreed *and* those who agreed – were moved to react by comparing this proposed future to a science-fiction plot ("The Matrix," "The Terminator," "Frankenstein"). The answers were also shaped by how closely people read every word of the scenario. The group disagreeing included many engineers and computer scientists – many of them taking issue with the phrase "impossible to reverse" – while many sociologists, government workers and network policy makers found some of this scenario's points to be quite worthy of serious discussion. Again, the scenario was written to engender engaged discussion, not to propose what we see as the likeliest future.

Technology architects generally answered by saying that humans will retain control of any system they design. "Agents, automated control and embedded computing will be pervasive, but I think society will be able to balance the use," wrote **David Clark** of MIT.[11] "We will find these things helpful and a nuisance, but we will not lose control of our ability to regulate them."

Internet Society board chairman **Fred Baker** wrote, "We will certainly have some interesting technologies. Until someone finds a way for a computer to prevent anyone from pulling its power plug, however, it will never be completely out of control." **Pekka Nikander** of Ericcson Research and the Internet Architecture Board responded: "As long as the everyday weapon-backed power systems (e.g. police force) are kept in human hands, no technical change is irreversible. Such reversion may take place as a socioeconomic collapse, though."

"Completely automating these activities will continue to prove difficult to achieve in practice. I do believe that there will be new dangers and dependencies, but that comes from any new technology, especially one so far-reaching," argued **Thomas Narten,** Internet Engineering Task Force liaison to ICANN, and chief of IBM's open-internet standards development.

Robert Kraut of the Human-Computer Interaction Institute at Carnegie Mellon University, sees the development of automated systems running smoothly. "Certainly intelligent agents and distributed control will automate some tasks," he wrote. "But heavy automation of tasks and jobs in the past (e.g., telephone operators) hasn't led to 'dangers and dependencies.'"

The most dismissive reactions to the scenario came mostly from those who are involved in writing code and implementing the network. **Anthony Rutkowski** of VeriSign, over the past decade a leader with the Internet Society and International Telecommunication Union, wrote: "Autonomous technology is widespread today and indispensable. Characterizing it as a 'problem' is fairly clueless." Programmer and anti-censorship activist **Seth Finkelstein** responded, "This is the AI bogeyman. It's always around 20 years away, whatever the year." And Alejandro Pisanty, of ICANN and the Internet Society, wrote, tongue-in-cheek: "This dysfunctional universe may come true for several types of applications, on and off the network. We better start designing some hydraulic steering mechanisms back into airplanes, and simple overrides of automatic systems in cars. Not to speak about pencil-and-paper calculations to get back your life's savings from a bank!" **Hal Varian** of UC-Berkeley and Google wrote, "It's a great science fiction plot, but I don't see it happening. I am skeptical about intelligent agents taking over anytime soon."

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[11] A section with more complete biographical data on most respondents who took credit for their remarks can be found at the end of this report.

Scenario Three: Autonomous technology is a danger

Leigh Estabrook, a professor at the University of Illinois, stated: "Human beings always have control, but they often choose to give it up. For example, when the airline agent tells me I cannot do something because 'the computer won't allow it.' Human beings have made choices to program that computer that way, to limit human abilities to override functions. I could also say I agree since we do seem willing to give up control to systems, and increasingly legislators and the judiciary have allowed surveillance, security, and tracking systems that would seem to me – and to many others – to be dangerous."

Many who see dangers or predict negative impacts discuss unforeseen consequences of surveillance.

Marc Rotenberg, executive director of the Electronic Privacy Information Center (EPIC), sees extreme danger in the autonomous technology scenario. "This is the single greatest challenge facing us in the early years of the 21st century," he responded. "We are constructing architectures of surveillance over which we will lose control. It's time to think carefully about 'Frankenstein,' The Three Laws of Robotics, 'Animatrix' and 'Gattaca.'"

Amos Davidowitz of the Institute of World Affairs, responded this way: "The major problem will be from providers and mining software that have malignant intent." His concerns about surveillance were echoed by many respondents, including **Michael Dahan**, a professor at Sapir Academic College in Israel, who wrote, "Things may be much worse with the increasing prevalence of RFID chips and similar technologies. Before 2020, every newborn child in industrialized countries will be implanted with an RFID or similar chip. Ostensibly providing important personal and medical data, these may also be used for tracking and surveillance."

Elle Tracy, president and e-strategies consultant for The Results Group, suggested overconfident humans may allow this scenario to unfold. "The only reason I can agree with this is because of my first-hand experience within the technology industry," she wrote. "The people who write this code are so proud of their work – and they should be – that the rational, real-world checks and balances that should be implemented on their results fall into a second-class-citizenry level of import. Until testing, bug fixing, user interfaces, usefulness and basic application by subject matter experts is given a higher priority than pure programmer skill, we are totally in danger of evolving into an out-of-control situation with autonomous technology."

Robert Shaw, internet strategy and policy adviser for the International Telecommunication Union, had other concerns: "Even in today's primitive networks, there is little understanding of the complexity of systems and possible force-multiplier effects of network failures," he wrote. "The science of understanding such dependencies is not growing as fast as the desire to implement the technologies."

Some respondents pointed to the fact that certain technological systems are already suffering due to a lack of well-intentioned human input throughout the processes they are built to accomplish. "Systems like the power grid are already so complex that they are

impossible to predictably control at all times – hence the periodic catastrophic failures of sections of grid," wrote author and social observer **Howard Rheingold.** "But the complexity and interconnectedness of computer-monitored or controlled processes is only a fraction of what it will be in 15 years. Data mining of personal traces is in its infancy. Automatic facial recognition of video images is in its infancy. Surveillance cameras are not all digital, nor are they all interconnected – yet."

Douglas Rushkoff, teacher and author of many books on net culture sees a need to take action. "If you look at the way products are currently developed and marketed," he explained, "you'd have to say we're already there: human beings have been taken out of the equation. Human intervention will soon be recognized as a necessary part of developing and maintaining a society."

Paul Craven, director of enterprise communications, U.S. Department of Labor, wrote: "History has shown that as technology advances the abuse of that technology advances. History has also demonstrated that we do not control technology as much as we think we do."

Another government official, **Gwynne Kostin**, director of Web communications for U.S. Homeland Security, pointed out the inadequacies of an automated system during a recent natural disaster in responding to this scenario. "This is an extension of the current status," she wrote. "A suggestion for an XML standard for emergency deployments during Hurricane Katrina ignored the fact that there was no electricity, no internet access, decreasing batteries and no access to equipment that was swamped. Non-technical backups will become increasingly important – even as we keep forgetting about them. We will need to listen carefully to people on the ground to assess – and plan for – events in which we have no (or non-trustworthy) technology."

There also were concerns about inequities created by computer networks. **Arent Greve**, a professor at the Norwegian School of Economics and Business Administration, wrote, "There will be a trend in this direction, not as extreme as displayed in the above scenario, but bad enough that we will experience injustice, I think that some of those systems may be reversible, others may not. I would guess a probability of about 30% that such systems develop." And **David Weinberger** of Harvard's Berkman Center wrote: "DRM and 'trusted computing' initiatives already are replacing human judgment with algorithms that inevitably favor restricted access to the content on our own computers."

Alik Khanna of Smart Analyst Inc. in India responded that advances in nanotechnology and robotics will build an increasing reliance on machines. "Whether the development of AI will lead to self-awareness in machines, time will tell," he wrote.

Some say elements of this scenario will take place, but predict humans will not lose all control.

"I agree, but this is not a doomsday scenario," wrote **Mark Gaved** of the Open University in the UK. "The development of these technologies will echo previous technologies with similar curves, unexpected developments and unauthorised appropriations by grassroots groups."

Marilyn Cade, CEO of ICT strategies for MCADE, wrote, "We are [into this scenario already] aren't we? But can't we also be into self-correction of this problem? Awareness is beginning to emerge, and technological solutions can develop for the technological challenges named *if* we self-govern as industry and partner with governments to achieve some limitations of the surveillance powers of the 'states.'"

Charlie Breindahl of the IT University of Copenhagen wrote, "I agree that it is a very real danger. However, I think that our present thinking about how automation and distributed computing works is naïve. In the year 2020, the general public will be much more aware of how to utilize their agents and control schemes. We should see a much more 'AI-literate' population, if not in 2020, then in 2040."

Michael Reilly of Globalwriters, Baronet Media, wrote, "While a few activities could spin off course, most really problematic issues will be spotted early and repaired. Also, monitoring which alerts humans to problems will become a high-order business on its own, incorporating 'self-healing' networks equipped with alarms when boundaries are exceeded."

Robin Lane, an educator and philosopher from the Universidade Federal do Rio Grande do Sul in Brazil, wrote, "The desire for convenience, for ease of use, for the removal of tedious, laborious tasks is – in my opinion – inherent in us as beings. As such we will continue to use and abuse technology to make our lives easier. The price for this is increased dependency on the technology."

Several suggest working to avoid "unintended consequences."

Some respondents specified that humans must plan in advance to build the best outcome for an automated future. "I truly do agree that there will be nearly complete automation of such boring-to-humans activity as surveillance, security and tracking systems," wrote **Glenn Ricart**, a member of the Internet Society Board of Trustees and the executive director for Price Waterhouse Coopers Research. "There will clearly be unintended consequences, some of which may endanger or take human life. However, I don't believe it will be impossible to reverse such things; indeed, we will continue to perfect them while undergirding them with something like Asimov's Three Laws of Robotics."

"The fact that this question is being asked/asserted suggests that it will NOT happen.," wrote **Kerry Kelley** of Snapnames.com. "Enough healthy paranoia exists among the

people on the inside – those creating the standards – that others who might purposefully, or accidentally, unleash these kinds of problems will be effectively neutralized."

Henry Potts, a professor at University College in London, expressed concern over potential economic impact. "The use of standard decision-making software by stock market traders has already led to effects outside of what we planned or wanted," he wrote. "I don't fear robots looking like Arnold Schwarzenegger taking over the world, but unexpected and unwanted effects of distributed control are feasible."

Jim Archuleta, senior manager for government solutions for Ciena Corporation wrote, "In some cases, reversal of the processes will be difficult and nearly impossible. There are scenarios where processes based on automation and intelligence based on rules and identities will miss 'outliers' and 'exceptions' thereby resulting in mistakes, some of which will be life-threatening."

Lilia Efimova, a researcher with Telematica Instituut in the Netherlands, wrote, "This is a possible scenario, so I believe there is a responsibility for internet researchers in that respect to recognize those dependencies in advance and to act on preventing dangers."

Sabino Rodriguez of MC&S Services responded that the European Commission is already assigning "studies, proposals and investments" into avoiding negative consequences of new technologies. And **Sean Mead**, an internet consultant, wrote, "Science fiction has warned of nearly any threat that autonomous technology can raise. There will be problems caused by autonomous tech, but, like germs provoking an immune-system response, the eventual effect of the initial damage will be to install safeguards that protect us from long-lasting damage."

Social power will grow along with technological power – perhaps thwarting runaway technology.

Several survey participants said this scenario also presents some positive aspects. **Ted Coopman,** a social science researcher and instructor at the University of Washington, sees the formation of a "new bottom-up, global, civil society" thanks to autonomous technology "in the form of ultra-structure capabilities that allow almost anyone to project power with little or no cost."

He continued: "The repertoires of individuals and groups will be readily available and successful or attractive ones will spread and scale rapidly. The aggregate adoption will cause huge and likely unpredictable shifts in social, political, economic arenas. People will no longer favor incumbent systems, but will move to systems that make sense to them and serve their needs. This will force incumbent systems to adapt quickly or fail. Governmental protection of incumbent corporate and social power will lose much of its effectiveness as a force of social control. These parallel systems to serve people's needs will arise via digital networks."

Scenario Three: Autonomous technology is a danger

Mary Ann Allison, a futurist and chairman and chief cybernetics officer for The Allison Group, responded: "While this scenario is clearly a danger, we don't yet understand how powerful fully-connected human beings can be."

And **Rob Atkinson,** president of the Information Technology and Innovation Foundation, and formerly director at the U.S. Congressional Office of Technology Assessment, responded, "The more autonomous agents the better. The steeper the 'J curve' the better. Automation, including through autonomous agents, will help boost standards of living, freeing us from drudgery."

Mark Poster, an authority on the ways social communications have changed through the introduction of new technologies, wrote, "The issue will be how humans and information machines will form new assemblages, not how one will displace the other."

"Autonomous systems will not become a serious problem until they are sophisticated enough to be conscious … As it stands now, they are simply tools – advanced tools, but tools nonetheless. True AI is still 50-100 years away," argued **Simon Woodside**, CEO, Semacode Corp, Ontario, Canada.

Where does 'autonomous technology' stand now?

Distributed control systems – those with remote human intervention – have long been used across the world to handle various tasks, including the operation of electrical power grids and electricity-generation plants, environmental control systems, traffic signals, chemical and refining facilities, water-management systems and many types of manufacturing. Systems are becoming more automated daily, as pervasive information networks are being invisibly woven into everything everywhere, helping us manage a world that becomes exponentially more complex each year.

Many operations are being handled by small microelectromechanical systems – better known as MEMS. Billions of these devices are already woven into our buildings, highways, and even our forests and other ecosystems; they are found in personal devices, from our automobiles to printers and cell phones. The market for MEMS hit $8 billion in 2005, with a forecast for growth to more than $200 billion by 2025, according to **Joe Mallon** of Stanford University.[12]

Some programmable, remote information devices now in use are called "agents" or "bots." Agents automatically carry out tasks for a user: sorting email according to preference, filling out Web page forms with stored information, reporting on company inventory levels, observing changes in competitors' prices and relaying statistics, mining data to detect specific conditions. Bots are programmed to help people who play online games perform various tasks; they are also used online to aid consumers in finding products and services – these shopping bots use collaborative filtering.

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[12] Mallon, J. Abstract for presentation Industry and Market Overview for 4th annual Microelectric Engineering Packaging and Test Engineering Council Conference, May 18, 2006,
http://www.meptec.org/06_MEMS_Symposium.html

Scenario Three: Autonomous technology is a danger

MEMS, agents and bots are self-contained tools designed and distributed by people who monitor them and replace or remove them from a network when necessary. They are autonomous to some extent in that they are capable of functioning independently to meet established human-set goals. Most of them do not possess any artificial intelligence. Intelligent agents have the ability to sense an environment and adapt to changes in it if necessary, and they have the ability to learn through trial and error or through example and generalization. MEMS, agents and bots are the reality today. In the near future, as computing and data storage become more advanced and nanotechnology and artificial intelligence systems are more nearly perfected, it is expected there will be far less direct human input in the day-to-day oversight of human-built systems.

Where might this technology take us in the future?

Many of the sophisticated operational systems developed in the next few decades will be invisible or nearly so. Nanoelectromechanical systems – 10,000 times smaller than the width of a hair – are being developed, and thousands of nano-related patents have already been issued. Most who predict a future that sounds a great deal like a science-fiction plot are those who see the continued development and convergence of networked nanotechnology, robotics and even genetics.

Among the seemingly "extreme" predictions made by various respected tech experts in various reports issued over the past few years are:

■ Networked "smartdust" devices, or "motes" – these would be the size of a dust particle, each with sensors, computing circuits, bidirectional wireless communication and a power supply. They could gather data, run computations and communicate with other motes at distances of up to about 1,000 feet. A concentrated scattering of a hundred or so of these could be used to create highly flexible, low-cost, low-power network with applications ranging from a climate control system to earthquake detection to the tracking of human movement.[13]

■ Advanced robots – British Telecom futurologist Ian Pearson has said robots will be fully conscious, with superhuman levels of intelligence by the year 2020. In a 2005 interview with The Observer, a UK newspaper, he said, "Consciousness is just another sense, effectively, and that's what we're trying to design in a computer." And, he added, "If you draw the timelines, realistically by 2050 we would expect to be able to download your mind into a machine, so when you die it's not a major career problem."[14]

In order to prepare in advance for a future that is likely to be filled with accelerating developments related to autonomous technologies, select leaders have founded watchdog organizations, held conferences and created research projects. Among them are the

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[13] Last, M., Liebowitz, B., Pister, K., Warneke, B., *Smart Dust: Communicating with a Cubic-Millimeter*, Computer, vol. 34 (pp. 44-51) 2001.

[14] Smith, David, *2050 and Immortality is Within Our Grasp*, The Observer (online), May 22, 2005, http://observer.guardian.co.uk/uk_news/story/0,,1489635,00.html

Center for Responsible Nanotechnology – http://www.crnano.org/index.html – and the Acceleration Studies Foundation – http://www.accelerating.org/. In addition, Battelle – http://www.battelle.org/ – and the Foresight Institute - http://www.foresight.org/ – are two major non-profit organizations conducting ongoing technology roadmap projects investigating the implications of autonomous technologies.

Acceleration to a "singularity" is predicted by some.

Respected professor and author Vernor Vinge and inventor Ray Kurzweil – author of *The Singularity is Near* and a winner of the U.S. National Medal of Technology and the Lemelson-MIT Prize – have been the most vocal proponents of the idea that a "technological singularity" will occur during this century. This "singularity" is defined as the point at which strong artificial intelligence or the amplification of human intelligence will change our environment to an extent beyond our ability to comprehend or predict.[15] Kurzweil has written that paradigm shifts will lead to "technological change so rapid and profound it represents a rupture in the fabric of human history," and he says this will happen by 2045.[16]

Other top thinkers see this sort of future: Robotics researcher Hans Moravec has projected that nano-scale machines equipped with AI could displace humans in the next century. Oxford philosopher Nick Bostrom wrote a 2002 essay titled "Existential Risks" about the likely threats presented by the Singularity. AI researcher Hugo de Garis wrote a 2005 book titled "The Artilect War: Cosmists vs. Terrans – A Bitter Controversy Concerning Whether Humanity Should Build Godlike, Massively Intelligent Machines."

The Singularity Institute for Artificial Intelligence (http://www.singinst.org/) was founded to further discussion of potential futures based on this idea. A great many other respected experts dispute the idea of the Singularity, including physicists Theodore Modis[17] and Jonathan Huebner[18], who have argued the exact opposite – that innovation is now actually in decline.

While few respondents to the "autonomous technology" scenario in this survey included the "singularity" idea in their remarks, most said such an event will arrive long after 2020, if ever. **Barry Chudakov,** principal partner in the Chudakov Company, wrote, "We will cut direct human input in a variety of human activities and this will cause problems. This is already causing problems and we're not yet near the 'singularity' where we're likely headed. However, the notion of 'technology beyond our control' is an alarmist construct … we are learning as we are making mistakes. So while we are hell-bent on acceleration of change, I believe we will also rethink and respond to those

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[15] *The Singularity* - reference page on KurzweilAI.net, accessed June 5., 2006, http://www.kurzweilai.net/meme/frame.html?main=/meme/memelist.html?m%3D1
[16] Kurzweil, R., *The Singularity is Near*, New York: Viking, 2005.
[17] Modis, T., *The Singularity Myth*, online at http://ourworld.compuserve.com/homepages/tmodis/Kurzweil.htm
[18] Adler, R., *Entering a Dark Age of Innovation*, New Scientist.com, July 2, 2005, http://www.newscientist.com/article.ns?id=dn7616

systems that seem to be running away from us. We have the time to understand our relationship with technology and I think we will not get lost on a dead-end J-curve."

Educational consultant **Jeffrey Branzburg** wrote, "Although I agree with the concept of a 'J-curve' of continued acceleration of change, as discussed in Ray Kurzweil's *The Singularity is Near*, I believe it is not a problem. The ingrained human system of checks and balances will continue to keep the potential dangers under control. (By ingrained human system of checks and balances I mean the propensity of people to resist when they believe an entity has attained a higher than desired degree of control and influence.)"

Daniel Wang, principal partner of Roadmap Associates, wrote: "This is one of the scariest consequences of our light-speed technological advancement. Hollywood fiction will become reality."

"The question has an overly dramatic spin to it, but the trend is correct," argues **Paul Saffo,** director of the Institute for the Future. "Now, fear of enslavement by our creations is an old fear, and a literary tritism. But I fear something worse and much more likely – that sometime after 2020 our machines will become intelligent, evolve rapidly, and end up treating us as pets. We can at least take comfort that there is one worse fate – becoming food – that mercifully is highly unlikely."

Scenario Four

Transparency builds a better world, even at the expense of privacy…

Prediction: As sensing, storage and communication technologies get cheaper and better, individuals' public and private lives will become increasingly 'transparent' globally. Everything will be more visible to everyone, with good and bad results. Looking at the big picture – at all of the lives affected on the planet in every way possible – this will make the world a better place by the year 2020. The benefits will outweigh the costs.

Respondents' reactions to this scenario	
Agree	46%
Disagree	49%
Did not respond	5%

Because results are based on a non-random sample, a margin of error cannot be computed.

An extended collection hundreds of written answers to this question can be found at:

http://www.elon.edu/e-web/predictions/expertsurveys/2006survey/transparencyandprivacy.xhtml

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An overview of respondents' reactions to the scenario: Some level of privacy will be retained, but there is disagreement over whether this should be achieved by force of law or social contract. There is an expectation that governments and corporations will continue to escalate surveillance and "own" access to information; the powerful and privileged will benefit most from this growing availability of personal information.

Respondents offered divided reactions to this scenario. "We will continue to have very mixed opinions about the effects of transparency and the loss of privacy, just as we do today," predicted **Gary Chapman,** director of the 21st Century Project at the LBJ School

of Public Affairs at the University of Texas-Austin.[19] "These mixed opinions are likely to intensify, meaning that there will be passionate extremes on both sides of the issue." In this 2006 survey, while the answers were nearly evenly divided, the passion was most deeply expressed by those who disagreed with the scenario. Those who agreed generally hedged their agreement with qualifications indicating that the world would have to find ways to deal with privacy issues.

Several top leaders of the internet groups surveyed took the view that in a transparent world the benefits will outweigh the costs, but they noted that privacy must also be protected in some manner – some argued for formal mechanisms and others expected informal mechanisms to predominate.

A starting point for some respondents was a sense expressed by writer and teacher **Douglas Rushkoff**: "Things have never been private anyway. The most important thing about transparency is it shows how transparent people have already been, all along, to the institutions that mean to control them."

"I generally agree," wrote Internet Society Chairman **Fred Baker.** "However, privacy remains important, so I tend to think that we will find ways to limit the invasion of it. Data mining techniques and other kinds of analysis will make the globe more similar to a small town than it is now, in much the same way that the deployment of the Internet has pushed the development of McLuhan's global village. One characteristic of a small town is that 'everybody knows everybody's business,' which is to say that gossip and other activities betray confidences and otherwise invade the privacy of the people in the town. That will be one side of the global village."

Thomas Narten of IBM, who also works as the Internet Engineering Task Force liaison to ICANN, wrote, "I generally agree, but legislation will be needed (and is probably inevitable) to curb abuses. The incentives for abuse are simply too great."

"Between 'agree' and 'disagree' I'll pick 'agree,' but I think it's more accurate to say it *could* make the world a better place overall," wrote **Seth Finkelstein,** EFF Pioneer Award winner. "The difference between the Open Society and the Police State is political, not technological."

Glenn Ricart, a member of the Internet Society Board of Trustees, wrote: "There *will* be higher degrees of transparency, but this will arise from a change in social norms and ultimately come from voluntary compliance … Look at taking cell phone calls. A decade ago, no one would have interrupted a personal conversation to answer a ringing desk telephone. Today, however, people provide lots of transparency into their lives by answering their cell phones anywhere and everywhere. It's being done so often that it's becoming culturally acceptable. And, even if you don't answer your phone, it's still OK to SMS someone even while your attention was assumed to be elsewhere. IM 'away' messages and more ... all make me believe that people will continue to surrender certain

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[19] A section with more complete biographical data on most respondents who took credit for their remarks can be found at the end of this report.

parts of their privacy for what they perceive to be benefits of interaction. However, I'm a staunch believer that we need to retain the 'off' button. People should be able to opt out of transparency, and I believe they will do so increasingly as a form of vacation or holiday or de-compression. Some new name will attach to this phenomenon. ('Turning-off'?)"

Matthew Allen, president of the Association of Internet Researchers and a professor at Curtin University in Australia, tackled today's definition of the concept of privacy in the world's democracies. "Privacy has been asserted as a right within the modern Western paradigm that has come to dominate our perceptions of what 'ought' to be," he wrote. "In fact, privacy is not a right but a state of engagement with the world. Technologies that interlink people (whether they be telephones, ships, or computing and the Internet) bring people into proximity and thus into a realm of less privacy."

Australian internet pioneer **Ian Peter** wrote: "The benefits are enormous in enabling communication across an inter-connected planet. The potential problems this may give rise to in areas such as privacy do need to be addressed carefully, though, and the benefits will only be as great as our governments and societal attitudes allow. If we do not learn to behave more compassionately and sensibly as global citizens, no amount of connectivity will make up for this (although it may help to bring it about)."

One simple strategy for coping in a world of more enabled surveillance same from **Bob Metcalfe,** founder of 3Com, now of Polaris Venture Partners: "The trick is not to do anything you're ashamed of."

Chris Sorek, former director of global communications for Red Crescent and Red Cross, now with SAP, wrote, "Without transparency there can be no 'level playing field'; competitive and open environments build economies and communities. This, in turn, enables everyone to have a fair chance to succeed and prosper."

Tiffany Shlain, founder of the Webby Awards, wrote, "Giving all people access to information and a context to understand it will lead to an advancement in our civilization."

And **Christopher Johnson,** co-founder and CEO for ifPeople, wrote, "I am optimistic about the ability of the public to maintain control of the information that is generated, despite the current trend in secretive government information control. If the public has control, the benefits will outweigh the costs. If powerful groups have control and use of the information, it will further greed, discrimination, and infringement of privacy."

There is plenty of pessimism, though, about prospects for transparency.

Some respondents expressed deep concerns about losses of privacy. Naturally, many of them are deeply attuned to the issues involved because they represent civil liberties organizations.

The answer was a clear "disagree" for **Marc Rotenberg,** executive director of the Electronic Privacy Information Center. "The cost of unlimited transparency will not

simply be privacy," he wrote. "It will be autonomy, freedom, and individuality. The personal lives of prisoners are transparent. So, too, is the world of the Borg."

Sharon Lane, president of WebPageDesign, was also forceful in her reply. "It will NOT be a better world," she wrote. "It will be an Orwellian world! The benefits most certainly will not outweigh the costs."

Robin Gross, executive director of IP Justice, a civil liberties organization that promotes balanced intellectual property law, wrote, "The cost to privacy will be greater than we expect."

Barry Wellman, a researcher on virtual communities and workplaces and the director of NetLab at the University of Toronto, responded, "The less one is powerful, the more transparent his or her life. The powerful will remain much less transparent." **Lisa Kamm**, an IT professional who has worked for IBM and the ACLU, wrote, "Privacy should remain a critical value and a right, and while there are benefits that come with increased transparency, they do not outweigh the costs."

Alejandro Pisanty, vice chairman of the board for ICANN and a member of the United Nations' Working Group for Internet Governance, built his own scenario: "Transparency builds a much worse world, at the expense of privacy and security. The benefits will not, or hardly, outweigh the costs. The situation will be dramatically worse in societies (countries or not) in which democratic governance is weak."

That kind of imbalance is what worries **Gwynne Kostin**, director of Web communications at the U.S. Department of Homeland Security: "There are bad guys out there ready to exploit these vulnerabilities. There may be a giant technical step backward caused by privacy concerns."

Forecaster and strategist **Paul Saffo,** director of the Institute for the Future, says the scenario is "a utopian overstatement." He explained: "It underestimates the intrinsic flaws in the technology, and the capacity of clever people to subvert the system for selfish ends. The sensor society will be a mixed bag of real benefits and real cost in terms of lost freedoms. That said, we must press for transparency at every opportunity. The only way to control Big Brother is for all the little brothers to watch back. The most we can hope is that we will be able to find a reasonable balance between privacy and the need to know."

Michael Cannella, a member of Computer Professionals for Social Responsibility and an IT manager for Volunteers of America, wrote, "This 'transparency' will result in loss of liberty and privacy for individuals but will not give the individual human any more information about nor control over the consolidation of power in non-governmental hands, such as multinational corporations. This will partially be a result of misinterpretation (by governments already beholden to these powers' and their interests) of the power of free markets to maximize all possible goods (including social and cultural). This outlook: ignores the reality of collusion, market manipulation and other limitations; overlooks the power money holds over politics (bribery, lobbying); forgets

our historical lessons about relying on the 'invisible hand of the market,' and the strengths of putting other values before money in market management."

A number of the survey respondents expect that information will often flow just one way.

Some respondents mentioned "Big Brother" and "1984" in their answers in reference to George Orwell's dystopian novel. Most just predicted that transparency will not be equitably applied. **Esther Dyson** of CNET, founding director of ICANN, wrote, "The world is not average, and the benefits and costs will not be evenly distributed." **Alex Halavais**, an internet researcher and assistant professor at Quinnipiac University, responded, "Recent events seem to indicate that reciprocal transparency is hardly an obvious future."

Steve Cisler, founder of the Association for Community Networking, put this in the context of double bookkeeping: "Certain groups that have maintained secrecy to guard their power (shamans, governments that are autocratic or kleptocratic, criminals) will continue to do so. There may be double bookkeeping of sorts: a private face and record, and a supposedly open and transparent spin for public scrutiny."

Denzil Meyers, founder and president of Widgetwonder, responded, "The general populace will have the experience noted above, but there are always ways to commit subterfuge for those who are so motivated. We will get lulled into a sense of false security and transparency, allowing the unethical to operate even more quietly than they do now; corporations will be the biggest offenders/danger."

And **Michelle Catlett** of Edubuilder wrote, "The loss of individual privacy will be controlled by the companies and governments that can afford to utilize the massive resources to manipulate the information. This won't be used to benefit the individual. Transparency isn't going to be two-way; individuals will not have access to information about governments or large companies in the same way."

David Elesh, a sociology professor at Temple University, was one of several respondents to propose that people will be able to hide their information for a price or buy an identity. "What will happen," he wrote, "is that those who can afford to do so will create 'managed lives' to convey the impressions that they wish to. This is true now for a thin elite, but it will diffuse." **Hernando Rojas,** a Colombian communications researcher for the United Nations Development Program, agreed, writing: "Privacy becomes commodified, so yes maybe more transparency, but not overall transparency."

In reaction to the prevailing assumption that those in power will try to escape being open to scrutiny, **John Browning,** co-founder of First Tuesday, a global network dedicated to entrepreneurs, wrote, "The global village metaphor holds true here. In villages, everybody knows everybody else's business. The security lies mainly in that, in a village, you know who's trying to find out about you. Governments and privacy advocates need to work to ensure mutual transparency."

There ought to be a social contract – or a better technology regime on the privacy front.

Internet policy makers are already thinking along the lines Browning suggested in his response. **Robert Shaw,** internet strategy and policy adviser for the International Telecommunication Union, said there will be a worldwide movement to protect privacy. "Privacy will be seen more and more as a basic human right," he wrote, "and there will be growing pressure to define this in an international instrument or convention and to have states enforce it through national legislation and regulation."

Boing Boing blogger **Cory Doctorow**, an EFF Fellow, wrote, "Transparency and privacy aren't antithetical. We're perfectly capable of formulating widely honored social contracts that prohibit pointing telescopes through your neighbours' windows. We can likewise have social contracts about sniffing your neighbours' network traffic." And **Hal Varian** of Google and the UC-Berkeley wrote, "Privacy is a thing of the past. Technologically it is obsolete. However, there will be social norms and legal barriers that will dampen out the worst excesses."

Robin Berjon, a technology developer working with the World Wide Web Consortium and Expway, wrote optimistically about the development of technology solutions to protect privacy: "I am convinced that as transparency becomes increasingly visible as an issue to the general public, solutions will be developed to handle the problems it causes while at the same time maintaining as much as possible of the information infrastructure. This relies on a number of technologies such as identity, web of trust, etc., that we have a crucial need to create very soon."

As people weigh costs v. benefits, some see virtues in the open-view world and others see problems.

Daniel Conover, new-media developer for Evening Post Publishing, responded, "The future of intrusive informatic systems will allow participants in private corporate internets access to all sorts of wonders, but their lives will be wide open to paying vendors. Most people will choose this lifestyle, and will continue to choose this lifestyle so long as the tradeoff between 'smart suggestions' and 'intrusiveness' breaks in their favor. Most people will not care to look back through the glass so long as their luxuries and entertainments continue to flow in ever-improving streams. Meanwhile, on the Open Source side of the culture, two-way transparency will change expectations of privacy and public life. Some aspects of life will become more guarded, and laws will require that specific permission be granted before certain types of information can be added to the data stream (think HIPAA). Most Americans, however, will trade waivers of those privacy rights for 'better' products and free access to media. And while Open Source culture will be a minority culture, it will include a vibrant mediascape. Because of its innovative and creative power, the two-way transparency of the Open Source networks will continue to influence the larger culture, even as expressed in the proprietary nets."

Perhaps today's youth will have different views about the tradeoffs between transparency and privacy, according to **Martin Kwapinski,** senior content manager for FirstGov, the U.S. Government's Official Web Portal. He wrote: "We are facing a tidal wave of new thought on this issue. That is, people who are now, and will be coming into their maturity in the next 15 years live in a very different technological environment, and the old meanings of such concepts as privacy are rapidly changing. Younger people seem to be less concerned with keeping private things private!"

Lynn Schofield Clark, director of the Teens and the New Media@Home Project, predicted that viable oversight groups will continue to be vital to the successful protection of privacy in the coming years of increasing transparency. "I am not sure that we as a society will place enough value on this watchdog role to underwrite the costs to continue to pursue lengthy investigations and legal action. It is incumbent on those of us in education and public life to continue to place a value on this watchdog and investigative role … and to continue to push for increased accountability structures, understanding that these must be continually updated so as to keep pace with the changes that technology allows."

Here is the current status of surveillance issues today.

Your life is being recorded in various ways today. Your cell phone is a tracking device. Your personal life and financial status are recorded in various databases. Anyone in the world can find out the tax-assessed value of your home with a 10-second internet search. And, with the further development of "IP on everything," the concept that people and goods will be tagged and trackable on the network through the use of sensors, things are becoming more complex and more transparent simultaneously.

Billions of radio frequency ID (RFID) tags are already in use due to their growing adoption by retailers (such as Wal-Mart) and government agencies (such as the U.S. Department of Defense). The fairly inexpensive, nearly invisible devices are used as a means to improve efficiency. They can be used to track inventory, equipment and personnel; they may replace bar codes. One estimate finds that corporations making RFID devices will make more than $24 billion a year by 2016.

At this point in their development, the information that is captured or transmitted by these tiny devices has little or no security – no screens or firewalls. A report released by researchers at Vrije University in Amsterdam in March 2006 raised concerns that RFID tags might be altered without a user's knowledge and utilized as a transmission medium for computer viruses, noting that the limited storage buffer of such tags (ranging from 90 to 100 bytes) could allow bad code a place to lurk and then enter the network.

A bigger concern is the surveillance applications implicit in the devices. In late May the U.S. Department of Homeland Security issued a 15-page draft report that expresses concerns over the potential use of RFID in identification cards or tokens for illegal tracking of people. "Miners or firefighters might be appropriately identified using RFID because speed of identification is at a premium in dangerous situations," the report reads,

"… but for other applications related to human beings, RFID appears to offer little benefit when compared to the consequences it brings for privacy and data integrity."

Bills regulating RFID tags have been proposed in at least 19 states, and Wisconsin passed a law that took effect in June stipulating that no person may force another to have a microchip implanted in his body. Several nations have begun to embed RFID devices in passports – the U.S. has tested this and is implementing it this summer and fall, despite complaints that the passports can be "read" by anyone with special equipment from 30 feet away.

Concerns have been raised because at this point it is easy to steal or modify data contained on most RFID chips. It is expected the RFID signals sent by U.S. passports will be encrypted.[20]

The internet is no longer a private, borderless network.

The governments of China and other non-democratic nations are exerting more controls and surveillance all the time over the internet – once considered to be a perfect conduit for anonymous communications. This is explained well in the book *Who Controls the Internet?*, by law professors Jack Goldsmith and Tim Wu. In it, they write: "[China] is trying to create an internet that is free enough to support and maintain the world's fastest growing economy yet closed enough to tamp down political threats to its monopoly on power."[21]

They cite the example of Liu Du, a 22-year-old university student whose 2002 online essay titled "How a national security apparatus can hurt national security" caused her to be jailed in a cell with a convicted murderer. When concerned supporters protested on her behalf, five of them were arrested. Liu Du was held for a year and released, but she is not allowed to leave Beijing, she is not allowed to speak to foreign journalists, and she is now under permanent surveillance. Alaa Seif al-Islam was arrested in May 2005 for protesting the beating of women at a pro-democracy rally in Cairo. Seif al-Islam is still in jail, and at least six additional bloggers were arrested for protesting Egyptian government policies in May 2006.[22]

China reportedly employs as many as 50,000 internet investigators who conduct online surveillance, erasing commentary, blocking sites, and authorizing the arrests of people for any communication that is seen to be unpatriotic. In addition it has begun to employ thousands of university students as volunteer internet monitors – the project is named "Let the Winds of a Civilized Internet Blow," and it is part of a broader "socialist

[20] Newitz, A., *The RFID Hacking Ground: They Can Steal Your Smartcard, Lift Your Passport, Jack Your Car, Even Clone the Chip in Your Arm*, Wired Magazine, May, 2006, available online: http://www.wired.com/wired/archive/14.05/rfid.html?pg=1&topic=rfid&topic_set=

[21] Goldsmith, J., Wu, T., *Who Controls the Internet? Illusions of a Borderless World*, New York: Oxford, 2005, p. 89.

[22] Williams, D., *New Vehicle for Dissent is Fast Track to Prison: Bloggers Held Under Egypt's Emergency Laws*, Washington Post Foreign Service, May 31, 2006, online at http://www.washingtonpost.com/wp-dyn/content/article/2006/05/30/AR2006053001178.html

morality" campaign, known as the Eight Honors and Disgraces.[23] Records from a court case in China showed that Yahoo may have been involved in identifying the email account of a dissident writer; Reporters Without Borders announced in April that this is at least the third incident of this type involving Yahoo. Google co-founder Sergey Brin acknowledged in June that his company has compromised its principles by accommodating censorship demands from the Chinese government. Brin told reporters in Washington, D.C., that Google agreed to the censorship only after Chinese authorities blocked its service. The popular search service is now accessible only through the censored site Google.cn.[24]

China isn't the only nation convincing people to participate in voluntary spy service. In another instance of a government recruiting people as active participants in surveillance, Texas governor Rick Perry announced a $5 million plan in June to install hundreds of night-vision cameras along the Mexican border, run live the video feeds on the internet, and encourage anyone with a computer who spots illegal immigrants trying to enter the U.S. to call a toll-free number and turn them in – it's called a "virtual posse."

In these and other less-public cases, governments and corporations are working – sometimes in league with one another – to spy on people, some of whom are being arrested and jailed. In order to convince internet companies to help, in many cases (China for one) governments threaten a loss of access (this equates to a loss of corporate income) if the companies don't follow their wishes in regard to censorship, the sharing of the personal computing records of protesters, and the sending of "tracing" packets out on the network to identify the location of wanted users.

Filtering, network tracing technology and geo-identification were developed to help all nations fight online fraud and other crimes, to help certain nations retain their cultural identity (France is a leader in this regard) and to help corporations and other groups share information selectively on a regional level. Goldsmith and Wu write in *Who Controls the Internet?* that the firewalling of nations is becoming more sophisticated as the newest internet geo-ID technologies are allowing companies to tailor content by geography and avoid sending content to places where it is not legal.

A new battlefield: Who can have access to what data?

Surveillance issues are not limited to non-democratic nations. In a May 2006 preliminary discussion, the FBI suggested that U.S. internet providers consider putting the storage capacity in place to retain their customers' Web-use records for up to two years in order to aid investigations into terrorism, child pornography, and other crimes. FBI and U.S. Department of Justice officials met formally with top internet executives from Google, Microsoft, AOL and other companies in an initial discussion of the request. At this point in time, internet companies generally keep such information as sites visited, email

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[23] French, H., *As Chinese Students Go Online, Little Sister is Watching*, New York Times, May 9, 2006, available online at http://www.nytimes.com/2006/05/09/world/asia/09internet.html?_r=1&oref=slogin

[24] Bridis, T., *Google Compromised Principles*, Associated Press story via Yahoo News, accessed June 7, 2006, at http://news.yahoo.com/s/ap/20060606/ap_on_hi_te/google_censorship_3.

contacts, and downloads for a period of a few days to a few weeks, and the government generally does not have any access to these records. Several internet firms have cooperated by opening records in specific government investigations of pornography and terrorist activity when subpoenaed in the past.

Earlier this year, the Department of Justice and National Security Agency were heavily criticized by privacy proponents for allegedly requesting access from U.S. companies to the phone and internet records of virtually all U.S. customers. U.S. law currently holds that court orders can be issued to require internet companies to turn over records when they have them, but the internet records needed to prove a case are generally erased before they are of use in court. In March, Google was ordered by a U.S. District Court to give the U.S. government a randomly generated selection of 50,000 indexed Websites to test internet filters. The Department of Justice had originally asked for several months of keywords and search results; Google refused, spurring the court action that led to a reduced request, but one that was fulfilled.

Data exposure makes headlines weekly and nearly daily, as personally sensitive data collections stored in corporate and government databases and on digital media are lost or stolen on a regular basis. A famous example: privacy advocates made public the Social Security numbers of then-Rep. Tom Delay and Florida Gov. Jeb Bush, both found easily online on county Websites. Another more recent example: AOL's release of the details of all online searches conducted over a period of time by a large sample of its customer base during the summer of 2006.

Sometimes the data isn't stolen or lost by accident. Some companies have been accused of improperly sharing it for a profit. Gratis, a Washington-based corporation, was sued in March 2006 by the state of New York for selling the personal information of millions of people to email marketers.

Scenario Five

Virtual reality is a drain for some…

Prediction: By the year 2020, virtual reality on the internet will come to allow more productivity from most people in technologically-communities than working in the 'real world.' But the attractive nature of virtual-reality worlds will also lead to serious addiction problems for many, as we lose people to alternate realities.

Respondents' reactions to this scenario	
Agree	56%
Disagree	39%
Did not respond	5%

Because results are based on a non-random sample, a margin of error cannot be computed.

An extended collection hundreds of written answers to this question can be found at:
http://www.elon.edu/e-web/predictions/expertsurveys/2006survey/virtualreality.xhtml

An overview of respondents' reactions to the scenario: Those who have technology available to them will spend more time immersing themselves in increasingly-sophisticated, networked synthetic worlds for work and entertainment. They will be experiencing "virtual" reality more. "Addiction" is a word that bothered some respondents, but others thought it is a likely consequence for some people.

What is virtual reality? Professionals in the field of VR research today say it is the immersion of human sensory channels within a computer-generated experience.[25] This can also be explained by saying VR allows one to be in a place without *really* being in that place. Others consider people who "lose" themselves in today's online role-playing games and even in online chats to be experiencing virtual reality and even "full-immersion VR" because it envelopes their minds to the point where they are not conscious of anything else; still, some don't see this as true VR.

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[25] Biocca, F., Kim, T., & Levy, M. *The vision of virtual reality.* In F. Biocca & M. Levy (Eds.) Communication in the Age of Virtual Reality (pp. 3-14). Hillsdale, N.J.: Lawrence Erlbaum Associates, 1995.

In this survey, respondents' replies reflect the full range of current popular definitions of VR – from the point of view that "it's already happening" (mostly in people's full-scale immersion in today's massively multi-player online role-playing games – MMORPGs) to the idea that the only true VR includes a full-scale 3-D touch-sight-sound experience, generally using highly specialized equipment to shut out "reality" and give one a virtual "presence" in another place.

A majority of survey participants agreed with the proposed 2020 scenario, with many declaring it is already a reality. Most who disagreed with the projection defined "virtual reality" in a more formalized, 3D, all-senses format that has yet to be perfected. Some respondents also took issue in various forms with the use of the terms "reality" and "addiction."

Only a few respondents chose to focus their elaborations on the idea that VR work will allow more productivity than work in the "real" world. **Richard Yee,** competitive intelligence analyst for AT&T,[26] wrote, "By 2020, the term 'virtual reality' will be outdated. The Internet will become more sensory, attracting more applications that will appeal to end-users. The Internet will be surrounded by more applications, where it will become more stimulating. In turn, more productivity will be driven from the new ideas originating from such stimulation."

Ben Detenber, an associate professor at Nanyang Technological University, responded, "VR will only increase productivity for some people. For most, it will make no difference in productivity (i.e., how much output); VR will only change what type of work people do and how it is done."

Glenn Ricart, a member of the board of trustees of the Internet Society, wrote, "Various kinds of computer-mediated business models/productivity models/configurable electronic workspaces will be key productivity enhancers." However, he also added, "There will be an increasing problem with people 'disconnecting' during their so-called leisure time and immersing themselves in purely virtual realities for entertainment purposes. We've already seen how these can be addictive, and, by 2020, the technological capability for them might be near ubiquitous – leading to perhaps an entire generation 'opting-out' of the real world and a paradoxical decrease in productivity as the people who provide the motive economic power no longer are in touch with the realities of the real world."

Respondents were sensitive to the word "addiction."

The use of the word "addiction" influenced most respondents to address this angle of the scenario exclusively in their responses. As author and sociologist **Howard Rheingold** noted, "The way the question is worded embeds some assumptions. I have a serious addiction to reading; is that a social problem? Has the world 'lost' me?"

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[26] A section with more complete biographical data on most respondents who took credit for their remarks can be found at the end of this report.

Writer **Fred Hapgood** responded, "Of course it is totally arbitrary as to who gets to call whom an addict." And **Toby Miller** of the UC-Riverside wrote, "Addiction is a bizarre metaphor to apply to forms of labor and leisure other than drugs. It buys into the medical model's attacks into popular culture."

Respondents predicting that addiction *will* be evident in 2020 were pretty much divided into two camps: those who imply that an addiction to VR can simply be classed with other addictions such as alcohol, drugs and gambling; and those who see VR in a different light as a new concern.

"There are lots of ways to get addicted, and the list changes with time," wrote **Roger Cutler** of the Worldwide Web Consortium and Chevron's Information Technology Division. "It is very unlikely that this source of addiction will have any magic power that others don't." **Robin Gross,** executive director of IP Justice, responded, "VR is no different than offline temptations." **Joe Bishop,** a vice president with Marratech, wrote, "We lose some folks to gambling and drugs now. And if drug addiction isn't an alternative reality I doubt I know what is. I doubt that this will be a serious problem."

"We won't 'lose' people," argued **Randy Kluver,** director of the Institute for Pacific Asia at Texas A&M University and former executive director of the Singapore Internet Research Centre at Nanyang Technological University. "But people will likely find virtual reality more interesting than the offline world. There will be a few people who don't interact much with the outside world, but there is something in human nature that craves real, physical closeness."

Scott Moore has been working with virtual worlds for 10 years as the online community manager for the Helen and Charles Schwab Foundation. He wrote, "I disagree with any large-scale doom prediction surrounding virtual-reality addiction. However, such addiction will progress very much as addictive drugs do. Right now, we see this with the large corporate-based virtual worlds which are like cocaine for some – expensive to produce and to consume. As the tools for creating such places become cheaper and easier to access, we will see lower-quality virtual worlds that will have a wider reach to people with less disposable income (starting with the middle-middle classes and working down). We can see the very beginnings of this progression with the many free social-networking services. Some people will be completely sucked in and their lives ruined, much as what happens for drugs now. However, the toll will still be far less than the damage to lives and communities that chemical drugs can do."

Torill Mortensen of Volda University College in Norway wrote, "First, there is nothing virtual about digitalised space. It has real-life effects, rewards, and problems. Second, what do we lose people to today? Is it better to go jump off a mountainside for your kicks or do drugs than to spend it in some digital version of reality that feels better and more rewarding? The main problem isn't that 'virtual worlds' are addictive; it is that the physical world is not sufficiently challenging and rewarding. Blaming the media should not be a way out of fixing the very real social problems the world faces."

Bryan Trogdon, president of First Semantic – a company working on a realization of the Semantic Web – responded, "Wall-sized monitors in conjunction with speech recognition, artificial intelligence, wireless broadband and computer power will take us from television to teleliving, a term defined by Professor William E. Halal as 'a conversational human-machine dialogue that allows a more comfortable and convenient way to shop, work, educate, and conduct most other social relationships.' I agree with his assessment that people will still crave real social relationships."

Some define the issues differently; they envision a threat.

Among those expressing concern over the future use of alternate realities is **Robert Shaw**, an internet strategy and policy adviser for the International Telecommunication Union, who wrote, "This is already the case in immersive gaming environments and virtual reality will be even more addictive. Policy and regulation will move increasingly from physical space into virtual space with analogous rules." **Fredric Litto,** a professor at the University of Sao Paulo, wrote, "Good legislation will make it obligatory to identify virtual objects and environments to users so that there can be no confusion between the real and the apparently-real."

Sean Mead, a technology consultant, wrote, "Simulations will develop to where some players' experiences so closely mimic reality that the players will be stimulated with the same neurotransmitters that drive feelings of love and pleasure in the real world. There will be simulations as addictive as nicotine and cocaine, but without same degree of societal antipathy." Consultant **Thomas Lenzo** agreed, writing, "as the quality of virtual reality increases, it will attract more users and the numbers of cyber-addicts will increase."

Tiffany Shlain, founder of the Webby Awards, wrote, "I already see many internet junkies who need a fix more than they can be present in the moment." **Denzil Meyers,** founder and president of Widgetwonder, expressed concern over a self-selected social stratification, writing, "These technologies allow us to find cohorts which eventually will serve to decrease mass shared values and experiences. More than cultural fragmentation, it will aid a fragmentation of deeper levels of shared reality."

Technology consultant **Robert Eller** responded, "A human's desire to reinvent himself, live out his fantasies, overindulge, addiction will definitely increase. Whole communities/subcultures, which even today are a growing faction, will materialise. We may see a vast blurring of virtual/real reality with many participants living an in-effect secluded lifestyle. Only in the online world will they participate in any form of human interaction. The gin holes of 19th century London or the opium dens of Shanghai are very likely outcomes."

Nick Carr, an independent writer and consultant, wrote, "I'm not sure if addiction is the right word, but the shift of people's attention to online information, media, entertainment and communities will erode culture and bring into being a colder if more efficient world." And **Hal Varian**, a professor at the UC-Berkeley and consultant for Google, responded,

"I think we can see this happening now. The question is whether this is really a bad thing. Personally, I think it is, but I'm not sure I could defend that view philosophically."

Addiction expert **Walter J. Broadbent** of The Broadbent Group offered a solution to VR addiction in his response. "I have studied addiction for 36 years. We already have tons of addicts in the world who STERB. That is, they use Short-Term Energy-Releasing Behaviors to feel better. We already have millions who are addicts. The issue is not to regulate them but to offer a life in which such behavior is not needed, and that, too, can be accomplished on the internet. We need to create valuable and helpful communities on the Web that will allow millions to connect."

Some specifically address concerns toward youth culture.

Ed Lyell, a pioneer in education and the internet who now works at Adams State College, proposes that we take a close look at finding ways to provide guidance to young people as they create their alternate, online personalities. "This is already the new reality for many youth," he wrote. "Instead of dealing with the challenges and fears of teen identity definition more and more youth are creating multiple 'virtual' personalities and losing themselves to each of those game scenarios. Who the 'actual' individual becomes or emerges as from such vivid role-playing is unclear to me. Do we end up with much more mature, experientially compassionate people, or even more anxious, fearful, and disassociative personalities? It seems that even minimal intervention at appropriate stages of virtual personality creations could dramatically improve positive over negative long-term outcomes."

Michael Cann Jr., CEO of Affinio Corporation, responded, "It will be possible for computer users to build 'alternate realities' around themselves, and some will find this environment to be so much more appealing and comfortable than the 'real world' that they will prefer it. I see a future epidemic, especially among children and teens." **Paul Craven** of the U.S. Department of Labor wrote, "Anyone with a teenager can tell you this is already a problem."

Heath Gibson, competitive intelligence analyst for BigPond in Australia, wrote, "Addiction to chat rooms and online gaming worlds is already emerging as an issue. Recent research has highlighted for example, how teenagers' ability to learn during school hours is being impacted by a lack of sleep – caused by late-night SMS/chat sessions. There is a real risk that some people will become 'lost' to virtual worlds."

Gordon Bell, senior researcher at Microsoft, assessed the prediction this way: "VR, like email, IM, blogging, gaming, is a new and interesting technology that competes for time and like the others, may become addictive. It will still be up to the individual."

A number of respondents simply classify VR with books, TV and other communications advances.

Some respondents drew comparisons with earlier communications innovations, including books, television and films. "We will survive to discover new horrors beyond VR," wrote **Paul Saffo.** "The history of media is a history of addiction for some, and moral hazard for others. Remember that half a millennium ago, Cervantes' Don Quixote was driven to windmill-tilting madness because he read too many books. Flaubert's Emma in 'Madam Bovary' got into a jam for the same reason. A century ago, parents lamented that kids were spending too much time inside reading. In mid-century the same fears were transferred to paperbacks, movies and then TV. Now it is videogames and the Web. VR is clearly next, and its seductive hyper-realism will be seductive indeed. But one generation's outrage is the next generation's mainstream tool. I will bet that in 2020, parents will be lecturing their children that they can't go out and play until they finish their VR-based simulation games."

Douglas Rushkoff, author and teacher, agrees: "As virtual reality gets better, people's ability to see through it gets better. Novels were the dangerous VR of their own day, just as TV was for us kids, and computer-simulated realities will be for our own kids."

As worlds converge, how do you define "reality"?

With many going online to participate in IM chat, emails, video conferencing, gaming, shopping, surfing and work, some respondents said it is already difficult to draw a line between what we once called "reality" and the virtual world.

Ted Coopman of the University of Washington wrote, "'Virtual reality' is a pointless and dated term that has no meaning other than the technical (computer science) definition. We live in a pervasive communication environment and this will only increase. The demarcation of virtual and real and mediated and non-mediated will have no meaning for most people and is an artifact of older generations. Reality will be one seamless world that spans face-to-face and digital areas of action. If anything, the ability to physically take a class or travel to meet with someone will be considered an elite privilege."

"The real and virtual are converging, and anyway, addiction is a disease for which we will soon find the cure; just a matter of suppressing the expression of a few genes here and there," wrote **Bob Metcalfe,** Ethernet inventor, founder of 3Com Corporation, and former CEO of InfoWorld.

Daniel Wang, principal partner with Roadmap Associates, wrote, "While area codes might still define geographic locations in 2020, reality codes may define virtual locations. Multiple personalities will become commonplace, and cyberpsychiatry will proliferate."

Martin Kwapinski, senior content manager for FirstGov, the U.S. Government's official Web portal, responded, "The distinction between 'real' and 'virtual' realities will continue to blur … Our definitions of what is 'real' will be tested and changed." **Raul Trejo-Delarbre** of Universidad Nacional Autonoma de Mexico wrote, "'Virtual reality' doesn't constitute a different reality. It is part of the reality that surrounds us."

"The internet is becoming increasingly transparent – just as the air is," argued **María Laura Ferreyra**, Instituto Universitario Aeronautico. "We will use it all the time as part of our daily life, just as we constantly breathe air. Therefore, we cannot become addicts to internet anymore than we can become addicts to air."

Charles Hendricksen, a research collaboration architect for Cedar Collaboration, wrote, "For professional communities, 'virtual reality' is a meaningless term. Transactions made on the Internet are completely and totally real."

Clement Chau, of Tufts University's Developmental Technologies Research Group, responded, "Virtual reality will merge with 'real reality' in that some activities will be predominantly virtual, while others will be real. A new term will probably be coined to describe real reality. When this merging of the two realities happens, addiction problems will not be a concern because, a) the novelty wears off, b) virtual reality REQUIRES participation in real reality, and c) virtual reality will become part of the daily lives, as much as the telephone or emails has become part of our everyday routines."

Patrick O'Sullivan of Illinois State University wrote: "What people refer to as 'virtual reality' is still an aspect of all of our reality – it's not a separate reality any more than books, movies, video games, or our imagination is a separate reality. Saying someone is addicted to virtual reality will one day sound as ridiculous as saying some people today are addicted to books." And **Alex Halavais** an assistant professor at Quinnipiac University, responded, "Alternate to what realities? Phone realities? The most recent Pew study seems to belie this: those with stronger virtual social ties have stronger ties generally."

Defining virtual reality today has to do with defining "presence."

Thousands of years ago, Roman naturalist Pliny expressed one of the earliest interests in perceptual illusion when he wrote about an artist who had "produced a picture of grapes so dexterously represented that birds began to fly down to eat from the painted vine."[27] Computer graphics and VR scientist Ivan Sutherland wrote in 1965: "The ultimate display would, of course, be a room within which the computer can control the existence of matter."[28]

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[27] Biocca, F., Kim, T., & Levy, M. *The vision of virtual reality.* In F. Biocca & M. Levy (Eds.) Communication in the Age of Virtual Reality (pp. 3-14). Hillsdale, N.J.: Lawrence Erlbaum Associates, 1995.

[28] Sutherland, Ivan, *The Ultimate Display*, from the Proceedings of the International Federation of Information Processing Congress, 2, (pp. 506-508).

Most researchers say virtual reality can be defined as a particular type of experience. It goes beyond the "goggles and gloves" systems first emerging in a useable form in the 1990s. Hardware, they say, should not be the focus in defining VR in terms of human experience. The ultimate goals of VR have been defined over time as the amplification of human cognition, perception, and intelligence. They say it has to do with one's "presence."

When perception/presence/cognition is not mediated by a communication technology, it reflects only immediate physical surroundings. A mediated environment can be considered an alternate reality or a virtual reality. VR is an experience in an alternate perception. VR researcher Jonathan Steuer of Stanford University has found that different individuals reach this state at different levels in differing ways. He says VR is distinguished from dreams and hallucinations because it requires perceptual input introduced through a communications medium. He also says participation in RPGs, MUDs and online discussion groups can be the construction of a virtual reality in a virtual space.[29]

As the levels of vividness and interactivity intensify the VR experience in the future, more users are likely to be spending more hours in virtual reality. Steuer warned in a 1995 research article that as VR is perfected it may present dangers: "Rapid advances in both multimedia computer technologies and high-speed data networks hasten the development of a truly global village, in which our ability to interact with friends, family and others who share interests similar to our own will no longer be limited … These new developments are also certain to enhance the possibility of using the media to manipulate and control beliefs and opinions … As an increasing proportion of most individuals' experiences come via mediated rather than direct sources, the potentially detrimental effects of such manipulation increases exponentially."

Users are already "migrating" to synthetic online worlds.

VR pioneer Jaron Lanier (the man who coined the term "virtual reality" in 1987) and researcher Frank Biocca predicted in 1992 that the market for VR entertainment would be fairly advanced by 2000, with VR "theaters" in malls, enabling people to watch VR "performances."[30] There are no such elaborate theaters in 2006, although one might argue that productions shown in the best Imax theaters might approximate a feeling of VR. While Mattel introduced the PowerGlove in 1989 (for $89) for use with Nintendo video games, and gamemaker Sega Genesis introduced a headset with VR goggles and earphones in the fall of 1993 for $150, the goggles-and-gloves VR idea has not been mainstreamed. Most "totally-immersive" VR technologies have remained too expensive for use outside major industries such as medicine, the military, and flight-training services.

[29] Steuer, J., *Defining Virtual Reality: Dimensions Determining Telepresence*, Journal of Communication, 42 (4), 1995, 73-79.
[30] Lanier, J., & Biocca, F. (1992). An inside view of the future of virtual reality. *Journal of Communication*, 42(2), 150-172.

But millions of people are finding in 2006 that they become so immersed mentally in massively multi-player online role-playing games that they feel themselves to be physically living and moving about in these limited but effective synthetic worlds. They say they are already experiencing VR. This phenomenon is most overwhelmingly in evidence in Korea, where broadband is nearly universally available and where a majority of people spend at least some time most days populating online worlds of one type or another.

In his 2005 book *Synthetic Worlds*, Edward Castronova wrote that "a virtual reality brought about by games rather than devices" is gaining users at the rate of Moore's Law (i.e. doubling every two years), and the current number of "hard-core" users numbers at between 10 million and 27 million people. He estimated the commerce conducted between people who spend time in synthetic worlds amounts to at least $30 million annually in the U.S. and $100 million globally, and the collective volume of annual trade within synthetic worlds is above $1 billion.[31]

The currencies of online worlds have begun to be traded against the dollar, and many of them trade at a higher rate of exchange than real Earth currencies. Some of the most popular of these games in 2006 include World of Warcraft, Second Life, Ultima Online, EverQuest, Lineage, Star Wars Galaxies, Legend of Mir, Eve, There, Mu and Dark Age of Camelot.

Second Life co-founder Philip Rosedale told Wired magazine that the monthly trade in his synthetic world is about $8 million and trending upward, and he added, "I'm not building a game; I'm building a new country." ICANN member Joi Ito testified in the same issue that he is a World of Warcraft "addict," adding, "It represents the future of real-time collaborative teams and leadership in an always-on, diversity-intensive, real-time environment – World of Warcraft is a glimpse into our future."[32]

In his book, Castronova predicted what he calls the "migration" of more and more people to computer-rendered internet communities and added, "Synthetic worlds are simply intermediate environments: the first settlements in the vast, uncharted territory that lies between humans and their machines … Add immense computing power to a game and … the place that I call 'game world' today may develop into much more than a game in the near future. It may become just another place for the mind to be, a new and different Earth … Ensuring that the technology serves such a marvelous end, rather than a less-happy one, is the real challenge for the next few decades. We will be less likely to meet that challenge the longer we treat video games as mere child's play." Castronova added, "There is a huge throng of people just waiting at their terminals for a fantasy world to

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[31] Castronova, E. (2005). *Synthetic Worlds: The Business and Culture of Online Games.* Chicago: University of Chicago Press., 2, 13, 55.
[32] *Superheroes of the Wired World: The 2006 Rave Awards*, June 2006, available on line at http://www.wired.com/wired/archive/14.06/warcraft.html and http://www.wired.com/wired/archive/14.06/rosedale.html

come along, one that is just immersive enough, under the technology they can afford, to induce them to take the plunge and head off into the frontier forever."[33]

Researchers warn about "toxic immersion" and other threats.

People are already using synthetic worlds like Second Life to host parties, offer schools, fight wars, exhibit art, conduct business, present theatrical stagings, exhibit political structuring and strife, and experience friendship, sex and marriage. As humans begin to spend many hours in these alternate worlds, they invest time and money, building personal assets. Security in synthetic worlds is a question, just as it is in the "real" online world, and researchers say there is a possibility of "toxic immersion."

Michael Shapiro and Daniel McDonald of Cornell University wrote in a 1995 research piece, "As the distinction blurs between the physical and computer environments, people will need to make increasingly sophisticated judgments about what is 'real' and what is not … we expect that aspect of communication research to become increasingly important as technologies like virtual reality make it possible to both mimic and to modify our perceptual bases of understanding in increasingly complex ways." They pointed out that whenever a new communications medium evolves and emerges people have a tendency to apply their already-established judgment processes to the new mode of delivery. This often leads to errors and problems (i.e. the 1938 CBS radio theater production of "War of the Worlds" leads to a panic). It takes a period of adjustment for people to become sophisticated in their reception and perception of information delivered in a different way.[34]

In his book, Castronova predicted three major threats presented by networked VR: 1) a sociopath might create an addictive world; 2) an unethical corporation might build a world that is a threat in some way; 3) an irresponsible government agency might seduce people into an addictive world or regulate other worlds in a way that endangers or causes injury or restrictions to users.[35] He warned: "We are unprepared for the emergence of a peer-to-peer world that might expose us to risks that we would rather not face. We can see countless opportunities for research, education and innovation, but only a small cadre of for-profit builders have mastered the craft of building worlds, and there are no training programs that teach it. In view of this general ignorance of synthetic world technology and all it might mean, perhaps the wisest policy of all at this point would be simply to support more research."[36]

In 1991, VR pioneer Tom Furness predicted before the U.S. Senate Subcommittee on Science, Space and Technology that "televirtuality promises to subsume the existing

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[33] Castronova, pp. 267-294.
[34] McDonald, D. & Shapiro, M. (1995). *I'm Not a Real Doctor, but I Play One in Virtual Reality: Implications of Virtual Reality for Judgments About Reality.* In F. Biocca & M. Levy (Eds.) Communication in the Age of Virtual Reality 95 (pp. 3-14). Hillsdale, N.J.: Lawrence Erlbaum Associates
[35] Castronova, p. 253.
[36] Castronova, p. 283.

media of communications." He explained that both humans and computers are growing more intelligent and as they do so they are collapsing their differences and merging.[37]

In responding to the 2006 survey scenario, **Marilyn Cade**, a technology consultant and policy expert, wrote, "We should acknowledge and embrace this as a challenge and look for solutions and remedies, and safeguards … We should not deny the value of the advances of technology because of the harm; we should embrace the technology and study and seek to provide any appropriate awareness and safeguards, harnessing technology/and managing it effectively. To benefit, and not to harm humankind is the next frontier, isn't it?"

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[37] *New Developments in Computer Technology*, Committee on Commerce, Science, and Transportation, United States Senate. May, 8, 1991. Washington, DC: U.S. Government Printing Office.

Scenario Six

The internet opens worldwide access to success…

Prediction: In the current best-seller *The World is Flat,* Thomas Friedman writes that the latest world revolution is found in the fact that the power of the internet makes it possible for *individuals* to collaborate and compete *globally*. **This scenario: By 2020, the free flow of information will completely blur current national boundaries as they are replaced by city-states, corporation-based cultural groupings, and/or other geographically diverse and reconfigured human organizations tied together by global networks.**

Respondents' reactions to this scenario	
Agree	52%
Disagree	44%
Did not respond	5%

Because results are based on a non-random sample, a margin of error cannot be computed.

An extended collection hundreds of written answers to this question can be found at:
http://www.elon.edu/e-web/predictions/expertsurveys/2006survey/accessandboundaries.xhtml

An overview of respondents' reactions to the scenario: There will be increasing opportunity for global success, and people will form allegiances to geography-neutral social and work groupings while maintaining a national and/or regional identity as well. Some inequities will continue to exist in regard to technology knowledge and access, and some nations and corporations will continue to try to restrict what people can accomplish online.

A great number of the people of China and India are using networked digital technology today to advance their economies and change the landscapes of their lives. These countries are held up as the prime examples, but many groups and individuals across the world are less isolated than they were just a decade ago, thanks to their leveraging of a relatively new tool called the internet. A commonly cited proof of this is India's IT offshoring revenue, which totaled $17.2 billion in 2005, with more than 1 million Indian IT workers serving overseas customers.

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While many thinkers recognized and wrote and spoke about the globalization brought about by networked communications before *New York Times* columnist Thomas Friedman published his best-seller *The World is Flat*, Friedman's book brought issues tied to technology and the future to the attention of well-read people in the West. Where will accelerating social and technological progress take the world in the next 15 years?

Survey responses to this proposed future ranged from "this will never happen" to "it's happening now." A considerable number of respondents agreed with the primary thrust of this scenario: that national groupings are being displaced to some extent by reconfigured human organizations tied together by global networks – city-states, corporation-based cultural groupings, and/or other geography-neutral sets of people. As in most of the earlier scenarios, a significant number of people found fault in enough of this proposed future to disagree with it and many wrote elaborations that both agreed and disagreed with aspects of this future.

Hal Varian, an expert on economics and technology at the UC-Berkeley and consultant for Google,[38] wrote, "I certainly agree that the Internet allows small groups to compete globally; in fact, I've written about 'micro-multinationals' as becoming an important force. But I think that such forces only work well in some domains. People will still be plowing fields on their own."

"I agree [with the prediction]," wrote **Anthony Rutkowski** of VeriSign, a co-founder of the Internet Society. "The mechanism for doing this, however, is the Next Generation Network infrastructure, not 'the internet.'"

Daniel Wang, principal partner with Roadmap Associates, wrote, "Much like tectonic shifts moved land masses long ago to form world geography, the online shifts we're experiencing are reconfiguring the human experience to form a new world order – one without borders. Success, however, will depend on the accessibility to networks, and whether the flat world is going to be an equal-opportunity one."

Luc Faubert of dDocs, president of Quebec's Internet Society chapter and an ambassador to the World Summit on the Information Society, wrote, "Both types of associations are needed and will co-exist: a) a cross-border, interest-driven virtual communities; and b) local communities.

Gordon Bell, a senior researcher with Microsoft, noted an economic reconfiguration will result from this scenario. "In the intervening 15 years," he responded, "there is going to be a very large financial reckoning as power is rebalanced."

Marc Rotenberg, executive director for the Electronic Privacy Information Center, said politics are key. "Citizens may be less willing to allow the collapse of nation states if they believe that international organizations lack accountability," he wrote. "The debate over the WTO is a precursor to the future." **Michel Menou**, an information-science researcher

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[38] A section with more complete biographical data on most respondents who took credit for their remarks can be found at the end of this report.

who has worked in nearly 80 nations, wrote, "The decline of the nation-state is much more the result of the subversion of those supposed to represent and defend the common interest by forces that represent particular ones."

Some project the possibility of turbulence and even violence.

Paul Saffo, forecaster and director of the Institute for the Future, responded, "I mostly agree, but strongly object to the Panglossian overstatement. This trend will continue, but the old order will fight back. National governments will aggressively defend their power, and corporate incumbents will fight dirty against networked challengers. I thus believe that the 2020 networked world will be a turbulent place, full of opportunity and real innovation, but also real risks. Friedman's writings will take their place alongside earlier optimist tracts extolling the wonders of technologies-to-come that over the years touted the benefits of radio (1930s), television (1950s), and personal computers (1970s)."

Pekka Nikander of Ericcson Research and the Helsinki Institute for Information Technology, a past member of the Internet Architecture Board, also expressed concerns about aggression. "The hind side of this scenario," he wrote, "is that the collapse of nation states and other existing power structures is unlikely to be peaceful, causing widespread low-intensity violence."

Robin Lane, teacher and philosopher at Universidade Federal do Rio Grande do Sul in Brazil, responded, "It may lead to less conflict between nations. However it may also result in more conflict as it creates cultural interfaces that were not factors in people's experience prior to high-speed international communications."

Ted Coopman of the University of Washington wrote, "Friedman … missed the 'democratization' of mass violence. While there will certainly be mass cooperation and competition, there will also be the ability of heretofore ineffectual entities to project power in unexpected and disruptive ways. This will be especially true for those who hold totalizing worldviews. This will result in a constant, global, low- to medium-intensity insurgent warfare manifesting across all venues and using all manner of repertoires to further agendas or thwart others. This will not be an entirely bad thing, as cooperation and building affinities and alliances will be the keys to success, rather than coercion."

Some say national divisions are too strong to disappear.

Many respondents said the established political systems in current world governments will resist major erosion and remain dominant. "Nation-states can control access to the Internet if they choose to," wrote **Joe Bishop**, a vice president with Marratech AB. "I doubt that national boundaries will dissolve by 2020 unless we discover extra-terrestrial intelligent life." Agreed **Charlie Breindahl** of the University of Copenhagen: "China is not going away by 2020."

John Quarterman, president of InternetPerils Inc., responded, "Some countries, such as U.S., Japan and China, will remain sufficiently nationalistic that even with blurring they'll

still be distinct. Even in Europe, the EU project has had recent setbacks, and while national boundaries are more porous than they used to be, national feeling still exists. Blurred yes; completely, no."

Barry Wellman, director of NetLab at the University of Toronto, wrote, "We still have bodies; we, states and organizations still have territorially-based interests (in the political sense of that word)."

Gary Chapman, director of the 21st Century Project at the LBJ School of Public Affairs at the University of Texas-Austin, wrote, "Nation-states are not going to go away, nor is nationalism." And **Fred Baker,** chairman of the board of trustees for the Internet Society, responded, "Gee, I'd love to see world peace, but I don't believe that the Internet alone will be able to accomplish it. Much of the thinking in *The World is Flat* is valid. However, I doubt that the Western notion of a nation-state will significantly change during my lifetime."

Robert Shaw, internet strategy and policy adviser for the International Telecommunication Union, wrote, "The contribution and creativity of individuals has always been important, way before the internet, but what the internet offers is a mechanism that connects and leverages individual creativity and behaviour into a collective mechanism that both rewards individual excellence and joint efforts. Therein lie the benefits. The individuals continue to live in nations, societies and cities with their own value systems that are not going to be displaced by this behaviour."

Alan Levin, a network architect and chairman of the South Africa chapter of the Internet Society, responded, "I partially agree, as national boundaries will be even more emphasized in those countries where there has been political resistance (explicit or inadvertent) to the information age. These countries will effectively become outdated islands of information poverty."

Peter Kim, senior analyst for Forrester Research, wrote, "I think this is feasible, but not in the timeframe. Government regulation will slow the pace of this change as political constituencies fight to keep revenue sources local."

A number of respondents take issue with the use of the phrase "completely blur."

Most respondents see a great deal of the scenario as likely, but some took issue with the strong wording indicating that shifting social and economic groups will take the starch out of national boundaries. "Virtual connections *will* increase in scale, scope and importance," wrote internet policy analyst **Alan Inouye**. "I disagree about the magnitude of this change by 2020 (e.g., don't agree with 'completely blur'). Physical relationships and communities will continue to be important. Nations have a lot of history, ideology and culture."

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Esther Dyson of CNET Networks, former chairman of ICANN, responded, "I disagree with 'completely.' Moreover, if anyone can be successful, then those who are not successful (by whose definition?) must be responsible for their own failure." **Adrian Schofield**, of South Africa's ForgeAhead, an ICT research and consulting firm, responded, "Although I agree in principle, there remains sufficient misguided nationalism to maintain borders between people – despots and dictators will still be in power."

And **David Weinberger,** a writer and teacher at Harvard's Berkman Center put it this way: "The world is flat, but it's also lumpy. We cluster together. Geography is one powerful attractor. So are interests. We're capable of maintaining many sets of relationships simultaneously."

Howard Rheingold, author and internet sociologist, wrote, "I disagree with the word 'completely' here, but I agree that Friedman's 'flatteners' add up to a powerful force. I would also point out that the global economic flows enabled by communication infrastructure are highly dependent on cheap petroleum when it comes to moving matter around. That could change overnight."

Glenn Ricart, a member of the Internet Society Board of Trustees, responded, "The phrase 'completely blur' probably goes too far, but it's fair to say that new non-geographical allegiances will become as important and probably more important than today's geographical communities. However, note that in addition to being connected with like-minded people, I also need to have economic intercourse with complementary groups. Hence, although I'm a Ph.D. computer scientist and will want to connect with the same and equivalent world-wide, I also want to connect with farmers who grow and will ship me great produce. The real world counts because I still can't get fine dark chocolate to appear from my wireless PDA. In fact, I suspect I'll spend a minority of my time with like-minded people of all types (cultural groupings, etc.) and the majority of my time with complementary people and groups."

David Clark, a senior research scientist at MIT and one of the original architects of the internet, responded, "I agree, except that I don't think national boundaries will be replaced. They will continue to play an important role. But it will be less unique. National identity will continue to be with us."

Technology writer and consultant **Fred Hapgood** took issue with the timing of the scenario. "It will all happen, but the right date is closer to 2120 than 2020; national cultures run deep," he wrote.

Corporate-based global groups draw fire from some respondents.

Concerns were expressed over the chance that business-based groupings with an emphasis on bottom-line financial goals will become too strong. "The Internet will open worldwide access to opportunities for success; it will also open ways for many dysfunctionalities," responded **Alejandro Pisanty,** an officer of ICANN. "Corporation-based cultural groupings may actually be one of the most destructive forces if not enough

cultural, relational, and bottom-up social forces are built up. This does not detract from the prediction that a lot more people than today will have a good life through extensive networked collaboration."

Peter Nieckarz Jr., of Western Carolina University, wrote: "It will not be city-states so much as it will be corporations that become the sovereign entities transcendent of geographic space."

Andy Williamson, managing director for Wairua Consulting Limited and a member of the New Zealand government's Digital Strategy Advisory Group, wrote, "I suspect there is likely to be a huge backlash against the global corporatisation of the world and commodification of culture. I also do not see a free flow of information, given the current attempts by many to control it. However, localised and topical tribalism (and multi-tribal affiliations) seem likely to rise."

Scott Moore, online community manager for the Schwab Foundation, responded, "There was a time that one could literally connect a computer to the internet and be on – now one must register the IP connection, which means such a connection can be denied. It is not freedom when a corporation or government holds the key to the cage."

Mirko Petric of the University of Zadar in Croatia wrote, "It can be hardly expected that current national boundaries will blur completely by 2020, but it can be predicted with a great deal of certainty that corporate-based power will continue to exert its influence, relying on the possibilities offered by the new technologies – not only the internet but also beyond it. In any sort of prediction of this kind, some room should be left for cultural forms that will be a reaction to this state of affairs."

Sam Punnett, president of FAD Research, sarcastically replied, "The corporation-based cultural groupings will still be called countries in 2020."

Where do nations stand in the current networked world?

While many people replied that 2020 will find us in a mostly positive place where national boundaries are disappearing thanks to cross-cultural communications, a number of the survey respondents dismissed this scenario, using words and phrases such as "Pollyannaish," "Nice dream," "Piffle" and "Get real." Perhaps they are familiar with another recent book, *Who Controls the Internet?* (Oxford, 2005) by Jack Goldsmith and Tim Wu.

The authors, both American law professors, describe how political and economic interests have come into play over the past decade in making the internet a much less "open" place than it was in the early 1990s. They dispel any notions that John Perry

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Barlow's free "civilization of the mind in cyberspace"[39] might still exist, and even go so far as to say that a "geographically bordered internet has many underappreciated virtues."

Their main argument runs like this: "Citizens want their government to prevent them from harming one another on the internet and to block internet harms from abroad. Companies need a legal environment that guarantees stability in the network and permits internet commerce to flourish. The bordered internet accommodates real and important differences among peoples in different places, and makes the internet a more effective and useful communication tool as a result."[40]

Goldsmith and Wu write that corporations and governments are working in concert to solidify their power, using the architectures of the internet and the law in addition to leveraging the sort of economic coercion seen in China's internet oversight and censorship.

Governments that wish to exercise control threaten a loss of access (this equates to a loss of corporate income) if internet companies don't follow their wishes in regard to censorship, the sharing of the personal computing records of protesters, and/or the sending of "tracing" packets out on the network to identify the location of wanted users. Network tracing technology and geo-identification was originally developed to help all nations fight online fraud and other crimes, to help certain nations retain their cultural identity (France is a leader in this regard), and to help corporations and other groups share information selectively on a regional level.

Goldsmith and Wu write that today's "bordered internet reflects top-down pressures from individuals in different places who demand an internet that corresponds to local preferences and from the Web page operators and other content providers who shape the internet experience to satisfy these demands."[41]

They maintain that if the trend of the past decade continues, the internet will continue to be more regulated at various levels (to fight crime, build trust in the system, etc.), and control of content will be easier to exercise, to positive and negative effect.

Those who prefer to see the glass half full might want to read *An Army of Davids: How Markets and Technology Empower Ordinary People to Beat Big Media, Big Government, and Other Goliaths*, by Glenn Reynolds (Nelson Current, 2006), or *The Only Sustainable Edge: Why Business Strategy Depends on Productive Friction and Dynamic Specialization,* by John Hagel III and John Seely Brown (Harvard Business School Press, 2006). Reynolds says accelerating advances in technology will increase individuals' empowerment at an accelerating rate over the next few decades. Hagel and Brown say, "The acceleration of capability building will shift our individual and collective mind-sets from a worldview that focuses on static, zero-sum relationships to

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[39] Barlow, J.P. Declaration of Independence for Cyberspace," online June 8, 2006, at
http://www.missouri.edu/~rhetnet/barlow_declaration.html
[40] Goldsmith, J., Wu, T., *Who Controls the Internet? Illusions of a Borderless World*, New York: Oxford, 2005, p. viii.
[41] Ibid, p. 89

one that focuses on dynamic non-zero-sum relationships … This new worldview emphasizes the importance of the evolution of local ecosystems."

While the United States has been a juggernaut of innovation and it has owned the world's biggest economy for a long stretch, analysts have seen the pendulum swing over the last decade. A great deal of this is tied to the ways in which people have been using networked communications to open new opportunities and markets; the enhanced connectedness brings it all together. A recent Goldman Sachs report projects that China will have the largest economy in the world by 2045. Clyde Prestowitz writes about this in detail in *Three Billion New Capitalists*, his book about the influence of increasing participation in the global economy of people from India, China and the former Soviet Union.

In his response to the 2020 scenario presented in this Pew Internet survey, **Amos Davidowitz** of the Institute of World Affairs and Association for Progressive Education wrote:

"The nation-state is an invention of the industrial world that allowed the most efficient management of resources both material and people. The information age needs the flow of ideas, the political form always follows the economic need. We will see a flattening of the nation-state in Western society. In third-world countries and networks of ethnic grouping such as the Arab world, we will see a desperate attempt to hold onto the framework as is. We cannot forget that Eastern Europe, Africa, and Asia lost many years, due to imperialism, to work through the various aspects of nationalism. It took Western Europe a thousand years and two very bloody world wars to work out the kinks of nation, culture, country, resource. The future is brighter since the source of wealth is no longer based on carbon, such as oil, minerals, land, which are limited – but based on information and creativity which is limitless."

Scenario Seven

Some Luddites/refuseniks will commit terror acts…

Prediction: By 2020, the people left behind (many by their own choice) by accelerating information and communications technologies will form a new cultural group of technology refuseniks who self-segregate from 'modern' society. Some will live mostly 'off the grid' simply to seek peace and a cure for information overload, while others will commit acts of terror or violence in protest against technology.

Respondents' reactions to this scenario	
Agree	58%
Disagree	35%
Did not respond	7%

Because results are based on a non-random sample, a margin of error cannot be computed.

An extended collection hundreds of written answers to this question can be found at:
http://www.elon.edu/e-web/predictions/expertsurveys/2006survey/ludditesoffthegrid.xhtml

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An overview of respondents' to the scenario: Resistance to the effects of technological change may inspire some acts of violence, but most violent struggle will still emerge from conflicts tied to religious ideologies, politics and economics. Many people will remain "unconnected" due to their economic circumstances. Some will choose to be unconnected for various reasons – all the time or sometimes.

The word "Luddite" has come into general use as a term applied to people who fear, distrust, and/or protest technological advances and the changes they engender, and "refusenik" has become a term used to refer to people who do not want to participate in the actions routinely expected of a particular social group. The use of these commonly accepted terms drew some resistance and that added some thoughtful insights to the discussion. One respondent also suggested an alternative term. "There will be refuseniks, but not enough Unabombers to make it a trend," wrote **Barry Parr**, an analyst from

Jupiter Research,[42] adding: "'Luddite' will be retaken by 'technoskeptics' as a positive term."

It is likely that most if not all people have some concerns about the negative effects of new technologies. The level of concern differs from individual to individual, and the reasons for such fears vary as well. It is impossible to gauge the numbers, but Kirkpatrick Sale, author of the book "Rebels Against the Future" wrote in his 1997 essay "America's New Luddites"[43]:

"A Russian scholar claimed five years ago that there were as many as 50 to 100 million people who 'rejected the scientific, technocratic Cartesian approach.' Surveys show that in the U.S. alone more than half of the public (around 150 million people) say they feel frightened and threatened by the technological onslaught … in 1996 the trend was reported in magazines from Newsweek ('The Luddites are Back') to Wired ('The Return of the Luddites')."

Other strong voices have warned that technological advances are a threat to our humanity include Stephen Talbott, author of the 1995 book *The Future Does Not Compute*,[44] and Theodore Roszak, the author of the 1994 book *The Cult of Information: A Neo-Luddite Treatise on High Tech* and a New York Times essay headlined "Shakespeare Never Lost a Manuscript to a Computer Crash."[45] Neil Postman's *Technopoly: The Surrender of Culture to Technology*[46] and his speech "Informing Ourselves to Death"[47] are often quoted by those with concerns over the effects rendered by humans who wield new communications technologies. Clifford Stoll followed that with the book *Silicon Snake Oil*,[48] and Bill Joy added his thoughts in an essay in Wired magazine titled "Why the Future Doesn't Need Us."[49]

The most infamous neo-Luddite (and some who believe in the strictest definition of "Luddite" would say the *only* one) is Theodore Kaczynski, also known as the Unabomber and author of a famous *Manifesto*,[50] who took violent action to draw the world's attention to his concerns, killing three and injuring 27 by sending 15 parcel bombs. "Of course there will be more Unabombers!" wrote **Cory Doctorow** of *Boing Boing* to this prediction.

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[42] A section with more complete biographical data on most respondents who took credit for their remarks can be found at the end of this report.

[43] Sale, K. *America's New Luddites*, Le Monde Diplomatique, February 1997, available online at http://mondediplo.com/1997/02/20luddites.

[44] Tabott, S. *The Future Does Not Compute: Transcending Machines in Our Midst*. Sebastopol, CA:O'Reilly. 1995, available online in full text at http://www.praxagora.com/%7Estevet/fdnc/index.html.

[45] Roszak, T. *Shakespeare Never Lost a Manuscript in a Computer Crash*, New York Times, March 11, 1999, available online at http://www.nytimes.com/library/tech/99/03/circuits/articles/11quil.html.

[46] Kaplan, N. *What Neil Postman Has to Say*, Computer-Mediated Communication Magazine, Vol. 2, No.3, March 1995, available online at http://www.ibiblio.org/cmc/mag/1995/mar/hyper/npcontexts_119.html.

[47] Postman, N. *Informing Ourselves to Death*, speech for the German Informatics Society, Oct. 11, 1990, available online at http://www.frostbytes.com/~jimf/informing.html.

[48] Publicity page for the 1995 book *Silicon Snake Oil* available at http://www.ocf.berkeley.edu/~stoll/silicon_snake_oil.html.

[49] Joy, B. *Why the Future Doesn't Need Us*, Issue 8.04, April 2000, available online at http://www.wired.com/wired/archive/8.04/joy_pr.html.

[50] Kaczynski, T. *Manifesto*, available online at http://www.thecourier.com/manifest.htm.

Most respondents agreed with some aspects of this 2020 scenario, but there was a great deal of variability in the reasons for these responses. The elaborations provide many interesting insights. A notable number of respondents argued that religious ideologies have been an underlying cause of violent acts throughout human history, and that this prediction's focus – the impact of advancing technologies – has rarely motivated destruction or death.

Naturally, people will protest – but to what extent?

Many survey respondents said there are always people who will not adopt the new technologies, but, they continue that this is to be expected and it really won't make much of a difference in the great scheme of things. "This is a pattern repeated through history and will not change," wrote **Adrian Schofield,** head of research for ForgeAhead, and a leader in the World Information Technology and Services Alliance from South Africa. "From 'flower power' to fundamental Islam, there will always be those who get their kicks from being outside of the mainstream of life."

Douglas Rushkoff, author and teacher at New York University, responded, "They're called cults and survivalists. Y2K was a fantasy for many who feel too dependent on the grid."

Anthony Rutkowski of VeriSign wrote, "More likely they will simply remain disconnected [no violence] – which is fine if it's an informed choice."

Jim Warren, founding editor of Dr. Dobb's Journal and a technology policy advocate and activist, wrote, "Yes, there will be some who live 'off the grid,' mostly disconnected from everyone except the few with whom they choose to have contact. There already are. There always have been! Yes, there will probably be *very* isolated incidents of a *very* few 'attacks' against information technology, just as there have always been attacks against all previous technologies – e.g., some people have been known to toss slugs into the coin-collection machines at tollbooths, or sugar in gas-tanks, and there were the occasional acts of the Luddites of a century ago."

Alex Halavais, an assistant professor at Quinnipiac University and a member of the Association of Internet Researchers, wrote, "It seems natural that the social changes now under way will lead to those who act against them. What is less clear is whether they will do so without the help of technology. I suspect that effective challenges to these social and economic changes will only come about through the use of information technologies. The model here is not the Luddites, but the Zapatista movement."

Violence is likely, some say, but it will be limited.

A number of respondents said they expect outbursts of violence motivated by human reactions to and expectations of technological advancements. "We'll always have a few like Jim Jones and David Koresh, and a few misguided folks will follow," wrote **Joe Bishop**, a vice president at Marratech AB.

Sean Mead of Interbrand Analytics responded, "Constant change will spook some into trying to slow everyone down through horrific and catastrophic terrorist attacks against the information infrastructure and all who rely upon it."

"Today's eco-terrorists are the harbingers of this likely trend," wrote **Ed Lyell,** an expert on the internet and education. "Every age has a small percentage that cling to an overrated past of low technology, low energy, lifestyle. Led by people who only know the idealized past, not the reality of often painful past life styles, these Luddites will use violence to seek to stop even very positive progress. It is unclear to me how much of such aggression is the nature of the individual who seeks a 'rationale' for her/his more personalized or inherent rage versus the claimed positive goals of such actors."

Jim Aimone, director of network development for HTC (the High Tech Corporation), wrote, "Terrorists exist today in the form of hackers, and I anticipate as we relinquish more controls to computers and networks they will be able to remotely commit any act they want."

A number of respondents say protests will be tied to technological advances.

There were respondents who expressed concern over the potential for damaging acts tied to effects of advancing technologies. "The real danger, in my opinion, is the Bill Joy scenario: techno-terrorists," wrote **Hal Varian** of the UC-Berkeley and Google.

"'Pro-life' never became a term until technology advanced to the point that abortions could be done routinely and safely – now some fringe groups have turned to violence," argued **Philip Joung** of Spirent Communications. "The increasing pervasiveness of technology could serve to anger certain individuals enough to resort to violence."

Thomas Narten of IBM and the Internet Engineering Task Force responded, "It is not Luddites who will do this, but others. By becoming a valuable infrastructure, the internet itself will become a target. For some, the motivation will be the internet's power (and impact), for others it will just be a target to disrupt because of potential impact of such a disruption."

Martin Kwapinski of FirstGov, the U.S. Government's official Web portal, wrote, "Information overload is already a big problem. I'm not sure that acts of terror or violence will take place simply to protest technology, though that is certainly a possibility. I do think that random acts of senseless violence and destruction will continue and expand due to a feeling of 21st century anomie, and an increasing sense of lack of individual control."

Benhamin Ben-Baruch, a market-intelligence consultant based in Michigan, responded that terror acts will be motivated by the same root causes of today. "It will be those who are struggling against the losses of freedom, privacy, autonomy, etc., who lack the resources to struggle in conventional ways and who will resort to whatever methods are available to them in asymmetrical wars," he wrote. "Ironically, increasing reliance on

vulnerable technologies will make cyber attacks increasingly attractive to the relatively powerless."

Howard Finberg, director of interactive media for the Poynter Institute, wrote, "The new terrorism might be cyber-terrorism. This will be a rebellion against the mass culture of technology."

Suely Fragoso, a professor at Unisinos in Brazil, responded, "I do not think that people will commit acts of terror or violence in protest against technology, directly, but against social, political, and economic conditions that bind the development of technologies as well as other human endeavours."

And **Peter Kim** of Forrester Research sees a 2020 organized online. "WTO-type protests grow in scale and scope," he wrote, "driven by the increasing economic stratification in society. Some fringe groups or even cults emerge that isolate themselves from society, using virtual private networks."

Some respondents point out that acts of civil disobedience have value.

Marc Rotenberg of the Electronic Privacy Information Center asked that the motivations of protesters be considered before labels are applied. "This will happen," he wrote. "The interesting question is whether these acts will be considered terrorism or civil disobedience. John Brunner's [book] 'Neuromancer' suggests that we should keep an open mind about this."

Some respondents welcomed a questioning of the advance of technology. "We need some strong dissenting voices about the impact of this technology in our lives," wrote **Denzil Meyers** of Widgetwonder. "So far, it's been mostly the promise of a cure-all, just like the past 'Industrial Revolution.'"

Wladyslaw Majewski of OSI CompuTrain and the Poland chapter of the Internet Society, pointed out the potential for acts of terror perpetrated by controlling groups. "There is no real data that would justify the connection of acts of terror with people refusing to use communication technologies," he wrote. "In fact exact opposite is a real danger – governments, corporations, and privileged circles eager to use new technologies to facilitate terror and deprive people from their rights."

Andy Williamson of Wairua Consulting and a member of the New Zealand government's Digital Strategy Advisory Group responded, "Remember that the original Luddites did not want to destroy technology because they did not understand it. They did so because they saw that it simply made a small group rich and a large group poorer and even less able to control their lives. If ICTs continue to be used for personal gain and by powerful governments and corporations to control freedoms and limit opportunities for the majority, then the above is not only likely, but highly necessary. Not quite storming the Winter Palace, but certainly information terrorism on Mountain View and Redmond!"

A number of respondents cast this as a battle between 'old' and 'new' values.

There were differences of opinion over whether current conflicts between traditionally conservative cultural groups and those with capitalistic, consumer-driven economies are actually a war over the advancement of technology. "The most important resistance to technology comes from those who oppose change for ideological, religious, economic or political reasons," wrote **Gary Chapman**, director of the 21st Century Project at the LBJ School of Public Affairs at the University of Texas-Austin. "These are the forces that have used government power to stifle progress in many times and places and could do so again."

"This [kind of violence] is already happening," wrote **Bob Metcalfe**, founder of 3Com. "The Jihad with which we are now at war is being led by people who prefer the 7th century to the internet."

Paul Saffo, forecaster and director of The Institute for the Future, responded, "The question is how many such attacks will happen and how large they will be. While anti-technology activists may capture our imagination, the risk will come from fundamentalists generally, and religiously-motivated eschatological terrorists in particular. But the good news is that this trend will gradually burn itself. The Caliphate will not return, the apocalypse will not happen, and eventually world populations will come to their senses. Even lone terrorists must swim in a social sea, and the sea will become less tolerant of their existence. Notions of 'super-empowered individuals' terrify us today in the same way that H-bombs terrified our parents and grandparents half a century ago. But if we are lucky, they will, like H-bombs, remain more looming threat than actual disaster."

Mike Kent, a professor of social policy at Murdoch University in Australia, responded, "It seems more likely to me that existing terror groups will attack the system from within, rather than without."

Whether technological process moves quickly or slowly, some believe anti-technology violence won't add up to an enormous problem.

IT policy maker **Alan Inouye**, formerly with the Computer Science and Telecommunications Board of the U.S. National Research Council, predicts that technological change won't inspire the radical differences that might lead to violence. "While I expect continuing advances in our ability to harness IT for societal good (and bad), I don't expect such dramatic changes in daily life," he wrote. "The past 15 years – 1990 to 2005 – represented the diffusion of the Internet and cell phones to the general population. The preceding 15 years – 1975-1990 – represented the diffusion of the PC to the general population. Although the advances in the past 30 years have been remarkable, much of daily life is not so different. Maybe we will finally see the long-threatened convergence of information technologies and, as a consequence, vastly improved capabilities. But I am not so convinced."

Glen Ricart, formerly of DARPA and currently with Price Waterhouse Coopers and the Internet Society Board of Trustees, predicts more breakthroughs, but says they will appear incrementally and not cause conflict. "I doubt there will be a new digital divide along the lines postulated here," he responded. "I think there will be a continuum of technology use that can be measured as 'face time' versus 'screen time.' I think there are good reasons that 'screen time' will never overtake 'face time.' Well, maybe one exception. There will probably be some pathological cases of being addicted to virtual realities. Interestingly enough, this may be caused by spending too much time in youth interacting with games (and perfecting that genre) instead of interacting with other kids (and perfecting the pleasures of inter-personal relationships in the real world). By the way, in 2020, it may no longer be 'screens' with which we interact. What I mean by 'screen time' in 2020 is time spent thinking about and interacting with artificially-generated stimuli. Human-to-human non-mediated interaction counts as 'face time' even if you do it with a telephone or video wall."

It's expected that people will resist too much connection in various ways.

"Off the grid" was originally a phrase constructed to refer to the idea of living in a space that is not tied to the nation's power grid. The definition has been sliding toward a more generalized concept of living an un-networked life that excludes the use of items such as televisions, cell phones. Some people even aim to live a life that can't be tracked and logged onto databases by the government and corporations. Some survey respondents see resistance to connection as a possible trend. The reason for such resistance was articulated by **Charlie Breindahl**, a professor at the University of Copenhagen: "By 2020 every citizen of the world will be as closely monitored as the Palestinians are in the Gaza Strip today. No one will be able to get off the grid."

Brian Nakamoto of Everyone.net predicted, "Living off the grid (comfortably) will be extremely difficult in 2020." **Barry Chudakov,** principal partner of The Chudakov Company, agreed. "My sense is that technology will become like skin – so common that we forget we're in it," he wrote. "Devices will be infused with some manner of intelligence and fit into all manner of objects, from clothing to prescriptions. So it won't be a simple thing to live 'off the grid' – unless, of course, you're a Unabomber type. But those types are rare and live only at the antisocial fringe."

"I'm already familiar with several colleagues who have chosen to only pay cash for items and to eschew cellular telephones because they can be tracked," wrote **William Kearns** of the University of South Florida. "Being 'always connected' is not healthy, any more than it's healthy to be always awake. It's also not particularly good for your survival to be out of touch with your surroundings (the wolf may be outside the door). Specialized intelligent filters will become popular to self-select information for people and filter out adware, pop-ups, nuisance mail, and everything we haven't thought of yet. The motivation will be to reduce the annoyance factor with dealing with the mountain of detritus that passes for information on the network. Humans do a remarkably good job of making decisions without having access to all the facts. We should revel in that ability."

Martin Kwapinski of FirstGov wrote, "There will absolutely be those who attempt to live 'off the grid.' The changes these technologies are bringing are massive, difficult to conceive and terrifying to many." Mitchell Kam of Willamette University responded, "Most will just choose to live in isolation and in separate societies." **Judy Laing** of Southern California Public Radio responded, "They'll probably pick up where the '60s left off; their communities will be the resorts of their time."

Walter Broadbent, vice president of The Broadbent Group, has a solution for that. "Allowing/encouraging others to create a place for themselves off the grid is a viable solution for them," he responded. "We can use the power and influence of the Web to support others and encourage them to participate."

'Transparent, humane' technology is most likely to be accepted.

Some respondents said innovations in interface design will make technology more approachable and accessible for the mass population, thus making it less likely to inspire protests of any sort.

Frederic Litto of the University of Sao Paulo responded, "In 1994, an international conference in London on resistance to new technologies concluded that: (1) a certain amount of such resistance is useful to society because it serves as a 'rein' to control possible excesses in the use of the new technology; (2) such resistance is frequently the product of bad design of the interface between the user and the system (like the first automobiles, which required every driver to know how to fix his own auto, because there were no mechanics on every street-corner – today, the interface design has improved, and the whole auto is a 'black box' to every driver). Just as those who used to throw stones at 'horseless carriages' are no longer with us, so, too, the crazies who protest against very useful and environmentally-friendly technologies, will eventually be drawn to other pursuits."

Martin Murphy, an IT consultant for the City of New York, wrote, "In 2020 I will be 75 years old. Many of the 'Baby-Boomers' will be over 70 years old. This large group of people may indeed be sick of the constant intrusion of technology and nostalgic for a more human-centered time. If they get together with young, philosophically-inspired anti-technology activists, things could get interesting. The trick will be to make the technology transparent and humane."

Funding priorities

Respondents rank four suggested priorities for building the networked future

Respondents were asked the following: If you were in charge of setting priorities about where to spend the available funds for developing information and communications technologies (predominantly the internet) to improve the world, how would you rank order the following international concerns? Please number these from 1 to 4, with 1 being the highest priority.

Setting Priorities for Development of Global Information & Communication Technologies						
	First Priority	**Second Priority**	**Third Priority**	**Fourth Priority**	**Did Not Respond**	**Mean Rank**
Building the capacity of the network and passing along technological knowledge to those not currently online	51	27	11	4	7	1.67
Creating a legal and operating environment that allows people to use the internet the way they want, using the software they want	32	32	21	8	7	2.05
Developing and "arming" an effective international security watchdog organization	8	12	23	50	7	3.25
Establishing an easy-to-use, secure international monetary microcredit system	8	21	36	28	7	2.90
Source: Pew Internet & American Life Project, Internet Issues 2020, Nov. 30-April 4, 2006. Results are based on a non-random sample of 742 internet users recruited via email. Since the data are based on a non-random sample, a margin of error cannot be computed.						

An extended collection hundreds of written answers to this question can be found at:
http://www.elon.edu/e-web/predictions/expertsurveys/2006survey/worldpriorities.xhtml

An overview of responses to the scenario: Most say building network capacity and technology knowledge should be top priorities.

More than three-fourths of respondents – 78% – identified building network capacity and the knowledge base to help people of all nations use it as the first or second priority for the world's policy makers and technology industry to pursue. It was selected as the first priority by 51% of the survey participants.

Following closely as a priority was "creating a legal and operating environment that allows people to use the internet the way they want, using the software they want," which gained support from 64% of respondents as either the first or the second international priority. Falling far down the list were the other two choices in the setting of priorities – "developing and 'arming' an effective international security watchdog organization" and "establishing an easy-to-use, secure international monetary microcredit system" – which each gained only 8% of respondents' votes as a first priority. Many respondents wound up including support for two or more of the priorities in their written elaborations. They most often combined the ideals of total access/tech knowledge and an open legal and operating environment.

Accessibility and the knowledge to use that access to advantage are seen as key priorities.

Respondents overwhelmingly agreed that bringing the tools of connection to as many people as possible and teaching them how to benefit from these tools will help improve the world.

"Capacity building should be the prime focus," wrote **Rajnesh Singh**, a leader in the Pacific Islands chapter of the Internet Society.[51] "Not just machines, but people and getting them to do new and wonderful things with technology."

Fred Baker, president of the board of trustees of the Internet Society, responded, "Education is key to internet deployment and use, and is something I am directly involved with."

"Providing access and literacy is paramount," wrote **Howard Rheingold**, internet sociologist and author. "Without affordable access, knowledge of how to use the technology and the legal and operating environment that permits innovation, we won't see the creative explosion we say with personal computers and the internet."

Robin Gross, executive director for IP Justice, wrote, "Building an open, inclusive, and inter-operable infrastructure is the most important because all of issues will depend upon the infrastructure."

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[51] A section with more complete biographical data on most respondents who took credit for their remarks can be found at the end of this report.

Ed Lyell, an expert on the internet and education, wrote, "We enhance the positive potential of global communication commerce only by bringing as many into the network as possible. To continue to expand the current digital divide will bring on negatives of jealousy, income disparity, have/have not battles, etc. This is a case when the economic common good must be nourished while minimizing the potential greed of individualized privatization. By this I do not mean government-run – but a structured system of individual incentives for excellence that lead to positive collective improvement."

Many respondents agreed with **Tunji Lardner**, CEO for the West African NGO network, wagonet.org, who wrote, "The challenge remains helping the majority of our brothers and sisters in vast underserved places in the world." **Lutfor Rahman**, executive director of the Association for Advancement of Information Technology at Pundra, Bangladesh, added, "Everybody should know the benefit and problems of using the internet, and this should get first priority."

"My priority would be to build a 100-mg-per-second broadband pipe into every home," said **Rob Atkinson** of the Information Technology and Innovation Foundation.

Nan Dawkins, co-founder of Red Boots Consulting, wrote, "While ensuring access certainly impacts the internet's potential as a change agent, it is important to remember that simple access is not enough. Giving a man (or woman) a laptop and a cheap connection is not sufficient to change his/her plight. The internet is a tool with some potential, but it is probably not within the top 100 factors that can drive significant change in the world."

Many respondents pressed for an operating environment that is open, fair and full of innovation.

Respondents also put "creating a legal and operating environment that allows people to use the internet the way they want, using the software they want" at the top of the priorities list. Their concerns in this realm include: the positive and negative effects of a software monoculture; regulation's influence on security, trust, innovation and access; and the outcomes caused by the imposition of various limitations by those in prevailing power structures.

"The social institutions of exchange and basic law (which requires some enforcement ability) are the most important for real development," wrote **Bruce Edmonds** of the Centre for Policy Modelling at Manchester, UK. "This will allow new online institutions to emerge."

Wladyslaw Majewski, of OSI ComputTrain and the Poland chapter of the Internet Society, responded, "The only listed goal worth significant funding is to defend and promote human rights and activities."

"Giving people the ability to develop their own strategies and appropriate technologies as they see fit will always be a more powerful method of ensuring equitable uptake than

by top-down measures or by allowing current power groups (e.g. corporate interests) to define the future environment," argued **Mark Gaved**, of The Open University, in the U.K.

John Quarterman, president of InternetPerils and an internet pioneer, wrote, "Without software diversity we're at the mercy of the monopoly software vendors, both directly and even more indirectly through ease of exploit of such software and especially ease of spread of such exploits, not to mention through the warping of political and social systems that happens as monopolists fight to maintain control … Distributed security is what we need, and the most effective first step is to deal with the software monopoly problem." **Baker** of the Internet Society responded, "I would simply leave (this) to anti-trust law."

Jeff Hammond, vice president for Rhea and Kaiser, wrote that innovation will trump any monoculture. "Creating a legal framework for the internet should focus on intellectual property alone," he argued. "I do not believe that the goals of 'using the internet the way they want' means that a political solution should be sought for infrastructure or technology platforms. Political solutions are typically about *discouraging* human activities. Innovation is about encouraging human activities, many of which will be failures. If a software monoculture results, it will be because it is the solution that solves the greatest number of problems for the greatest number of people...it will also be temporary until the problems it creates are solved by the next wave of innovation."

 "Any effort to improve the world by means of development of information and communication technologies should be based on empowerment of the individual as user and various groups of users, and not be conducive to a business monoculture. In other words, the current trends of corporate domination in the area should be reversed. Public interest should be the top priority," maintained **Mirko Petric**, of the University of Zadar, Croatia.

Ross Rader of Tucows Inc. wrote, "Various current legal environments are threatening to tear apart the fabric of the network (i.e. U.S. intellectual property law, communications regulation, etc.). This trend must be reversed. Without a fundamental right to choose platform, service, and application, there is very little merit left in the network. The edge must be left to its own devices, despite the economic pursuits of big business."

Robin Berjon of the World Wide Web Consortium and Expway wrote, "If there is no environment for open standards and multiple platforms, none of the two remaining points will be feasible, so I would place it at the top of the priority list because it is a prerequisite." And **Glenn Ricart**, a member of the Internet Society Board of Trustees, put it this way: "The highest priority is to make sure that the Internet can continue to foster economic and social growth and development for everyone (in all cultures) via innovation, competition, and free speech (e.g. uncensored and unmonitored packets)."

"[We must] embed the openness with which the internet began, the culture of creativity and connection and sharing and transparency. Standards will help that harmonization.

Political and legal support will follow and should not lead … governments and commerce should have less valence than civil society and academia," argued **Sylvia Caras**, a disability rights advocate for People Who.

Simon Woodside, CEO of Semacode Corporation in Ontario, Canada, responded, "The legal environment today is excellent, and bodies such as ISOC, ICANN, and IETF, along with world governments, should continue to nurture and protect the open nature of the internet."

Some respondents selected this priority as the first on their list and then made sure to emphasize the fact that the internet should remain as *unregulated* as possible.

"Digital Rights Management, 'trusted computing' that bakes restrictions into hardware, and extensions of copyright law such as the Digital Millennium Copyright Act are roadblocks that could strangle a global creative renaissance before it can take root worldwide," **Howard Rheingold** argued.

Jim Warren, a pioneer technology-policy advocate and activist, responded, "I do not imply that government and laws should do much. Quite the contrary – I want government and laws to mostly GET OUT OF THE WAY! First and foremost, government *mostly* serves itself first (and serves its most powerful supporters second) – and that is perhaps the foremost danger."

If the network is not secure and trusted, will it be used?

At a June 2006 technical conference in Boston, Microsoft officials reported that a significant percentage of the world's computers have been infected by keystroke loggers, Internet Relay Chat bots and rootkits. Microsoft said that between January 2005 and June 2006 it removed at least 16 million instances of malicious software – one virus, Trojan, rootkit or worm in every 311 times it scanned one of the 270 million computers running the Windows Malicious Software Removal Tool.[52]

 "Security has to come first. As long as we have … Trojan, spyware, malware, we will not be able to gain any true integrity of the internet," insisted **Terry Ulaszewski**, of Long Beach Live.

A vocal minority of survey respondents pointed out that the communications network will not be used or useful if it is not seen as a safe place to be, no matter how well-connected everyone is. "Unless we find ways to curb spam, identity theft, cyber extortion, virus writing, and other such criminal activity, people will not WANT to use the enhanced IT environment that the other three choices present," explained **Eugene Spafford**, executive director of the Center for Education and Research in Information Assurance and Security. "Technology alone (or even primarily) cannot solve this

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[52] Naraine, R. Microsoft: *Trojans, Bots Are 'Significant and Tangible Threat,'* eWeek.com, June 12, 2006, available online at http://www.eweek.com/article2/0,1895,1974620,00.asp?kc=ewnws061206dtx1k0000599

problem – we will need international response to bad actors, with appropriate investigation and punishment."

Anthony Rutkowski of VeriSign, a company that includes a team of malware detectives based out of Dulles, Va., called the Rapid Response Team, responded, "Cybersecurity and infrastructure protection will remain the highest priority. Next-Generation Network legal norms, regulations, and standards will likely have proliferated so as to all for flexible use to the extent that is achievable given other priorities like security and infrastructure protection."

Amos Davidowitz of the Institute of World Affairs wrote, "People will not use it if they do not feel secure, so access and security are the primary goals."

Marc Rotenberg, executive director of the Electronic Privacy Information Center, responded, "We need stronger safeguards for privacy and human rights before enabling greater security authority."

There were notable expressions of concern about whether it would be wise to create an internet police agency.

Interpol, the International Criminal Police Organization, is the group effort of 184 nations to facilitate cross-border police cooperation. It has been in existence since 1923, and has seen crime shift online in the past decade. It has limited influence, but is has concentrated some efforts on internet crime and crime prevention. It hosted its first international cybercrime conference in September 2005.[53] In March 2006 an Interpol spokesman called on international politicians to make it easier for cybercrime to be fought across borders. He cited gangs that work online from Russia, China, the U.S. and other nations to target internet users across the globe.[54]

In responding to the survey scenario of "developing and arming an effective, international security watchdog organization," several participants wrote in support of the way that individual nations are working separately and together right now in preventing crime and leveraging punishments.

"Billions of dollars are already being used to build an effective international security watchdog organization," wrote **Charlie Breindahl** of the IT University of Copenhagen. "It goes under names such as NSA, CIA and the Department of Homeland Security. Some of it is legal, some illegal. If there is a need to fulfill in this area, it is to put in place an international cyberpolice controlled by the UN; that possibility is moot, of course."

Alejandro Pisanty, vice chairman of the board for ICANN and CIO for the National University of Mexico, responded, "A single 'watchdog organization' seems less

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[53] First International Cybercrime Investigation Conference site available online at
http://www.interpol.int/Public/TechnologyCrime/Conferences/1stCybConf/Conference.asp
[54] Espiner, T., Interpol: Give Us the Tools to Fight Cybercrime, ZDNet UK, March 21, 2006, available online at
http://news.zdnet.co.uk/internet/security/0,39020375,39258540,00.htm

preferable, and less viable, than an active network of national, functional, and cross-national and cross-functional bodies with solid agreements among them."

A counter argument was sounded by **John Browning,** founder of First Tuesday: "A specialist tech-security watchdog sounds like a *really* bad idea: use a computer, go to jail."

Fredric Litto of the University of Sao Paulo in Brazil said "incentivated communication" (providing business groups and individuals with various incentives to encourage their continued use of communications tools for the common good) is a better answer than employment of such a force, adding, "Leave policing to the last stage, you might not even need it."

And many people voiced strong dissent regarding the concept of a formalized international internet-security group. **Glenn Ricart** wrote, "I will not willingly choose to give up my privacy so that some international security organization can decide to intervene when they think it appropriate." **Cory Doctorow**, blogger and co-founder of *Boing Boing,* wrote, "Why do we need internet cops? How about internet architecture that helps users protect themselves instead?"

Rajnesh Singh responded, "ICTs have become a new tool for criminals and terrorists, and it is important to think about and take the necessary protective measures, however this must not be at the peril of freedom of expression and basic human rights." **Ted Coopman** of the University of Washington-Seattle wrote, "Any international ICT police force would not (based on my read of history) be used to protect people or infrastructure in general, but protect those in power from those who are not."

"Qui custodiet ipsos custodies? An effective international security watchdog organization will limit the possibilities of the other three [priorities to choose from on this list],"wrote **Alec MacLeod,** of the California Institute of Integral Studies.

Scott Moore, online community manager for the Helen and Charles Schwab Foundation, wrote, "A centralized 'enforcement unit' is utter bullshit. A watchdog group should do just that – use their resources to inform and spread the warnings so that people can be prepared. Arming a central organization against internet criminals is like trying to destroy bad weather."

Lynn Schofield Clark, director of the Teens and the New Media @ Home Project at the University of Colorado also emphasized the ideal that members of civil society can work together to help patrol the internet. "We need a watchdog organization to oversee criminal and terrorist acts carried out through the use of ICTs; and we really need a series of well-supported, lower-level watchdog organizations to ensure that ICTs are not utilized by those in power to serve the interests of profit at the expense of human rights. We need ICT specialists to augment the work of important organizations already in existence that are fulfilling this watchdog role. The need for the watchdogs will only increase as time goes on."

Here is the state of play on internet policies and enforcement policy.

A treaty to help nations deal with cross-border crime has been in the works for many years. The Council of Europe Cybercrime Convention is open to signature by all nations, but conflicts over sovereignty and worries about speech and privacy rights have stalled it regularly since its beginnings in 1997.[55] Only a few nations have signed it, but the work continues. The Organization of American States and the Council of Europe held a joint cybercrime conference in December 2005, and the Asia Pacific Economic Cooperation Forum also conducts annual conferences. Representatives of the Computer Crime and Intellectual Property Section of the Criminal Division of the U.S. Department of Justice conduct cybercrime workshops in cooperation with representatives of many other nations.[56]

Individual countries have developed resources to educate internet users and help them identify and report crimes. In the U.S., five federal agencies and 13 private organizations announced the January 2006 launch of OnGuard Online (http://www.onguardonline.gov), a site with information about monitoring credit history, the effective use of passwords and other security measures, and recovering from identity theft.[57]

Some see the enhancement of economic systems as a top priority.

Throughout the survey many respondents noted that economics is critical for the creation of a better world. Consistent with that assertion, some of them ranked the fourth item as a valuable priority. While a few respondents replied that it is not possible to make such a system secure and few selected it as a first priority, some said it is a worthy goal to work toward.

"The open-source development model must be applied to currency," wrote **Douglas Rushkoff,** author and teacher. "Interest-bearing, centralized currency is the final obstacle to a collaborative international network."

"Microcredit programmes have shown themselves to be some of the most useful and culture-enabling programmes yet developed. It's brilliant that people should be able to find them independent of the intermediaries currently involved in brokering the programmes," wrote **Elle Tracy**, president and e-strategies consultant for The Results Group.

Ricart responded, "The ordinary industrial finance system will get around to arranging an international monetary microcredit system as it is feasible to do so. Credit cards are

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[55] The following U.S. Department of Justice site has a number of links to details regarding the treaty:
http://www.usdoj.gov/criminal/cybercrime/intl.html
[56] From the U.S. DOJ, *United States Activities to Improve Cybercrime Legislation and Investigate Capacities*, March 2006, available at http://www.coe.int/t/e/legal_affairs/legal_co-operation/combating_economic_crime/6_cybercrime/t-cy/(T-CY%20_2006_%2006%20-%20e%20-%20US%20Activities%20to%20ipmrove%20cybercrime%20l_205).pdf
[57] To see a summary of recently prosecuted computer-crime cases in the U.S. online, go to:
http://www.cybercrime.gov/cccases.html

getting close. I want trusted intermediaries to assure me that Ubu and Kwana's farm really exists and that the pictures are not from somewhere else."

Singh wrote, "A microcredit scheme would reach out to a new capital market that would benefit primarily those in the developing world who would otherwise find it hard to finance their small ventures. The funder would decide on the risk and partake in the necessary course of action (hopefully) without banking bureaucracy – a very practical outcome."

Dan McCarthy, managing director of equity funds company Neuberger Berman Inc., responded, "Communities on eBay/PayPal/Skype, Google, or Western Union could facilitate microcredit well before 2020." And the Internet Society's **Fred Baker** wrote, "I don't know that microfinancing as a vehicle for international philanthropy actually works, but finding ways to extend credit/debit card systems to developing countries can be a way of helping them close the digital divide in commerce."

There were those who disagreed. **David Weinberger** of Harvard's Berkman Center wrote, "Microcredit will just make it easier to charge per bit. I'd hate to lose the froth of sharing." And **Paul Craven**, director of enterprise communications at the U.S. Department of Labor, wrote, "I don't think it is possible to build a 'secure' international monetary microcredit system."

There is a virtue to putting all the priorities together.

Most respondents couldn't resist including comments on the entire list of suggested priorities in their elaborations. Following are a few tightly woven responses.

Syamant Sandhir of Futurescape responded, "Basic safeguards need to be set up in a global legal framework that builds on current growth and increasingly takes in new communities. Keeping peace in these now global communities would be paramount and on the basis of this safe and secure framework a microcredit system that helps communities would emerge."

"These are all critically important policy pursuits," wrote **Jim McConnaughey**, a senior economic adviser active at the NTIA in U.S. policy on access and the digital divide. "One result that I would expect to happen would be a natural flow towards greater democratic tendencies in many developing and even developed countries, including more participatory debates and a higher rate of participation in political elections (through secure electronic voting)."

Seth Finkelstein, author of the Infothought blog and an EFF Pioneer Award winner, wrote, "1) The legal environment just might kill technological development. It's a palpable threat. 2) Diversity is helpful. 3) I have my doubts microcredit is solvable, but it's potentially useful. 4) Although scary, criminal and terrorist acts are relatively rare in the grand scheme of things."

Joe Bishop of Marratech AB wrote, "1 and 2 will bring commerce. Commerce will create some equalization of wealth in places where it does not now exist. That will prompt 3. Governments will take care of 4 out of paranoia."

Kerry Kelley, vice president for SnapNames.com, responded, "1) Making the Internet friendlier to native languages, so that people can communicate more easily cross-culturally. 2) Being able to trust that who you are communicating with is who they say they are - as opposed to a security watchdog. 3) Reducing 'taxes' and 'tolls.' Cost of bandwidth, ISP subscriptions, PCs and an 'affordable' micropayment system are key. 4) Doing what we can to head off the balkanization of the Internet into incompatible systems. These are more where I see priorities lying personally. Some are a re-phrasing of the above."

Steve Cisler, a developer of world-wide community networks (including public-access projects in Guatemala, Ecuador, and Uganda), was among several respondents who said the meeting of basic human needs is the only real priority in many vast regions of the world today. "Non-internet-related problems are a much higher priority than any of these," he wrote, "though I realize money will flow to these technological/policy challenges without taking care of more basic problems. This comes from the eight months I spent offline talking to people not using the Internet. It's just not a high priority – except those of us/you in the ICT world."

Over the past few years some people concerned about the degree of U.S. influence over internet policy decisions have lobbied for more international voices to be heard. Because most of the innovation of the network architecture took place in the United States and the U.S. was the first nation to overwhelmingly adopt the internet in day-to-day communication, it had exercised the most control in network decisions. But the world caught up with (and some nations have surpassed) the U.S. in regard to internet proliferation and usage over the past few years.

In the beginning years of the new millennium, leaders of the United Nations and its affiliated communications organization the International Telecommunication Union called together representatives from all nations for an effort called the World Summit on the Information Society. This spawned the Working Group on Internet Governance – a body assigned to make recommendations about worldwide involvement in the positive development of the internet as a tool for all.

There was some speculation that an international organization under the jurisdiction of the United Nations would be created to replace ICANN and the Internet Society. Representatives of the U.S. and other nations opposed this idea and seem to have won their point during negotiations in 2005. ICANN will remain the key authority through 2011, with the Internet Society's Internet Engineering Task Force and Internet Architecture Board also making key decisions. The WGIG eventually recommended in the fall of 2005 that a new international consulting body – the Internet Governance Forum – should be formed. The UN announced that this group is "a new forum for multi-stakeholder dialogue on internet governance."

The IGF's power is expected to be limited to identifying issues to be addressed in order for all people to benefit from digital communications networks. At its first meeting in Athens in October 2006, the pre-identified talking points are openness, security, diversity and access; and the meeting announcement reports that "capacity will be a cross-cutting priority."

Reflections

The issues are the same, but the stakes are higher than ever before; looking ahead instead of simply looking backward is of vital importance

Hope and fear are threaded through the material shared by respondents to this survey. This is a predictable outcome, since all human progress has had its negative and positive influences; as social communications theorist **Mark Poster** pointed out in one of his survey elaborations, "ambivalent effects are typical of all great historical changes."

The hope found here appears in common future visions of people helping people through connections on a massive, collaborative, open, worldwide communications network. The internet is already a powerful tool for social networking, for *connection*. Innovations such as Wikipedia, MySpace, Flickr and Second Life are showing the power of individual participation and creativity and the wisdom of crowds. In addition, the number of internet initiatives for the public good is on the increase as the economics of connectedness are beginning to flatten. One such project is the Center for Information Technology Research in the Interest of Society (CITRIS), based out of the UC system units at Berkeley, Davis, Merced and Santa Cruz.

The efforts of CITRIS, supported by funding from tech companies, are responsible, for instance, for a Wi-Fi wireless network that allows eye specialists in the Tamil Nadu region of India to examine patients in remote clinics via high-quality video conference. The program is now expanding to include 50 clinics that will serve up to 500,000 patients each year. CITRIS also hosted a June 2006 international conference in Helsinki on the convergence of future communications technologies; the environment, energy and sustainability; and services, security and society.[58]

A lot of the fear about the future of the worldwide communications network is expressed in concerns about the outcomes of political and economic power struggles in the new age of human networking.

Throughout the history of communications innovations, every new-media mechanism has been perceived and framed by existing firms and their political allies in the old-media paradigm. For instance, decision-makers applied their experiences with the telegraph when evaluating how best to deploy radio; they looked at the diffusion of television with radio-tinted glasses. The old-media rules, regulations, pecking order and associated social, political and economic power structures are always superimposed upon the latest breakthrough technology. As Carolyn Marvin observed in her book *When Old Technologies Were New*, "New practices do not so much flow directly from technologies

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[58] The Center for Information Technology Research in the Interest of Society site is available online at http://www.citris-uc.org/.

that inspire them as they are improvised out of old practices that no longer work in new settings."[59]

There is a mournful tone – sometimes tinged with frustration – underlying a significant percentage of the written responses to several of the proposed scenarios in this survey. Many respondents reflect disappointment in seeing the internet's open, neutral potential being threatened by what they believe to be corporate and governmental attempts to return to older business and political models. They would like to see the internet defined in a new way, not in the telephone/television paradigm, and they would like to see hope restored for an internet that can help topple oppressive regimes and allow individuals everywhere to self-actualize.

Survey participant David Clark, an original internet architect who is working to help inspire a new, improved internet, said in a recent interview with Red Herring magazine that it's vital to stop struggling with the past (the old paradigm) and dream of how good the future can be. "We don't presently have a roadmap of where we are trying to go with the internet, where we would like to be in 10 to 15 years," he said in the interview. "If the story is compelling enough, people will figure out how to get there."[60]

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[59] Marvin, C. *When Old Technologies Were New: Thinking about Electric Communication in the Late Nineteenth Century.* New York, NY: Oxford University Press. 1988, p. 5.
[60] *The Future of the Internet: In a Decade, the Net Will Dig Deeper into Our Lives,* Red Herring, April 10, 2006, available online at
http://www.redherring.com/Article.aspx?a=16391&hed=The+Future+of+the+Internet

Methodology

This Web-based survey, sponsored by the Pew Internet & American Life Project and conducted by Princeton Survey Research Associates International, elicited a non-random sample of 742 internet stakeholders. The interviews were conducted online, via WebSurveyor, between Nov. 30, 2005 and April 4, 2006. Details on the design, execution and analysis of the survey are discussed below.

Sample design and contact procedures

Email invitations to participate in the survey were initially sent to 550 select internet leaders, both stakeholders and skeptics. The initial list included as many members as possible from the "200 Internet Figures" identified in the research project that began Imagining the Internet, the Elon University/Pew Internet & American Life Predictions Database project (http://www.elon.edu/predictions/200briefbios.aspx), and the board of directors lists for major internet organizations such as the Internet Society, the Working Group on Internet Governance, the World Wide Web Consortium, ICANN, the Association of Internet Researchers, and Internet2.

In addition, leaders of top internet organizations were asked to send an open invitation to participate in the survey to members of their groups. These email invitations provided a direct link to the survey, and contained the following language: *Internet leader,*

The 2005 Pew Internet Predictions Survey is now online. It is aimed at helping illuminate important issues and concerns. It is only effective if the best and brightest people take part. We would appreciate it if you would share the address for the survey with people who are on the membership list of the major world internet organization in which you are a leader. We are inviting ISOC, W3C, WGIG, IEEE and Internet2 members to participate, in addition to other top technology leaders who have been previous survey participants.

Please look at the following list and share the appropriate PIN for your organization with your membership in the email in which you inform your group about the survey address:

- Internet Society (ISOC): 1111
- Association for Computing Machinery (ACM): 2222
- World Wide Web Consortium (W3C): 3333
- Working Group on Internet Governance (WGIG): 4444
- Institute of Electrical and Electronics Engineers (IEEE): 5555
- Asssociation of Internet Researchers (AoIR): 6666
- Internet2: 7777

The address of the survey is:
        http://www.psra.com/experts

Here is a sample introduction paragraph you might want to send to your group's membership along with the site address and PIN number:

ISOC, W3C, WGIG, IEEE and Internet2 members and a select group of additional top technology leaders are being asked to participate in the 2005 Pew Internet Predictions Survey. The Web-based survey asks respondents to assess the future impact of the internet in order to illuminate important issues and concerns.

> *You can participate by going to the survey site:*
> *http://www.psra.com/experts*

> *At the start of the survey, please use the PIN number:*
> *****(((INSERT YOUR GROUP'S PIN FROM ABOVE IN THIS SPACE)))****

If you receive more than one invitation, please only respond to the survey once. The Pew Internet Project will issue a report on this survey in the winter of 2006.

If you have any questions, please feel free to contact Pew Internet Project Director Lee Rainie at lrainie@pewinternet.org or 202-419-4500.

Thank you!

Your participation will help us illuminate important issues and create a useful document that will be of importance for years to come.

Thanks very much for your assistance. We hope you will take advantage of this opportunity to inform members of your organization about the survey.

Pew Internet encouraged the initial sample of stakeholders to forward the email invitation to any colleagues whose thoughts on the future of the internet they would consider useful and important. In addition, respondents were encouraged to share with Pew Internet the email addresses of people who would be excellent participants in the survey. These addresses were collected, and an email invitation was also issued to these people to participate. This created an additional snowball sample of respondents, whose ideas are also included in the final data.

The survey title page gave the following brief description of the survey and its sponsors, along with instructions for how to complete the survey:

Predictions Survey
Welcome to the Pew Internet Project's 2005 Predictions Survey!

If you received an email invitation from the Pew Internet Project with a personalized identification number (PIN) for taking this survey, please enter it below.

Those who were invited to participate by a friend or colleague should use guest PIN 900.

If you did not receive either an individual or guest PIN, please enter 999 and proceed.

ENTER PIN.
General Survey Instructions

Thank you for agreeing to assess the following predictions about the internet. Most are extensions of recent statements by leaders in science, technology, business and politics.

Immediately below each question/prediction is a space for you to elaborate on your answers; we hope you will take the opportunity to expand the body of knowledge about internet issues by contributing your personal thoughts. Likewise, if you disagree with the premise or wording of a question/prediction, please tell us why in your elaboration. You are free to skip any questions you do not wish to answer.

This survey is confidential, but we encourage you to take credit for your responses. To do so, please type your name AT THE START of the elaboration section immediately below each question/prediction. We will only credit to you the individual elaborations that have your name AT THE BEGINNING. Please remember that accredited statements have more validity and add a great deal more to the body of knowledge than those for which people do not take credit.

The predictions made here are offered in the spirit of testing ideas about how the future might unfold. They are not meant to represent our "best guess" or our preferences about the future. Neither the Pew Internet Project nor Elon University advocates any policy outcomes related to the internet.

By the year 2020…

The first section of the survey asks you to assess predictions about what the internet will be like in 15 years. Here's a preview of the kinds of predictions and questions you will encounter as you move through the survey:

Where will things stand in 2020?

A global, low-cost network thrives.

English is displacing other languages online.

Technology advances to the point where humans have lost control of many aspects of it.

People's activities, preferences, transactions, and whereabouts are logged and profiled, making life more efficient but also more transparent; there is an ensuing lack of privacy.

Virtual reality is a boon and a drain.

Success is more attainable for people living outside of nations that dominated the 20th century, allowing them to become important contributors.

Luddites will commit acts of violence and terror.

Please proceed to share your views about these proposed scenarios…

Following this section, participants were given fuller descriptions of seven different scenarios for the year 2020. In each section, they had three options: skip the question, agree with the scenario or disagree with the scenario. They were asked to provide written elaborations with their answers, and each participant began eacch elaboration by typing his or her name if willing to be identified with any direct quotations taken and used in this report or the online version of the survey data.

Respondents were also presented with four different proposed priorities for using the internet to better the world and they were asked to rank them in order from first to last. They were asked to also suggest issues for Pew Internet to give further study.

Questionnaire development

The questionnaire was developed by PSRAI in collaboration with staff of the Pew Internet & American Life Project and their partners at Elon University.

Brief biographies

A selection of biographical data about some of the leading internet stakeholders who participated in the survey and were willing to take credit for their remarks.

This collection of more than 250 brief biographies describing some of the 2006 Survey respondents includes data about some of the top participants who were willing to be quoted on the record for one or more of their statements in answer to the survey. Dozens of additional internet leaders/stakeholders preferred to remain anonymous, keeping their comments off the record; you will not see their names here although they did participate in the survey. The list includes leaders from ITU (International Telecommunication Union), ISOC (Internet Society), ICANN (Internet Corporation for Assigned Names and Numbers), IETF (Internet Engineering Task Force), IEEE (Institute of Electrical and Electronics Engineers), ACM (Association for Computing Machinery), AoIR (Association of Internet Researchers) and CPSR (Computer Professionals for Social Responsibility). Predictions from a majority of the following are included in this report, however to review the most comprehensive collection of their credited statements in response to the survey you should access the details on the Imagining the Internet site: http://www.elon.edu/predictions.

Matthew Allen, associate professor of internet studies at Curtin University of Technology, Australia, and founder of its internet studies program, which offers one of the few BA degrees in internet studies in the world; president of the Association of Internet Researchers; internet user since 1992.

Mary Ann Allison, chairman and chief cybernetics officer, The Allison Group, LLC; she has worked with Microsoft, the Alliance for Public Technology, Glasgow's Urban Learning Space and other major businesses, governments and NGOs to improve their capacity to change; internet user since 1981.

Stewart Alsop, investor and analyst with Alsop Louie Partners, a venture capital firm; former editor-in-chief and executive vice president of InfoWorld; columnist for Fortune magazine; internet user since 1994.

Al Amersdorfer, president and CEO, Automotive Internet Technologies, a provider of internet marketing solutions for the retail automobile industry; internet user since 1985.

Jim Archuleta, senior manager, government solutions, Ciena Corporation; manages partnerships with research and government entities to deliver advanced networks; internet user since 1989.

Gary Arlen, president, Arlen Communications Inc., The Alwyn Group LLC; founder and former long-time director of the Internet Alliance; expert in new applications and policy implications of broadband and interactive services; internet user since 1982.

Nick Arnett, director of business intelligence, Liveworld Inc. (online communities for businesses); formerly of Senti-Mentrics Partners, MCC Media, Opion Inc., Invisible Worlds; MCC Media; Verity; a co-founder of Multimedia Computing Corp. with Tim Bajarin of Creative Strategies; former InfoWorld writer; internet user since 1988.

Rob Atkinson, president of the Information Technology and Innovation Foundation; author of New Economy Index series and the book "The Past and Future of America's Economy: Long Waves of Innovation that Power Growth"; previously project director at the CongressionalOffice of Technology Assessment; internet user since 1993.

Fred Baker, CISCO Fellow, CISCO Systems, Internet Society (ISOC) chairman of the board; Internet Engineering Task Force (IETF) leader; he has worked in the telecommunications industry since 1978, building servers, bridges and routers; an architect of the internet and internet user since 1987.

Reva Basch, consultant for Aubergine Information Systems (online research expert); active longtime member of The WELL, one of the earliest cyberspace communities; author of many books, including "Researching Online for Dummies"; internet user since 1973.

Rashid Bashshur, director of telemedicine, University of Michigan; a catalyst for the development of telemedicine systems since the 1970s who has worked at the National Academy of Sciences and has been awarded National Science Foundation funding for telemedicine research; internet user since 1980.

Gordon Bell, senior researcher, Microsoft; an internet pioneer, he proposed a plan for a U.S. research and education network in a 1987 report to the Office of Science and Technology in response to a congressional request by Al Gore; earlier in his career, he was a technology leader at Digital Equipment Corporation; internet user since 1986.

Benhamin Ben-Baruch, senior market intelligence consultant and applied sociologist, Aquent, General Motors, Eastern Michigan University; internet user since 1980.

Robin Berjon, World Wide Web Consortium and Expway (Paris, France), where he is a research scientist working with XML in constrained and high-performance environments; member of the SVG Working Group and active in the Perl XML community; internet user since 1996.

Ivair Bigaran, Global Messenger Courier do Brasil, American Box Serviço Int'l S/C Ltda.; internet user since 1994.

Joe Bishop, VP business development, Marratech AB, a Swedish company that develops and markets software solutions that allow remote groups to collaborate; representative to Internet2; internet user since 1994.

Paul Blacker, head of broadband strategy, British Telecom, with more than 20 years of telecommunications work in the UK, Portugal, Spain, Malaysia and Saudi Arabia; internet user since 1993.

Ralph Blanchard, investor; has a Ph.D. in economic history; formerly worked as CEO for a franchised information-services business, now managing a private real estate firm; internet user since 1994.

Grant Blank, assistant professor of sociology, American University; author of "New Technology in Sociology" and co-author of "Desktop Data Analysis with SYSTAT"; internet user since 1987.

Jeffrey Boase, internet researcher and co-author of the 2006 Pew Internet report "The Strength of Internet Ties," Ph.D. student, University of Toronto, where he works with NetLab; a former fellow at the National Center for Digital Government; internet user since 1992.

Michael Botein, professor and founding director, Media Center, New York Law School; consultant to the FCC in international telecommunications law and the regulation of cable TV; he wrote "International Telecommunications in the United States" and "Cases and Materials on Regulation of the Electronic Mass Media"; internet user since 1985.

Jeffrey Branzburg, educational consultant for National Urban Alliance, Center for Applied Technologies in Education and other groups; former supervisor of instructional technology for New York; columnist for Technology & Learning magazine; internet user since 1997.

Charlie Breindahl, external lecturer, University of Copenhagen, IT University of Copenhagen; research areas include the aesthetics of new media and internet dating; internet user since 1996.

Greg Brewster, associate dean, School of Computer Science Telecommunications and Information Systems, DePaul University; formerly worked at Bell Laboratories for AT&T; recipient of National Science Foundation networking grants; internet user since 1979.

Walter J. Broadbent, vice president, The Broadbent Group; expert in addiction and recovery; internet user since 1994.

John Browning, co-founder of First Tuesday, a global network dedicated to entrepreneurs; former writer for The Economist and other top publications; internet user since 1989.

Enid Burns, managing editor for statistics at ClickZ.com, a major resource of interactive marketing news, research, and reference; internet user since 1994.

Lillian Buus, E-learning Lab: Center for User-Driven Innovation, Learning and Design, Aalborg University, Denmark; research interests include change processes, virtual-learning environments.

Marilyn Cade, CEO and principal, ICT Strategies, MCADE, LLC; also with Information Technology Association of America (business alliance); represents the technology industry in international forums, including the OECD, ITU, CITEL, ICANN, WIPO and the World Summit on the Information Society; former director of internet policy for AT&T; internet user since 1986.

Jean-Pierre Calabretto, staff member and Ph.D. student, Division of Information Technology, Engineering, and the Environment at University of South Australia; internet user since 1989.

Michael Cannella, IT manager for Volunteers of America-Michigan, member Computer Professionals for Social Responsibility.

Sylvia Caras, disability rights advocate for People Who; internet user since 1993.

Nicholas Carr, independent writer and consultant whose work centers on information technology; internet user since 1987.

Gary Chapman, director of the 21st Century Project at the graduate school for public policy at the University of Texa; executive director of Computer Professionals for Social Responsibility from 1984 to 1991; served on selection committee for the Turing Award - the computer-science field's equivalent of the Nobel Prize; internet user since 1982.

Clement Chau, research assistant and program coordinator, Tufts University-Developmental Technologies Research Group; internet user since 1995.

Barry K. Chudakov, principal, The Chudakov Company, specializing in strategies for complex adaptive systems; internet user since 1989.

Steve Cisler, former senior library scientist for Apple, founder of the Association for Community Networking, now working on public-access projects in Guatemala, Ecuador and Uganda; internet user since 1989.

David Clark, from 1981 to 1989 the chief protocol architect of the internet; senior research scientist at MIT; past chair of Computer Sciences and Telecommunications Board of the National Research Council; now working under a major National Science Foundation grant to rethink the architecture of the internet; internet user since 1975.

Lynn Schofield Clark, director of Teens and the New Media @ Home Project, University of Colorado; member of the international study commission on Media, Religion, and Culture; internet user since 1991.

James Conser, professor emeritus, Youngstown State University; expert on criminal justice and co-author of "Law Enforcement in the United States"; a leader of Police Futurists International and member of the World Futures Society; internet user since 1985.

Ted M. Coopman, activist, social science researcher, instructor at the University of Washington, Seattle, member of Association of Internet Researchers board of directors.

Jeff Corman, government policy analyst, Industry Canada, Government of Canada; internet user since 1995.

W. Reid Cornwell, director of The Center for Internet Research; former CEO of Intratech, a high-tech executive search firm; author of "A Primer of Internet Marketing, Metrics and Management"; internet user since 1974.

Todd Costigan, National Association of Realtors, Center for Realtor Technology; internet user since, 1985.

Karen Coyle, information professional and librarian, active leader of Computer Professionals for Social Responsibility; expert on internet privacy; internet user since 1983.

Paul Craven, director of enterprise communications, U.S. Department of Labor; internet user since 1993.

Brent Crossland, government technology policy analyst based in Illinois; specializes in securing digital identities and information; internet user since 1992.

Mark Crowley, researcher, The Customer Respect Group; internet user since 1995.

Claudia Cruz, online editor of elPeriodico, based in Guatemala.

Roger Cutler, W3.org (the World Wide Web Consortium, Tim Berners-Lee's web development group), senior staff research scientist at the Chevron Information Technology division of Chevron U.S.A.; internet user since 1994.

Cary Curphy, operations research analyst, U.S. Army; internet user since 1989.

Michael Dahan, professor, Sapir Academic College, Israel; Digital Jerusalem; His works include the paper "National Security and Democracy on the Internet in Israel." He has led projects to foster peace in the Middle East through new technology; internet user since 1989.

Amos Davidowitz, director of education, training and special programs for Institute of World Affairs, Association for Progressive Education; founder of Global Peace Experiences; internet user since 1994.

Nan Dawkins, co-founder of RedBoots Consulting; has more than 20 years of experience in marketing communications with J. Walter Thompson and other agencies; a frequent speaker on search engines, blogs, and online advocacy; internet user since 1997.

Jascha de Nooijer, Universiteit Maastricht, Netherlands; research studies teens and use of the internet for health information; internet user since 1995.

Ben Detenber, associate professor, Nanyang Technological University, Singapore; research interests include media effects and information and communications technologies.

Cory Doctorow, self-employed journalist, blogger, co-editor of *Boing Boing*, a leading blog; born in Canada, he now lives in London; he worked as the European Affairs Coordinator for the Electronic Frontier Foundation before quitting to work on writing and speaking full-time; internet user since 1987.

Georg Dutschke, Universida Sevilla, Forum Criança, Cortefino; research interests include the impact of new technologies, organization development and marketing; internet user since 1996.

Esther Dyson, editor Release 1.0 (now part of CNET Networks), investor and adviser to start-ups, and member of many boards, including Electronic Frontier Foundation and the Global Business Network; former chair of ICANN (Internet Corporation for Assigned Names and Numbers) board; internet user since 1985.

Bruce Edmonds, Centre for Policy Modelling, Manchester Metropolitan University, UK; his research has included work on social intelligence and the construction of AI and social agents; internet user since 1992.

Lilia Efimova, researcher, Telematica Instituut, Netherlands; research interests include personal knowledge management and weblogs; internet user since 1993.

David Elesh, associate professor of sociology at Temple University; an expert on political fragmentation in metropolitan areas and consequences of industrial change; internet user since 1983.

Leigh Estabrook, professor, University of Illinois; research includes a study of the impact of the USA Patriot Act; recipient of the 2003 Association for Library and Information Science Award for professional contributions to education; internet user since 1978.

Luc Faubert, consultant, dDocs Information Inc.; president of Quebec's Internet Society chapter and an ambassador to the World Summit on Information Society; working on the creation of the North American Regional At-Large Organization (NARALO) within ICANN; member of Computer Professionals for Social Responsibility (CPSR); internet user since 1985.

Bret Fausett, an intellectual property and internet attorney and a partner with Hancock, Rothert & Bunshoft, LLP in the Los Angeles area; he has done work tied to ICANN, urges its reform and produces a blog and podcasts about it.

Stan Felder, president and CEO, Vibrance Associates, LLC; publisher of the health/medical websites hisandherhealth.com, newshe.com and ourgyn.com; internet user since 1985.

María Laura Ferreyra, strategic planner, Instituto Universitario Aeronautico; active leader in the Internet Society chapter in Argentina; internet user since 1996.

Cliff Figallo, online communities architect, SociAlchemy; was managing director of the WELL (Whole Earth 'Lectronic Link, one of the best-known conferencing systems and virtual communities in the United States in the 1990s) and a director of the Electronic Frontier Foundation's Cambridge office in the early 1990s; internet user since 1985.

Howard Finberg, director of interactive media, The Poynter Institute; was named the Newspaper Association of America "New Media Pioneer" in 2000; a journalist for 30 years, he previously worked at the Chicago Tribune, the New York Times, the San Francisco Chronicle and the Arizona Republic; internet user since 1991.

Seth Finkelstein, activist and programmer, author of the Infothought blog and an EFF Pioneer Award winner; he devoted hundreds of hours of time over the span of several years to decrypt and expose to public scrutiny the contents of censorware blacklists, raising the level of public awareness about the freedom of speech issues on the internet.

Richard Forno, principal consultant, KRvW Associates (information security), Infowarrior.Org; CMU Software Engineering Institute; formerly the chief information security officer for Network Solutions; author of "The Art of Information Warfare"; publishes a website with information on computer security; internet user since 1992.

Gary Foster, Gary D. Foster Consulting, a consulting company that concentrates on Christian marketing and management; internet user since 1990.

Suely Fragoso, professor and researcher at the Center of Communications Science, Unisinos, Brazil; active in Association of Internet Researchers, research interests include the digital divide; internet user since 1994.

Mark Gaved, The Open University, United Kingdom; research interest is community activism; internet user since 1987.

Rick Gentry, acquisition coordinator, Greenpeace USA; internet user since 1995.

Heath Gibson, competitive intelligence manager, BigPond, a provider of broadband customer websites in Australia; internet user since 1994.

Amy Gill, Association of Alternative News Weeklies, a trade association providing support and information from more than 100 alternative newsweeklies in the United States.

Mike Gill, electronics engineer, National Library of Medicine; internet user since 1988.

Michael Gorrell, senior VP and chief information officer for EBSCO publishing, responsible for all technology and product development for this online research platform; member of Internet2; internet user since 1994.

Stine Gotved, cultural sociologist, University of Copenhagen; her research looks into cybersociology issues, including online communities; time/space relations; mediated interaction; and the sense of belonging.

Arent Greve, professor of organization theory, The Norwegian School of Economics and Business Administration; research topics include organization theory and the development and diffusion of technology; internet user since 1983.

Robin Gross, executive director, IP Justice, civil liberties organization that promotes balanced intellectual property law and defends consumer rights to use digital media worldwide; internet user since 1988.

Carlo Hagemann, professor, Radboud Universiteit Nijmegen, Netherlands; member of the Association of Internet Researchers; internet user since 1989.

Alex Halavais, assistant professor, State University of New York-Buffalo; graduate director for the informatics school at Buffalo; he studies how social networks are formed on the Internet and promotes the practice of "self-Googling" − establishing your own identity on the internet; internet user since 1984.

Jeff Hammond, VP, Rhea and Kaiser; expert on strategic planning, design, and implementation of interactive communications; internet user since 1992.

Fred Hapgood, technology author and consultant; an accomplished freelance writer in technology and science; in the 1990s, he took on the role of moderator of the Nanosystems Interest Group at MIT, and has written a number of articles for Wired and other tech publications since then; internet user since 1981.

Joel Hartman, CIO, University of Central Florida; chair of the EDUCAUSE Learning Initiative Planning Committee; member of the Microsoft Higher Education Advisory Council; representative to Internet2; and on the board of Florida LambdaRail; internet user since 1970.

Caroline Haythornthwaite, associate professor, University of Illinois at Urbana-Champaign; active leader with the Association of Internet Researchers; research areas include social networks and the internet in everyday life; internet user since 1996.

Carter Headrick, director of grassroots and field operations for Campaign for Tobacco-Free Kids; engaged in creating online activism; internet user since 1993.

Don Heath, internet pioneer and president and CEO of the Internet Society from 1996 through 2001; board member, iPool, Brilliant Cities Inc., Diversified Software, Alcatel, Foretec; member of U.S. State Department Advisory Committee on International Communication and Information Policy; internet user since 1988.

Charles Hendricksen, research collaboration architect for Cedar Collaboration in Redmond, Washington; research interests include development and evaluation of geospatial information technologies for decision support; internet user since 1968.

Steffan Heuer, a German journalist who covers the technology industry, U.S. correspondent, brand eins Wirtschaftsmagazin; internet user since 1994.

Buff Hirko, virtual reference coordinator, Washington State Library; an expert on virtual reference she is a frequent speaker at regional and national conferences; internet user since 1988.

Donna Hoffman, professor of management and co-director, Sloan Center for Internet Retailing, Vanderbilt University; founder of eLab, and an internationally known expert on internet marketing strategy and consumer behavior online; internet user since 1975.

Scott Hollenbeck, director of technology, VeriSign (provider of global infrastructure services for telecommunication, content, Internet, and Ecommerce services); active director in the Internet Engineering Task Force; expert at developing applications and systems; internet user since 1988.

Jim Huggins, associate professor of computer science, Kettering University; research interests include theory of computation, computing history, programming language design, computing ethics, cryptography; internet user since 1989.

Christian Huitema, general manager of wireless and mobility at Microsoft in the Windows Networking and Devices group; pioneering internet engineer (on the Internet Architecture Board from 1991-96; Internet Society leader from 1995-2001; still active in building the internet).

Alan Inouye, U.S. internet policy analyst previously with the Computer Science and Telecommunications Board of the National Research Council, where he completed several key studies, including "Trust in Cyberspace" and "A Digital Strategy for the Library of Congress"; formerly worked at Atari and Verbatim; internet user since 1990.

David Irons, VP, co-founder, Ascribe: The Public-Interest Newswire; consultant on strategic communication; formerly public affairs director at Harvard's Kennedy School of Government and UC Berkeley's business school; internet user since 1993.

Jim Jansen, assistant professor, Penn State University School of Information Sciences and Technology; has published more than 90 articles on information technology and systems; recipient of an ACM Research Award; internet user since 1993.

Jakob Linaa Jensen, assistant professor in media studies, University of Aarhus, Denmark; participant in Modinet, a study of mediated democracy.

Christopher Johnson, co-founder and CEO for ifPeople, Inspiring Futures; a life member and chair of the Working Group for Computer Professionals for Social Responsibility (CPSR); internet user since 1995.

Philip Joung, Spirent Communications (wireless positioning products); representative to Internet2; internet user since 1989.

Lisa Kamm, has worked in information architecture since 1995 at organizations including IBM, Agency.com, and the ACLU; started the first ibm.com Information Architecture department; leader in the Association for Computing Machinery; presenter at Computers, Freedom & Privacy conference; internet user since 1987.

William Kearns, assistant professor at the University of South Florida; representative to Internet2; internet user since 1992.

Susan Keith, assistant professor in the school of communication, information and library sciences at Rutgers University; research interests include the issues arising from the junction of "new" and "old" media; internet user since 1996.

Thomas Keller, domain services, Schlund + Partner AG (a Germany-based web-hosting company - one of the largest ICANN registrars in Europe); he represents Schlund in the Registrar Constituency and is a member of the GNSO (Generic Names Supporting Organization) Council; internet user since 1995.

Kerry Kelley, vice president for product marketing, SnapNames.com, a Portland-based company that helps customers "back-order" a currently registered domain name to secure it when it becomes available; internet user since 1986.

Mike Kent, professor of social policy, Murdoch University, Australia; research interests include the internet, literacy, and access to technology; internet user since 1994.

Alik Khanna, Smart Analyst Inc. (a business employing financial analysts in India); internet user since 1996.

Peter Kim, senior analyst, marketing strategy and technology team, Forrester Research, Boston; specializes in e-strategy and management, social marketing, blogs; internet user since 1993.

David Kluskiewicz, a senior account executive at First Experience, a marketing communications company.

Randy Kluver, director of the Institute for Pacific Asia at Texas A&M University; former executive director, Singapore Internet Research Centre, Nanyang Technological University; internet user since 1989.

Gwynne Kostin, director of Web communications, U.S. Homeland Security; responsible for content strategy and integration, program development, web evangelizing; coordinates public web communications during incidents of national significance; internet user since 1993.

Cheris Kramarae, professor, Center for the Study of Women in Society, University of Oregon; internet user since 1976.

Robert Kraut, Human Computer Interaction Institute, Carnegie Mellon University; an expert on the design and social impact of information technologies in small groups, in the home and in organizations; author of "Computers, Phones and The Internet: Domesticating Information Technology."

Oliver Krueger, visiting professor, Princeton University Center for the Study of Religion; a native of Germany who previously worked at Heidelberg University; research areas include media and religion; internet user since 1995.

Martin Kwapinski, senior content manager, FirstGov.gov, the U.S. Government's Official Web Portal; internet user since 1997.

Jeannette LaFrance, The Shpigler Group (providing data, analyses and strategic recommendations on subjects such as BPL, metropolitan networks, fiber-route feasibility and "utelco" business models); internet user since 1990.

Mark O. Lambert, former utilities commissioner, State of Iowa; consultant; futurist; internet user since 1989.

Edward Lee Lamoureux, associate professor, director of the multimedia program, and co-director of the New Media Center, Bradley University; research interests include new media and intellectual property law.

Robin Lane, educator and philosopher, Universidade Federal do Rio Grande do Sul, Brazil; internet user since 1990.

Cheryl Langdon-Orr, independent internet business operator and director for ISOC-Australia; she is a board member of AUDA, the group in charge of Australian Domain Name registration, and she is a member of ICANN At Large; internet user since 1977.

Tíscar Lara, assistant professor at the School of Journalism, University Carlos III Madrid, Spain; internet user since 1995.

Tunji Lardner, CEO for the West African NGO network: wangonet.org; agendaconsulting.biz; has held various consultancies for the World Bank and United Nations as well as being a resource person and consultant to the UNDP African Internet Initiative; internet user since 1988.

Pierre Le Fèvre, president, Yomux Media Inc., based in Montreal, Canada; internet user since 1990.

Russell Lefevre, vice president for Technology Services Corporation in Los Angeles; former Institute of Electrical and Electronics Engineers-USA Congressional Fellow.

Thomas J. Lenzo, technology consultant with 30 years of experience, clients include Kaiser Permanente, Parsons Engineering and others; internet user since 1979.

Alan Levin, programmer, designer, systems and network architect; chairman of the South Africa Chapter of the Internet Society; active in ICANN; serves on the boards of Future Perfect Corporation, AfriNIC and .za DNA; internet user since 1994.

Bud Levin, program head/psychology and commander/policy and planning, Blue Ridge Community College; Waynesboro (VA) Police Department; internet user since 1988.

Peter Levine, director of CIRCLE (Center for Information and Research on Civic Learning and Engagement), University of Maryland; formerly worked for Common Cause; he also works with the Prince George's County Information Commons (a nonprofit website community, produced mainly by youth), National Alliance for Civic Education and Deliberative Democracy Consortium; internet user since 1993.

Rich Ling, senior researcher and sociologist, Telenor Research Institute, Oslo, Norway; author of the book "The Mobile Connection: The Cell Phone's Impact on Society"; associate editor for The Information Society and for Norsk Mediatidskrift; internet user since 1984.

Fredric M. Litto, professor and director for the School of the Future at the University of Sao Paulo, Brazil, an interdisciplinary lab investigating the question of how new communications technologies can improve learning; president, ABED-Brazilian Association for Distance Education; representative to Internet2; internet user since 1993.

Geert Lovink, media theorist, professor and internet critic, Institute of Network Cultures, University of Amsterdam; in 2005-2006 he is a fellow at the Wissenschaftskolleg, the Centre for Advanced Study in Berlin; internet user since 1993.

Robert Lunn, Focalpoint Analytics; worked as a senior research analyst on the 2004 Digital Future Report: Surveying the Digital Future, produced by the USC Annenberg School Center for the Digital Future.

Wainer Lusoli, University of Chester, UK; originally from Italy; former research fellow, European Studies Research Institute (2003-2005); member of Association of Internet Researchers; research initiatives include the Internet & Elections Project and a look at the impact of the Internet on the 2005 UK general election; internet user since 1994.

Ed Lyell, pioneer in issues regarding internet and education, professor of business and economics at Adams State College, Alamosa, Colorado; designer and consultant for using telecommunications and high-touch/high-tech methods to improve school effectiveness; internet user since 1965.

Mike McCarty, chief network officer, Johns Hopkins; internet user since 1992.

Jim McConnaughey, senior economic adviser active in U.S. policy on access and the digital divide, including work at the Federal Communications Commission, Harvard and the National Telecommunications & Information Administration.

Kevin McFall, director, Online Products & Affiliate Programs, Tribune Media Services, NextCast Media; internet user since 1984.

Alec MacLeod, associate professor, California Institute of Integral Studies; his research interests include the visual culture of the internet; internet user since 1989.

Shawn McIntosh, lecturer in strategic communications, Columbia University; a co-author of "Converging Media" who formerly worked as an editor and freelance writer for newspapers and magazines in the UK, U.S., and Japan; co-founded Netgraf, which examines issues and trends related to online journalism; internet user since 1992.

Ursula Maier-Rabler, assistant professor, University of Salzburg, Austria; research interests include ePolicy, eDemocracy and eGovernment; internet user since 1982.

Wladyslaw Majewski, OSI CompuTrain SA, a leader of ISOC Polska – the Internet Society chapter in Poland; internet user since 1989.

Meg Houston Maker, director of external information services, Dartmouth College; active in Association for Computing Machinery; internet user since 1993.

Willis Marti, associate director for networking, Texas A&M University; former builder of large networks for TRW, Martin-Marietta, and SYtek; research interests include security, fault tolerance; distributed platforms; distributed operating systems; leader with Internet2; internet user since 1983.

Andrea Matwyshyn, executive director, Center for Information Research, assistant professor of law, University of Florida; an affiliate of the Centre for Economics and Policy at the University of Cambridge; research focuses on information security and information technology and privacy regulation; internet user since 1992.

Sean Mead, networking consultant, for Interbrand Analytics, Design Forum, Cannon Retail Technologies, Mead Mead & Clark P.C. and other companies; internet user since 1989.

Nicco Mele, internet strategist, political web architecture expert, CEO for EchoDitto, an online communications firm serving non-profits and political organizations; born in West Africa, but now active in politics in the U.S., he's known for heading the internet strategy for Howard Dean's 2004 presidential campaign.

Michel Menou, professor, consultant and information-science researcher; born in France, he has worked in nearly 80 nations since 1966; research is concentrated on information policy, including significant studies of information technology and its impact in Africa; on the editorial board of seven scholarly journals; internet user since 1992.

Bob Metcalfe, internet pioneer, invented Ethernet when working at Xerox PARC in 1973, founder of 3Com Corporation, former CEO of InfoWorld, now a venture capitalist and partner in Polaris Venture Partners; director of the Pop Tech executive technology conference; winner of IEEE Medal of Honor and the U.S. National Medal of Technology; internet user since 1970.

Denzil Meyers, founder and president, Widgetwonder (internal branding consultants and facilitators of corporate storytelling), Applied Improvisation Network; internet user since 1993.

Vincent Michon, strategic marketing manager, France Télécom; internet user since 1979.

Toby Miller, professor, University of California-Riverside; an Australian with research interests in cultural policy and political economy; internet user since 1990.

Sturle J. Monstad, Research Centre for Health Promotion, University of Bergen, Norway; internet user since 1989.

Scott Moore, online community manager, Helen and Charles Schwab Foundation; an expert on online communities; internet user since 1991.

Torill Mortensen, associate professor, Volda University College, Norway; her research interests include media theory and reader-response theory; internet user since 1991.

Martin F. Murphy, IT consultant, City of New York; internet user since 1993.

Brian T. Nakamoto, Everyone.net (a leading provider of outsourced email solutions for individuals and companies around the world); author of the blog Information Overload; internet user since 1990.

Thomas Narten, IBM open-internet standards development, based out of North Carolina; involved in networking for more than 20 years, he is the Internet Engineering Task Force (IETF) liaison to the ICANN Board of Directors; he has been the IBM technical lead for Internet Protocol v.6; co-chaired the IETF multi6 Working Group; internet user since 1983.

Louis Nauges, president, Microcost (an IT services and hardware company based in France); internet user since 1990.

Peter P. Nieckarz Jr., assistant professor of sociology, Western Carolina University; research interests include the emergence of community and social structure on the internet; internet user since 1993.

Pekka Nikander, engineer at Ericcson Research, Helsinki Institute for Information Technology, Finland; past member of the Internet Architecture Board; internet user since 1987.

Christine Ogan, professor, University of Indiana School of Journalism; working with two other professors under a NSF grant to study recruitment and retention of women in information technology disciplines in U.S. universities; internet user since 1986.

Doug Olenick, computer technology editor, TWICE (This Week In Consumer Electronics) Magazine; internet user since 1996.

Jill O'Neill, director of planning & communication, National Federation of Abstracting and Information Services; internet user since 1986.

Andy Oram, writer and editor specializing in free software and open-source technologies for O'Reilly Media, based in Boston; member of Computer Professionals for Social Responsibility; internet user since 1983.

Olav Anders Øvrebø, freelance journalist based in Oslo, Norway; internet user since 1995.

Cleo Parker, senior manager, BBDO (international agency for networked, multi-channel communications solutions); internet user since 1993.

Barry Parr, analyst for the media group, Jupiter Research; formerly e-commerce research director for International Data Corporation; former vice president of news at CNET; and former managing producer of the San Jose Mercury News's Mercury Center; internet user since 1990.

Craig Partridge, internet pioneer and early leader in the IETF; active member of the Association for Computing Machinery's SIGCOMM and the IEEE Communications Society; he chaired a National Research Council study of how the internet functioned during the 9/11 attacks; now chief scientist, BBN Technologies; internet user since 1983.

Alix L. Paultre, executive editor, Hearst Business Media, Smartalix.com, Zep Tepi Publishing; author of "Cyberchild"; internet user since 1996.

Pascal Perrin, futurologist, France Telecom; internet user since 1998.

David Perry, president, Consensus Point (formerly Foresight Technologies), a prediction market organization based in Nashville; internet user since 1990.

Ian Peter, internet pioneer, helped develop the internet in Australia and the Asia-Pacific region in the 1980s; maintains a project on the future of the internet - the Internet Mark II Project; internet user since 1986.

Mirko Petric, lecturer in media theory and semiotics, University of Zadar, Croatia; internet user since 1996.

Kathleen Pierz, managing partner, The Pierz Group (consultants in directory assistance/enquiry); internet user since 1985.

Alejandro Pisanty, CIO for UNAM (National University of Mexico); vice chairman of the board for ICANN; member of United Nations' Working Group for Internet Governance; active in ISOC; internet user since 1977.

Nathaniel Poor, lecturer in the Department of Communication Studies at the University of Michigan; research areas include the convergence of internet use and international engagement.

Mark Poster, professor of film and media studies, University of California-Irvine; studies the ways social communications have changed through the introduction of new technologies; author of the book "Second Media Age"; internet user since 1983.

Henry Potts, professor, Centre for Health Informatics, University College, London; internet user since 1990.

Sam Punnett, president, FAD research; has worked in the field of interactive digital media since the 1980s in the music business, social research, broadcast production, equities analysis, electronic game design, and for the last nine years on strategy, marketing, and product development related to e-business; internet user since 1988.

Polly Purvis, executive director ScotlandIS, a trade association; formerly of the Royal Bank of Scotland, Matrix Management and the Scottish Software Federation; board member for Technology Ventures Scotland and Scottish Technology Forum.

Teddy Purwadi, secretary-general of the Indonesian Internet Service Providers Association; active in work with ICANN; leader of the Indonesian Chapter of the Internet Society.

John S. Quarterman, president InternetPerils Inc.; a founder of Matrix.Net Inc., which began publishing the first maps of the Internet in 1993; conducted the first demographic survey of the Internet; Matrix News, which he started in 1991, was the earliest continuing commercial newsletter published over the Internet; internet user since 1974.

Ross Rader, director of research and innovation, Tucows Inc; works with ICANN in the Registrars Constituency, part of the GNSO (Generic Names Supporting Organization); internet user since 1991.

Sheizaf Rafaeli, professor in the graduate school of business administration, Haifa University, Israel; director of INFOSOC, the Center for the Study of the Information Society; contributor to Globes (a business journal); founder and co-editor of the Journal of Computer-Mediated Communication; internet user since 1982.

Lutfor Rahman, executive director of Association for Advancement of Information Technology and vice-chancellor of Pundra University of Science and Technology, Bangladesh; internet user since 1996.

Gisela Redeker, professor, University of Groningen, Netherlands; member of the editorial boards of the journals Linguistik Online, Poetics and Tijdschrift voor Communicatiewetenschap; internet user since 1981.

Michael Reilly, GLOBALWRITERS, Baronet Media LLC, Hally Enterprises, Inc., State University of New York at Stony Brook, Global Public Affairs Institute; internet user since 1972.

Howard Rheingold, internet sociologist and author; one of the first to illuminate virtual communities; in the '90s he published the webzine Electric Mind; he wrote the books "Virtual Reality," "Smart Mobs" and "Virtual Community"; he also was the

editor of Whole Earth Review and the Millennium Whole Earth Catalog; internet user since 1990.

Glenn Ricart, executive director, Price Waterhouse Coopers Advanced Research; member of the board of trustees of the Internet Society; formerly CTO at Novell and a founder or co-founder of three successful start-ups; former program manager at DARPA (Defense Advanced Research Projects Agency); won the first NSF grant for networking and created the first operational regional TCP/IP network; internet user since 1968.

Mario Rios, TDCLA (Tecnologías del Conocimiento, an e-learning group), Chile; internet user since 1997.

Nicolas Ritoux, freelance technology reporter for La Presse, Montréal, and other media outlets; internet user since 1995.

Nuno Rodrigues, 4EMESmultimédia (a multimedia development company based in Portugal); internet user since 1992.

Sabino M. Rodriguez, MC&S Services; internet user since 1994.

Hernando Rojas, a native of Colombia and a professor in the department of life sciences communication at the University of Wisconsin-Madison, consultant for the United Nations Development Program.

Peter Roll, retired chief system administrator; internet user since 1981.

Marc Rotenberg, founder and executive director Electronic Privacy Information Center; he won an Electronic Frontier Foundation Pioneer Award in 1997 for his work as a "champion of privacy, human rights and civil liberties on the electronic frontier"; internet user since 1978.

Douglas Rushkoff, social theorist, journalist and teacher, New York University; wrote "Cyberia: Life in the Trenches of Hyperspace," "Media Virus! Hidden Agendas in Popular Culture," "Exit Strategy" and "Coercion"; he is a recipient of the Neil Postman Award for Career Achievement in Public Intellectual Activity; internet user since 1985.

Anthony Rutkowski, an internet pioneer who helped establish internet protocols, he works as vice president for regulatory and standards, VeriSign; he is a co-founder and former executive director of the Internet Society and he is an active leader in International Telecommunication Union (ITU); internet user since 1979.

Sherida Ryan, internet analyst, Openflows Networks Ltd. (provider of news, analysis, network facilities and tools for Open Source); internet user since 1995.

D.K. Sachdev, founder and president, SpaceTel Consultancy LLC (management and engineering support to organizations engaged in operating and/or developing total systems for broadband, multimedia, Internet, telecommunications and digital satellite broadcasting); early developer of XM Radio; internet user since 1987.

Paul Saffo, forecaster and strategist with more than two decades of experience exploring long-term technological change, director, Institute for the Future; serves on many boards, including the Long Now Foundation; Fellow in the Royal Swedish Academy of Engineering Sciences; chairman of Samsung Science Board; Internet user since 1978.

Janet Salmons, president, Vision2Lead Inc. (consultants on organizational leadership and development and virtual learning); internet user since 1985.

Mike Samson, interactive media writer and producer, Creative Street Media Group; internet user since 1989.

Syamant Sandhir, leader in experience design and implementation, Futurescape; internet user since 1995.

Kevin Schlag, director of web development and IT for Western Governor's University, BYU-Hawaii; internet user since 1993.

Jan Schmidt, professor, Bamberg University's Forschungsstelle Neue Kommunikationsmedien, Germany; research includes the principles and practices of networking with a focus on Weblogs and social software; internet user since 1993.

Adrian Schofield, head of research for ForgeAhead (focused on ICT research and consulting in Africa), South Africa; a leader in the World Information Technology and Services Alliance (WITSA); internet user since 1994.

James Schultz, principal, Pretty Good Consulting; Institute for Work and the Economy (a consortium studying challenges posed by new immigrants in the labor market); former executive at Walgreen's; internet user since 1995.

Robert Shaw, senior internet strategy and policy advisor for the International Telecommunication Union (ITU); ITU is an organization with 189 member states based in Geneva, Switzerland, responsible for the global development of telecommunications networks and services; internet user since 1987.

Tiffany Shlain, filmmaker and founder and ambassador of the Webby Awards; named one of Newsweek's "Women Shaping the 21st Century"; Shlain has also directed 10 films, including "Life, Liberty and the Pursuit of Happiness" (a selection at the 2003 Sundance Film Festival) and a profile of Intel founder Gordon Moore; internet user since 1987.

Rajnesh J. Singh, PATARA Communications & Electronics Ltd., Avon Group, GNR Consulting, chairman of the Pacific Islands chapter of the Internet Society; member of IEEE; internet user since 1993.

Tom Snook, chief technology officer, New World Symphony; representative to Internet2; internet user since 1967.

Jonathan Sills, SVP (strategy & corporate development), Provide Commerce, Liberty Media; internet user since 1993.

Kerri Smith, Elexio (web design, content management and enterprise solutions for non-profit organizations); internet user since 1997.

Chris Sorek, senior vice president of public communications, SAP (provider of client/server enterprise application software); formerly with the International Federation of the Red Cross and Red Crescent Societies in Geneva, where he directed global communications activities; internet user since 1980.

Mikkel Holm Sørensen, software and intelligence manager, Actics Ltd. (ethical management systems); internet user since 1997.

Eugene Spafford, internet and executive director for Purdue University's CERIAS (the Center for Education and Research in Information Assurance and Security - a web-based incident-response database); internet user since 1980. Member of U.S. President's Technology Advisory Committee and adviser to National Science Foundation and other agencies; leader in ACM (Association of Computing Machinery).

Suzanne Stefanac, author/interactive media strategist, dispatchesfromblogistan.com; freelance technology writer with 15 years of work in publications such as Wired, Macworld, Salon, PC World, Publish, Rolling Stone; formerly of MSNBC; founding editor of Macworld Online and co-founder of RespondTV; internet user since 1989.

Russell Steele, president, The Insightworks (provider of tools for research and teaching in economics and public policy); internet user since 1995.

Danny Sullivan, editor-in-chief, SearchEngineWatch.com (a guide to how search engines operate); producer of search engine strategies conferences in the U.S. and U.K.; internet user since 1994.

Ellen K. Sullivan, former diplomat, policy fellow, George Mason University School of Public Policy; spent several years in Romania and Singapore, looking at how government employees use technology to filter information; internet user since 1988.

Elle Tracy, president and e-strategies consultant, The Results Group, based in Seattle; formerly senior web strategist at Circle.com; internet user since 1993.

Raul Trejo-Delarbre, political science professor, Universidad Nacional Autonoma de Mexico; author of the book "The New Magic Carpet: Uses and Myths of the Internet, the Network of Networks"; internet user since 1993.

Bryan Trogdon, president, First Semantic (working on a realization of the Semantic Web); internet user since 1995.

Terry Ulaszewski, publisher, Long Beach Live Community News; internet user since 1989.

B. van den Berg, faculty of philosophy at Erasmus University, Rotterdam, The Netherlands; internet user since 1993.

Miguel Sicart Vila, junior research associate, Information Ethics Group, Oxford University; internet user since 1997.

Hal Varian, a professor at University of California-Berkeley and a world-renowned expert on the economics of information technology, he has also taught at Oxford, MIT, Stanford, Michigan and other universities around the world; he is a paid consultant for Google and writes a monthly column for the New York Times; internet user since 1986.

Daniel D. Wang, principal, Roadmap Associates (coaching and advisory company); internet user since 1995.

Jim Warren, internet pioneer (founding editor of Dr. Dobb's Journal), technology-policy advocate and activist, futurist; in 1992, he organized the first Computers, Freedom, and Privacy Conference. When he won an EFF Pioneer Award in 1992, he was noted as being "instrumental in assuring that rights common to older mediums and technologies are extended to computer networking"; internet user since 1970.

David Weinberger, teacher, writer, speaker, consultant and commentator on internet and technology; fellow at Harvard's Berkman Center for Internet & Society; author of the "Cluetrain Manifesto"; internet user since 1986.

Barry Wellman, researcher on virtual communities and workplaces; professor and director of NetLab at University of Toronto; expert on human-computer interaction and social networks in communities and organizations; winner of achievement award from the International Network for Social Network Analysis; internet user since 1976.

Nancy White, principal, Full Circle Associates (communications consultants); active in Computer Professionals for Social Responsibility; internet user since 1998.

Monica Whitty, psychology professor at Queen's University, Belfast; research focuses on internet relationships, including trust online, cyberstalking and internet privacy and surveillance; internet user since 1994.

Susan Wilhite, design anthropologist, Habitat for Humanity; interests include authority and reputation in an open-source world, online social networks, domestic space uses and identity; internet user since 1993.

Andy Williamson, managing director for Wairua Consulting Limited, New Zealand; a member of the NZ government's Digital Strategy Advisory Group; an authority on community informatics; active in e-Democracy efforts and helps establish community-based groups; internet user since 1990.

V.K. Wong, Ph.D. in physics, director of IT campus initiatives and CARAT (Collaboratory for Advanced Research and Academic Technologies), University of Michigan; internet user since 1981.

Simon Woodside, founder and CEO, Semacode Corporation, based in Ontario, Canada; internet user since 1992.

Richard Yee, competitive intelligence analyst, AT&T; internet user since 1995.

Norito H. Yoshida, new business development manager, Yahoo Japan; internet user since 1993.

Jonathan Zittrain, co-founder of the Berkman Center for the Internet and Society, Harvard University, and a top forum administrator for CompuServe; holds the chair in Internet Governance and Regulation at Oxford University and is a principal of the Oxford Internet Institute; active in work with ICANN.