

The Future of the Internet III

A survey of experts shows they expect major tech advances as the phone becomes a primary device for online access, voice-recognition improves, and the structure of the Internet itself improves. They disagree about whether this will lead to more social tolerance, more forgiving human relations, or better home lives.

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FUTURE OF THE INTERNET III

SUMMARY OF FINDINGS

Technology stakeholders and critics were asked in an online survey to assess scenarios about the future social, political, and economic impact of the Internet and they said the following:

- The mobile device will be the primary connection tool to the Internet for most people in the world in 2020.
- The transparency of people and organizations will increase, but that will not necessarily yield more personal integrity, social tolerance, or forgiveness.
- Voice recognition and touch user-interfaces with the Internet will be more prevalent and accepted by 2020.
- Those working to enforce intellectual property law and copyright protection will remain in a continuing “arms race,” with the “crackers” who will find ways to copy and share content without payment.
- The divisions between personal time and work time and between physical and virtual reality will be further erased for everyone who’s connected, and the results will be mixed in terms of social relations.
- “Next-generation” engineering of the network to improve the current Internet architecture is more likely than an effort to rebuild the architecture from scratch.

ABOUT THE METHODOLOGY AND INTERPRETING THE FINDINGS

This is the third canvassing of Internet specialists and analysts by the Pew Internet & American Life Project.¹ While a wide range of

¹ The results of the first survey can be found at:
http://www.pewinternet.org/pdfs/PIP_Future_of_Internet.pdf.

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.

Some 578 leading Internet activists, builders, and commentators responded in this survey to scenarios about the effect of the Internet on social, political, and economic life in the year 2020. An additional 618 stakeholders also participated in the study, for a total of 1,196 participants who shared their views.

Experts were located in two ways. First, nearly a thousand were identified in an extensive canvassing of scholarly, government, and business documents from the period 1990-1995 to see who had ventured predictions about the future impact of the Internet. Several hundred of them participated in the first two surveys conducted by Pew Internet and Elon University, and they were recontacted for this survey. Second, expert 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 United Nations’ Multistakeholder 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. For the first time, some respondents were invited

The results of the second survey are available at:
http://pewinternet.org/pdfs/PIP_Future_of_Internet_2006.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>.

to participate through personal messages sent using a social network, Facebook.

In all, 578 experts identified through these channels responded to the survey.

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 or are otherwise known to the 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.

In all, 618 additional respondents participated in this survey from these quarters. Thus, the expert results are reported as the product of 578 responses and the lines listing “all responses” include these additional 618 participants.

This report presents the views of respondents in two ways. First, we cite the aggregate views of those who responded to our survey. 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 & American Life Project Web site: <http://www.imaginingtheinternet.org/>. 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.

How Respondents Assessed Future III Scenarios for 2020			
Scenarios presented in order they were posed in the survey	Mostly agree	Mostly disagree	Did not respond
<p>The mobile phone is the primary connection tool for most people in the world. In 2020, while "one laptop per child" and other initiatives to bring networked digital communications to everyone are successful on many levels, the mobile phone—now with significant computing power—is the primary Internet connection and the only one for a majority of the people across the world, providing information in a portable, well-connected form at a relatively low price. Telephony is offered under a set of universal standards and protocols accepted by most operators internationally, making for reasonably effortless movement from one part of the world to another. At this point, the "bottom" three-quarters of the world's population account for at least 50% of all people with Internet access—up from 30% in 2005.</p>	<p>Of 578 Experts 77%</p> <p>Of 1,196 total respondents 81%</p>	<p>Of experts 22%</p> <p>Of total respondents 19%</p>	<p>Of experts *%</p> <p>Of total respondents *%</p>
<p>Social tolerance has advanced significantly due in great part to the Internet. In 2020, people are more tolerant than they are today, thanks to wider exposure to others and their views that has been brought about by the Internet and other information and communication technologies. The greater tolerance shows up in several metrics, including declining levels of violence, lower levels of sectarian strife, and reduced incidence of overt acts of bigotry and hate crimes.</p>	<p>Of 578 Experts 32%</p> <p>Of 1,196 total respondents 33%</p>	<p>Of experts 56%</p> <p>Of total respondents 55%</p>	<p>Of experts 13%</p> <p>Of total respondents 13%</p>
<p>Content control through copyright-protection technology dominates. In 2020, strict content controls are in place thanks to the efforts of legislatures, courts, the technology industry, and media companies. Those who use copyrighted materials are automatically billed by content owners, and Internet service providers automatically notify authorities when they identify clients who try to subvert this system. Protestors rarely prevail when they make claims that this interferes with free speech and stifles innovation.</p>	<p>Of 578 Experts 31%</p> <p>Of 1,196 total respondents 31%</p>	<p>Of experts 60%</p> <p>Of total respondents 61%</p>	<p>Of experts 9%</p> <p>Of total respondents 8%</p>
<p>Transparency heightens individual integrity and forgiveness. In 2020, people are even more open to sharing personal information, opinions, and emotions than they are now. The public's notion of privacy has changed. People are generally comfortable exchanging the benefits of anonymity for the benefits they perceive in the data being shared by other people and organizations. As people's lives have become more transparent, they have become more responsible for their own actions and more forgiving of the sometimes-unethical pasts of others. Being "outed" for some past indiscretion in a YouTube video or other pervasive-media form no longer does as much damage as it did back in the first decade of the 21st Century. Carefully investigated reputation corrections and clarifications are a popular daily feature of major media outlets' online sites.</p>	<p>Of 578 Experts 45%</p> <p>Of 1,196 total respondents 44%</p>	<p>Of experts 44%</p> <p>Of total respondents 45%</p>	<p>Of experts 11%</p> <p>Of total respondents 10%</p>
<p>Many lives are touched by the use of augmented reality or spent interacting in artificial spaces. In 2020, virtual worlds, mirror worlds, and augmented reality are popular network formats, thanks to the rapid evolution of natural, intuitive technology interfaces and personalized information overlays. To be fully connected, advanced organizations and individuals must have a presence in the "metaverse" and/or the "geoWeb." Most well-equipped Internet users will spend some part of their waking hours—at work and at play—at least partially linked to augmentations of the real world or alternate worlds. This lifestyle involves seamless transitions between artificial reality, virtual reality, and the status formerly known as "real life."</p>	<p>Of 578 Experts 55%</p> <p>Of 1,196 total respondents 56%</p>	<p>Of experts 30%</p> <p>Of total respondents 31%</p>	<p>Of experts 15%</p> <p>Of total respondents 13%</p>

Scenarios presented in order they were posed in the survey	Mostly agree	Mostly disagree	Did not respond
Talk and touch are common technology interfaces. People have adjusted to hearing individuals dictating information in public to their computing devices. In addition “haptic” technologies based on touch feedback have been fully developed, so, for instance, a small handheld Internet appliance allows you to display and use a full-size virtual keyboard on any flat surface for those moments when you would prefer not to talk aloud to your networked computer. It is common to see people “air-typing” as they interface with the projection of a networked keyboard visible only to them.	Of 578 Experts 64% Of 1,196 total respondents 67%	Of experts 21% Of total respondents 19%	Of experts 15% Of total respondents 14%
Next-generation research will be used to improve the current Internet; it won’t replace it. In 2020, the original Internet architecture is in the continuing process of refinement – it hasn’t been replaced by a completely new system. Research into network innovation, with help from the continued acceleration of technologies used to build, maintain, enhance, and enlarge the system, has yielded many improvements. Search, security, and reliability on the Internet are easier and more refined, but those who want to commit crimes and mischief are still able to cause trouble.	Of 578 Experts 78% Of 1,196 total respondents 81%	Of experts 6% Of total respondents 19%	Of experts 16% Of total respondents *%
Few lines divide professional time from personal time, and that’s OK. In 2020, well-connected knowledge workers in more-developed nations have willingly eliminated the industrial-age boundaries between work hours and personal time. Outside of formally scheduled activities, work and play are seamlessly integrated in most of these workers’ lives. This is a net-positive for people. They blend personal/professional duties wherever they happen to be when they are called upon to perform them—from their homes, the gym, the mall, a library, and possibly even their company’s communal meeting space, which may exist in a new virtual-reality format.	Of 578 Experts 56% Of 1,196 total respondents 57%	Of experts 29% Of total respondents 29%	Of experts 15% Of total respondents 14%
<i>Source: Pew Internet & American Life Project Survey. December 28, 2007- March 3, 2008. This was a non-random Web-based survey sample of internet users recruited via email and social networks. Data are based on a non-random sample; a margin of error cannot be calculated.</i>			

THINKING AHEAD TO 2020:

THEMES MANY RESPONDENTS STRUCK IN THEIR ANSWERS

Here are some of the major themes that run through respondents’ answers:

The mobile phone will be the dominant connection tool: More than three-quarters of the expert respondents (77%) agreed with a scenario that posited that the mobile computing device—with more-significant computing power in 2020—will be the primary Internet communications platform for a majority of people across the world. They agreed that connection will generally be offered under a set of universal standards internationally, though many registered doubts about corporations’ and regulators’ willingness to make it happen.

Heightened social tolerance may not be a Web 2.0 result:

Respondents were asked if people will be more tolerant in 2020 than they are today. Some 56% of the expert respondents disagreed with a scenario positing that social tolerance will advance significantly by then, saying communication networks also expand the potential for hate, bigotry, and terrorism. Some 32% predicted tolerance will grow. A number of the survey participants indicated that the divide between the tolerant and intolerant could possibly be deepened because of information-sharing tactics people use on the Internet.

Air-typing, touch interfaces, and talking to devices will become

common: A notable majority of the respondents (64%) favored the idea that by 2020 user interfaces will offer advanced talk, touch, and typing options, and some added a fourth “T”—think. Those who chose to elaborate in extended responses disagreed on which of the four will make the most progress by 2020. There was a fairly even yes-no split on the likely success of voice-recognition or significant wireless keyboard advances and mostly positive support of the advance of interfaces involving touch and gestures—this was highly influenced by the introduction of the iPhone and various multitouch surface computing platforms in 2007 and 2008. A number of respondents projected the possibility of a thought-based interface—neural networks offering mind-controlled human-computer interaction. Many expressed concerns over rude, overt public displays by people using ICTs (“yakking away on their phones about their latest foot fungus”) and emphasized the desire for people to keep private communications private in future digital interfaces.

IP law and copyright will remain unsettled: Three out of five respondents (60%) disagreed with the idea that legislatures, courts, the technology industry, and media companies will exercise effective content control by 2020. They said “cracking” technology will stay ahead of technology to control intellectual property (IP) or policy regulating IP. And they predicted that regulators will not be able to come to a global agreement about intellectual property. Many respondents suggested that new economic models will have to be implemented, with an assumption that much that was once classified as paid content will have to be offered free or in exchange for attention or some other unit of value. Nearly a third of the survey respondents (31%) agreed that IP regulation will be

successful by 2020; they said more content will be privatized, some adding that this control might be exercised at the hardware level, through Internet-access devices such as smartphones.

The division between personal and professional time will disappear: A majority of expert respondents (56%) agreed with the statement that in 2020 “few lines (will) divide professional from personal time, and that’s OK.” While some people are hopeful about a hyperconnected future with more freedom, flexibility, and life enhancements, others express fears that mobility and ubiquity of networked computing devices will be harmful for most people by adding to stress and challenging family life and social life.

Network engineering research will build on the status quo—there isn’t likely to be a “next-gen” Internet: Nearly four out of five respondents (78%) said they think the original Internet architecture will still be in place in 2020 even as it is continually being refined. They did not believe the current Internet will be replaced by a completely new “next-generation” system between now and 2020. Those who wrote extended elaborations to their answers projected the expectation that IPv6 and the Semantic Web will be vital elements in the continuing development of the Internet over the next decade. Among other predictions: there will be more “walled gardens,” separated Internet spaces, created by governments and corporations to maintain network control; governments and corporations will leverage security fears to retain power over individuals; crime, piracy, terror, and other negatives will always be common elements in an open system.

Transparency may or may not make the world a better place: Respondents were 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: 45% of expert respondents agreed that transparency of organizations and individuals will heighten individual integrity and forgiveness and 44% disagreed. The comments about this prediction were varied: Some argued that transparency is an unstoppable force that has positives and negatives; it might somehow influence people to live lives in which integrity and forgiveness are more likely. Others posited that transparency won’t have any positive influence, in fact it makes everyone vulnerable, and bad things will happen because of it. Still

others argued that the concept of “privacy” is changing, it is becoming scarce, and it will be protected and threatened by emerging innovations; tracking and databasing will be ubiquitous; reputation maintenance and repair will be required; some people will have multiple digital identities; some people will withdraw.

Augmented reality and interactive virtual spaces might see more action: More than half of respondents (55%) agreed with the notion that many lives will be touched in 2020 by virtual worlds, mirror worlds, and augmented reality. Yet 45% either disagreed or didn’t answer this question, so the sentiment isn’t overwhelming. People’s definitions for the terms “augmented reality” and “virtual reality” are quite varied; smartphones and GPS help people augment reality to a certain extent today and are expected to do more soon; many think today’s social networks qualify as a form of virtual reality while others define it in terms of Second Life or something even more immersive. Some noted that by 2020 augmented reality (AR) and virtual reality (VR) will have reached the point of blurring with reality. Many indicated this will enhance the world, providing new opportunities for conferencing, teaching, and 3-D modeling, and some added that breakthroughs to come may bring significant change, including fusion with other developments, such as genetic engineering. Some respondents expressed fear of the negatives of AR and VR, including: new extensions of the digital divide; an increase in violence and obesity; and the potential for addiction or overload. There is agreement that user interfaces have to be much more intuitive for AR and VR to become more universally adopted.

THINKING AHEAD TO 2020:

A SAMPLE OF REVEALING QUOTATIONS AND PREDICTIONS

SELECTED FROM THE THOUSANDS SUBMITTED

The evolution of the device for connection: “People in Africa turned paid telephone minutes into an ad-hoc, grassroots, e-currency...There are already reasons why people at the bottom of the economic system need and can use cheap telecommunication. Once they are connected, they will think of their own ways to use connectivity plus computation to relieve suffering or increase

wealth.” —**Howard Rheingold**, *Internet sociologist and author of “Virtual Community” and “Smart Mobs”*

“By 2020, the network providers of ‘telephony’ will have been disintermediated. We’ll have standard network connections around the world...Billions of people will have joined the Internet who don’t speak English. They won’t think of these things as ‘phones’ either—these devices will be simply lenses on the online world.” —**Susan Crawford**, *founder of OneWebDay and an Internet Corporation for Assigned Names and Numbers (ICANN) board member*

“Traditional carriers have little incentive to include poor populations, and the next five years will be rife with battles between carriers, municipal, and federal governments, handset makers, and content creators. I don’t know who will win.” —**danah boyd**, *Harvard University’s Berkman Center for Internet and Society*

“Telephones in 2020 will be archaic, relics of a bygone era—like transistor radios are today. Telephony, which will be entirely IP-based by then, will be a standard communications chip on many devices. We’ll probably carry some kind of screen-based reading device that will perform this function, though I assume when we want to communicate verbally, we’ll do so through a tiny, earplug-based device.” —**Josh Quittner**, *executive editor of Fortune Magazine and longtime technology journalist and editor*

The evolution of social tolerance: “Not in mankind’s nature. The first global satellite link-up was 1967, BBC’s Our World: the Beatles ‘All You Need Is Love,’ and we still have war, genocide, and assassination (Lennon’s poignantly).” —**Adam Peake**, *policy analyst for the Center for Global Communications and participant in the World Summit on the Information Society*

“Polarization will continue and the people on the extremes will be less tolerant of those opposite them. At the same time, within homogenous groups (religious, political, social, financial, etc.) greater tolerance will likely occur.” —**Don Heath**, *Internet pioneer and former president and CEO of the Internet Society*

“Tribes will be defined by social enclaves on the Internet, rather than by geography or kinship, but the world will be more fragmented and less tolerant, since one's real-world surroundings will not have the homogeneity of one's online clan.” —**Jim Horning**, chief scientist for information security at SPARTA Inc. and a founder of InterTrust's Strategic Technologies and Architectural Research Laboratory

The evolution of intellectual property law and copyright: “Many people want IP protection, but everyone wants to steal. Regardless of the legal mechanisms so far—e.g., automatic damages, compulsory copyrights—many people would prefer the illegal route, perhaps because it runs up their adrenaline.” —**Michael Botein**, founding director of the Media Law Center at New York University Law School

“Copying data is the natural state of computers; we would have to try to compromise them too much to support this regime.” —**Brad Templeton**, chairman of the Electronic Frontier Foundation

“While I applaud the efforts of DRM [digital rights management] opponents, I am discouraged by the progress DRM seems to continue to make in hardware as much as in software. Having purchased an iPhone, I was delighted when Apple updated its software to allow custom ringtones, only to discover that I needed to pay for a ringtone via the iTunes Music Store even though the ringtone I wanted to use was one in which I own the copyright!” —**Steve Jones**, co-founder of the Association of Internet Researchers and editor of *New Media & Society*

“There will be cross-linking of content provider giants and Internet service provider giants and that they will find ways to milk every last ‘currency unit’ out of the unwitting and defenseless consumer. Governments will be strongly influenced by the business conglomerates and will not do much to protect consumers. (Just think of the outrageous rates charged by cable and phone company TV providers and wireless phone providers today—it will only get worse.)” —**Steve Goldstein**, ICANN board member formerly of the US National Science Foundation

“Copyright is a dead duck in a digital world. The old regime based its power on high distribution costs. Those costs are going to zero. Bye-bye DRM.” —**Dan Lynch**, founder of CyberCash and Interop Company, now a board member of the Santa Fe Institute

“You cannot stop a tide with a spoon. Cracking technology will always be several steps ahead of DRM and content will be redistributed on anonymous networks.” —**Giulio Prisco**, chief executive of Metafuture Second Life, formerly of CERN

The evolution of privacy and transparency: “We will enter a time of mutually assured humiliation; we all live in glass houses. That will be positive for tolerance and understanding, but—even more important—I believe that young people will not lose touch with their friends as my generation did and that realization of permanence in relationships could—or should—lead to more care in those relationships.” —**Jeff Jarvis**, top blogger at Buzzmachine.com and professor at City University of New York Graduate School of Journalism

“Gen Y has a new notion of privacy. The old ‘never trust anyone over 30’ will turn into ‘never trust anyone who doesn't have embarrassing stuff online.’” —**Jerry Michalski**, founder and president of Sociate

“Viciousness will prevail over civility, fraternity, and tolerance as a general rule, despite the build-up of pockets or groups ruled by these virtues. Software will be unable to stop deeper and more hard-hitting intrusions into intimacy and privacy, and these will continue to happen.” —**Alejandro Pisanty**, ICANN and Internet Society leader and director of computer services at Universidad Nacional Autónoma de México

“By 2020, the Internet will have enabled the monitoring and manipulation of people by businesses and governments on a scale never before imaginable. Most people will have happily traded their privacy—consciously or unconsciously—for consumer benefits such as increased convenience and lower prices. As a result, the line between marketing and manipulation will have largely

disappeared.” —*Nicholas Carr, author of the Rough Type blog and “The Big Switch”*

“The volume and ubiquity of personal information, clicktrails, personal media, etc., will desensitize us. A super-abundance of transparency will lose its ability to shock. Maybe there will be software-driven real-time reputation insurance service, offering monitoring and repair to dinged reputations. This could be as ordinary as auto insurance or mortgage insurance is today, and as automated as the nightly backups performed by most online businesses. I don't agree that this will make us any kinder.” —*Havi Hoffman, Yahoo Developer Network*

The evolution of augmented and virtual reality: “Mirror worlds are multi-dimensional experiences with profound implications for education, medicine, and social interaction. ‘Real life’ as we know it is over. Soon when anyone mentions reality, the first question we will ask is, ‘Which reality are you referring to?’ We will choose our realities, and in each reality there will be truths germane to that reality, and so we will choose our truth as well.”—*Barry Chudakov, principal with the Chudakov Company*

“We in the present don't think of ourselves as living in ‘cyberspace,’ even though people of a decade previous would have termed it such. Of the various forms of the metaverse, however, the majority of activity will take place in blended or augmented-reality spaces, not in distinct virtual/alternative world spaces.” —*Jamais Cascio, a co-author of the “Metaverse Roadmap Overview,” a report on the potential futures of VR, AR, and the geoWeb*

“Augmented reality will become nearly the de facto interface standard by 2020, with 2-D and 3-D overlays over real-world objects providing rich information, context, entertainment, and (yes) promotions and offers. At the same time, a metaverse (especially when presented in an augmented-reality-overlay environment) provides compelling ways to facilitate teamwork and collaboration while reducing overall travel budgets.” —*Jason Stoddard, managing partner at Centric/Agency of Change*

“The virtual world removes all barriers of human limitation; you can be anyone you want to be instead of being bound by physical and material limitations. That allows people to be who they naturally are, freed of any perception they may have of themselves based on their ‘real life’—it is the power of removing the barriers of your own perception of yourself.” —**Tze-Meng Tan**, *Multimedia Development Corporation in Malaysia, a director at OpenSOS*

“We are in the last generation of human fighter pilots. Already, drones in Iraq are piloted in San Diego. What will improve is the ability of the artificial spaces to control physical reality, to expand our reach more effectively in many aspects of the physical universe.” —**Dick Davies**, *partner at Project Management and Control Inc. and a past president of the Association of Information Technology Professionals*

“In a reaction to the virtual world, entrepreneurs will establish ‘virt-free’ zones where reality is not augmented. In various heavily connected areas, there will be sanctuaries (hotels, restaurants, bars, summer camps, vehicles) which people may visit to separate themselves from adhesion or other realities.” —**C.R. Roberts**, *Vancouver-based technology reporter*

“For some reason I’ve never been able to comprehend, certain pundits can seriously propose that the wave of the future is chatting using electronic hand-puppets. Flight Simulator is not an aircraft, and typing at a screen is not an augmentation of the real world.” —**Seth Finkelstein**, *author of the Infthought blog, writer and programmer*

“A map is not the territory and a letter is not the person. We have always had multiple facades, for most, most common, work, home and play. The extension into more immersive ‘unreal’ worlds is going to happen.” —**Hamish MacEwen**, *consultant at Open ICT in New Zealand*

The evolution of user interfaces: “There will be ‘subvocal’ inputs that detect ‘almost speech’ that you will, but do not actually voice. Small sensors on teeth will also let you tap commands. Your

eyeballs will track desires, sensed by your eyeglasses. And so on.”
—**David Brin**, futurist and author of “*The Transparent Society*”

“WiFi- and WiMax-enabled badges with voice recognition will act as personal assistants—allowing you to talk with someone by saying their name, to post a voice blog, or access directions from the Internet for the task at hand.” —**Jim Kohlenberger**, director of *Voice on the Net Coalition*; senior fellow at the *Benton Foundation*

“I could see a whole physical way of communicating with our technology tools that could be part of our health and exercise. A day answering e-mails could be a full-on physical workout ;)....” —**Tiffany Shlain**, founder of the *Webby Awards*

“We will see the display interface device separated from the input device over the next 12 years. Display devices will be everywhere, and you will be able to use them with your input device. The input device might be virtual, as in the case of the iPhone or a holographic keyboard, or they might resemble the keyboards and touchpads that people are using today.” —**Ross Rader**, a director with *Tucows* who is active in the *ICANN Registrars constituency*

“While air-typing and haptic gestures are widespread and ubiquitous, the arrival of embedded optical displays, thought-transcription, eye-movement tracking, and predictive-behavior modeling will fundamentally alter the human-computer interaction model.” —**Sean Steele**, CEO and senior security consultant for *infoLock Technologies*

The evolution of network architecture: “The control-oriented telco (ITU) next-generation network will not fully evolve, the importance of openness and enabling innovation from the edges will prevail; i.e. Internet will essentially retain the key characteristics we enjoy today, mainly because there's more money to be made.” —**Adam Peake**, executive research fellow and telecommunications policy analyst at the *Center for Global Communications*

“Some parts of the Internet may fragment, as nations pursue their own technology trajectories. The Internet is so vastly complex,

incremental upgrades seem to be the only way to get anything done...Places like China may make big leaps and bounds because there is less legacy.” —**Anthony Townsend**, *research director, The Institute for the Future*

“Current Internet standards bodies and core Internet protocols are ossifying to such an extent that security and performance requirements for next-generation applications will require a totally new base platform. If current Internet base protocols survive, it will be as a substrata paved over by new-generation smarter ways of connecting.” —**Ian Peter**, *Ian Peter and Associates and the Internet Mark 2 Project*

“The Web must still be a messy, fabulous, exciting, dangerous, poetic, depressing, elating place...akin to life; which is not a bad thing.” —**Luis Santos**, *Universidade do Minho-Braga, Portugal*

“When have we ever stopped crime? If it is a choice between having some criminals around and having a repressive government, I will take the former; they are much easier to deal with.” —**Leonard Witt**, *associate professor at Kennesaw State University in Georgia and author of the Weblog PJNet.org*

“The Internet is not magical; it will be utterly over-managed by commercial concerns, hobbled with ‘security’ micromanagement, and turned into money-shaped traffic for business, the rest 90% paid-for content download and the rest of the bandwidth used for market feedback.”—**Tom Jennings**, *University of California-Irvine, creator of FidoNet and builder of Wired magazine’s first online site*

The evolution of work life and home life activity: “Corporate control of workers’ time—in the guise of work/ family balance—now extends to detailed monitoring of when people are on and off work. The company town is replaced by ‘company time-management,’ and it is work time that drives all other time uses. This dystopia challenges the concept of white-collar work, and unionism is increasingly an issue.”—**Steve Sawyer**, *associate professor in the College of Information Sciences and Technology, Penn State University*

“The result may be longer, less-efficient working hours and more stressful home life.”—*Victoria Nash, director of graduate studies and policy and research officer, the Oxford Internet Institute*

“It’s already happened, for better or worse. Get over it.”—*Anonymous respondent*

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

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 associate 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* Web site (www.imaginingtheInternet.org/)—now numbering about 6,200 pages—includes results from the entire series of Future of the Internet surveys, video and audio interviews showcasing experts' predictions about the next 10 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 expect 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 encourage readers of this report to enter their own predictions at the site.

The series of Future of the Internet surveys is also published in book form by Cambria Press.

ACKNOWLEDGEMENTS

About the Pew Internet & American Life Project: The Pew Internet Project is an initiative of the Pew Research Center, a nonprofit “fact tank” that provides information on the issues, attitudes, and trends shaping America and the world. Pew Internet explores the impact of the Internet on children, families, communities, the work place, schools, health care, and civic/political life. The Project is nonpartisan and takes no position on policy issues. Support for the project is provided by The Pew Charitable Trusts. The Project’s Web site URL is: <http://www.pewinternet.org>.

Princeton Survey Research Associates International: PSRAI conducted the survey that is covered in this report. It is an independent research company specializing in social and policy work. The firm designs, conducts and analyzes surveys worldwide. Its expertise also includes qualitative research and content analysis. With offices in Princeton, New Jersey, and Washington, D.C., PSRAI serves the needs of clients around the nation and the world. The firm can be reached at 911 Commons Way, Princeton, N.J. 08540, by telephone at 609-924-9204, by fax at 609-924-7499, or by email at ResearchNJ@PSRA.com

The Imagining the Internet Center at Elon University’s School of Communications: The Imagining the Internet Center at Elon University holds a mirror to humanity’s use of communications technologies, informs policy development, exposes potential futures, and provides a historic record. It has teamed with the Pew Internet Project to complete a number of research studies, including the building of Imagining the Internet (a foresight and history Web site), a survey of stakeholders at the UN-administrated Internet Governance Forum in Rio de Janeiro in 2007, and an ethnographic study of a small town, “One Neighborhood, One Week on the Internet,” all under the direction of Janna Quitney Anderson. For contact regarding Imagining the Internet, send e-mail to predictions@elon.edu. The university site is: <http://www.elon.edu/>.

BACKGROUND

Predictions often inspire lively discussion about the future and they can help stakeholders prepare to make adjustments to meet the needs associated with technological change. Those who think about the future are best poised to influence it and cope with it.

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. This survey is aimed at gathering a collection of opinions regarding the possibilities we all face.

HOW THE SURVEYS ORIGINATED AND HAVE BEEN 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 result is available on the site *Imagining the Internet: A History and Forecast* (www.imaginingtheInternet.org/). We reasoned that if experts and technologists had been so thoughtful in the early 1990s about what was going to happen, they

would likely be equally as insightful looking ahead from this moment. In 2004, we asked most of those whose predictions were in the 1990-1995 database and additional experts to assess a number of predictions about the coming decade, and their answers were codified in an initial futures survey: “The Future of the Internet” (http://www.pewInternet.org/pdfs/PIP_Future_of_Internet.pdf).

Several years later, we repeated the process with some new predictions and an expanded base of experts. In late 2005 and the first quarter of 2006, the Pew Internet Project issued an e-mail invitation to a select group of technology thinkers, stakeholders, and social analysts, asking them to complete the second scenario-based quantitative and qualitative survey, “The Future of the Internet II.” The official analysis of the results of that survey is available here: http://pewinternet.org/pdfs/PIP_Future_of_Internet_2006.pdf

And we report here the results of a third survey that was conducted online between December 26, 2007 and March 3, 2008. Some 1,196 people were generous enough to take the time to respond to this Future of the Internet III online survey.

Nearly half of the Future III respondents are Internet pioneers who were online before 1993. Roughly one fifth 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 United Nations' Multistakeholder 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 Clay Shirky, Fred Baker, David Brin, Susan Crawford, Brad Templeton, Howard Rheingold, Jim Kohlenberger, Josh Quittner, Seth Finkelstein, danah boyd, Hal Varian, Jeff Jarvis, Anthony Rutkowski, Michael Botein, Steve Jones, Richard Bartle, Alejandro Pisanty, Tom Vest, Milton Mueller, Bernardo Huberman, Jonne Soininen, Don Heath, Doug Brent, Anthony Townsend, Steve Goldstein, Adam Peake, Basil Crozier, Craig Partridge, Sebastien Bachollet, Geert Lovink, James Jay Horning, Dan Lynch, Fernando Barrio, Roberto Gaetano, Christian Huitema, Susan Mernit, Jamais Cascio, Norbert Klein, Tapio Varis, Martin Boyle, Ian Peter, Todd Spraggins, Catherine Fitzpatrick, Tom Keller, Charles Kenny, Robert Cannon, Hakikur Rahman, Larry Lannom, David Farrar, John Levine, Cliff Figallo, Sebastien Ricciardi, Lea Shaver, Seth Gordon, Jim McConnaughey, Neil McIntosh, Charles Ess, Alan Levin, David W. Maher, Jonathan Dube, Thomas Vander Wal, Adrian Schofield, Clifford Lynch, Jerry Michalski, Paul Miller, and David Moschella, to name a few.

A sampling of the workplaces of respondents includes the Internet Society, World Bank, Booz Allen Hamilton, AT&T Labs, VeriSign, Cisco, Google, BBN Technologies, Fing, Yahoo Japan, France Telecom, the International Telecommunication Union, Alcatel-Lucent, the Electronic Frontier Foundation, GLOCOM, AfriNIC, Electronic Privacy Information Center, APNIC, Universiteit Maastricht, Amnesty International, BBC, PBS, IBM, Microsoft, Forrester Research, Harvard University's Berkman Center for Internet and Society, Open Society Institute, Open the Future, Yahoo, First Semantic, CNET, Microsoft, Universidad Nacional Autonoma de Mexico, IDG, FCC, Institute for the Future, 1&1 Internet AG, Moody's, HP Laboratories, Amazon.com, Gannett, Lexis/Nexis, Tucows, InternetNZ, ICANN, Oxford Internet Institute, Institute of the Information Society—Russia, The Center on Media and Society, Online News Association, Nokia, the Association for the Advancement of Information Technology, Massachusetts Institute of Technology, the Institute of Network Cultures, Nortel, Disney, DiploFoundation, Information Technology Industry Council, J-Lab, Information Society Project at

Yale University, Santa Fe Institute, the London School of Economics, the University of California-Berkeley, NASA, the Singapore Internet Research Center, Princeton University, the federal government of Canada, several policy divisions of the US government, and many dozens of others.

Participants described their primary area of Internet interest as “research scientist” (12%); “technology developer or administrator” (11%); “entrepreneur or business leader” (10%); “author, editor, or journalist” (9%); “futurist or consultant” (7%); “advocate, voice of the people, or activist user” (5%); “legislator or politician” (1%); or “pioneer or originator” (2%); however many participants chose “other” (24%) for this survey question or did not respond (18%).

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 provoke reaction, not because we think any of them will necessarily come to fruition.

The scenarios for this survey and survey analysis were crafted after a study of the responses from our previous surveys and of the predictions made in reports by the Organisation for Economic Cooperation and Development, the United Nations Multistakeholder Group on Internet Governance, the Metaverse Roadmap, The Institute for the Future, Global Business Network, and other foresight organizations and individual foresight leaders.

The 2020 scenarios were constructed to elicit engaged responses to many-layered issues, so it was sometimes the case that survey participants would agree with most or part 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 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 discussion, 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 responses are included on the *Imagining the Internet* site, available at: <http://www.imaginingtheinternet.org>.

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.

SCENARIO 1

THE EVOLUTION OF MOBILE INTERNET COMMUNICATIONS

PREDICTION: *The mobile phone is the primary connection tool for most people in the world. In 2020, while "one laptop per child" and other initiatives to bring networked digital communications to everyone are successful on many levels, the mobile phone—now with significant computing power—is the primary Internet connection and the only one for a majority of the people across the world, providing information in a portable, well-connected form at a relatively low price. Telephony is offered under a set of universal standards and protocols accepted by most operators internationally, making for reasonably effortless movement from one part of the world to another. At this point, the "bottom" three-quarters of the world's population account for at least 50% of all people with Internet access—up from 30% in 2005.*

Expert Respondents' Reactions (N=578)

Mostly Agree 77%
Mostly Disagree 22%
Did Not Respond *%

All Respondents' Reactions (N=1,196)

Mostly Agree 81%
Mostly Disagree 19%
Did Not Respond *%

Note: Since results are based on a nonrandom sample, a margin of error cannot be computed. The "prediction" was composed to elicit responses and is not a formal forecast.

Respondents were presented with a brief set of information outlining the status quo of the issue 2007 that prefaced this scenario. It read:

According to the UN/ITU *World Information Society Report 2007*, there has been some progress in improving digital inclusion: In 1997 the nearly three-quarters of the world's population who lived in low-income and lower-middle-income economies accounted for just 5% of the world's population with Internet access.² By 2005, they accounted for just over 30%. A number of commercial and non-profit agencies are combining forces to bring inexpensive laptop computers to remote regions of the world to connect under-served populations. In addition, by the end of 2008 more than half the world's population is expected to have access to a mobile phone.

OVERVIEW OF RESPONDENTS' REACTIONS:

A significant majority of expert respondents agreed with this predicted future. The consensus is that mobile devices will continue to grow in importance because people need to be connected, wherever they are. Cost-effectiveness and access are also factors driving the use of phones as connection devices. Many respondents believe that mobile devices of the future will have significant computing power. The experts fear that limits set by governments and/or corporations seeking control might impede positive evolution and diffusion of these devices; according to respondents, this scenario's predicted benefit of "effortless" connectivity is dependent on corporate and government leaders' willingness to serve the public good.

The overwhelming majority of respondents agreeing with this scenario took note of the current boom in cell phone and smartphone use and imagined its extension. "By 2020 we should see several billion cell phones shipping per year, most of which will be Internet-capable; this will probably dwarf the volumes of other Internet-capable devices, such as PCs," wrote one anonymous participant.

There are 6.6 billion people in the world, and the UN estimates that 1.2 billion have access to and use the Internet (2007 figures).

2

<http://www.itu.int/osg/spu/publications/worldinformationsociety/2007/report.html>

Wireless Intelligence, a market database, reports that it took 20 years for the first billion mobile phones to sell, just four years for the second billion, and two years for the third billion.³ The firm projects there will be 4 billion cell phones in the world by the end of 2008; about 11 percent were Internet-enabled in 2007, and it is expected that could rise to 15 percent by the end of 2008. (It is important to remember that some people own more than one mobile phone—in 2007 it was estimated that 700 million people owned more than one—so 3 billion phones does not equate to 3 billion people who have and use mobile phones.)

Several survey participants noted in their written elaborations to the survey question that connectedness serves humanity in so many ways that even people who are struggling to make a dollar a day in the world's least-developed nations find the economics of mobile telephony to be manageable and sometimes even vital to their lives.

“Communication is a basic human need,” responded **Howard Rheingold**, Internet sociologist and author of “Virtual Community” and “Smart Mobs.” “People who are trying to scrape by have immediate need for connection to information about local labor and commodities markets. Public-health and disaster-relief information can be an SMS [short-message-service—or “text”] message away. People in Africa turned paid telephone minutes into an ad-hoc, grassroots, e-currency, because they had the need to transfer small amounts of money. Billions of squatters might live in slums but still ingeniously and often illegally deliver the construction and utilities services they need. There are already reasons why people at the bottom of the economic system need and can use cheap telecommunication. Once they are connected, they will think of their own ways to use connectivity plus computation to relieve suffering or increase wealth.”

Lutfur Rahman, of the Association for Advancement of Information Technology in Bangladesh, said mobile communication is world-changing. “Before introducing the mobile

³ <http://www.ovum.com/go/content/c.377,66726> and <http://www.guardian.co.uk/technology/2008/sep/26/mobilephones.unitednations>

phone in remote areas of Bangladesh, the exchange of information was through physically meeting,” he wrote. “That wasted much time, and sometimes it became impossible in short time because of lack of communication facilities.”

Gbenga Sesan, a Nigerian and consultant on the use of the Internet for development for Paradigm Initiative, has written extensively about the use of mobile communications. “With the rise in the number of mobile phone users across the continent, it is only wise to start planning that the future will be driven through mobile phones—governance, businesses, networking, leisure, and more,” he commented. “The story will be the same across the world. Regardless of technology choice (GSM, CDMA, etc), mobile telephones will form the core of human interaction and livelihood. And when you consider the fact that some mobile phones were competing with computers in 2007, you can only wonder if owning a PC will matter by December 31, 2019.”

IT WILL BE MORE COMPUTER THAN PHONE

Many who responded with a further elaboration on this scenario said while the device we will be using will be small and possibly resemble today’s wireless phones in its shape, it will actually be a multitasking computer, used less for voice communication than for other tasks. “The computing power that will be able to fit into a phone-size device in 13 years will be incredible,” wrote an anonymous respondent.

“By 2020 a device that more closely resembles today's mobile phone rather than today's computer will certainly be the primary connection tool,” said **Paul Miller**, a technology evangelist for Talis, a UK-based Web company, and blogger for ZDNet. “Whether it is at all 'phone'-like, or even used very often for voice-only communication is more open to question, though.”

Susan Crawford, the founder of OneWebDay and an Internet Corporation for Assigned Names and Numbers (ICANN) board member, agreed. “By 2020 we'll stop talking about ‘phones,’ with any luck,” she wrote. “Nor will we be talking about ‘telephony.’ Those terms, I hope, will be dead. These devices will just be

handsets of which we'll be very fond. They'll have screens that are just large enough for us to feel immersed in the visuals provided. What will we be doing? Using the Internet. Interacting, doing work, talking, participating, uploading to the cloud. By 2020, the network providers of 'telephony' will have been (with any luck) disintermediated. We'll have standard network connections around the world, but they won't be optimized on billing (as telephone and wireless connections are now). Billions of people will have joined the Internet who don't speak English. They won't think of these things as 'phones' either—these devices will be simply lenses on the online world.”

Rich Miller, CEO for Replicate Technologies and an Internet pioneer with ARPANET, wrote, “The ‘phone’ as such is more likely to be a personal media server/media gateway. This same personal media server—size not much different than today's mobile phone—permits varieties of ‘terminal’ devices, including display, voice input/output, etc. Audio and video interfaces are more likely to be separate devices (like today's Bluetooth headset, but with more user interface controls).”

Steve Jones, co-founder of the Association of Internet Researchers and associate dean at the University of Illinois-Chicago, projected, “By 2020 I don't think it will be so easy to distinguish between a mobile phone and a laptop. These will blend into a general ‘mobile computing’ category of device (for which we probably don't yet have a name).”

Jim Kohlenberger, executive director of Voice on the Net Coalition, a senior fellow for the Benton Foundation and former White House policy advisor, commented, “The mobile ‘phone’ will largely be eclipsed and replaced by the open network device—an open mobile computing device also capable of voice. But the assumption is correct that these mobile devices will be more significant and ubiquitous than wired devices. In terms of inclusion, there are already developing countries that have set up open and competitive wireless markets to foster these innovations and reap their benefits. But other developing countries that still have

government-run telecom sectors or that haven't enabled wireless competition could be further left behind.”

And **Jeff Jarvis**, top blogger at Buzzmachine.com and professor at City University of New York Graduate School of Journalism, and many other respondents said we should not concentrate on the appliance, but the connectivity. “We will have many devices that are constantly connected; in that sense, it's connectivity that will be mobile and the devices will merely plug in,” Jarvis explained. “This will lead to a world that is not only connected but also live and immediate. Witnesses will share news as they witness it. We can get answers to any question anytime. We can stay in constant touch with the people we know, following their lives as we follow RSS and Twitter feeds.”

RESPONDENTS SAY MOBILITY IS KEY TO SHARING INFORMATION EVERYWHERE IN THE WORLD

In 2007 the bottom three-quarters of the world's population included about 30 percent of the people who have Internet access. The 2020 scenario proposed to survey respondents that this number will rise to 50 percent. Participants agreed that mobile communications devices—most of them not yet Internet-connected—have made an amazing impact already and will continue to bridge the digital divide and promote digital inclusion. **Geert Lovink** wrote, “We now still look at the world from a 'digital divide' perspective, but that will soon be of little use. The massive use by the 'emerging' underclasses of the 'Global South' of mobile phones should be interpreted as a necessity of the labour force to gain mobility in order to increase their output.”

Charles Kenny, senior economist for the World Bank, the international aid agency, commented, “The mobile phone will be used for an increasing range of services such as m-banking in developing countries, but it will also remain key as a tool for voice communication. For around a quarter of the world's population still officially illiterate (and many more functionally illiterate), voice telephony will remain the primary means of communicating over distance.” An anonymous survey participant added, “Voice

communication is the most common method used by humans to communicate, and devices with voice capabilities will be key.”

Jonne Soininen, Internet Engineering Task Force and Internet Society leader and manager of Internet affairs for Nokia Siemens Network, added, “In many places having fixed infrastructure is not possible either physically or economically, thus, making mobile systems the viable option for Internet access.”

Active Internet Society and ICANN participant **Cheryl Langdon-Orr** said she takes issue with the figure of 50 percent of the world being connected, and she hopes for more. “Mobile device connectivity to the Internet is indeed a cost-effective e-future vision for many,” she wrote, “but in my utopia where the Internet Society states ‘The Internet is for Everyone’ we would be looking at much more than 50 percent of people being online by 2020.”

And **Sudip Aryal**, president of the Nepal Rural Information Technology Development Society, wrote, “to meet this target of 50 percent or even more than that, each and every country should make ICT as a national-priority issue. Just like the awareness of HIV/AIDS and use of condoms, the national and international bodies must launch a program to aware about the ‘importance of Internet in one’s life’ to the grass root communities.”

Michael Botein, a telecommunications law expert at New York University and consultant to the Federal Communications Commission, said improved, affordable mobile technology could help pave the way to a friendlier world. “It is difficult to foresee a future short of a technological breakthrough in which mobile technology will have enough bandwidth to provide data services, real-time video, and the like,” he wrote. “On a positive note, however, cellular will allow the beginnings of universal service in most parts of the world—as already in Latin America and Africa—and thus may help break down long-held hostilities.”

Several respondents, including **Neil McIntosh**, director of editorial development for the top news site guardian.co.uk, based in London, said, “a greater and more fundamental problem, however, may be

poor literacy and continued widespread poverty, which technology by itself can't solve.”

SOME EXPERTS EXPRESS DOUBTS ABOUT INTEROPERABILITY AND OPEN NETWORKS

Some of those who chose to mostly agree with this scenario did so while expressing reservations about parts of it. A number of them suggested that governments and/or corporations concerned with retaining or gaining more control over use of the Internet might limit some types of connection in certain parts of the world, and others projected a potential lack of universal standards and protocols in a world of changing technology.

Michael Zimmer, resident fellow at the Information Society Project at Yale Law School, wrote, “I agree almost entirely with this prediction... My only hesitation is whether there will be universal standards and protocols accepted by most operators internationally, since US mobile providers have shown little interest in providing full interoperability and open devices to take full advantage of new mobile services.”

Social media research expert **danah boyd** of Harvard University’s Berkman Center for Internet and Society wrote, “Traditional carriers have little incentive to include poor populations, and the next five years will be rife with battles between carriers, municipal, and federal governments, handset makers, and content creators. I don’t know who will win. If the carriers continue to own the market, network access through mass adoption of the mobile will be far slower than if governments would begin blanketing their land with WiFi (or network access on other spectrum channels) as a public-good infrastructure project and handset makers would begin making cheap accessible handsets for such access. The latter dynamic would introduce network access (and telephony) to many more people, much to the chagrin of carriers.”

Ross Rader, a member of the ICANN Registrars Constituency and executive for Tucows Inc., wrote, “This scenario may likely happen over the next few years, not the next 12. The only real obstacle to this level of adoption and social integration lies with the willingness

of the telecommunications industry to resist the temptation to segregate and verticalize its offerings. In other words, the communications network market must be made much more competitive than it is today. Handsets need to be freed from applications, and applications need to be freed from networks. Only truly open networks will drive the sort of adoption envisaged in this scenario. We are starting to see the first glimpses of this today with Google's Android, Verizon's open network initiative, the power of the iPhone, but much work in all of these, and other, areas remains to be done before the networks, applications, and handsets markets are fully competitive.”

A few respondents said they believe corporate leaders are interested in the positive diffusion of affordable technology tools to less-developed areas of the world. **Peter Kim**, a senior analyst for Forrester Research, commented, “Handset manufacturers have already started to focus on countries with lower GDP. Continued efficiency in production and increase in computing power, along with the natural desire of humans to connect will help make this scenario a reality.”

Many survey participants expressed concerns about pricing. One anonymous respondent wrote, “The success of the mobile phone as a universal-access device is contingent on adoption of flat-rate style charges, as is normal for Internet applications, rather than high per-minute charges which currently dominate mobile-pricing structures.”

BANDWIDTH, SCREEN SIZE, POOR USER-INTERFACE ARE AMONG THE OTHER POTENTIAL LIMITS CITED

Some respondents who mostly disagreed with the scenario wrote that delivery will continue to be more efficient through earth-based connections. “Wireless doesn't ever provide as much bandwidth as wired connections; wireless will always be slower, thus second-best,” wrote one anonymous respondent. “Primary ‘work’ will still be done over wired connections, with wireless filling in the gaps and supporting mobile applications.” Another wrote, “Will there be enough wireless infrastructure for truly complex Internet applications on a phone?”

Another more multi-layered response in regard to limitations of the scenario came from an anonymous survey participant: “Wireless technologies have a number of inherent problems including but not limited to interference and capacity. The simple log trend of traffic and data patterns precludes wireless. While some form of ubiquitous wireless access will be available most places, fibre will be more important than ever. Phones also have UI restrictions, any conception of phones without other peripheral interfacing technologies such as HUDS eye movement/brain interfaces simply will not meet the needs.”

“Unless the phone—which will really be seen as the one device that we carry around that includes voice, text, still/video camera, GPS, AV player, computer, voice-to-digital-information interface, Internet, television, bank account, etc.—has the capacity to project at least a 15" display, it will be too small to use as the primary connection tool for the majority of world-wide users,” wrote **Peter Eckart**, director of health information technology for the Illinois Public Health Institute. “The majority of us will carry our digital presence indicator with us from place to place on that device, but the bandwidth and interface will be provided by our home or work or coffee shop, with the device there to maintain digital identity. I do agree that the mobile device will be the primary or only connection for poorer folks. People's wealth or income will be reflected in the size of their display, the number of Ds (2 or 3), their connection speed, amount of digital storage, and most importantly, their level of access to information stores.”

Adrian Schofield, a leader in the World Information Technology and Services Alliance and manager of applied research at the Johannesburg Center for Software Engineering in South Africa, wrote that people will use multiple devices. “There are likely to be two distinct types of hand-held device—the mobile phone and the mobile PDA,” he commented. “The phone will be the instrument that enables the less economically empowered people to communicate by voice and text and to perform basic financial and government transactions. The PDA will offer the full range of communications and computing facilities, including TV, GPS, and

video camera. Using improved solar technology, battery life will be significantly extended and offices, hotels, and other venues will provide free plasma screens for those who wish to access a larger image than the one offered on the device.”

Well-known economist and technology expert **Hal Varian**, of Google and the University of California-Berkeley, responded, “The big problem with the cell phone is the UI [user interface], particularly on the data side. We are waiting for a breakthrough.”

Fabrice Florin, the executive director of NewsTrust.net, a nonprofit social news network, wrote, “While I agree that the mobile phone will play a growing role as a low-cost computing platform, I disagree that it will be the ‘primary Internet connection and the only one for a majority of the people across the world.’ Other computing platforms and connectivity options will become widely available by then, such as cheap computers (or wall-based computing environments) with landline or comparable broadband connections. I predict that these faster connections and larger-screen platforms will be more affordable and effective from a productivity standpoint than small and slow mobile platforms.”

ONE LAPTOP PER CHILD IS SEEN AS LIMITED

One Laptop Per Child (OLPC) is a large-scale US-based project to provide affordable, practical computing and Internet capabilities to people in underserved communities around the world. The effort has brought together people from the technology industry, non-governmental organizations, and governments in the process of designing, manufacturing, and distributing these tools.

The Future of the Internet III survey was distributed at about the same time the OLPC computers became available; they have come under some criticism in the popular media, and they met some criticism from survey participants. **Scott Smith** wrote, “OLPC-style efforts are already beginning to fragment at the start of 2008 even before the actual OLPC initiative gains any real ground.” **Seth Finkelstein** wrote, “One Laptop Per Child is a classic ‘ugly American’-style project.”

Charles Ess, an online culture and ethics researcher from Drury University and a leader of the Association of Internet Researchers, commented, “The One Laptop Per Child initiative is foundering not so much on issues of economics, but more on issues of culture. Most of the non-Western ‘targets’ for the initiative use languages that are not easily captured through the use of the standard Roman keyboard. More broadly, the literacy required to manipulate most computer-based communications technologies and venues is not to be taken for granted among all populations and demographic groups—certainly not within the US and Western Europe, much less through other cultures in which orality still predominates (e.g., indigenous peoples). For that, mobile phones present a relatively straightforward interface—and talking, for most people at least, is easy! In short, talking via a phone is far more universally realizable than presuming everyone will be able and willing to communicate via a Roman keyboard and an expensive computer.”

SOME SAY 2020 WILL OFFER A NEW PARADIGM

Some survey participants said this scenario as written is shortsighted and we will have moved into a different communications environment. “A new technology will blow all of this away,” wrote one anonymous respondent, and another wrote, “Another ‘killer app’ will emerge before 2020 that will change everything; communication will not achieve stability in the 21st century.”

Josh Quittner, executive editor of Fortune Magazine and longtime technology journalist and editor, wrote, “The notion of a ‘mobile telephone’ in 2020 is quaint. Telephones in 2020 will be archaic, relics of a bygone era—like transistor radios are today. Telephony, which will be entirely IP-based by then, will be a standard communications chip on many devices. We’ll probably carry some kind of screen-based reading device that will perform this function, though I assume when we want to communicate verbally, we’ll do so through a tiny, earplug-based device.”

Mike Treder, executive director of the Center for Responsible Nanotechnology and an expert on the social implications of emerging technologies, responded, “It shows a lack of imagination

to assume that mobile phones as we know them today will still exist in 2020. While I agree that desktop computers will no longer be the standard interface for Internet connection by then, it seems far more probable to me that some form of ubiquitous wireless communication that goes beyond today's mobile phones will have taken over.”

Hamish MacEwan, a consultant at Open ICT in New Zealand, enthusiastically sees an edges-oriented future. “The mobile Internet will dominate usage, but the device will be very different in 13 years from our concept of a ‘mobile phone,’” he explained. “So will the providers of connectivity, and another group will provide the services and content. Universal standards will not control access, already WiMax and other non-proprietary standards are being deployed in competition, and combination, with the legacy integrated solution required in the cellular environment... Does your scenario imagine or imply that the legacy dominance of vertically integrated telecommunications services will return? If so, you are very wrong. Operators no longer define the service or the future; the edge, the customer, is now in charge. While we may temporarily embrace or endure the closed proprietary model, with an operator elite, the trend is towards decentralisation, toward control by the edge, with devices that will utilise whatever connectivity is available in a transparent and open mode. As Feynman and Rangaswami, and others have explained, there is plenty of room at the bottom.”

And **Jonathan Dube**, president of the Online News Association, director of digital media at CBC News, and publisher of CyberJournalist, net, wrote, “It's highly unlikely that telephony will be offered under a set of universal standards and protocols accepted by most operators internationally. More likely, telephony will merge with Internet technology and the two will fuse, so that everyone who is using a mobile phone will always be online and everyone who is online can easily make connections via voice and video. Who knows, maybe by then we'll be too busy running from our robot overlords to spend much time on our mobile phones.”

SCENARIO 2
THE INTERNET AND
THE EVOLUTION
OF SOCIAL TOLERANCE

PREDICTION: *Social tolerance has advanced significantly due in great part to the Internet. In 2020, people are more tolerant than they are today, thanks to wider exposure to others and their views that has been brought about by the Internet and other information and communication technologies. The greater tolerance shows up in several metrics, including declining levels of violence, lower levels of sectarian strife, and reduced incidence of overt acts of bigotry and hate crimes.*

Expert Respondents' Reactions (N=578)

Mostly Agree 32%
Mostly Disagree 56%
Did Not Respond 13%

All Respondents' Reactions (N=1,196)

Mostly Agree 33%
Mostly Disagree 55%
Did Not Respond 11%

Note: Since results are based on a nonrandom sample, a margin of error cannot be computed. The "prediction" was composed to elicit responses and is not a formal forecast.

OVERVIEW OF RESPONDENTS' REACTIONS:

A majority of respondents disagreed with the proposed future. Many say while there is no doubt the Internet is expanding the potential for people to come to a better understanding of one another it also expands the potential for bigotry, hate, and terrorism, thus tolerance will not see net gains. They believe that the natural human tendencies to congregate with like-minded allies and act in tribes is too potent to be overcome by technology tools that expand communication and the flow of information. Still, about a third agreed with the premise, optimistic that gains will be made, while adding the qualifier that negative agendas will always also be well-served by advances in communications technologies.

More than half of respondents mostly disagreed with the idea that the Internet will help inspire a significant increase in social tolerance. A representative response came from **Adam Peake**, a policy analyst for the Center for Global Communications and a leader in the United Nations-facilitated World Summits on the Information Society and Internet Governance Forums. "Not in mankind's nature," he wrote. "The first global satellite link-up was 1967, BBC's Our World: the Beatles 'All You Need Is Love,' and we still have war, genocide, and assassination (Lennon's poignantly)."

Jamais Cascio, the founder of Open the Future, active in the Institute for Ethics and Emerging Technologies, commented, "Sadly, there's little evidence that greater observational exposure to one's 'enemies' automatically reduces hostility and increases tolerance. In many cases, it does the opposite, especially if that observational exposure is controlled or manipulated in some way."

The same line of reasoning was followed by **Alex Halavais**, a professor and social informatics researcher at Quinnipiac University. "Wider exposure to different views does not guarantee more tolerance," he wrote, "and there are plenty of opportunities for people to use the Internet to encourage factionalism and ignorance."

Fred Baker, Cisco Systems Fellow, Internet Society and IETF leader, and an architect of the Internet, wrote, “Human nature will not have changed. There will be wider understanding of viewpoints, but tolerance of fundamental disagreement will not have improved.” And **Tom Vest**, an IP network architect for RIPE NCC Science Group, expert on Internet protocol policy, and consultant for the Organization for Economic Cooperation and Development, commented, “Absent some major external shock, effective education on the kind of global scale necessary to make this one come true will take much longer than 15 years. On average, people will not be much more tolerant/intolerant (or educated/ignorant) than they are today.”

Matt Gallivan, senior research analyst for National Public Radio in the US, wrote, “Sharing, interacting, and being exposed to ideas is great and all, but saying the Internet will eventually make human beings more tolerant is like saying that the Prius will reverse global warming; a little too much of an idealistic leap in logic. People are people are people. And people are terrible.”

Philip Lu, vice president and manager of research analysis for Wells Fargo Bank Internet Services, commented, “Just as social networking has allowed people to become more interconnected, this will also allow those with extreme views (who would otherwise be isolated) to connect to their ‘kindred’ spirits elsewhere. Therefore, I am not optimistic that violence will go down.”

Clay Shirky, author of “Here Comes Everybody,” a book about the ramifications of the new forms of social interaction enabled by emerging technology, responded, “The net’s ability to enhance the sense of in-group membership will enhance fragmentation of previously large, multi-ethnic polities. (Consider that there are secession movements in Scotland and Belgium.) There may be lower levels of sectarian strife, but only in the same way and for the same reason that there are lower levels of sectarian strife in the former Yugoslavia today, relative to 1997.”

And **Frederic Litto**, president of the Brazil Distance Learning Association, wrote, “Much to the contrary, all our advancement in

knowledge about evolution, human cognition, and medical diagnostics and treatment have done little to reduce human stupidity, hate, and violence. We may advance indefinitely into new worlds of technological competence and globalized knowledge about one another, but there's no guarantee that universal education, sophisticated flows of communication, and international organizations attempting to reduce intolerance and acts against peace, will be entirely successful. This reminds me of Henry Thoreau's famous retort (1870's?) when told that the first long-distance telephone lines had been put into place linking the inhabitants of the states of Georgia and Vermont: 'All well and good; but what if the peoples of Georgia and Vermont have nothing to say to each other?'"

**SOME SAY THE INTERNET WILL ACCELERATE OR
EXPAND FRAGMENTATION AND REINFORCE PREJUDICES**

A number of respondents said the Internet's capabilities enhance the opportunities for people with ill will and violent agendas. "Are you kidding?" responded **Dan Larson**, CEO of PKD Foundation. "The more open and free people are to pass on their inner feelings about things/people, especially under the anonymity of the Internet—will only foster more and more vitriol and bigotry."

Many expressed concerns over the use of networked communications to further the goals of groups that sometimes leverage the differences between themselves and others to gain unity. "I see more anger in society, more carelessness, less regard for rules of civility and behavior," wrote **Alexis Chontos**, Webmaster for the Art Institute of Pittsburgh. "There will be greater crime, an increase in the 'you owe us' mentality, less tolerance, more sectarianism, more hate crimes (religion against religion)."

Fred Ledley, founder and chairman of Mygenome, was even more certain of the negatives. "The Internet is a danger to social tolerance," he wrote. "The easy distribution of hate and propaganda through the Internet allows dissemination of hateful material that would not previously have received attention. Worse, it makes it harder to appreciate what is fringe behavior by a small number of individuals, and what represents a true movement or organization.

The prevalence of anti-semitic propaganda on the Web is a frightening example of what the Web can sustain.”

The propagation of propaganda and lies is a concern for **Bruce Turner**, director of planning services for a US regional transportation commission. “Bad info drives out good and the degree of intolerance will rise as superficial examinations of non-issues become more and more the order of the day,” he commented. “Bigots and governments spoofing as knowledgeable experts will make the information suspect and largely ignored. Bigotry and hate crimes will be facilitated for the remaining fringe who pay attention.”

Bernardo Huberman, senior fellow and director of the Social Computing Lab at HP Laboratories, commented, “Have you been on the Internet? It allows people to find their own insular communities that are outside the criticisms of others. See: furies.” An anonymous participant added, “There will be more tolerance on a whole, which will only aggravate extremists even more.” And another added, “By bringing people of every background together, the immediate effect is more and bloodier wars, perhaps not on the battlefield, but certainly in social movements and politics.”

Many shared the view that people will spend less time in face-to-face communications, and that this will damage their ability to have empathy and relate well to others. “Insofar as the virtual world permits less actual interaction, then individuals with dangerous biases will have no cause to question their beliefs,” wrote one anonymous contributor.

MANY RESPOND THAT THE INTERNET WILL CONTRIBUTE TO THE EXPANSION OF TOLERANCE AND INTOLERANCE

Many mostly disagreed with the scenario because the Internet, like all technologies, serves both good and evil human motives equally well. “Although I believe the Internet is a net positive for tolerance and sociability, its impact will be gradual, even generational, and although positive on balance, it will also contribute to the cohesion and separateness of intolerant (and worse) subgroups,” responded

Tom Hughes, COO at The Connors Group, a financial markets information company.

“Polarization will continue and the people on the extremes will be less tolerant of those opposite them,” wrote **Don Heath**, Internet pioneer and former president and CEO of the Internet Society. “At the same time, within homogenous groups (religious, political, social, financial, etc.) greater tolerance will likely occur...I hope I am wrong.”

William Winton, project manager for digital media at the 1105 Government Information Group, wrote, “The Internet is a two-edged sword. Its openness and ease-of-communication have also fostered the rise in on-line Jihadists, resurrected a flagging neo-Nazi movement and enable all sorts of intolerant movements, ideas, and people to flourish online. The jury will probably still be sequestered in 2020 as to whether the Internet has fostered ‘tolerance’ or merely ‘siloed’ hate.”

Richard Osborne, Web manager for the School of Education & Lifelong Learning at the University of Exeter, responded, “Humans are basically tribal and they will simply use the new virtual spaces to create new tribes or solidify and enhance existing ones. Knowing more about someone online could just as easily lead to less tolerance as opposed to more—because you can read their views more fully you might find this enhances your dislike.”

**SOME SAY THE INTERNET IS MAKING A POSITIVE DIFFERENCE,
ALLOWING PEOPLE TO COME TO A BETTER UNDERSTANDING**

Still, some respondents agreed with the scenario. “I do see a long, slow road of improvement,” wrote **Paul Jones**, director of ibiblio.org, based at the University of North Carolina-Chapel Hill. An anonymous participant commented, “Levels of sectarian strife and overt bigotry and hate crimes will peak after 2020 (not before) in response to this wider exposure and increased public presence of cultural minorities.”

“One can only hope,” wrote BuzzMachine blogger **Jeff Jarvis**. “I wouldn't go so far as predicting world peace through the Internet.

Sadly, there will always be fanatics and criminals... But I do at least believe that the Internet's ability to bridge nations and divides and bring together individuals can only be positive.”

“Access to information will increase cultural, social, and intellectual tolerance among people who have access,” responded **Clement Chau**, manager for the Developmental Technologies Research Group at Tufts University. “Because of this, we shall see that the control and access of information will become the primary concern for governments worldwide.”

“Increased access to information about different people will enhance our understanding of different cultures and promote greater intercultural sensitivity,” wrote **Gary Kreps**, chair of the department of communication at George Mason University. “People will recognize similarities in values and goals and use these shared values as a basis for coordination and cooperation.”

Joe McCarthy, self-described “principal instigator” at MyStrands, formerly principal scientist at Nokia Research Center in Palo Alto, wrote, “Yochai Benkler's book ‘The Wealth of Networks’ shows how the Internet can help transform economics and society, and enable more people to be both self-sufficient and entrepreneurial. As more people are able to truly engage in this increasingly inclusive economy, there will be less violence. We'll all come to see that ‘everyone's a customer’...and that everyone's a potential trading partner (on an individual, not just a national, stage).”

“I believe that as Derrick de Kerckhove so aptly named it, the Internet has created a global, connected intelligence,” wrote **Barry Chudakov**, principal of the Chudakov Company, a marketing strategies firm. “And while this connecting can be used to foment hate and divisiveness, the larger use of the Internet is to create intelligent communities. Further, one can encounter voices within these communities that build awareness of wider views than one may have known before. So it is the community-building, the focusing of shared interest, that has the potential at least to allow more and varied voices to be heard. Whether this will indeed result

in greater tolerance and declining levels of violence and strife... let's just say there is great potential for that to happen.”

DO OUR TOOLS SHAPE US OR DO WE SHAPE OUR TOOLS?

THE QUESTION OF TECHNOLOGICAL DETERMINISM

This question drew the attention of several respondents who are attuned to the concept known as “technological determinism.” A dominant view holds that advances in technology are the driving force behind social change and that they carry inherent effects—that our tools are vital to how we act and who we are. This view is referred to as technological determinism by those who argue against it—they say technological innovation is mostly shaped by society through the influence of economic, political, and cultural motivations.

“It would be marvelous if this were to happen, but be wary of attributing deterministic effects to the Internet and other ICTs, never mind assuming they will change human nature in this short a time scale,” wrote **Victoria Nash**, of the Oxford Internet Institute, formerly a fellow at the Institute of Public Policy Research.

Benjamin M. Ben-Baruch, senior market intelligence consultant and applied sociologist for Aquent, wrote, “First, I disagree with the notion that social tolerance has advanced or increased. Second, I disagree with the notion that either technology or education tend to increase tolerance. There is, as far as I can discern, no body of evidence that supports such notions. To the extent that evidence exists, it supports the notion that both education and technology can be used to increase tolerance but only under conditions that are unlikely to be replicated broadly across large populations (at least in the foreseeable future).”

“To credit the Internet would be overly technologically deterministic,” responded **Christine Boese**, information architect for Avenue A-Razorfish. “There are aspects of both greater and lesser social tolerance online. If the technology tends to lead cultures in any particular direction, it is leading to greater polarization of extremes, and less of the middle. Does greater tolerance constitute the middle? Not in this case. The extremes find

support for their views online, more so than in the less-connected, face-to-face world, so bigots find their views reinforced and even the far extremes of social relativists find their views reinforced...Is everyone really entitled to his or her own opinion, or are there very real and socially-constructed methods to evaluate whether some opinions and views are indeed superior to others? I believe the latter. Perhaps we should all go back and read that dated study by William Perry on the intellectual development of Harvard undergraduates in the homogenous 1950s.”

SCENARIO 3

THE EVOLUTION OF IP LAW AND COPYRIGHT PROTECTION

PREDICTION: *Content control through copyright-protection technology dominates. In 2020, strict content controls are in place thanks to the efforts of legislatures, courts, the technology industry, and media companies. Those who use copyrighted materials are automatically billed by content owners, and Internet service providers automatically notify authorities when they identify clients who try to subvert this system. Protestors rarely prevail when they make claims that this interferes with free speech and stifles innovation.*

Expert Respondents' Reactions (N=578)

Mostly Agree 31%
Mostly Disagree 60%
Did Not Respond 9%

All Respondents' Reactions (N=1,196)

Mostly Agree 31%
Mostly Disagree 61%
Did Not Respond 8%

Note: Since results are based on a nonrandom sample, a margin of error cannot be computed. The "prediction" was composed to elicit responses and is not a formal forecast.

Respondents were presented with a brief set of information outlining the status quo of the issue 2007 that prefaced this scenario. It read:

Major content producers such as the world's music and film businesses are lobbying governments and courts to protect their assets. Digital rights management (DRM) is one of the umbrella terms used to describe various technologies being developed to help copyright holders control access to digital products and prevent copying. Its intent is to assure that content creators maintain control of their work and are rewarded with appropriate compensation. Opponents of DRM say its language and approach are geared toward forcing public acceptance of intellectual monopolies. They argue that the movement toward assigning ownership of everything stifles innovation and competition, saying DRM is actually "digital restrictions management," and IP stands for "intellectual protectionism" and "intellectual poverty."

OVERVIEW OF RESPONDENTS' REACTIONS:

A number of predictors used the phrase “the horse is out of the barn,” implying the old paradigm of intellectual property (IP) protection is ineffective. Others talked of the “arms race,” implying that those who wish to access information without regard to law will continue to find ways to circumvent IP-control attempts. Still others referenced “continued co-existence,” suggesting that in the future content owners will sometimes expect monetary payment, but will sometimes offer their content free or in exchange for attention or other action. The varied themes among the “mostly disagree” responses to this scenario were dominated by two points: regulators will not arrive at universally-accepted policy; and people everywhere will continue to circumvent IP structures if regulatory guidelines are not enforced globally. Several respondents said they think the future of IP is “up to China.” Many dissenters believe that “cracking” technology will stay ahead of IP-control technology and that new economic models will be developed to deal with new realities of digital, online content. They argue that to gain a sizeable audience, most content will have to be offered for “free.” They project that regulation will be layered, and concepts such as Creative Commons will prosper. Those who mostly agreed with the scenario said content will be privatized and kept under the control of media and/or telecommunications firms. They also suggest that content

control may be reasserted by currently entrenched institutions that might control devices through hardware or software restrictions.

A significant majority disagreed with the idea of a dominant and successful copyright-protection system by the year 2020. Some people's remarks echo Electronic Frontier Foundation co-founder John Perry Barlow's 1994 essay on the changing nature of "ownership."

Humanity now seems bent on creating a world economy primarily based on goods that take no material form. In doing so, we may be eliminating any predictable connection between creators and a fair reward for the utility or pleasure others may find in their works. Without that connection, and without a fundamental change in consciousness to accommodate its loss, we are building our future on furor, litigation, and institutionalized evasion of payment except in response to raw force...We're going to have to look at information as though we'd never seen the stuff before...The economy of the future will be based on relationship rather than possession. It will be continuous rather than sequential. And finally, in the years to come, most human exchange will be virtual rather than physical, consisting not of stuff but the stuff of which dreams are made. Our future business will be conducted in a world made more of verbs than nouns.⁴

Some respondents noted that it is human nature to desire to acquire at no cost those things for which others pay a price. And some warned that extreme management of IP rights would not be worth the trade-off of the potential inherent in free and open communications networks.

"Digital rights management is fool's gold," wrote **Michael Botein**, founding director of the Media Law Center at New York University Law School. "Many people want IP protection, but everyone wants

⁴ http://www.wired.com/wired/archive/2.03/economy.ideas_pr.html

to steal. Regardless of the legal mechanisms so far—e.g., automatic damages, compulsory copyrights—many people would prefer the illegal route, perhaps because it runs up their adrenaline.”

“The dominant business plan will be access to attention, rather than access to content, so this scenario seems rather unlikely,” responded **Oscar Gandy**, author, activist, and emeritus professor of communication at the University of Pennsylvania.

Brad Templeton, chairman of the Electronic Frontier Foundation, commented, “While people will try to do this, it is so technologically intractable as to not succeed. Copying data is the natural state of computers; we would have to try to compromise them too much to support this regime.”

SOME SEE CHANGES COMING AT THE HARDWARE LEVEL

Several experts noted the ways in which digital rights management is already being exercised at an accelerating pace through the introduction of digital-information-access appliances or devices, like the iPhone, that are closed systems.

Steve Jones, co-founder of the Association of Internet Researchers and editor of *New Media & Society* commented, “While I applaud the efforts of DRM opponents, I am discouraged by the progress DRM seems to continue to make in hardware as much as in software. Having purchased an iPhone, I was delighted when Apple updated its software to allow custom ringtones, only to discover that I needed to pay for a ringtone via the iTunes Music Store even though the ringtone I wanted to use was one in which I own the copyright!”

Social media researcher **danah boyd** of Harvard University’s Berkman Center for Internet and Society referred to her colleague Jonathan Zittrain’s work in her response. In his 2008 book “*The Future of the Internet—And How to Stop It*,” Zittrain describes the pros and cons of “generative” technologies (wide open to innovation and contribution, with everything shared by all) and “non-generative” technologies (controlled, proprietary systems like cell phones and DVRs). “While the media and public are talking

about DRM at a software level, the reality is playing out at a hardware level,” Boyd wrote. “Non-generative technologies are being produced, restricting users from nearly everything, often to protect DRM. New mobile handsets and Intel-based hardware are having DRM baked into the circuitry. This is a problem and, if this continues, strict controls are somewhat possible. While we are marching toward this scenario at a fast pace, I think that we’ll see a disruption before 2020. I’m not sure what the disruption will be. Ad hoc mesh networks? Foreign-produced technologies brought in on the black market? As long as we can record media and as long as we can share content online (through encrypted channels), there will be breaks in the system. Realistically, there will be a lot more. I think that the likelihood of devising bulletproof DRM is about as high as the likelihood of stopping spam.”

At least one respondent says hardware makers are going to see more profit if they support open information sharing. “Technological protection of intellectual property seems to make good business sense for copyright holders, particularly compared to the difficulties of enforcing these rights through slow and expensive justice systems,” wrote **Lea Shaver**, A2K (Access to Knowledge) program coordinator at the Yale Information Society Project. “But ultimately consumer demand for openness will largely prevail over the effort to preserve pre-digital business models. There will always be a market for new tools to subvert DRM, and the pace of innovation is much faster than that of the legal system. Just as important, the many companies who stand to gain from greater content openness—such as makers of hardware and providers of indexing and remixing services—are increasingly going to organize to block legislation that puts the teeth in DRM.”

NEW ECONOMIC MODELS SEEN AS LIKELY

A number of the respondents reflected some optimism that people living in a highly networked age will adjust to new ways of thinking about the exchange of goods and services, including what is now referred to as “intellectual property.” **Louis Houle**, president of the Quebec chapter of the Internet Society responded, “A new capitalism will rise with the Internet (only an infant now).” **Fred Baker**, Cisco Fellow and an architect of the Internet, noted, “The

current attempts at DRM mostly curtail a growing business, and the business will eventually be allowed to grow.”

Paul Greenberg, president of The 56 Group LC, commented, “The fact that Gen Z or whatever they are called at the moment will have grown up in a peer-to-peer-empowered environment by 2020 will be (and is) the harbinger of social change that, when it comes to copyright control, will break down the traditional barriers that protect intellectual property.”

Paul Miller, technology evangelist for the United Kingdom-based company Talis, responded, “There is early evidence of a more pragmatic recognition that value is shifting. With a recasting of the value proposition with respect to content, it becomes less necessary to over-control the content itself, more useful to have that content widespread, and increasingly possible to recoup more revenue on value-added services built around the content and its community of use.”

Payment will come in new ways, according to **Scott Smith**, a futurist and consultant who formerly worked with Yankee Group and Jupiter. “By 2020, costs will be recovered in other ways,” he noted, “from subsidies built into device costs to live performance to embedded ads, but DRM-locked content will be in the minority for mass-market entertainment. Looser DRM systems designed to protect small producers may still be in place—a hybrid between Creative Commons and limited-play versions.”

Clay Shirky, author of “Here Comes Everybody” and a professor at New York University, agreed things will change, writing, “By 2020, alternative licensing regimes will have superseded the DRM rationale.”

Tze-Meng Tan of Multimedia Development Corporation, an architect of the Malaysian Internet, responded, “In 2020 most content will be distributed ‘free’ or for very low cost but supported by advertising, which will be embedded in the content.”

Jeff Jarvis, blogger at Buzzmachine.com, commented, “When audience and content can be metered and monetized, then it will be in the interest of copyright holders to have their content distributed as widely as possible, with the knowledge that this is how they will make money through advertising or through the expansion of their brands (that is, the reduction of their marketing costs).”

Thomas Quilty, president of BD Consulting, a firm that investigates software piracy, among other high-tech crimes, predicted that by 2020, “though content control is in place, competition in the form of royalty-free content competes with products with high usage fees. This competition forces the rights holders to lower their fees to be competitive. Additional changes to laws worldwide place restrictions on the length of time after creation of a work that fees can be changed, using a schedule where the fees are reduced and finally eliminated over time.”

Josh Quittner, executive editor of Fortune Magazine, formerly of Time Magazine and Business 2.0, and a longtime technology writer, responded, “As a content producer, my heart (or rather stomach) would like to see some form of IP protection going forward, but my brain tells me copyright will pretty much go away. From a tech perspective, I could see this going in either direction. If online advertising fails as a way to monetize content, I could see a micropayments system evolve, and that could easily go hand in hand with iron-clad DRM.”

Peter Kim, a senior analyst with Forrester Research who specializes in e-strategy, suggested, “the advertising model which supports media will collapse; both sides of DRM must learn to coexist, because content must be circulated with ease to build audiences and consumers alone cannot and will not subsidize the commercial model which incents artists to create.”

John Jordan, a professor of communications at the University of Wisconsin-Milwaukee, wrote, “The money to be made in technologies comes when user-consumers feel free to play and experiment. If all content is governed by a set of complex laws, user-consumers will feel stifled and will engage less with these

technologies. They may not protest; they simply will withdraw. Once that happens, companies will be forced to realize that the content they offer and seek to protect will not, in fact, sell itself—they must instead accommodate user-consumer desires and ease restrictions in order to see growth.”

MANY SAY ‘INFORMATION WANTS TO BE FREE’

Many respondents said people will continue to get what they want at the price they are willing to pay; sometimes they will pay with their attention, sometimes with money, and sometimes with the decision to ignore politically constructed mechanisms established to compensate the creators of content. “You cannot stop a tide with a spoon,” responded **Giulio Prisco**, chief executive of Metafutura Second Life, formerly of CERN. “Cracking technology will always be several steps ahead of DRM and content will be redistributed on anonymous networks.”

“Information will always want to be free,” wrote **Fabrice Florin**, executive director of NewsTrust.net, “and repeated attempts by governments and media companies to impose a digital rights management system will remain largely unsuccessful.” **Dan Lynch**, founder of CyberCash and Interop Company, now a board member of the Santa Fe Institute, commented, “Copyright is a dead duck in a digital world. The old regime based its power on high distribution costs. Those costs are going to zero. Bye-bye DRM.”

Geoff Arnold, senior principal and software development engineer for Amazon.com, responded, “This is a classic ‘arms-race,’ but in this case technology is going to be decisive. Every individual will have access to sufficient computing power to simulate every relevant content consumption use-case, and DRM won’t be able to keep up.”

Christine Satchell, senior researcher at the Institute for Creative Industries and Innovation at Queensland University of Technology, agreed, writing, “Users will always find a way to overcome barriers put up by those with sheer interest of generating capital, and industry will have to look at ways of aligning themselves with a new generation of savvy users.”

One respondent said he wished he could choose to “*totally disagree*” with the scenario. **Richard Hall**, co-director of the Laboratory for Information Technology Evaluation at the Missouri University of Science and Technology, commented, “As long as network neutrality remains in place, there is no way that DRM will survive, not just because the technologies will always be hacked, but, also because the philosophy behind it is so onerous and evil. All through our history, if we owned a physical device, the device did what we wanted. When I purchased a record it played on any record player and if I wanted to record it for my own use, of course I could. Once people truly come to understand the nature of DRM: 1) I don't actually own things that I purchase; and 2) I am punished (e.g., my media won't play on my own players) because someone else might commit a crime. They absolutely won't stand for it, and, once this philosophy is widely understood, the open Web will send it crumbling to pieces more and more, and politicians will have to work with the will of the people. One other issue is to keep in mind (though it's more abstract, and people may not respond) is that virtually all innovation occurs when one thing builds on another, and that is why the law has always held that intellectual property is not eternal like physical property.”

Alexander Halavais, a professor and social informatics researcher at Quinnipiac University, wrote, “While I have little doubt that there will be strife and problems with the interpretation of copyright in 12 years, we'll be seeing support for access to knowledge and knowledge commons, particularly in the international context.”

Christine Boese, researcher and analyst for Avenue A-Razorfish and Microsoft, commented, “The people who are intent on destroying the public commons with excessive digital rights management controls and strictures may win some battles, but they will lose the war, may have already lost it. They killed their own golden goose. Cultural forces are much stronger than corporate fascists, and whatever they seek now to block will simply arise from other providers in other sectors, even if it means a return to singing around campfires and pianos, or making homegrown media products. Here's a thought: maybe as the digital-rights-management

Nazis kill their golden goose, they will also force creatives beyond excessive postmodernist remixing as an aesthetic, and artists of all stripes will start to value ‘originality’ over ‘derivation.’”

SOME SUGGEST ALTERNATE METHODS OF PROTECTING RIGHTS AND PREDICT THAT ADAPTATIONS WILL EMERGE.

There will still be some controls, but they will come under a different system, according to many survey participants. **Nicholas Carr**, author of “The Big Switch: Rewiring the World, from Edison to Google,” wrote, “By 2020, there will likely be a monthly arts fee added to ISPs’ Internet-access charges, and the resulting pool of money will be split among copyright-holders depending on usage. The fee will give users unfettered access to most copyrighted works.”

Susan Thomas of S2 Enterprises LLC agreed, adding, “Content control through copyright cannot prevail. What IS likely is that access to the Internet will be controlled, and Internet service providers will charge a toll at the onramps.”

Some expect that added scaffolding of regulation will make IP law work better than it is now. “There will be multiple levels of copyrights, some with very few restrictions,” wrote **David Moschella**, global research director for Computer Sciences Corporation’s Leading Edge Forum, a Computerworld columnist. “New forms of cooperation will emerge which are less win/lose,” predicted **Mary Ann Allison**, principal of The Allison Group. “Commons will become a standard.”

“UGC [user-generated content], creative commons, and open source are too powerful to suggest that the strict standards and complete micropayment systems these scenarios describe will be universal standards,” responded **Susan Mernit**, an independent consultant and former senior director for product development at Yahoo! “I think we will see parallel systems for content and copyright management—the ‘integrated systems’ that are walled gardens much like AOL was for an ISP in the ’90s, and the ‘open media/open source’ distribution sites that are smaller, more fragmented and that represent the long tail. The popular wisdom of

crowds will dictate what is most popular, and payment structures will vary.”

“We’re already seeing new models of shared, commons-type ownership,” commented **Cameron Norman**, a professor at the University of Toronto. “It will continue because in too many cases the free ownership or shared products are simply better and more responsive. The ability for open-sourced products to respond as we get faster and faster in terms of turnaround in all sectors will continue and the old ways of copyright only limit that.”

Havi Hoffman, of the Yahoo Developer network noted, “In a perpetual panopticon (supervilliant society) most media consumption will be trackable. But an alternative economy of reputation and information intermediation could begin to develop in parallel to the money system, which even today is traumatized by the technology of total connectivity.”

Clement Chau, research manager for the Developmental Technologies Research Group at Tufts University, commented, “As the world begins to assimilate into a culture where creativity is collaborative and participatory, and where the lines between the audience and the creator are blurred, IP and authorship will be redefined. Rather than creators having the ‘rights to own’ intellectual property, audience will pay to have the ‘rights to participate.’”

REGULATORS ARE LIKELY TO REMAIN AT ODDS

Some respondents do not think the industries and political groups involved in digital rights management will be able to find enough common ground internationally to secure more complete control. “Things will stay lumpy and unpredictable for the DRM world,” wrote **Susan Crawford**, an ICANN board member and visiting professor at Yale Law School. “I see two alternatives here. If network providers, law enforcement, and content companies continue along their present European path towards authentication, retention, surveillance, and control of every possible online communication, and if this route is adopted by the rest of the world, then—yes, DRM becomes perfect, perfectly-charged for, perfectly

controlled. But the world is a diverse and competitive place. Somewhere, somehow, there will be countries and network providers who just don't want to go along. There will even be competitors in providing DRM technologies who don't want to go along.”

Robin Gunston, a consulting futurist for Mariri Consulting, wrote, “The only way this scenario can come about is if Asian countries agree to this accord, which I believe will take far longer than 2020.” An anonymous survey participant wrote, “No chance. Too many legal entities in the world.”

And **Hal Varian**, chief economist for Google, wrote, “Regardless of whether one thinks DRM is desirable or not, the coordination (in standards setting) and competition problems (inevitable due to zero marginal cost) are too great to overcome.”

Many respondents see the system surviving to 2020 as it is currently tiered. “The world will be increasingly divided between creators of proprietary content and creators of open-source content; two worlds with different kinds of information ecologies,” commented **Joan Connell**, the online editor for The Nation magazine, formerly an executive producer for MSNBC.com.

“The situation will be much like it is today and much like it was 100 years ago—major content producers will continue to find new ways to over-protect their investments and consumers will continue to find ways to subvert these systems,” noted **Alexis Turner**, Webmaster at Greenwood Publishing Group in New York. “Cat and mouse are eternal.”

DRM AND IP LAW HAVE SUPPORT

There were some respondents who expressed satisfaction with the current trends in digital rights management and IP law. “You don't have to read Marx or Foucault (though it helps) to understand that, contrary to 1990s techno-utopianism, power tends to replicate itself, no matter how ‘democratizing’ or otherwise liberating a new technology may appear to be,” wrote **Charles Ess**, a researcher on online culture at ethics at Drury University. “...While there will be

modestly successful resistance at the margins, most of us, most of the time, will find ourselves happy to drop 99 cents for a song from the iTunes store rather than fuss with copy protection workarounds.”

Johanna Sharpe, senior marketing manager for Microsoft, commented, “DRM is important and critical in helping protect IP. New DRM tools that digitally protect copyright materials give attribution between content owners and producers and their work so I don't believe using DRM is too restrictive. The arguments against DRM are weak, in my opinion. On the flip side, legislation that is too over-broad in shutting down all P2P [person-to-person] networks, and P2P innovation, doesn't make sense. P2P networks could be viable tools to educate and share information between groups, so it isn't in the public's best interest to shut down these technologies, just the exploitation of copyright infringement via networks. There has to be a balance between technology innovation and usage rights where people or companies are fairly compensated and technologies can advance to drive more open real-time communications online.”

William Winton, product manager of digital media for the 1105 Government Information Group, commented, “The Licensing Act of 1662 was greeted by many as the potential downfall of the free press. History proved this assumption wrong—indeed, English literature and art flourished in the Restoration Period as never before. The seemingly eternal give-and-take between the creator, publisher and public in regards to intellectual rights will not abate. Only a strong, fair and effective system of digital content control will enable artistic expression to flourish, while at the same time protecting the substantial investments that are required to enable such expression.”

SOME AGREED WITH THE SCENARIO

Few of the respondents to this survey appear to be supporters of a perfected, global digital-rights-management system or universal law of intellectual property—the word “draconian” was used often by respondents in reference to the scenario presented. A significant majority either answered it cannot happen or said they wish it would

not come about but think it likely. “This is the ‘Big Brother’ trend we anticipate in 2020,” commented **Janet D. Cohen**, blogger, futurist, and trend analyst.

“This scenario is likely, as the result of an increasing share of Internet access delivered via a smaller number of global wireless providers and partnerships (driven by threat of lawsuits) between these wireless providers and content producers,” noted **Timothy McManus** of Nuance Communications. And **Seth Finkelstein**, author of the Infothought blog, wrote, “Much of this is the case now! Note my ‘mostly agree’ response doesn’t indicate endorsement.”

Steve Goldstein, ICANN board member formerly of the US National Science Foundation, responded, “My main reason for agreeing is the increasingly oligarchic evolution of the service-provision marketplace. I would further predict that there will be cross-linking of content-provider giants and Internet-service-provider giants and that they will find ways to milk every last ‘currency unit’ out of the unwitting and defenseless consumer. Governments will be strongly influenced by the business conglomerates and will not do much to protect consumers. (Just think of the outrageous rates charged by cable and phone company TV providers and wireless phone providers today—it will only get worse.)”

Catherine Fitzpatrick, a lecturer on humanitarian issues with the Open Society Institute, wrote, “Despite the strenuous efforts of the copyleft movement, no viable business model has emerged or will likely emerge to pay artists who create content in any other way but in selling copies of their content which they must therefore copyright. Making the content free hinges on a philosophy that the state or philanthropy must pay all content creators, and that has many troubling ramifications for the freedom and viability of content creation. ISPs will simply find ways to bill for microchunks of content more expertly and efficiently, and, as more and more people monetize time online, billing micropayments will become normalized.”

“Much as I would like to see openness and abundance triumph, I don't see any political will to overturn the Digital Millennium Copyright Act,” wrote Internet sociologist and author **Howard Rheingold**. “To the contrary, other countries, most notably and recently Canada, are turning to similar legislation. Incumbent culture industries have the ears and pocketbooks of political leaders in the USA—witness how the USA has slipped from the inventors of the Internet to number fifteen in broadband Internet access. There are plenty of hopeful signs—both iTunes and Amazon are stripping DRM from downloadable music because that is what music customers demand. Free Culture is a growing anti-enclosure movement. Digital technologies continue to enable infinite reproducibility. But at this point, only a highly caffeinated optimistic could make hopeful signs into a strong argument that the forces for enclosure might lose. Right now, the RIAA, MPAA, and other copyright abusers are winning.”

SCENARIO 4

THE EVOLUTION OF PRIVACY, IDENTITY, AND FORGIVENESS

PREDICTION: *Transparency heightens individual integrity and forgiveness. In 2020, people are even more open to sharing personal information, opinions, and emotions than they are now. The public's notion of privacy has changed. People are generally comfortable exchanging the benefits of anonymity for the benefits they perceive in the data being shared by other people and organizations. As people's lives have become more transparent, they have become more responsible for their own actions and more forgiving of the sometimes-unethical pasts of others. Being "outed" for some past indiscretion in a YouTube video or other pervasive-media form no longer does as much damage as it did back in the first decade of the 21st Century. Carefully investigated reputation corrections and clarifications are a popular daily feature of major media outlets' online sites.*

Expert Respondents' Reactions (N=578)

Mostly Agree 45%
Mostly Disagree 44%
Did Not Respond 11%

All Respondents' Reactions (N=1,196)

Mostly Agree 44%
Mostly Disagree 45%
Did Not Respond 10%

Note: Since results are based on a nonrandom sample, a margin of error cannot be computed. The "prediction" was composed to elicit responses and is not a formal forecast.

Respondents were presented with a brief set of information outlining the status quo of the issue 2007 that prefaced this scenario. It read:

People openly share more intimate details of their lives online every day, and they are flocking to social networks and uploading and/or viewing homemade videos by the millions. Ubiquitous computing is diffusing into everyday life. Much of what goes on in daily life is more visible – more transparent – and personal data of every variety is being put on display, tracked, tagged, and added to databases. The number of mobile camera phones in use will top 1 billion in 2007; miniaturized surveillance cameras are simultaneously becoming extremely inexpensive, sophisticated, and pervasive; clothing is being designed with technology woven into the fabric; and it is expected that most surfaces can and will be used as two-way interfaces in the future.

OVERVIEW OF RESPONDENTS' REACTIONS:

The comments supplied by respondents, who split their vote evenly, were widely varied. Some noted that transparency is an unstoppable force that has positive and negative impacts. The views of many could be summed up as: More transparency might somehow influence people to live lives in which integrity and forgiveness are more likely, but there is just as much chance it will not have any positive influence, in fact it makes everyone vulnerable, and bad things will happen because of it. Respondents believe the concept of “privacy” is changing, and that privacy itself is becoming scarce. They are equally likely to cite hope that privacy will be protected as they are to cite concerns that privacy will be threatened by emerging innovations. For citizens and consumers, tracking and databasing will be ubiquitous. Reputation maintenance and repair will be required. Some people will have multiple digital identities; some people will withdraw from a world where surveillance and exploitation is so easy.

The response to this scenario was evenly divided between mostly agree and mostly disagree. At least part of this reaction is due to the variety of issues the scenario encompasses; the multiple layers inspired a bounty of thoughtful insights that provide a wealth of telling detail about our times and our expectations for the times to come. **William Winton**, product manager for digital media for 1105 Government Information Group, wrote, “To be certain, social

mores change; human nature does not. By making every action public we open ourselves up to scrutiny that, using more measured judgment, we might not desire, either as individuals or as a public. Humanity perhaps is not as evolved as our conceits would have us think. While there is private behavior that befits public scrutiny (there always is), there is a great deal that does not. To make everything 'transparent' is to lay bare our own shortcomings. Does this humanize us or make us ever more vulnerable to ill-considered attack, calumny, or worse? Will this discourage future potential leaders who may be fully qualified in every respect, but feel restrained by past behavior that might come to light? Are we to be exposed as being 'all-too-human,' or taken to task? Ecce homo?"

A number of respondents noted a generational divide, among them **Alex Don**, linguist and educator, who wrote, "This is not a world in which I would be comfortable living. The younger generation however, having grown up with these cultural backdrops, will adapt fairly well to this type of scenario or they will not be able to partake of their brave new world."

Jerry Michalski, founder and president of Sociate, wrote, "Gen Y has a new notion of privacy. The old 'never trust anyone over 30' will turn into 'never trust anyone who doesn't have embarrassing stuff online.'" And **Lynn Blumenstein**, senior editor for Library Hotline, Reed Business Information, commented, "A significant minority...will opt out of the transparency scenario, which will remain the domain of the young."

It must be noted that a vast majority of the respondents to this survey are not of the "digital generation"; they are over 30 and thus may not have the same sensibilities in regard to this question as those who actively participate in emerging online communications forms of all types. Age differences are a probable influence on the quantitative result on this survey question. Many said the pendulum of people's trust in one another will swing from more to less.

"New innovations come in and sometimes become major tidal waves of change," explained **Walt Dickie**, executive vice president and chief technology officer for C&R Research. "But they tend to

be over-played and soon their internal contradictions and dysfunctional, over-zealous applications become clear. Then there's a pullback, and the change is integrated more sensibly into the culture. Thesis/antithesis/synthesis, remember?"

Peter Kim, senior analyst for Forrester Research, responded, "Although society will seem more transparent, most people will guard many private aspects of their lives with great tenacity."

ICANN board member **Roberto Gaetano**, says there will be a mixed future in regard to transparency. "We will probably have a distinction between 'public' people, who will be exposed more and more to openness and transparency, and will consider that a necessary condition for being a public person, and 'normal' people, who will have more the tendency to hide in anonymity," he wrote. "The pressure for transparency in public people will come from different pressures. For politicians, for instance, it will be considered a prerequisite for office. But the people who do not have the need for divulging personal information will develop even more fear than they have today that private information might be used by wrongdoers."

Roderick White, editor of Admap Magazine, summed up the position of many respondents when he wrote, "Obviously, there are two possible views of how this will develop. At present, there is clearly a developing backlash against the exploitation by third parties (from insurers to recruiters to sexual predators to all-purpose criminals) of such transparency as already exists. Given the evident desire of a large proportion of humankind for five minutes of fame, it may well be that we do all come to wear our hearts on our home pages, but the potential downside is there, and it should only take a few major scandals to change this climate. I'd say the jury was out, and the prospects pretty evenly balanced."

"As author of 'The Transparent Society,' I agree that this is the best of many difficult possibilities. The alternatives are far worse. We must adapt. In an open world at least we'll be free," wrote futurist and writer **David Brin**.

**TRANSPARENCY MAKES EVERYONE MORE VULNERABLE
AND TECHNOLOGY WILL NOT CHANGE HUMAN NATURE**

Many of the respondents who did not agree with the scenario took a dim view of the future framed by this prediction. **Marco Rivera**, an Internet specialist for Vistrionix, an information-management firm, wrote, “Ubiquitous computing (UC) does not change human nature. While I'd like to believe that most people will use UC to create a more open and ‘forgiving’ society, there are always those who will use it to substantiate, defend, and evangelize their particular bias. UC will re-enforce ancient hatreds and may even radicalize those who in past times would have been uncommitted and unconcerned.”

Jim Horning, chief scientist for information systems security for SPARTA Inc., a former fellow at Xerox’s Palo Alto Research Center, wrote, “Yes, there will be a lot more information about a lot more people readily accessible to a lot more people, but inequality will continue, and those with the most power will have the greatest influence on what will receive widespread attention and what will quietly disappear from view. Character assassination will continue to be a blood sport, now carried out on a global scale. The division of society into mutually distrustful enclaves, each taking seriously only what appears in media it trusts will enhance neither integrity nor forgiveness.”

Frank Thomas, a respondent who chose not to share his place of employment, wrote that the scenario does not take cultural differences under consideration. “In 2020 the majority of global Internet users will live in China, India, Indonesia, and other Asian countries with a completely different culture of shame and of identity,” he responded. “The scenario also implies that the trend towards increased transparency will continue without limits. The massive identity frauds that become more and more common will make people more hesitant in publishing (real) individual information on Internet. As people can play with multiple identities, a large overload of fake information mixed with genuine will limit the trend towards transparency. So, in 2020 there will be an Internet world with a heightened transparency, where fake and genuine

information is mixed and another one with restricted transparency. Concerning forgiveness, this has nothing to do with technology but with cultural values.”

“Viciousness will prevail over civility, fraternity, and tolerance as a general rule, despite the build-up of pockets or groups ruled by these virtues,” wrote **Alejandro Pisanty**, ICANN and Internet Society leader and director of computer services at Universidad Nacional Autónoma de México. “Software will be unable to stop deeper and more hard-hitting intrusions into intimacy and privacy, and these will continue to happen.”

John Jobst, an IT specialist for the US Army Corps of Engineers commented, “People are going to realize that their privacy is becoming non-existent and resent the intrusions. Personal tabloid journalism will be so prevalent that reputation corrections and clarifications will be almost impossible to make. As more people try to hide in the corner to prevent the public spotlight from shining on them, forgiveness will shrink and intolerance will grow.”

Mack Rhoades Jr., Web services product manager for Michael Baker Corp., projects that more people will feel the need to hide their identities. “People will be less open as more private sector or government intrusion occurs,” he predicted. “Being ‘outed’ causes people to become less transparent and take more measures to hide or protect their identities.”

Nancy W. Bauer, CEO and editor-in-chief of WomenMatter Inc., noted, “People are learning the hard way that everything they say or show electronically will never disappear—and will never be forgiven. This is already the case. Nothing disappears.”

Paul Jones, director of ibiblio.org at the University of North Carolina-Chapel Hill, commented, “We all yearn for the idea of the village or the small town until we feel how they work to stifle individuality. Transparency will be painful and asymmetric. So yes, more sharing and more knowing, but forgiving? The small-town accommodation might be made, but not without costs and sanctions.”

Benjamin Ben-Baruch, senior market intelligence consultant and applied sociologist for Aquent, wrote, “Privacy will become increasingly compromised and increasingly important. People will pay a premium for services that limit practicable access to so-called ‘public’ information about them, and an underground will be created where people can try to hide from being surveilled and recorded. Organized crime will attempt to forge identities, mask identities, corrupt data about individuals, and sabotage databases of private information. Increasingly, there will be a gap between those who are protected from surveillance and from having private information exposed and those who lack privacy.”

Several respondents noted that high-profile people are likely to continue to be the most exposed. **Brad Templeton**, chairman of the Electronic Frontier Foundation, responded, “I disagree that the public will become that much more forgiving. Worse, there will be sins defined in the future that most people are not aware are sins today, and the records of those sins will come back to haunt the future as better AI-enabled search technology finds them.”

Catherine A. Fitzpatrick, an expert on humanitarian issues with the Open Society Institute and Physicians for Human Rights, commented, “Far from leading people to become more human and more forgiving, the ‘always-on’ exposure of the Internet and aggressive data scraping by the IT industry will lead to more and more forms of escaping responsibility through subverting identity and the use of hacking and anonymous avatars and such, and will also lead people to become more and more conformist and tribalist and fearful of the opinion of the mob online. The new media will become more and more intrusive and aggressive, more and more unforgiving, and there will be a backlash by the rich, the famous, and the criminal to find ever-new ways of hiding or confusing this aggressive new power. The noise of a million confidences blaring all the time will drown out the meaning.”

Social media researcher **danah boyd** called the survey’s scenario “wonderful science fiction but dreadful social-science prediction,” writing, “There are two populations that most users want to avoid at

all costs: those who hold power over them (parents, teachers, bosses, governments, etc.) and those who want to prey on them (corporations, marketing firms, bullies, etc.). We are going to see a lot of chaos around privacy in the next 13 years, yet I don't think that we will have equilibrium by then. Realistically, the only comfort we will reach will be over embarrassing material. I think that we'll be far less embarrassed by our pasts once everyone's are out there in some form or another. My prediction is that we will find ways of using content to talk at different levels, just as writers have in the past and just as Chinese activists do now. Much of the 'private' content will be produced in a way that is publicly palatable and can be read at multiple levels by those who are closer to the individual. Already, this is what teens are doing with their SNSes (while they are also trying to restrict access using whatever means are available)."

And **Nick Dearden**, campaigns manager for Amnesty International, wrote, "There is a rapidly expanding trend for the Internet to be used by governments and companies to exert control over what individuals can and cannot say, and the ways in which they can use the Internet. In more-repressive countries, anonymity and privacy are the key ingredients in creating an Internet useful in the battle for expanding rights and social change. As the desire and ability to control the Internet spreads, privacy is likely to become more important in more countries."

TRANSPARENCY, ALONG WITH ITS ASSOCIATED POSITIVES AND NEGATIVES, IS AN UNSTOPPABLE FORCE

The respondents who mostly agreed with the scenario expect that transparency will prompt people to cut each other some slack. "Web 2.0 is all about transparency," wrote **Gerard LaFond**, founder of red TANGENT, a marketing agency. "When we hit that tipping point where there are more people online participating in social networks and sharing personal information, then privacy no longer matters. This is a scary proposition, but it's already happening. The good news is this creates all-new social mores and fosters a new order of morality."

Jeff Jarvis, Buzzmachine.com blogger and professor at City University of New York Graduate School of Journalism, says the issue is not privacy; it is about control. “The digital generation realizes that one cannot make connections with people without giving up something of oneself—you can’t meet skiers until you reveal that you ski,” he explained. “We will enter a time of mutually assured humiliation; we all live in glass houses. That will be positive for tolerance and understanding, but—even more important—I believe that young people will not lose touch with their friends as my generation did and that realization of permanence in relationships could—or should—lead to more care in those relationships.”

“In 2020, privacy will have emerged as a best-friend issue, where you tell the world what previous generations told their very best friends,” wrote **Stan Felder**, CEO of Felder Communications, a marketing company. **Clement Chau**, manager for the Developmental Technologies Research Group at Tufts University, commented, “Transparency in people's identity will bring people together closer in 2020. Rather than struggling between public disclosure and privacy, people will leverage the power of the Internet and other social networking media to form their own identities. People will assume that you know who they are and who they want to be. We will fully understand that we all have different ‘selves’ that we affiliate with different social-cultural groups. As a result, action will be valued much more than first impressions.”

Mary Ann Allison, principal of The Allison Group, noted, “The past becomes less important in a society which is now- and future-oriented. Repressive control continues to diminish, not always for normative reasons...but also for practical reasons.” **Virginia Bisek**, Web content developer and writer, celebrates the idea of transparency, writing, “Anonymity has provided a safe haven for Cowards and Ignorants. Although this reeks of loss of privacy, the good outweighs the bad. Yes, people will pause before shouting or doing something stupid. We can only dream.”

Some respondents shared the expectation that repeated “outings” of people’s previous indiscretions will make their errors seem less

egregious. “When we *all* have skeletons in our cupboards, having a skeleton in your cupboard won’t matter,” wrote one anonymous respondent. “Time dulls all outrages,” wrote **John Jordan**, an associate professor of communications at the University of Wisconsin-Milwaukee. “A newly-minted teacher applying for a job at a children’s school may find it difficult to explain away Flickr photos and YouTube videos of wild partying from just a few months ago. But an older teacher who has a wilder side exposed from 20 years ago likely will not have the same difficulty explaining away a ‘youthful indiscretion.’ What will certainly be true is that, given the number of such pictures and videos available, they will not seem as shocking. Something else will have come along to satisfy our shock-quotient.”

Nikki Waters, manager of the Internet services group for Kaiser Permanente, responded, “By 2020, the dark secrets that used to (perhaps rightfully) be things you should be ashamed of will now be ‘okay’ because people will be desensitized.” And **Hank Dearden**, director of business development for Digital Industry Inc., noted, “People won’t care about past indiscretions mostly due to fatigue, which is, I guess, a form of acceptance.”

A number of people agreed but qualified the agreement. “The bar of acceptable behavior will be set higher and we will be more tolerant,” wrote **Ted Coopman**, a communications technology lecturer at San Jose State University. “However, I think that outing extreme deviancy for public figures will still grab attention and ruin people. Look for more libel suits and therefore more care in what people accuse others of.”

Some respondents cautioned transparency cuts both ways. “The opportunity to find more and more people who share our interests and appreciate our points of view encourages us as individuals to be more open about who we are,” commented **Kent Kirschner**, media specialist for Neighborhood America, an online community-building company. “This will continue to evolve and open up as today’s activities become ubiquitous. Simultaneously, we will see a rise in predatory behavior.”

Nicholas Carr, author of the Rough Type blog and “The Big Switch,” observed, “This scenario is a great example of wishful thinking. By 2020, the Internet will have enabled the monitoring and manipulation of people by businesses and governments on a scale never before imaginable. Most people will have happily traded their privacy—consciously or unconsciously—for consumer benefits such as increased convenience and lower prices. As a result, the line between marketing and manipulation will have largely disappeared.”

Some people who expressed views against the scenario’s likelihood pointed out cultural differences across the globe as a reason, but at least one respondent saw the blending of global mores coming as a result of an expansion of familiarity and transparency. “We may find a massive amount of change as our societies integrate a general base view and allow for niche attitudes and ways of life,” responded **Robert Eller** of Concept Omega, a marketing company. “Already we see this reality in larger Western cities where people play their daily public role and due to a greater amount of anonymity are also able to live ‘their’ lifestyle viewpoint with little risk of desocialization. In the US it was virtually a stoning offence if you were to be divorced/be gay/be female/be black etc. as a candidate for president; German chancellor Gerhard Schröder had his fourth wife...and did anybody give a hoot? Nope.”

PRIVACY WILL BE BOTH PROTECTED AND THREATENED THROUGH INNOVATIONS

Some respondents projected that systems will be adapted to afford at least some privacy. **Bertil Hatt**, a researcher of Internet and social services and innovation valuation for France Telecom and Orange, proposed the following 2020 scenario: “Most individual data cannot be accessed unless by explicitly authorized relatives. Thanks to Semantic coding, almost any information can be accessed, but the main process by computers is done to prevent people from deducing the information they are not supposed to have. More generally, privacy is enforced by the fact that excessive access to confidential data can be revealed.”

Duane Degler, a designer and strategist for Design for Context and writer and editor of IPGems, which is focused on Semantic Web integration, agreed. “Increasing individual-level tolerance has been a trend in modern societies, and is likely to continue as the novelty of this format of data sharing wears off,” he wrote. “...It is probably not major media that will guard reputations, but background Semantic Web services and pervasive agents that individuals can control.”

Peter Bihl, a freelance consultant on Web strategies based in Berlin, wrote, “Social networking sites will, by 2020, long have incorporated strong mechanisms for privacy control by their users. As an exception, there might be social networks with strong incentives to really openly share personal data. These networks will be used by a large number of people, partly for financial reasons (free of use; vouchers or other financial rewards), partly due to lack of understanding of the effects (low education).”

Thomas Quilty, president of BD Consulting and Investigations, responded with this 2020 scenario: “As technology makes the collection of information easier—at times without the consent of individuals—laws are passed worldwide to protect the rights of an individual as to whether data collected even anonymously can be used or shared with others. Personal AI-presence programs that represent the individual constantly search databases—even private databases—containing information related to its owner for information in violation of the owner's privacy-profile settings. Data in government or private databases, if found to be wrong or illegally collected are disputed automatically without the individual's intervention.”

Tom Vest, IP network architect and consultant for RIPE NCC Science Group, predicts there will be some moves aimed at reputation-blurring. “More people will opt for greater affectation (celebrity-style image management on a micro-scale) or obfuscation, e.g., using bots to generate personal ‘info-chaff’ to obscure actual online and offline behavior.”

Hal Varian, chief economist for Google, responded, “The key issue with privacy is trust: will the organization to which I transmit private information use it in my interest? I am optimistic that we can move in this important direction.”

And **Jim Kohlenberger**, director of Voice on the Net Coalition and a former White House specialist on telecom policy, pointed out this idea of a likely reality in the next few years: “Complicating this vision is that by 2020, storage is so cheap that a person's entire life can be recorded in video, audio, converted to text and searched. Someone else's life recording, in which you may interact and be a part, could become posted without your consent. Thus, new privacy protections would nonetheless be put in place along to prevent digital defamation.”

OUR CONCEPTS OF ‘PRIVACY’ ARE CHANGING

Many respondents agree that perceptions of privacy will change due to the changing communications landscape. “The same way having a tattoo today is no longer a barrier to career growth or social access, the standard for what is considered the ‘norm’ will continue to change,” predicted **Bryan Trogdon**, president of First Semantic, a company that leverages the Semantic Web. “The benefits of instant, autonomous social feedback (what movie to watch, where to vacation, which chair to buy) based on shared personal preferences will far out way the cost.”

John Eckman, a director with Next Generation Internet, Optaros Inc., wrote, “Our collective notions of privacy (there are many notions of privacy, not one notion of privacy, even today) will evolve—we will come to have a broader understanding of what it means to have a public record of statements going back to youth. I'm not certain, though, that this will result in more integrity or more forgiveness. I guess that the context of everyone having such a visible record will make any one individual's statements less impactful, but so far we have seen this tending towards more judgmental and discriminatory behavior, not more forgiveness.”

Blogger **Richard Silverstein** responded, “While I agree that notions of privacy, rectitude and sin will evolve over time in a freer

direction. I don't think people will be more willing to sacrifice what they view as essential elements of privacy. This will still be a realm in which people will see a virtue in protecting the most personal and intimate facts about themselves and their lives.

Ivor Tossell, technology columnist and journalist for the Toronto Globe and Mail, wrote, “YouTube ‘outings’ will indeed become more commonplace and accepted, as will evidence of putative politicians' lewd and offensive senses of humor as 20-somethings. But one of the lessons of the Web thus far is that name-and-shame sites (remember www.dontdatehimgirl.com?) have had limited traction, despite their salacious premises. It seems more likely that a privacy-aware generation will instead take active ownership over its online identities, and instead of becoming comfortable sharing intimate information, move decisively to manage (and often limit) what the world sees, to its own advantage.”

Peter Eckart, director of technology at the Illinois Public Health Institute responded, “It's more likely that people give in to having their personal information bought and sold in the marketplace, and kids grow up—and the culture changes—to not having understood the value of privacy at all, so they don't miss it. 2020 will see the latter stages of a culture war, fought by older folks (I'll be 58 that year) trying to hold on to what privacy is still left, and younger folks—distracted by the media marketplace—wondering what all the fuss is about.”

Scott Smith, principal at Changeist LLC, and others projected a divide, with more people consciously populating one of the extreme ends on a scale that goes from total transparency toward total privacy. “What seems more likely is a growing division between those who don't mind transparency and operate out in the open light of day—warts, broadcasted SSNs and all—and those who choose to avoid disclosure of any kind,” he wrote. “The benefits of open disclosure/transparency will decrease as more people flood the open market with predominantly useless private information—constant location and status updates, multiple ‘cosmetically retouched’ life stories and vast amounts of visual pollution from their personal lives.”

**TRACKING WILL BE LEVERAGED MORE,
SURVEILLANCE UBIQUITOUS, PRIVACY SCARCE**

While most respondents concentrated on the aspects of the scenario tied to forgiveness and trust, others addressed the ways in which data about individuals' lives will be collected and used. **Sean Steele**, CEO and senior security consultant for infoLock Technologies presented the following 2020 scenario: "Ubiquitous surveillance will allow those who are willing—or those unlucky enough to be forced—to place some or all of their lives online in real time for others' entertainment (a la '1984,' 'The Truman Show,' 'Max Headroom' and/or 'Running Man'). Pervasive one-way surveillance by government and law enforcement will exist in all major cities and nations, as it will online, and GPS tracking of persons, vehicles, goods, and possessions, etc., will be commonplace and easily accessed for those willing to pay for it. Narrowcast advertising will be used in virtually every public area and retail space, and ads will be customized, personalized, audible only to the individual and only while in proximity to the good/service being sold. Spot promotions will target impulse buying habits like never before. Mobile devices and or RFID tagging will continuously communicate via short-range radio (e.g., Bluetooth) with corporate marketing databases, and marketers will cross-feed and share data in order to provide rich, up-to-the-minute, 'three-dimensional' profiles of consumers."

Havi Hoffman, of the Yahoo developer network, wrote, "The volume and ubiquity of personal information, clicktrails, personal media, etc., will desensitize us. A super-abundance of transparency will lose its ability to shock. Maybe there will be software-driven real-time reputation insurance service, offering monitoring and repair to dinged reputations. This could be as ordinary as auto insurance or mortgage insurance is today, and as automated as the nightly backups performed by most online businesses. I don't agree that this will make us any kinder, gentler or more open in our dealings with each other. I do believe the next generations will take a different view of public and private/ much as our take on social mores and self-expression has changed radically when compared to the time when our grandparents came of age."

“Many people are not aware of the loss of privacy and freedom when they put all their data on the Internet,” wrote **João Miguel Rocha Filho**, director of DataOne, a provider of software for connecting to Linux based in Brazil. “Not only other people are doing use of this data but also business enterprises, security agencies and all sort of government bodies. Also people are not aware that their info will drive others to access it – health (or lack of it), familiar life, financial life, political life, etc. The technologies in use now are very helpful to people but in time, without control, they may well be dangerous tools.”

Josh Quittner, executive editor of Fortune Magazine, wrote that he expects privacy will be exchanged soon when it is decided that complete transparency is required for safety: “Total transparency for total security! Sounds Orwellian. Is Orwellian. Sadly, it’ll be our response to the next major terrorist event in the US (and then elsewhere).”

SOME EXPECT PEOPLE TO WITHDRAW

A number of respondents said as people begin to see how their personal information is being collected in databases and used they will begin to back away and become more careful about public displays of private materials. “Backlash” was a word used in many responses.

“The backlash against social networking's incursions into personal privacy is already beginning,” commented **Milton Mueller**, a professor at Syracuse University and expert on Internet governance and technology policy. “People will adjust their behavior to be more careful about the possible future uses and abuses of information about themselves. There will be more data, and more things done online, so there will be much more to keep track of and to hide.”

Richard Osborne, Web manager for the University of Exeter, wrote, “I suspect more of a backlash as unscrupulous and manipulative people start to understand just how much power they can hold over others using freely available online information. Perhaps a couple of nasty cases will lead to a shift in public perception and changes in the law.”

Susan Mernit, an independent consultant and former executive with Yahoo! and America Online, predicted, “By 2020, we will have a backlash against openness and privacy and have a series of private networks that individuals can use with greater anonymity—they will be premium, secure channels. Rather than forgiveness, society will negatively rate a larger number of people and a backlash against transparency will occur—the New Privacy of smaller and more elite networks will rule.”

Scott Brenner, a Web developer and consultant for Fortune 500 companies, noted, “There will be major data breaches and other negative aspects of all this ‘openness’ that will cause some people to push back. Schools, employers, potential romantic partners, neighbors, etc. will routinely obtain personal information on others (and use it for both good and evil purposes) that would have been nearly impossible to uncover in the latter part of the 20th century.”

Many respondents indicated that all of this will cause people to want to drop out of sight, off “the grid.” **Chris Miller**, senior vice president for Element 79, an advertising agency, wrote that he sees three factors at play in his mostly-agree answer to the proposed scenario: “1) Lack of privacy will force people (who don't want public outing) to live their lives more openly and not commit the ‘indiscretions of the past’—if anyone could tell if anyone was lying, people wouldn't lie. 2) There will most likely be a few high-profile murders, kidnapping, etc., based on someone monitoring another individuals’ information. This will at first create a privacy backlash but will push for more openness. 3) Coming off of number 2 and a bit of ‘who's watching the watchmen?’ there will be a small part of the population who continues to live off the grid to an even greater extent. They will not trust the new notion of privacy. This will at first be people who have ‘dropped out’ but then will continue with their children, who are born off the grid and stay out of the openness of society.”

REPUTATION REPAIR WILL BE COMMONPLACE

There was a high level of agreement on the growth of the reputation-maintenance business. “In 2020 your online identity will be more important than your physical one,” wrote **Mark Youman**, principal at ICF International, a Washington, D.C., consulting company.

A number of respondents expect to see people of privilege and power managing to rise above the exposure likely for the lower classes. “A high level of transparency (through profiles, user ratings, feedback, and other mechanisms) will be necessary for doing business by 2020—you simply won't be invited to the table if you don't provide that type of information, predicted **Jason Stoddard**, managing partner for strategy at Centric/Agency of Change. “Of course, gaming the system will be the new ‘search optimization’ of the day, but ‘found media’ will typically correct any gamed records. The highest social status may indeed be the people who are truly invisible, unknowable, and opted-out of the system, since this will imply that they have large amounts of money and power.”

Patti Nelson, a Webmaster who works on US government sites, wrote, “This has started; reputation cleanup services are already in business. Interesting though that this type of transparency might encourage people to behave better. It's as though people are creating a global Big Brother by choice.”

Matt Gallivan, senior research analyst for National Public Radio, commented, “I see there being two main options in the future: 1) people shut themselves off to the interactive world and as a result lose the massive value and utility that sharing offers, or 2) people accept that utility and value and, in so doing, learn that everyone in this age—not just politicians and celebrities—has to work to maintain a carefully calibrated public-facing image. I don't imagine many people will choose option one.”

Several responded that it's not possible to completely rehabilitate a damaged reputation. “I do not really believe that reputation corrections are really functional,” wrote **Oliver Quiring**, a professor at the Institute for Communication Science and Media

Research at Ludwig-Maximilians-Universität in Munich. “It is much easier to destroy than to build up reputation.”

Brian Dunbar, Internet services manager with NASA, commented, “‘Truth’ will become a quaint 20th-century idea. Whatever gets the most hits, and most blog/MySpace/media coverage, will be accepted as fact.”

The portion of the scenario indicating that media organizations might publish reputation updates was mostly ignored and sometimes denigrated. “I got a big laugh out of, ‘Carefully investigated reputation corrections and clarifications are a popular daily feature of major media outlets’ online sites,” wrote Infothought blogger **Seth Finkelstein**. “This combined ‘Carefully investigated,’ ‘popular,’ and ‘major media’ in one sentence and wanted it taken seriously. I think the reality is going to be more like ‘Sleazy reputation hit-pieces are a popular daily feature of tabloid media outlets’ online sites’ (like they have been as long as such media has existed—i.e. ‘yellow journalism’).”

And **Hamish MacEwen**, a consultant with Open ICT in New Zealand, wrote, “‘Major media outlets?’ You must be joking. Fragmentation and decentralization, combined with aggregation and collaboration will remove those legacy institutions and supplement them with a bewildering range of sources and opinions.”

DIGITAL IDENTITIES CAN AND WILL BE MULTIPLE

A few respondents pointed out the complexities of “privacy” in a digital present and future in which people sometimes have more than one “self.” “Digital duplicity will become a high art,” wrote **Greg Laudeman**, a technology specialist at Georgia Tech Enterprise Innovation Institute.

Anthony Townsend, research director for the Technology Horizons Program for The Institute for the Future, responded, “Expect a whole new layer of social infrastructure for reputation and identity management to be layered on top of this. Social networks will proliferate, as will the ability to maintain multiple,

sometimes conflicting identities and trails across each one. In the end, who will be the arbiter of what's true and what isn't?"

Barry Chudakov, principal of the Chudakov Company, a marketing and advertising agency, commented, "New digital identities deconstruct our singular notions of self, just as our 'life on the screen' obliterates the proscenium arch of literate theater. It is more than Pollyannaish to think that transparency heightens integrity and forgiveness; this ignores the growing dynamic of self and other merging, of copies and originals replicating each other. At stake here is our sense of self that grew up feeding on the alphabet and its linear outcroppings. I believe the more likely scenario is that we will realize that we must manage our digital identities, much as a corporation manages its messages and relations with the media. Further, as our lives become more transparent, we will regard privacy much as Rousseau regarded nature once the industrial revolution threatened it. The rarity of privacy will only be slightly affected by reputation corrections and clarifications, because these will be seen to be as yet another identity foray, another option in the malleable sense of self which will define each of us."

And **Luis Santos** of the Universidade do Minho in Braga, Portugal, wrote, "We do not need to go forth a decade to anticipate a much more complex (hyper-complex, as Qvortrup calls it) social environment. People will most certainly adopt more flexible identities and more public facets of those identities, and that will not produce enhanced transparency; quite the opposite. Still, transparency in that particular sense is not a very desirable goal in itself—it rhymes with conformity, and that runs against the pillars of knowledge appropriation and development."

SCENARIO 5

THE EVOLUTION OF AUGMENTED REALITY AND VIRTUAL REALITY

PREDICTION: *Many lives are touched by the use of augmented reality or spent interacting in artificial spaces. In 2020, virtual worlds, mirror worlds, and augmented reality are popular network formats, thanks to the rapid evolution of natural, intuitive technology interfaces and personalized information overlays. To be fully connected, advanced organizations and individuals must have a presence in the “metaverse” and/or the “geoWeb.” Most well-equipped Internet users will spend some part of their waking hours—at work and at play—at least partially linked to augmentations of the real world or alternate worlds. This lifestyle involves seamless transitions between artificial reality, virtual reality, and the status formerly known as “real life.”*

Expert Respondents’ Reactions (N=578)

Mostly Agree 55%
Mostly Disagree 30%
Did Not Respond 15%

All Respondents’ Reactions (N=1,196)

Mostly Agree 56%
Mostly Disagree 31%
Did Not Respond 13%

Note: Since results are based on a nonrandom sample, a margin of error cannot be computed. The “prediction” was composed to elicit responses and is not a formal forecast.

Respondents were presented with a brief set of information outlining the status quo of the issue 2007 that prefaced this scenario. It read:

While most current Internet interaction is found in the user-generated content and social networks of Web 2.0, the 3-D Web-computing ecosystem is developing quickly. Augmented reality enables the enhancement of real-world information through the use and confluence of the Internet, RFID, GPS, smart-tag networks and portable/wearable information technology. 3-D environments, which are just beginning to be more efficient and accessible, offer ideal design spaces for social and economic experimentation, rapid-prototyping and customized and decentralized production. Every item in the physical world is being mapped, tagged, and databased, as humans build mirror worlds (data-enhanced virtual models of the "real" physical world, also known as digital Earth systems or the geoWeb), and innovate in new, virtual worlds (Second Life, Cyworld, World of Warcraft). MIT's Fall 2007 Emerging Technologies conference had a headline session titled "Second Earth: Second Life, Google Earth, and the Future of the Metaverse," with the explanation: "Social virtual worlds such as Second Life and mapping tools such as Google Earth are beginning to overlap, perhaps foreshadowing the advent of an immersive, 3-D 'metaverse.'" A 2007 Gartner study estimated 80% of all active Internet users will have virtual selves by the end of 2011.

OVERVIEW OF RESPONDENTS' REACTIONS:

A modest majority of respondents agreed with the idea that time spent leveraging augmented and virtual reality for various uses will continue to grow; some noted that by 2020 augmented reality (AR) and virtual reality (VR) will have reached the point that reality itself will be blurred. Many projected that this will enhance the world, providing new opportunities for conferencing, teaching, and 3-D modeling. Some added that breakthroughs to come may bring significant change, including fusion with other developments, such as genetic engineering. Some respondents fear negative ramifications, including possible new extensions of the digital divide, an increase in violence and obesity, and the potential for addiction or overload. Because of this, some respondents noted that people may begin to "opt out" of using AR and VR tools. Many of those who disagreed with the scenario said VR will not reach the scenario's level of acceptance or sophistication by 2020 or indicated its primary users will "still be geeks and gamers."

More than half of the respondents mostly agreed with this scenario while just under a third disagreed. “Our beloved mobile handsets (no longer ‘phones’) will make seamless traveling within electronic circles of our own creation eminently possible,” wrote **Susan Crawford**, OneWebDay founder and ICANN board member. “We won’t see the difference between RL [real life] and other life—our presence will be felt whether we’re there or not. It already is.”

Nicholas Carr, author of “The Big Switch: Rewiring the World from Edison to Google,” noted, “By 2020, the virtual world will have blended with the physical world; to speak of them as separate spheres will seem anachronistic.”

Jamais Cascio, a co-author of the “Metaverse Roadmap Overview,” a report on the potential futures of VR, AR, and the geoWeb that was released in 2007, commented, “The striking aspect of this scenario is that, for these everyday inhabitants of the metaverse, this *is* real life. We in the present don’t think of ourselves as living in ‘cyberspace,’ even though people of a decade previous would have termed it such. Of the various forms of the metaverse, however, the majority of activity will take place in blended or augmented-reality spaces, not in distinct virtual/alternative world spaces.”

Adrian Schofield, manager of the applied research unit at Johannesburg Centre for Software Engineering in South Africa, responded, “Much will depend on the ability of the hardware and power sources to keep pace with the software that enables the metaverse/geoWeb. It also remains to be seen if the proliferation of wireless has a negative impact on the human body.”

Clay Shirky, author of the book “Here Comes Everybody” and a professor in the Interactive Technologies Program at New York University, sees success for augmented reality, not for virtual worlds. “Augmented reality is in many ways the opposite of virtual worlds,” he wrote. “Fusion of data and physical space will succeed, VR alternatives to it will not.”

Jerry Michalski, founder and president of Sociate, a technology consulting firm, commented, “I see worlds like Second Life as of very limited interest. However, gaming environments from Webkinz to World of Warcraft are extremely popular and teach more valuable lessons than the early generations of single-player video games. Also, the tagging and instrumentation of the world as an augmented reality will soon find some useful applications, making it increasingly common.”

Hal Varian, chief economist for Google, predicted, “The transition will be driven by gaming, but I hope to see scientific and educational spillovers.”

Bryan Trogdon, president of First Semantic, a company working to leverage the Semantic Web, wrote, “Wall-sized televisions supporting blazing-fast data transfers, voice recognition and a fully realized semantic Web will blur the lines between real and virtual. This ‘Teleliving’ will fundamentally change the way we shop, work, learn, and live.”

Barry Chudakov, principal with the Chudakov Company, commented, “David Gelernter saw this coming a decade ago and much of what he wrote in ‘Mirror Worlds’ will be commonplace by 2020. We are augmenting our ability to see and imagine our world; we are literally walking into the mirror and exploring the reflection. This has huge implications for what we see there and how we see ourselves when we’re in these mirror worlds. In most of human history we have not had simulations to describe and invent ourselves other than texts and two-dimensional representations. These mirror worlds are multi-dimensional experiences with profound implications for education, medicine, and social interaction. ‘Real life’ as we know it is over. Soon when anyone mentions reality, the first question we will ask is, ‘Which reality are you referring to?’ We will choose our realities, and in each reality there will be truths germane to that reality, and so we will choose our truth as well.”

Jason Stoddard, managing partner at Centric/Agency of Change, predicted, “Augmented reality will become nearly the de facto

interface standard by 2020, with 2-D and 3-D overlays over real-world objects providing rich information, context, entertainment, and (yes) promotions and offers. At the same time, a metaverse (especially when presented in an augmented-reality-overlay environment) provides compelling ways to facilitate teamwork and collaboration while reducing overall travel budgets.”

Those who disagreed often shared the point of view expressed by **Joanna Sharpe**, senior marketing manager for Microsoft, who wrote, “I don’t think most well-equipped Internet users will spend some part of their waking hours, at work and at play, linked to augmented, virtual-reality worlds. A smaller subset of the well-equipped Internet users will spend time as outlined in this question but it’s going to be a smaller percentage of Internet users, 5-10 percent, tops, not most.”

AR, VR, AND GEOWEB WILL ENHANCE OUR LIVES; BLURRING WILL ELIMINATE DISTINCTIONS

Many of the respondents who mostly agreed with this scenario said it will offer positives that will benefit people in some way. **Fred Hapgood**, technology author and consultant, noted that the lack of regulation thus far in virtual worlds is an attractive feature. “If you want to throw a rock concert online you don’t have to post bonds, buy insurance, rent portable toilets, and so on,” he explained. “There are no closing costs associated with buying virtual real estate. As time goes on and the thicket of regulation in the physical world gets denser, this feature will become more and more important.”

Cliff Figallo, social innovator and original member of the first online community, The WELL, now of AdaptLocal.org, wrote, “Virtual worlds will help local communities plan their adaptation to the impacts of climate change.” **Jill O’Neill**, communication director for the National Federation of Abstracting and Information Services and author of the Infotoday blog, commented, “This will happen on the basis of economics and any forthcoming fuel shortages. It is easier (and far less costly in terms of time and money) to have people interact in a virtual world rather than have them traipse around the world.”

A number of survey participants said in their responses that virtual worlds will revolutionize training and education—all forms of knowledge sharing. **Debbie Murray**, associate director of the University of Kentucky’s health education extension office, noted, “Many of our problems can be solved inexpensively by being able to simulate real-world conditions and manipulate those conditions to arrive at projected outcomes.” **Jane Sarasohn-Kahn**, founder of THINK-Health, responded, “The metaverse and augmented reality will have a transformational impact on health and health care.” And **Peter Kim**, a senior analyst for Forrester Research specializing in e-strategy and management, wrote, “Educational applications of virtual reality will prove to be highly valuable. Individuals will be able to learn in new ways and improve their physical beings through virtual experimentation.”

Tze-Meng Tan of Multimedia Development Corporation in Malaysia, a director at OpenSOS, responded, “The virtual world removes all barriers of human limitation; you can be anyone you want to be instead of being bound by physical and material limitations. That allows people to be who they naturally are, freed of any perception they may have of themselves based on their ‘real life’—it is the power of removing the barriers of your own perception of yourself.”

Beth Hesse, vice president for Garfield Group Public Relations, predicted, “The notion of a mirror or virtual world will be replaced by another version where both are merged. They will not be separate. It will hard to define where your real self and virtual self end as GPS/LBS [global-positioning system/location-based services] functionality are merged into devices of all kinds.”

Some wrote that people online will blend real-life and virtual applications. **Gbenga Sesan**, an Internet-for-development consultant for Paradigm Initiative in Nigeria, commented, “The difference between ‘real’ and ‘virtual’ is becoming less obvious/important. By 2020, anyone without a search result through Google may be assumed dead (or to be using a pseudo name because even dead people will have information at least on

Wikipedia). Real life in 2020 will not be very different from what was known in 2007 as ‘virtual life’!”

“Is the future of the Web 3-D and integrated with the real world? Of course it is,” wrote **Alexander Halavais**, professor and social informatics researcher at Quinnipiac University. An anonymous respondent wrote, “Interface design in general is moving toward the metaverse, which means that everyone who interacts with a computer will encounter augmented reality.” And another wrote, “Just as e-mail today augments other forms of communications, artificial spaces will augment real spaces.” **Jim Witte**, a professor at Clemson University who researches Second Life and the differences between online and offline society, responded, “Mobile devices will act as the means to access and seamlessly bridge artificial and virtual worlds and maintain a sense of blended reality.”

SOME PEOPLE SAY THEY ARE ALREADY AUGMENTING REALITY AND LIVING IN VR

Many respondents noted that the transition to individuals’ cultivation of more life experiences online has already begun. “Augmented reality and artificial spaces are apt terms and they’re already blended into our noisy environment nearly everywhere; it’s bound to get more cluttered,” wrote **David Allen**, Ph.D., Temple University.

Josh Quittner, longtime technology writer and executive editor of Fortune Magazine, added, “As computing power increases and our ability to render lifelike (and dreamlike) graphics matures, more believable forms of virtual worlds will take hold. While current iterations of virtual worlds (Second Life, etc.) still have enormous room to grow, a whole generation of children is growing up on Club Penguin and Webkinz. They will continue to socialize in more sophisticated virtual worlds as those worlds evolve.”

Maz Hardey, a social analyst and blogger completing a doctorate funded by the Economic Social Research Council in the UK, wrote that the divisions now seen—with men spending more time than women in Second Life and women spending more time than men

on social networks such as MySpace and Bebo—may change. “By 2020, the scenario could be that there are more sophisticated technologies that make such ‘virtual’ realities compelling to both men and women Internet users. Moreover, these ‘life worlds’ are likely to be accessed not just through a computer, but other devices that cut down on the ‘interface’ and ‘user’ divergences. If this is the case, then a presence in a ‘metaverse’ may in turn respond to the ‘real’ digital presence that an individual already shares across SNSs. However, it is unlikely that these will take the place of ‘real’ connections. What is likely—as we are seeing now—is that the intersection of ‘real’ and ‘virtual’ will be outdated.”

Military applications currently in use were mentioned by several respondents. “We are in the last generation of human fighter pilots,” wrote **Dick Davies**, a partner at Project Management and Control Inc. and a past president of the Association of Information Technology Professionals. “Already, drones in Iraq are piloted in San Diego. What will improve is the ability of the artificial spaces to control physical reality, to expand our reach more effectively in many aspects of the physical universe.”

MANY NOTE THAT COMMUNICATION IS JUST BEING REFINED

There are varying definitions of virtual reality, and even augmented reality can be seen as different things to different people. Much of the variety in responses was due to varying definitions of the terminology. Some people consider cave paintings, books, and television to be forms of virtual reality, and they see most Web 2.0 relationships as already representing VR. Some people define VR as more of an out-of-body immersion than one gets when using these “old technologies” or new ones such as Facebook (with profile photos serving as avatars) or Second Life (with its cartoonish renderings of avatars). A number of respondents noted that people in technologically advantaged areas of the world are already exploiting AR and VR, and more will likely participate as the tools are made easier to use.

“Ever since we could communicate beyond the reach of face-to-face, ‘virtual’ worlds and relations have existed,” **Hamish MacEwan**, a consultant at Open ICT in New Zealand, pointed out.

“A map is not the territory and a letter is not the person. We have always had multiple facades, for most, most common, work, home and play. The extension into more immersive ‘unreal’ worlds is going to happen.”

“Using the Internet to find out how to get from here to there was near-miraculous when it first started happening a decade ago,” wrote **Howard Rheingold**, author of “Virtual Reality” and “Virtual Communities.” “Now it's part of daily life for hundreds of millions of people. And just as location-aware, mobile navigation systems are used by relatively affluent enthusiasts today, it won't be many years before cheap toys know where they are. Mashups, simulations, virtual worlds, geotagging, and applications that don't seem possible today will just be part of the environment, like dialtone.”

BREAKTHROUGHS WILL CHANGE HOW WE LIVE

Some respondents were optimistic that technological development and the improvement of user interfaces will allow many to enjoy opportunities offered in AR and VR settings. “The browser that we know will be replaced by a 3-D platform and Internet will become a 3-D environment where people will ‘live’ more than surf,” wrote **Fernando Barrio**, senior lecturer and programme leader for the MA in E-business regulation at London Metropolitan University.

Steve Goldstein, an ICANN board member who is retired from the US National Science Foundation, where his job in the 1990s was to diffuse the Internet internationally, predicted, “My intuition tells me that the evolution will be strongly influenced by fusion with other developments such as genetic engineering, creation of artificial life forms (through a merger of genetic engineering and microelectronics, for example), global warming. (Will it force humankind indoors more and lead to more isolated and/or speculative existences, and how might that affect augmented reality evolution?)”

Fadi Salem, a researcher of e-government at the Dubai School of Government, foresees the need for new laws and standards. “Long before 2020, many businesses will make presence in the

'metaverse' mandatory for employees. Many governments will have a regulation system in place for such presence by then."

Vancouver-based technology reporter **C.R. Roberts** anticipates social adjustments will have to be made in response to the 2020 scenario. "In a reaction to the virtual world," he wrote, "entrepreneurs will establish 'virt-free' zones where reality is not augmented. In various heavily connected areas, there will be sanctuaries (hotels, restaurants, bars, summer camps, vehicles) which people may visit to separate themselves from adhesion or other realities."

Some respondents see major developments to come in the realm encompassed by this scenario, and chose to look out beyond 2020. "I can envisage whole segments of society virtually cocooned in their virtual existence," predicted **Robert Eller** of Concept Omega, a media marketing and communication company. "Fully body-suited, fluids and nourishment being fed or removed, and more or less hardwired into the interface. Whilst this may not be a reality in 2020 I do believe that this will be a possible reality extending to downloading one's conscious self to one's cyborg counterpart. This will in effect mean immortality. The present steps into the 'second' life are only a beginning and whilst this may not be mainstream, there will be a large niche group getting their interactive fix this way."

Havi Hoffman of the Yahoo developer network wrote, "There are niche communities where this could emerge first: aging baby boomers in affluent nursing home/robotic retirement environments interacting with dispersed friends and family via virtual reality environments that are much easier on fragile carbon systems; people [who are] pioneering settlement in hostile environments interacting socially in a virtual world created to help maintain communications while isolated in a space suit, or survival pod of some sort, living in deep ocean or polar regions or in a space station or lunar outpost; infected people could also use virtual environments while in quarantine. I can visualize...dystopias emerging; mirror worlds being used, as in 'Total Recall,' by the powerful to control the behavior of the many. But I can also picture

free zones, enclaves of affluence and innovation like Silicon Valley, and its counterparts around the world—still thriving, precarious as ever, and still subject to cycles of expansion and contraction. I can see metaverse/multiplayer gaming become the prevailing metaphor for workplace problem-solving. It would be nice if nation-states would duke it out in the metaverse instead of in the meatspace. Avatars, after all, are easy to replace.”

RL ISN'T LIKELY TO BE OVERTAKEN BY VR ANYTIME SOON

Many respondents used the word “overrated” to describe synthetic online worlds like Second Life or described massively multiplayer online role-playing games (MMORPGs) as addictions or distractions. “For some reason I’ve never been able to comprehend, certain pundits can seriously propose that the wave of the future is chatting using electronic hand-puppets,” wrote **Seth Finkelstein**, author of the Infothought blog, writer and programmer. “Flight Simulator is not an aircraft, and typing at a screen is not an augmentation of the real world.”

“The ‘second self’ hobby has been widely overrated,” responded **Geert Lovink**, a professor and expert on culture, sociology, and the Internet who is based in Amsterdam. “It is pushed by a specific group of artists, academics and entrepreneurs who believe in cyberculture as some parallel universe. Most people are not interested in avatars. They have trouble enough managing their first life. What the metaverse faction refuses to see is that they operate in a niche. It is only a specific social group that is interested in this online activity. Having said that, technology, of course, is on the side of the metaverse gurus and their followers. There is more bandwidth, more storage and computer power than ever before—and it has to be utilized for something. The overcapacity will not be used by blogs or Web 2.0 applications. 3-D is the perfect industry solution and is pushed accordingly, mainly by bored manager types who do not have a first life.”

Some respondents weren’t so critical of VR worlds, but they just don’t think they will be a dominant force in 2020. Social media researcher **danah boyd**, of Harvard University’s Berkman Center for Internet and Society, commented, “Predictions in this vein tend

to emerge every 5-10 years. Remember VRML? Remember the days of MUDs? ‘Snow Crash’ is great science fiction, but dreadful social prediction (although lovely technology motivation). Many things will prevent us from focusing on immersive environments or 3-D engagement. At the simplest level, people don't want to be immersive—they want to be mobile and to maintain connections with their friends, family, and loved ones when absent. Mobile supports these connections; immersive systems take them over. (And, then, there's my way-early research on how 3-D systems will always be sex-biased because depth-cue prioritization is dependent on the levels of sex hormones in your system...in other words, there's a reason why women get sick going into immersive environments and there's no good way to solve it.)”

Bruce Turner, director of planning services for a U.S. regional transportation commission, pretended to have his avatar file his response to the scenario:

“Bruce Turner's alternate self Nevadawasel here: Bruce and I are in each other's presence no more than 5 minutes a day, usually to respond to other proxy selves. In 2020, this will probably be the case: (1) Some will reject it altogether, first as a progressive, then a regressive movement (2) those who do participate in augmented reality will do so routinely and only a very limited group will spend as much time as the current gaming geeks. The technology that seems so cool to us today will, as it become routine, be very much accepted by the majority but play a decreasing role (time-wise) in their lives. e.g., Nevadawasel may shop for Bruce and be his public net avatar / persona, but not become an obsession. A reality world will simply be to current WOW world like Windows is to DOS: A convenience that improves accessibility to existing functions. Anyone for a stroll through the Amazon warehouse with Nevadawasel?”

Michael Botein, founding director of the Media Center at New York University Law School, wrote, “Second Life and related phenomena seem little more than unilateral egoistic forms of stress reduction—electronic substance abuse in a way. Unlike traditional forms of ‘acting out’ with other people, these ultimately lead

towards isolation. Although some are brokers of information among people, they do not seem to promote long-term affiliations. I doubt very much that we'll see a political or cultural revolution arising out of 'MyPage.'”

Some respondents noted that VR worlds will not be in popular use by 2020, although they will be of use to some people. “This 2020 scenario is appealing to the geeks and the gamers among us,” wrote **Susan Mernit**, an independent consultant who was formerly an executive with Yahoo and America Online, “but I don't see the seamless transitions that this posits happening this quickly—it's elitist and too far out of the mainstream for many Americans, especially those with less free time. Having said that, I do think there are sectors of society that will use the metaverse to play and to train in disproportionate numbers—and that we will see a rise in virtual worlds as entertainment spaces outside of gaming (think sex, travel, historic simulations).”

Scott Smith, consultant, writer, futurist, and principal at Changeist LLC, based in North Carolina, predicted, “As we've seen with use of the Web and blogging, participation in general metaverses may decline in duration and variety after a short-term peak in usage as users seek to rebalance toward the ‘real’ and authentic and see fewer benefits in being active in metaverses. This is not to say that function- or interest-specific metaverses may not continue to flourish, based around certain applications or activities, but a mass market spending significant time in virtual worlds on a daily basis is less likely.”

Anthony Townsend, research director for the Technology Horizons Program of The Institute for the Future, wrote, “Separate, ‘virtual’ worlds will be much less important than augmented realities. The real world is a fascinating place—overlying information and cues from digital spaces will make it even more compelling—for socializing, traveling, playing games, and working. It will still be real life [but it will be enhanced] in the sense that people who wear eyeglasses still see real life, just a refocused version of it.”

Karen Schneider, a researcher and thought-leader in the library and technology community based at the College Center for Library Automation in Tallahassee, Fla., wrote, “This might be the new TV. I’m waiting for the breakthrough reality show where I can be on some island from my living room. Well, no, I’m not really, but I’m sure it’s imminent.”

THERE WILL BE ECONOMIC, GENERATIONAL DIVIDES; SOME WILL ‘OPT OUT,’ BECOME ADDICTED, OR BE UNPRODUCTIVE

As is the case with most looks at the future of a technology, some people are predicting that these developments will cause a divide between the “haves” and the “have-nots,” and others are saying there will be people who have access to this technology who choose to opt out. “Real life remains real life,” wrote **David Maher**, senior vice president for law and policy for the Public Interest Registry, the Internet top-level domain registry. “Other ‘realities’ will more likely interfere with rather than augment real life.”

Brian Dunbar, an Internet manager for NASA, wrote about the digital divide: “The physical infrastructure required to make these features available to large numbers of people will restrict their widespread use to affluent sectors of developed nations.”

Or, perhaps, some suggest, while alternate realities can help people escape negative conditions, addiction to virtuality might be a future root cause of unemployment and/or withdrawal from productive society. **Leonard Witt**, author of the PJNet.org Weblog and an associate professor in communication at Kennesaw State University in Georgia, predicted, “These virtual environments will be used to help lift people out of mental poverty, even when their real world is immersed in physical poverty. The big next question: Will virtual worlds become the opiate of the masses?”

Many respondents see a generational divide, with younger people readily moving into the world of the scenario, while older people generally do not participate. “Today’s preadolescents are likely the oldest to experience such a fully immersed virtual reality,” responded **Jade Miller**, a researcher of global flows of information and culture and Ph.D. student at the University of Southern

California. “Older Internet users may have virtual selves but will likely use them only sparingly, or to spy on their children.”

A number of respondents predicted that people will decide to “opt out” of the virtual and augmented opportunities available. “I believe, bottom line, that people have only one life to live, no matter how many avatars you create, and that people will weary of the virtual and yearn for the real world,” wrote **Jan Schaffer**, executive director of the Institute for Interactive Journalism and a Pulitzer Prize winner.

Charles Ess, a professor of philosophy and religion and researcher on online culture and ethics at Drury University, responded, “While it is certainly true that these expressions of CMC will become more important, it is equally true, as the current turn *away* from Second Life suggests, that people are also getting tired of ‘the virtual.’ I might have an augmented self in some virtual world by 2011—but my suspicion is that that ‘self’ will be a largely dressed-up version of a very mundane self that needs to check on bank balances, make appointments for a haircut or automobile inspection, etc. The genuinely pedestrian tasks of daily life will not clearly be enhanced or made better by building avatars around them. I also have a strong suspicion that as these technologies increasingly dominate our lives, there will also be a strong—perhaps overly romantic—reaction against them. People will be willing to pay real money to talk with a real person, rather than a voicemail system. And until we get more-or-less infinite bandwidth systems that include every dimension of ‘being there’ in fine detail—including smells, touch, etc., I suspect more and more people will find that they enjoy getting out of ‘The Matrix’ that already seems to increasingly dominate our lives in the developed world. (We are in love with the technologies of our enslavement, Neil Postman said in 1984. But perhaps even machine-reinforced love can only go so far?)”

Jim Lucas, Web manager for CACI, an intelligence and security solutions company, commented, “A rebound effect will occur that drives people to treasure actual human contact more.” **William Winton**, product manager for digital media for 1105 Government Information Group, noted, “The ‘slow-life’ movement has grown in

direct response to the disassociated, amorphous, and out-of-touch societies that are emerging in the developed world. Encouraging family, friends and neighborhood, the movement seeks to restore the tangible social bonds that the Internet cannot replicate. People will discover that the 'real-world' for all its faults, is much more interesting than any 'virtual world' could ever be." An anonymous participant wrote, "As virtual worlds become overrun with 'real-world' problems people will abandon their use."

SOME SAY THE SCENARIO IS LIKELY TO HAPPEN, AND WE MUST BE WARY OF OTHER DANGEROUS IMPLICATIONS

Respondents who mostly agreed sometimes concentrated their elaborations on the fears they have for such a future. "Although this appears to be almost sci-fi-like, it will only take some major cataclysmic event to reverse this trend, e.g. young people's identities being manipulated by others to persuade them to do immoral things or even commit suicide en masse," responded **Robin Gunston**, consulting futurist for Mariri Consulting, a strategic and business-planning company.

Ed Lyell, a pioneer in issues related to the Internet and education, expressed concerns about violent VR triggering negative behaviors in the real world. "Some young people are unable to separate violent acts in an artificial world from violent acts in the real world," he wrote. "We need to ensure that more people in the world are educated in the ability to discern multiple layers or types of reality. One of my mentors was S.I. Hayakawa a leader in General Semantics. Being able to separate object and referent, to see multiple roles, layers, viewpoints without seeing any of them as absolute will become a more necessary skill."

Joe McCarthy, principal instigator at MyStrands, and formerly a principal scientist at Nokia Research Center in Palo Alto, commented, "It's not clear to me whether/how immersive online worlds will augment or enhance the offline world, and I fear that the time and attention consumed in such worlds will come at the expense of actions that might make the offline world a better place."

Clement Chau, manager for the Developmental Technologies Research Group at Tufts University, predicted that adoption of virtual identities will be simple but it will raise problems. “Adopting a virtual identity will be as seamless as the adoption of a professional identity in the 20th and early 21st centuries,” he wrote. “However, we will have problems and concerns keeping our multiple virtual and real-life identities consistent. We will begin to see both positive and negative implications of such potential inconsistencies seeping into different aspects of our lives.”

Timothy McManus, a vice president with Nuance Communications, a software-technology company known for speech-recognition work, noted there are privacy implications tied to the development of most aspects presented in this scenario. “This scenario...reinforces the case for more controls on privacy and more limits on access to personal information, because people will have one or more personalities or lifestyles in a virtual world that is fundamentally different from the physical world,” he commented.

The dystopian film “The Matrix” was mentioned by a number of survey respondents. “This scenario paints a ‘Matrix’ model which is eerily true already for some people,” wrote **Michael Castengera**, a senior lecturer at the University of Georgia and president of Media Strategies and Tactics Inc. “Research shows that many people care as passionately about their virtual life and friends as their real-world life and friends. People are actually getting married in Second Life. Two questions come to mind. One is—is this retreat into a virtual world, actually an escape for a limited number of people who don't have the social skills to make it in the real world? Second is—will the global-warming, environmentally degraded real world lose its attraction (less fresh air, no singing birds, no sweet smelling flowers), thus making a virtual world more attractive or at least more acceptable?”

SCENARIO 6

THE EVOLUTION OF THE INTERNET USER INTERFACE

PREDICTION: *In 2020, the most commonly used communications appliances prominently feature built-in voice-recognition. People have adjusted to hearing individuals dictating information in public to their computing devices. In addition “haptic” technologies based on touch feedback have been fully developed, so, for instance, a small handheld Internet appliance allows you to display and use a full-size virtual keyboard on any flat surface for those moments when you would prefer not to talk aloud to your networked computer. It is common to see people “air-typing” as they interface with the projection of a networked keyboard visible only to them.*

Expert Respondents' Reactions (N=578)

Mostly Agree 64%
Mostly Disagree 21%
Did Not Respond 15%

All Respondents' Reactions (N=1,196)

Mostly Agree 67%
Mostly Disagree 19%
Did Not Respond 14%

Note: Since results are based on a nonrandom sample, a margin of error cannot be computed. The “prediction” was composed to elicit responses and is not a formal forecast.

OVERVIEW OF RESPONDENTS' REACTIONS:

A clear majority of respondents favored the idea that by 2020 user interfaces will offer advanced talk, touch, and typing options, and some respondents added a fourth “T” —think. Those who chose to elaborate in extended responses disagreed on which of the four will make the most progress by 2020, with a fairly even yes-no split on the success of voice-recognition or significant wireless keyboard advances and mostly positive support of the advance of interfaces involving touch and gestures. A number of respondents projected the possibility of a thought-based interface—neural networks, mind-controlled human-computer interaction. Many expressed concerns over overt public displays of ICT use and emphasized the desire for people to keep private communications private.

Nearly two-thirds of survey participants mostly agreed with this scenario about advances in network interfaces, with just one-fifth mostly disagreeing. “It is these technologies that will enable the mobile device to become powerful enough for use in serious applications,” responded **Brad Templeton**, chairman of the Electronic Frontier Foundation and an Internet pioneer who has been active online since 1979. **Cliff Figallo**, social innovator and original member of the first online community, The WELL, agreed. “More time on the move, less time sitting at orthodox computer interfaces,” he wrote. “The need to communicate and think through handhelds will stimulate growth in use of such features.”

“In addition to this,” predicted **David Brin**, futurist and author of “The Transparent Society,” “there will be ‘subvocal’ inputs that detect ‘almost speech’ that you will, but do not actually voice. Small sensors on teeth will also let you tap commands. Your eyeballs will track desires, sensed by your eyeglasses. And so on.”

Respondents noted that intuitive, human-centric interfaces allow technology to eliminate some social, economic, and physical divides. “Ease of access + usability will entice more people to interact with technology—in other words, it will not only be limited to computer-literate people,” commented **Sam Ozay**, an e-learning and e-communication specialist and solutions architect at

Postmodern-Asia/Pacific. **Jan Schaffer**, executive director of J-Lab, the Institute for Interactive Journalism, wrote, “I see great benefits for education in the form of alternative learning, and assessments of learning for dyslexics and LD children.”

Security is always an issue, as noted by **Alejandro Pisanty**, director of computer services at the Universidad Nacional Autónoma de México, an active leader in the Internet Society and ICANN. “They will all be hacked big-time!” he predicted. “Think of using a cell phone for video-recording a person who types on her lap while riding a subway.”

Many are concerned about social ramifications of new interfaces. “By 2020 I would hope that there is some other way to get information without a public display of any kind through ubiquitous technology,” suggested **Teresa Hartman**, associate professor and head of education at the University of Nebraska Medical Center. “Interactions with personal communication interfaces should be less intrusive to others than taking out a notepad today and writing a note. Communication users have allowed the public display of their interactions to continue and even increase due to what they perceive as a ‘wow’ factor—‘look at me, I have a cell phone and know how to use it.’ I see the prediction of us air-typing to be in the same category. In the future, using technology (hopefully) won't be a status item, and can be conducted discreetly and with panache. Somehow, interactions with communication/information have to be put back in the individual's world, instead of bleeding over into everyone's world, and not causing any more interruption or notice than a quick cough into a handkerchief.”

All respondents expect evolution of some kind. “Yes, yes, and yes,” noted **Leonard Witt**, associate professor at Kennesaw State University in Georgia and author of the Weblog PJNet.org. “It's all disruptive technology, which means as Clayton Christensen says, cheaper, smaller, faster, and easier to use. It can't be stopped.”

“Solitude will soon become a thing of the past, as no one is ever disconnected,” commented **Lisa Carr**, director of strategy for Targetbase Interactive.

**YES, TALK WILL BE EFFECTIVELY DEVELOPED, OR, NO,
TALK CAN'T BE EFFECTIVELY DEVELOPED, AT LEAST BY THEN**

Respondents debated the idea of voice as a user-interface, with some in support of its development to perfection, some saying the technical issues to develop it correctly have been and will continue to be too difficult to overcome by 2020, and some expressing concern over social acceptability.

“By 2020 the voice 'interface' will be more sophisticated,” predicted **Maz Hardey**, a social analyst and blogger completing a doctorate funded by the Economic Social Research Council at the University of York. “When not touch typing, voice commands will allow the user to talk to those in the immediate and physical vicinity, as well as to update and 'chat' across SNS.”

“We are already used to the way dictating to devices would sound, since Bluetooth headsets and cells create a similar hearing experience,” commented **Paul Greenberg**, president of the 56 Group LLC. “This is not a difficult one to see, given the rates of technological advance, especially in computers and electronic gear that we are seeing today.”

“WiFi- and WiMax-enabled badges with voice recognition will act as personal assistants—allowing you to talk with someone by saying their name, to post a voice blog, or access directions from the Internet for the task at hand,” predicted **Jim Kohlenberger**, director of Voice on the Net Coalition, a senior fellow at the Benton Foundation.

Those who disputed the likely use of talk as a UI by 2020 generally noted how difficult it has been up to this point to overcome the technical barriers in designing a usable talk interface. “Speech-recognition and even natural-language understanding are evolving, but it's been a very gradual process over several decades and it is likely to take several additional decades before we approach Hal-like performance,” commented NMS Communications CTO **Brough Turner**, referring to the AI computer Hal in the film “2001: A Space Odyssey.”

“Voice will continue to be the most over-sold, over-hyped, but unused interface,” noted **Walt Dickie**, executive vice president and CTO for C&R Research. “Voice recognition has been a holy grail of computing since ‘Star Trek’ in the 1960s,” wrote **Charles Ess**, a researcher on online culture and ethics based at Drury University in Springfield, Missouri, a leader of the Association of Internet Researchers. “Like the artificial intelligence that was supposed to make it happen...it has faltered for a host of reasons, beginning with technical ones. Perhaps there will be some sort of technological breakthrough in the next few years that will make voice-recognition workable and affordable—but I'm not optimistic.”

“Although voice control will progress to where it can be mainstream, it will not surpass other input mechanisms—mostly touch screen and accelerometers,” commented **Todd Spraggins**, chairman of the board of directors of the Communications Platforms Trade Association and a strategic architect with Nortel Carrier Networks.

Clay Shirky, consultant and professor in the Interactive Telecommunications Program at New York University, author of “Here Comes Everyone,” wrote, “Ben Shneiderman's work on the limits of voice recognition and the weakness of the human brain's ability to co-process other information alongside the spoken word are, in my view, dispositive critiques.”

“I worked on voice-activated technologies and AI in the 1980s, and I am familiar with the overblown predictions that were made then,” responded **Micheál Ó Foghlú**, research director for the Telecommunications Software & Systems Group, Waterford Institute of Technology, Ireland, arguing in support of the positive future of the talk interface. “Steady progress has been made, and the need to use innovative interfaces on small mobile devices is a good spur for these developments in the next 12 years.”

Some noted that those with special needs are most likely to use speech-recognition UIs first. “With increased attention being given to the need of ‘specially-abled’ people, ‘talk and touch’ will become more popular (and profitable) as devices that employ such will help

empower more people who never had the chance,” noted **Gbenga Sesan**, a consultant for Internet development with Paradigm Initiative in Nigeria, adding that 2020 may be too soon for it to be practicable.

Concerns over the appropriate use of talk interfaces were expressed by some respondents. “I mostly agree with the scenario, although a rise in voice-driven interactions might lead to social reactions against the use of these devices in public spaces,” commented **Paul Miller**, technology evangelist on the senior management team at Talis, a company delivering human-centric Web applications, based in the UK. “See, for example the differing attitudes to speaking on phones in restaurants, etc., today. In some places this is acceptable, in others most definitely not.”

“The sound rules out using [voice] in many environments,” commented **Christine Boese**, researcher and analyst for AvenueA-Razorfish and Microsoft, “(and I even avoid listening to podcasts on the subway because my hearing is so bad already, and the train noise is too loud). Privacy concerns arise with too much spoken technology, or should, when we see people walking up and down aisles at the grocery store, talking out loud on their mobile phones with the ear bud hanging out of their ears.”

“People in airports and grocery stores who talk to themselves using those stupid looking knobs in their ears are already annoying. Imagine an office where people in cubicles are all talking to themselves—composing proposals, sending e-mails, making notes on their next presentation to the boss. Yipes!” noted **Mike Samson**, an interactive media writer and producer.

“I expect to see some use of these things, but my use of them so far (Amtrak's ‘Julie’ for example) suggests that they only work when conflicting sound can be stopped and when talking to a computer is not disruptive to others,” wrote **Fred Baker**, fellow at Cisco Systems and a longtime leader of the Internet Society and IETF. “That imposes quite a limit.”

TOUCH IS NATURAL AND INTUITIVE AND IT WILL SUCCEED

While talk drew heated debate from the respondents who wrote elaborations to their answers on this scenario, positive support for the future of the touch interface was nearly unanimous. “Touch is there already, with the Microsoft Surface computer, the iPhone, the Wii,” noted **Christian Huitema**, distinguished engineer with Microsoft and an Internet pioneer and active leader of the IAB and Internet Society.

Jerry Michalski, founder and president of Sociate, a technology consulting firm, responded, “Touch is the first major step away from the windows/mouse interface, which is very long in the tooth. We’re due for some more advances in the next 13 years.”

Jonathan Dube, president of the Online News Association, director of digital media at CBC News and publisher of Cyberjournalist.net, wrote, “Touch feedback will be the primary mode, with voice recognition an increasingly common tool (but not on airplanes!)” An anonymous respondent predicted, “touching machines in ways that we have not imagined will become possible.”

MANY SAY TYPING HAS ADVANTAGES AND IT WILL ADVANCE

Many respondents see the survival of keyboards as input devices as highly likely. “Most people form a tactile bond with their keyboards and a comfort with their workplace/desktop environments that will be difficult to replace with haptic appliances and voice recognition,” noted **Michael Edson**, director for Web and new-media strategy for the Smithsonian Institution.

Jeff Jarvis, blogger at Buzzmachine.com and a professor at City University of New York, predicted, “We will have control environments that don’t require us to read buttons. We will also have some means of typing specific wording quickly and accurately without two-handed (or two-thumbed) keyboards. I await their invention.”

“Air keyboards or projected keyboards will be a great advancement, as they will allow small devices to become fully-functional computers that finally will allow people to work the way they want

and with a maximum of convenience,” wrote **John Jordan**, associate professor of communications at the University of Wisconsin-Milwaukee.

Survey participants had mixed reactions to the idea of air-typing. Many thought it unlikely. “This one sounds too much like The Kitchen of the Future at some 1930s World Fair; I think we’ll have better, more adaptable devices, but I doubt we’ll be air-typing,” commented **Susan Crawford**, founder of OneWebDay (celebrated each September 22) and an ICANN board member and law professor at Yale. “Roll-out, flexible keyboards might be the more likely development,” wrote **Seth Finkelstein**, author of the Infthought blog and an EFF Pioneer Award winner. An anonymous respondent commented, “Laser-based keyboards are available today but are often inaccurate and inconvenient. It’s hard to imagine this situation will change much by 2020.” Another anonymous respondent wrote, “Keyboards will remain. So will street signs and the alphabet.”

Many who disagreed with the idea of air-typing noted the lack of physical feedback one gets when typing in an empty space. “Tactile interaction requires feedback,” noted **Richard Osborne**, a Web manager at the University of Exeter. “That’s why our hands are designed the way they are.”

But Internet sociologist and author **Howard Rheingold** responded, “The point-and-click user interface is 40 years ago. It’s time for more human-machine bandwidth. You are a typist, try ‘air-typing’ and see if it doesn’t feel natural very quickly.” And **Havi Hoffman**, of the Yahoo developer network noted, “I can imagine air typing of a kind, and a flat and more fluid electronic paper than we’ve seen yet.”

Some respondents disputed the idea that keyboarding will still be a dominant UI. “I still envisage a replacement for the keyboard, virtual or otherwise,” commented **Adrian Schofield**, manager of the applied research unit at the Johannesburg Centre for Software Engineering. “My vision is of a virtual pen that can interpret any type of script.”

“Typing will be a thing of the past; it seems reasonable that some forms of subvocalization, not to say ‘mind reading’ will eliminate the need for a manual interface—kind of like reading ‘almost aloud,” suggested **Oscar Gandy**, author, activist, and emeritus professor of communication at the University of Pennsylvania.

**LOOK, MA, NO HANDS OR VOICE;
COMMUNICATING BY THOUGHT ALONE**

Many respondents predicted that brain science will advance to the point at which there will be at least some human-machine interaction conducted through the reading of brain activity. Most who offered this view did not note that they expected this to be true as soon as 2020.

“Future technologies (although perhaps not by 2020) will involve physically connecting our bodies ‘wirelessly’ to computer/digital networks through true ‘neural nets,”” responded **Benjamin Ben-Baruch**, senior market intelligence consultant and applied sociologist for Aquent. “It will literally become possible to interface with these networks via neural nets that connect our nervous systems to the networks. The common technology interfaces will be ‘talk-touch-think.’”

“I totally expect even mind-controlled interaction by thought using a simple range of commands which in combination allow ‘joystick’-style interaction,” commented **Robert Eller** of Concept Omega, a marketing and communication company. “This is already today virtually possible. Some research even shows that we can grow additional synapses into minute glass vials that will connect to wires allowing fighter pilots to steer a jet. Nano and bio technologies should yield some significant advances here making such interaction, if not mind-controlled, at least be part of the body.”

“I suspect we will eventually move beyond voice and touch interfaces for computing in the future,” predicted **Gary Kreps**, chair of the department of communication at George Mason University. “Instead we will direct computing directly through our cognitions, through thought.”

Bruce Turner, director of planning services for a US regional transportation commission, agreed, writing, “As brain-mapping technology improves, we may forego the virtual of the real world to direct our consciousness to type inside our brains for transmittal to the surface.”

RESPONDENTS SUGGEST ADDITIONAL INTERFACE INNOVATIONS

Some respondents expressed various additional expectations for UI in 2020. Many noted that gestures and body language (as exemplified in Nintendo’s Wii game system) may be more common than talk, typing, or touch. “Air-typing (difficult without tactile feedback) will be less commonplace than seeing people make gestures into thin air,” noted **Ivor Tossell**, technology columnist and journalist for the Toronto Globe and Mail.

Ed Steinmueller, a professor whose research expertise is the industrial structure of high-technology industries, commented, “Although I doubt that the keyboard metaphor is entirely apt, the extension of the interface to gesture seems very likely.” **Scott Brenner**, technologist and consultant, predicted, “The haptic technologies will prevail, although we’ll be getting away from the keyboard method of input. Instead, data-getting and giving will be more intuitive, using icons, structured gestures, and a more semantic information universe.”

“Other types of inputs, such as simple gestural inputs, may prove more popular than full-keyboard inputs,” suggested **Scott Smith**, a futurist with Changeist LLC, consultant, and writer based in North Carolina. “Additionally, interfaces will be more predictive, taking into account contextual information about a user to determine data we might have to manually enter today.” **Tiffany Shlain**, founder of the Webby Awards, commented, “I could see a whole physical way of communicating with our technology tools that could be part of our health and exercise. A day answering e-mails could be a full-on physical workout ;).”

Smaller movements made by the eyes and face were also noted as possible interface methods by respondents. **Jay Neely**, social

strategist and founder of News Armada, a Boston-based Internet-news community, wrote, “Advancements in eye-tracking technology, combined with the miniaturization of components needed to create devices in the same size and form as eyeglasses, make sight a more likely interface for services that only require information consumption and very limited data entry.”

A number of respondents noted that devices will interface with ubiquitous computing built into human architecture. “It will be common to see people interacting with signs,” responded **Fred Hapgood**, technology author and consultant.

“We will see the display interface device separated from the input device over the next 12 years,” wrote **Ross Rader**, a director with Tucows who is active in the ICANN Registrars constituency. “Display devices will be everywhere, and you will be able to use them with your input device. The input device might be virtual, as in the case of the iPhone or a holographic keyboard, or they might resemble the keyboards and touchpads that people are using today. Likely, some combination of these will prevail. These devices will be able to securely interact with any display device that the user selects, using common standards that permit the user to interact with data in a variety of resolutions and formats.”

Chris Miller, senior vice president for digital operations for Element 79 predicted, “Common objects, desks, countertops, etc., will become haptic-sensitive and provide feedback and content and send/receive information based on touch. This will correspond to the *everyWeb* which allows appliances, objects, etc., to be networked. ‘The Minority Report’s’ haptic gestures and feedback will be a reality.”

Some respondents suggested a cluster of alternative user-interfaces. **Sean Steele**, CEO and senior security consultant for infoLock Technologies, predicted that by 2020: “While air-typing and haptic gestures are widespread and ubiquitous, the arrival of embedded optical displays, thought-transcription, eye-movement tracking, and predictive-behavior modeling will fundamentally alter the human-

computer interaction model. What we think is performed almost in real time, when and how we imagined it to be.”

THE SCENARIO IS WRONG; IT IS NOT GOING TO HAPPEN THIS WAY

Those who disputed the scenario expressed a variety of viewpoints in their elaborations. Layered reasoning came into play in a number of the responses. “Neither of these are particularly efficient interfaces, at least as described,” wrote **Jamais Cascio**, blogger, public speaker, and futurist. “The social response to mobile-phone conversations in public—resigned/resentful acquiescence—is a likely model for voice interfaces, slowing or even halting their widespread adoption. As for haptics, these seem more likely, but not as described; ‘air typing’ and similar non-responsive interfaces have a poor record of usability. More likely is some kind of touch-based interface, possibly even a finger-on-opposite-palm model.”

“Products continue to be driven by short product lives and lowest-possible-cost, and dim displays and flat membrane switches,” answered **Tom Jennings**, the creator of FidoNet, the first message-and-file networking system online and builder of Wired magazine’s first online presence. “Extreme power management will continue to work apparent miracles in ubiquity, and will have unpredictable side effects. People forget that ‘lack of interface’ also allows for perceptual partitioning and maintaining of separate cognitive spaces. Eg. I can let the phone sit on the table and not answer it and it doesn’t impinge on my conversation. Talk to people over 16 years of age. Oh, I forgot, you’re too busy taking their money.”

“Future communications devices are unlikely to remain tethered to QWERTY or any other similar relic,” commented **Buddy Scalera**, vice president for interactive content and market research for CommonHealth Qi. “The tools are likely to be icon-based, batched and routine-oriented. That is, it takes too long to type certain concepts, so taking a cue from programming language, we’ll have communication subroutines that we’ll drag and drop in highly streamlined conversations. Physical objects tagged with information will be part of an overall, organic language that’s able to be virtualized over long distances.”

SCENARIO 7

THE EVOLUTION OF THE
ARCHITECTURE OF THE INTERNET

PREDICTION: *Next-generation research will be used to improve the current Internet; it won't replace it. In 2020, the original Internet architecture is in the continuing process of refinement – it hasn't been replaced by a completely new system. Research into network innovation, with help from the continued acceleration of technologies used to build, maintain, enhance, and enlarge the system, has yielded many improvements. Search, security, and reliability on the Internet are easier and more refined, but those who want to commit crimes and mischief are still able to cause trouble.*

Expert Respondents' Reactions (N=578)

Mostly Agree 78%
Mostly Disagree 6%
Did Not Respond 16%

All Respondents' Reactions (N=1,196)

Mostly Agree 80%
Mostly Disagree 6%
Did Not Respond 14%

Note: Since results are based on a nonrandom sample, a margin of error cannot be computed. The "prediction" was composed to elicit responses and is not a formal forecast.

Respondents were presented with a brief set of information outlining the status quo of the issue 2007 that prefaced this scenario. It read:

Due to concerns over Internet security, reliability, and complexity, the National Science Foundation in the US is funding research into the building of a "next-generation" or "clean-slate" Internet. The NSF initiatives include the Global Environment for Networking Innovation (GENI – building a test network on which researchers will be able to try out their ideas) and Future Internet Network Design (FIND). The European Union is funding research through its Future Internet Research and Experimentation (FIRE) program. Creating an all-new Internet might solve problems like viruses, spam, phishing, and worms. But it would cost billions of dollars and there is a debate among experts about how long it might take. If a next-generation Internet is built, some people are concerned it will be characterized by intrinsic features that will allow governments and corporations to exercise more control over what happens online. So, the constant question remains: How do we raise barriers against spam, cybercrime, and terrorism and provide secure systems for digital transactions without infringing on civil liberties?

OVERVIEW OF RESPONDENTS' REACTIONS:

Respondents clearly feel the current structure and basic architecture of the Internet will continue to underlie the technology. They believe there will be significant enhancements and updates, however, a “new” system will not “replace” the current architecture; transformations will occur gradually. They point to two major changes that are already running in parallel with legacy systems: institution of IPv6, the new protocol; and implementation of elements of the Semantic Web, which will make it easier to find and link related information. Some argue, though, that by 2020 there will be specific “walled gardens” (or restricted areas of interaction and information) that will be secure but also give control over the network to the garden creators. Others suspect there may be split networks or partitions in the Internet, especially as governments and corporations leverage security fears to retain power over who can do what on the network. While protections are consistently added to the network, many experts think crime, piracy, terror, and other negatives will always be elements in an open system.

There was resounding support among these respondents for the idea that the current Internet architecture will be continually refined and

not completely replaced by a next-generation Internet, with four of every five responses mostly in agreement with the scenario. Just 5% mostly disagreed. “Legacy computing platforms tend to last a long time, as will the Internet,” wrote **David Moschella**, global research director for the Computing Sciences Corporation’s Leading Edge Forum and a Computerworld columnist.

“The control-oriented telco (International Telecommunication Union) next-generation network will not fully evolve, the importance of openness and enabling innovation from the edges will prevail; i.e. Internet will essentially retain the key characteristics we enjoy today, mainly because there's more money to be made,” responded **Adam Peake**, executive research fellow and telecommunications policy analyst at the Center for Global Communications (GLOCOM).

Scott Brenner, consultant, technologist, and Web developer for Fortune 100 companies, commented, “The current Internet won't be replaced by a new system by 2020 any more than the highway system originally built in the 1950s has been replaced by a new system. Sure, the asphalt and concrete has long since been replaced, but no one's suggested to let the forest reclaim the land while another system of roads is built (at least not on a large scale). The Internet of 2020 will be very different from today. But it will just be a many-orders-of-magnitude improvement over what we've got now.”

Alejandro Pisanty, director of computer services at the Universidad Nacional Autónoma de México, an active leader in ICANN, the Internet Society, and the Internet Governance Forum, noted, “Most of the clean-slate proposals that are being thought of in public would seem to underestimate the value of the yet-existing system, and the fact that the Internet's strong decentralization makes it incumbent on the users at the edge to apply changes they often don't master technically and for which it is difficult for them to pay. The abuse by intermediaries (from large telcos to small, local providers including small ISPs and Internet cafes) disincentivates change even further.”

Some survey participants responded that there are multiple conduits in the network now and that approach will become more formalized. “In fact,” wrote **Anthony Townsend**, research director for the Technology Horizons program of The Institute for the Future, “some parts of the Internet may fragment, as nations pursue their own technology trajectories.”

Townsend also agreed that change will continue to be an incremental evolution, writing, “The Internet is so vastly complex, incremental upgrades seem to be the only way to get anything done. Look at how little IPv6 there is. Places like China may make big leaps and bounds because there is less legacy.”

Joe McCarthy, principal instigator at MyStrands and formerly principal scientist at Nokia Research Center in Palo Alto, left the door open when he commented, “Too much is already at stake on the existing Internet to build a new one. However, the recent FCC rulings that will force everyone to switch from analog to digital television shows that the [US] federal government is not averse to forcing large-scale changes on its population in the conduits through which they must seek electronic information and entertainment.”

Hal Varian, chief economist for Google, wrote, “The research on next-generation Internet will pay off by allowing some retrofit of the current network.”

Just one respondent who provided an elaboration jumped in with a clear statement of expectation that significant system upgrading is needed. **Ian Peter** of Ian Peter and Associates and the Internet Mark 2 Project, a pioneer who helped develop the Internet in Australia and the Asia-Pacific region in the 1980s, responded, “It is unlikely that TCP/IP (be it v4 or v6) will survive much beyond 2020. Current Internet standards bodies and core Internet protocols are ossifying to such an extent that security and performance requirements for next-generation applications will require a totally new base platform. If current Internet base protocols survive, it will be as a substrata paved over by new-generation smarter ways of connecting.”

Many the many fears expressed over the politics that could be built into its architecture and the Internet's deepening complexities respondents also indicated there is reason for optimism. "The Web must still be a messy, fabulous, exciting, dangerous, poetic, depressing, elating place...akin to life; which is not a bad thing," noted **Luis Santos**, Universidade do Minho-Braga, Portugal.

**INCREMENTAL CHANGE WILL CONTINUE;
THERE WILL NOT BE A CLEAN-SLATE INTERNET**

A number of survey participants noted that change is rarely delivered in a wholesale way in complex systems. "Successful solutions are almost always built on existing infrastructure, rather than starting from a clean sheet—simple economics," noted **Jason Stoddard**, managing partner for strategy at Centric/Agency of Change, an interactive strategies company. **Walt Dickie**, executive vice president and CTO for C&R Research was aggressive in his support for the scenario. "I don't 'mostly' agree, I agree completely," he wrote. "The utopian vision of a next-generation Internet birthed by wise and benevolent leaders will be preceded by flocks of flying pigs, peace in our time, and the Easter Bunny."

Jeff Jarvis, blogger at Buzzmachine and a professor at City University of New York, commented, "Any media company that has tried to build the ultimate content-management system has learned this lesson: It's never done, far from perfect, too expensive, and always behind. We will build on what we have."

"The Internet is too distributed to undergo a clean-slate facelift," wrote **Susan Thomas** of S2 Enterprises LLC. "Incremental innovation will reign, based on short-term pressure to monetize," noted **Peter Kim**, a senior analyst specializing in e-strategy and management for Forrester Research.

Steve Goldstein, an ICANN board member whose job with the US National Science Foundation in the 1990s was to help diffuse the Internet globally, commented, "Depending on where in time one reckons the start of the Internet (~1970 or ~1980), it took about 25 or 15 years for a truly commercial Internet to develop (~1994), an another 10 years at least for it to become as feature-rich as we now

experience it to be (recall Mosaic, first browser in 1993; fully functional browsers on phones in early 2000s). So, even if NSF's and the EU's experimental network technologies were to be successful in developing a revolutionary next-gen Internet, I would not expect it to displace the legacy Internet until after 2020. And, I am not a real fan of either the NSF's or the EU's ability to re-create another disruptive technology to displace the Internet as we know it. There is likely to be too little funding and too much cronyism for that to happen. On the other hand, I would expect to see some developments feed into incremental improvements in today's Internet.”

James Jay Horning, chief scientist for information systems security at SPARTA Inc. and a former fellow at Xerox’s Palo Alto Research Center, wrote, “Telephone managed to eventually supersede the legacy infrastructure of telegraph wires, but I don't see any correspondingly disruptive technological advantage that will cause the clean-slate Internets to replace, rather than supplement, the current one. I see a rolling transition, rather than a clean break.”

Christine Boese, a researcher and analyst for Avenue A-Razorfish and Microsoft, responded, “The groups funding and building these so-called ‘new’ platforms are delusional. Not that there never will be new platforms, but they won't come from any of those groups. If such a new platform should magically appear, it will arise from inside the current Internet, and it will be fully backward-compatible and inclusive. There will never be a ‘clean-slate Internet,’ unless our culture does an Atlantis and dumps our beautiful Alexandria on the Ethers into the sea.”

Hamish MacEwen, a consultant for Open ICT in New Zealand, wrote, “Looking at fundamentals such as the calendar, after lunar/solar, there was Julian, after Julian there was Gregorian. Will there be a replacement. No. Some basics reach a state of ‘good enough’ and we move on to other things. So it is with the Internet. So it was with Ethernet. So it was with SMTP. Could it be better, yes. Is it good enough, yes. IPv6, yes, but there'll be a lot of IPv4 for a long time to come, probably still in 2020. ‘Those who want to

commit crimes and mischief are still able to cause trouble.' Now there's an eternal verity."

THE MOVE TO IPv6 AND THE SEMANTIC WEB WILL CREATE NEW ONLINE OPPORTUNITIES

Some survey participants noted that the Internet is a system of networks (including the research networks Internet2 and Lambda Rail) that is already undergoing the most major overhaul since its beginnings, as improvements in the technologies of the architecture are introduced and it transitions to Internet Protocol version 6 from IPv4 and as it also begins to weave in the added features of the Semantic Web, a longtime project of Web-innovator Tim Berners-Lee and the World Wide Web Consortium.

"Internet2 is providing today the promise for advanced networks of tomorrow; unexpected jumps in optical networks will permit new types of access to rich media data and HD-based imaging," wrote **Don Kasprzak**, chief executive officer of Panaround.com and a former system engineer at Apple Computer. **Paul Jones**, director of ibiblio.org at the University of North Carolina-Chapel Hill, noted, "The work already under way on National LambdaRail and Internet2 is showing evolutionary improvements."

Paul Greenberg, president of The 56 Group LLC, commented, "There is no reason to create a new ether out of whole cloth. With the implementation of the address protocol IPv6, which provides an infinitely large number of Internet addresses, we don't have to worry about it running out of 'space' so to speak. The new forms of the Web, like Web 3.0—the Semantic Web—will begin to show us how to interact with the Web in context, ways we can hardly imagine now will provide us with new directions. The idea of specialized search will unlock much of the so-called 'dark Web'—that portion of the Internet that isn't really being searched with Google or any other engine for that matter. Yet, there is always the possibility with something that covers as much ground as the Internet for breaching it. If it is secure, given the old problems it has, there will be someone who will creatively find a way to commit criminal mischief. So problems will continue but there really is no reason to create a whole new Web."

Micheál Ó Foghlú, the research director for the Telecommunications Software & Systems Group at the Waterford Institute of Technology, Ireland, and a member of W3C and an active participant in next-generation research, wrote, “In the short term, we need to put effort into migrating from IPv4 to IPv6 to respond to the looming crisis in IPv4 address space...My research group, the TSSG, plans to participate in the research efforts of GENI/FIND and FIRE and already have to some degree; these are medium- to long-term, and cannot come to fruition by 2020. Most of this work will involve various overlay networks (over the IPv4 or IPv6 Internet) but some will take a clean-slate approach, and any clean-slate approach is very unlikely to be widely deployed in the next 12 years. So I hope to see a healthy IPv6 Internet with a legacy IPv4 Internet both operating in 2012, and lots of interesting ideas from research being deployed as overlay networks over that basic infrastructure. I do not see the private telecommunications infrastructure adopting the open-Internet model, though it may use IP technologies, so there will still be a number of interesting networks in 2012, most using forms of IP. One other interesting trend in network infrastructure development is the use of carrier-grade Ethernet, pushing previous LAN technologies into use within a wider remit, such as metropolitan networks. The promise is that these are cheaper to deploy and manage even compared to IP networks. IP will still be needed to interconnect these networks, and IPv6 will be needed.”

Todd Spraggins, strategic architect for Nortel Carrier Networks and president and chairman of the board of directors of the Communications Platforms Trade Association, responded, “The Internet can never be ‘replaced,’ as the next best thing will not overlay it but be integrated, thus always having the appearance of being extended by the uninitiated outsider.”

**DEVELOPMENTS WILL BE DRIVEN BY SECURITY;
THERE WILL BE INCREASED PRIVACY CONCERNS**

Many respondents say a further surrender of privacy in exchange for security will play out in a big way before 2020. “The arms race between the good guys and the bad guys doesn’t slow or stop—it goes on hyper-overdrive,” predicted **Sean Steele**, CEO and senior

security consultant for infoLock Technologies. “Average business users and consumers will have more, not less, security in transactions and communications, but will be required to use more invasive technologies and techniques, such as biometric authentication (e.g., fingerprint recognition, voiceprinting, iris/retina scanning, etc.).”

Robert Eller of Concept Omega, a marketing and communication company, agreed that identification will be based on genetic information. “We will eventually only be able to interact with the Web with a personal biometric/genetic code which will imprint on any interaction we provide,” he responded. “This should remove all forms of fraud or spam. To allow for privacy in 2020, laws are required for government access to this data when reason for fraud/misuse are evident.”

Bertil Hatt, an Internet researcher employed by France Telecom and Orange who is completing a Ph.D., predicted that in 2020 “most piracy has been solved through licensing, although corporate-secret appropriation (CSA) has taken the lead. Most malware used to come from rogue countries who have been so ostracized for harboring spam-, virus-, or worm editors that they finally took part in global agreement on extraterritoriality of digital crime and e-terrorism. Phishing is still rampant, perpetrated by very small actors, but widespread knowledge and Bayesian filtering considerably limits its impact.”

Thomas Lenzo, a business and technology consultant with Thomas Lenzo Consulting, wrote, “By 2020, beyond technology, there must be multi-national initiatives to coordinate efforts to fight cybercriminals; laws must change to combat evolving cybercrimes; nations must cooperate in their arrest and prosecution. There must be a unified global effort to deal with those countries that encourage or employ cybercriminals.”

Chris Miller, senior vice president for digital operations for Element 79, commented, “The how, when and what we use to access the Internet will change (smartphones vs. computer; anywhere vs. home/work becomes the norm). Hackers will continue

to be a part of society but their mischief also drives innovation as it does today...Cybercrime or cyberterrorism takes on more priority. Look at the Middle East and Asia shutdown and delays due to the FALCON cable cut. At this time we don't know what caused it.”

Leonard Witt, an associate professor of communications at Kennesaw State University and author of the Weblog PJNet.org, remarked, “When have we ever stopped crime? If it is a choice between having some criminals around and having a repressive government, I will take the former; they are much easier to deal with.”

Respondents held out hope that privacy protections can somehow be preserved. “If enough people demand privacy protection, that will improve, too,” noted **Peter W. Van Ness**, president of the Van Ness Group, a Web-development company. “If we do not demand it, privacy will be traded away for increased security and reliability; that is not a good trade.”

CORPORATE AND GOVERNMENT CONTROL ARE AMONG THE PRIMARY CONCERNS ABOUT NETWORK CHANGE

Many respondents’ negative remarks about the diffusion of a “clean-slate” Internet were prompted by concerns that some see the “do-over” efforts as a threat to civil liberties. “The Internet is not magical; it will be utterly over-managed by commercial concerns, hobbled with ‘security’ micromanagement, and turned into money-shaped traffic for business, the rest 90% paid-for content download and the rest of the bandwidth used for market feedback,” wrote **Tom Jennings**, of the University of California-Irvine, creator of FidoNet, the first message and file-networking system online, and the builder of Wired magazine’s first online presence. “Notice that ARPANET was handed to commercial interests; it wasn't turned into a national/international resource for citizens (and don't tell me that mega-corporations are citizens).”

Nick Dearden, campaigns manager for Amnesty International, the human-rights organization, responded, “All I would like to do is point out the risks. The Internet has, in many ways, grown up from the grass roots, it wasn't controlled by governments or corporations.

That fact has led to it being a useful space, beyond normal social controls that we see, for instance, in the broadcast and print media. As governments and companies extend their control—sometimes to near-monopolies—over sections of the Internet, this space has closed down. On the surface, controlling spam seems like something few people would argue with. But in China, the war against spam has actually been used to crack down on all matter of political activity. The only way to protect free space is to ensure that any systems created to deal with real problems on the Net—e.g. child pornography—are grounded in human rights and protect fundamental freedoms like freedom of speech. To date these rights have taken a back seat in discussions of Internet governance, and I'm therefore fearful of how new-generation research will be utilized.”

Howard Rheingold, Internet sociologist and author, noted, “The Internet's end-to-end architecture is being compromised when the Great Firewall of China filters packets and blocks data for political reasons, and the architecture of participation that made the Web possible is under attack when broadband providers break ‘network neutrality’ for commercial reasons. But the problems with replacing something as widespread and flexible as the present Internet—with all its problems, which may indeed necessitate radical redesign—are economic, political, and formidable. Who is going to design, govern, deploy, pay for the new system, and how are the world's major political and economic players to agree? Starting the Internet was simple back when everybody trusted Jon Postel. The world lacks that technopolitical simplicity today.”

Theresa Maddix, a research analyst for ForeSee Results, responded, “NSF initiatives, GENI, FIND, and FIRE are all well-intentioned and led by very bright individuals. However, the information wants to be free. It was the release of the Internet from government hands and agencies that allowed it to explode. Google and others are always building better spam filters. Cybercrime still is much lower than non-cybercrime.”

Don Heath, a former leader of the Internet Society and member of the U.S. State Department Advisory Committee on International

Communication and Information Policy, noted, “The Internet has achieved its remarkable success because it was not controlled by any one entity or government. As soon as governments attempt to exercise control or otherwise regulate the Internet, its usefulness will greatly diminish.”

The delicate balance of all interests was pointed out by **Jerry Michalski**, founder and president of Sociate, a technology-consulting firm and former managing editor of Release 1.0 and co-host of the PC Forum. “The Internet is what it is because commercial interests and government agencies didn't know what it was (DARPA aside),” he responded. “There is no way to build anything like that anymore, so I have no hope that something better can be built, or that everyone can be migrated to it. That said, I'm worried about Net neutrality and I see many ways in which today's Internet could be hobbled significantly or improved greatly over time, with no big disjunction.”

**THERE WILL BE OTHER NETWORKS OR PARTITIONS;
'WALLED GARDENS' WILL BE LEVERAGED FOR CONTROL**

Some respondents expect that various motivations will cause more separation of networks. “Those with resources and security concerns will have access to ‘better’ and more secure channels. Speed and security will increase for everyone but someone will figure out how to partition off areas of the network for elites,” wrote **Ted Coopman**, a communications technology lecturer at San Jose State University.

Michael Zimmer, resident fellow at the Information Society Project at Yale Law School, responded, “The most likely scenario: A secure architecture to complement the existing Internet backbone for those who want to use it. One alternative view might be a new Internet-like infrastructure emerging tailored specifically for secure mobile-data transfer, capitalizing on the rise of mobile telephony.”

Cambria Ravenhill, manager of national channel planning at TELUS Communications, wrote, “The Internet will split into the ‘official’ Internet, where most civic life and corporate and

government transactions occur, and an ‘underground’ Internet fueled by scarcity economics.”

Jay Neely, founder of News Armada, a Boston-based online news and community company, commented, “If government encouragement does not occur within the next 5 years, while there will still be refinements made to existing infrastructure, the process will be too slow for some organizations, and we will see development of separate networks, like Internet2 for universities. While unlikely, it is possible that a future technological mega-corporation could build an Internet-like infrastructure that competes with publicly available Internet; concerns about civil liberties and tracking are even more valid in this scenario, but may be overlooked by the general public due to the convenience of the advanced infrastructure.”

“There will be two Internets,” predicted **Garland T. McCoy**, founder of the Technology Policy Institute, a think tank focused on the economics of innovation, “one for ‘us’ and one for the financial institutions, security folks, spooks, government agencies, major corporations, etc. That almost exists today.”

Mark Youman, principal at ICF International, a Washington, D.C., consulting-services company, wrote, “The current Internet will be improved rather than replaced wholesale, but it will be one of MANY global networks. Institutions, industries, and other groups will construct independent networks when the Internet becomes too overrun or corrupt to serve their needs. Access to these networks will be part of what defines the ‘haves’ from the ‘have nots.’”

Could a division of networks lead to another type of visible divide and possibly even an “Internet class war”? Some respondents mentioned the possibility. **John Jordan**, an associate professor of communications at the University of Wisconsin-Milwaukee, wrote, “Like a highway, significant parts of the Internet likely would need to be shut down and closed off in order to receive a major upgrade. Unlike a highway, the public will not stand for this, necessitating that instead of a completely new Internet infrastructure, people get slightly better service over time as patches and upgrades are made,

but this leaves open potential problems familiar today. At the same time, private business ventures and new housing developments in exclusive neighborhoods will experiment with and implement new Internet architecture, leading to a point in the more-distant future where there may be two Internets, creating a true Internet class war.”

Benjamin Ben-Baruch, senior market intelligence consultant and applied sociologist for Aquent, predicted that there will be two Internets, the original and the next-generation. “Those with the resources to move much of their communications and functions to this new architecture will do so—and early adopters will have to pay hefty costs to do so. But along with this high-cost barrier will come control of this new environment. Part of the digital gap in the future will be between those who operate on both the current and next-generation platforms and those who are limited to the current Internet...Security and privacy on the current Internet will be increasingly compromised. There will be two reasons for this slowly but steadily decreasing security and privacy: (1) Hackers and pirates will develop security-breaking technologies faster than security technologies can be developed and rolled out. (2) As the secure, next-generation platform is developed, hackers and spammers and pirates and other Internet criminals will focus on the much easier but very lucrative prey on the current Internet.”

IT'S POSSIBLE—EVEN BEFORE 2020—THAT SOME REVOLUTIONARY IDEA COULD SHAKE THINGS UP

A few respondents noted that breakthroughs incorporating influences from biology, nanotech, and other sciences could push Internet evolution in new directions. “By 2020, two major advances will have significant impact. The first is bioengineering and nanotechnology, allowing the Net to be ‘embedded’ into individual humans (scary, eh?); the second is quantum computing that will significantly alter the current electrically loaded computing engines,” predicted **David Hakken**, a professor of anthropology at the Indiana University School of Informatics who studies social change and the use of automated information and communication technologies.

Roberto Gaetano, an ICANN board member who also works for the International Atomic Energy Agency, commented, “I concur in seeing the development of the ‘next-generation Internet’ as evolutionary rather than revolutionary. However, I am wondering whether by then we would not start seeing something that is started based on some new concept that we can’t even figure out today. And I wonder whether this is not likely to come from a socio-cultural environment that is completely different from ours.”

SCENARIO 8

THE EVOLVING CONCEPT OF TIME FOR WORK, LEISURE

PREDICTION: *Few lines divide professional time from personal time, and that's OK. In 2020, well-connected knowledge workers in more-developed nations have willingly eliminated the industrial-age boundaries between work hours and personal time. Outside of formally scheduled activities, work and play are seamlessly integrated in most of these workers' lives. This is a net-positive for people. They blend personal/professional duties wherever they happen to be when they are called upon to perform them—from their homes, the gym, the mall, a library, and possibly even their company's communal meeting space, which may exist in a new virtual-reality format.*

Expert Respondents' Reactions (N=578)

Mostly Agree 56%
Mostly Disagree 29%
Did Not Respond 15%

All Respondents' Reactions (N=1,196)

Mostly Agree 57%
Mostly Disagree 29%
Did Not Respond 14%

Note: Since results are based on a nonrandom sample, a margin of error cannot be computed. The "prediction" was composed to elicit responses and is not a formal forecast.

OVERVIEW OF RESPONDENTS' REACTIONS:

Many respondents agreed with every aspect of the scenario except for the “net-positive” outcome. This is where the debate was centered in the written elaborations. While some people are hopeful about a hyperconnected future that they say will offer more freedom, flexibility, better mental health, and positive life-improvement, others express fears that mobility and ubiquitous computing will be a burden. When people are always on the grid, these experts believe it will cause stress and the disintegration of family and social life. It also might include oppressive surveillance by bosses and government. Other observations by these respondents: People will rebel against corporate control of their lives. Workers and institutions will have to draw boundaries. Successful employers will adjust by taking holistic approaches that might focus more on work output (projects completed) than inputs (amount of time in the cubicle). Because work infiltrates every corner of life, these experts believe people will be motivated to pursue satisfying employment, rather than settling for a “job.” Deepened personal networks will strengthen professional outcomes. The workforce will be more dispersed. There will be an increase in divorce. People will not take the time to enjoy nurture or nature.

While 29% disagreed, the majority of respondents mostly agreed that by 2020 the formalized delineation of social, personal, and work time will be eliminated for knowledge workers in the world's most-developed areas, and this will generally be a positive change. There was varied response about the pluses and minuses of the “always-on” environment. Most of the people who wrote elaborations spoke of concerns about the potential negatives of hyperconnectivity.

The following anonymous responses are a sampling of typical attitudes and commonly held views:

- “What a nightmare! It’s bad enough already, with 24-hour e-mail responses expected.”

- “What’s going to happen to focus?”
- “Agree...You can be enjoying deep-sea fishing as you do your stock quotes.”
- “It will increase the number of people involved in freelance employment.”
- “If this takes place, you’ll find me in a less-developed country where my time is MINE.”
- “People will work more from home and remotely instead of wasting time commuting to cubicle hell.”
- “It will not be a net-positive for anybody but Type A’s and geeks—people who didn’t have a social life in the first place.”
- “As corporations expand their demands and intrusions into employees’ personal time, workers will eventually rebel.”
- “It’s already happened, for better or worse. Get over it.”

Respondents noted that work and play evolve as humans and their tools do, and they pointed out that set “workdays” are a recent human concept. “The 9-to-5 approach will disappear completely, with few exceptions,” responded **Roberto Gaetano**, ICANN Board member. “The current separation between ‘work time’ and ‘free time’ is a byproduct of the industrial revolution, and is bound to disappear with it. Whether this is positive or negative, I don’t know, because the pressure of being ‘always at work’ just because you have the ability to be ‘always connected’ will be high. But we would need to build a new way of life that has to cope with this.”

“The boundaries between work and home, or private life will have been transformed,” wrote **Oscar Gandy**, author, activist, and emeritus professor of communication at the University of Pennsylvania, warning, “The sorts of stress-related illnesses that we see will be astounding.”

Nicholas Carr, author of “The Big Switch: Rewiring the World, from Edison to Google,” noted hyperconnectivity is already reality for some people, writing that it is a net-positive for corporations,

and will cause, “the expansion of the work to encompass all time and all space.”

Gbenga Sesan, an Internet-for-development consultant for Paradigm Initiative in Nigeria, saw positives, responding, “Even those who live in developing (or underdeveloped) nations will be able to overcome the barrier of geography through Internet access and other connected devices. It may be ‘plug-and-pray’ and not ‘plug-and-play’ but it plugs anyway! It’s now 4:05 a.m. in Lagos, Nigeria, and I’m asking myself if everything I’ve done in the last 5 hours will count as work, rest, play, or sleep-mode tasks. In 2020, professional and personal time will be as far from each other as fingers from the keys on a mobile phone. Multitasking will no longer mean driving and talking alone, but it will include work and play at the same time.”

Jerry Michalski, founder and president of Sociate, formerly of Release 1.0 and co-host of the PC Forum, wrote, “It’s healthy to have flextime and other ways to work when you’re sharpest and avoid temporal hassles like rush hour. Some people like to keep their work and private lives very separate; they will find this new world hostile. I’m on the other side—seldom not thinking about the things I care about professionally. One big caveat: we have to have a better Do Not Disturb function. Without it, we are all at the end of electronic leashes, and a major backlash will be much more likely.”

And **Charles Kenny**, senior economist for the World Bank, an expert on technology and economics, noted, “I hope 200 years’ worth of social progress towards the paid holiday doesn’t end like this.”

Tom Jennings, creator of FidoNet and builder of Wired magazine’s first online presence, reflected the feelings of many survey respondents who disagreed with the scenario, writing, “We work more, work more from home, take more work home, and are overall, paid less for it. Notice that all cars have cup holders now; the extreme technology for such exotic things existed in 1960, only no one wanted them! We drank coffee at home or in a cafe or restaurant!”

A high percentage of the respondents who wrote explanatory elaborations to this scenario used the phrase “this is already happening” or something similar. Of course, the people invited to participate in the Future of the Internet III survey are well-informed technology-savvy knowledge workers, so many are living hyperconnected lives. An example of one of many dozens of responses in this vein comes from **Louis Naugès**, president of Revevol, an enterprise 2.0 company with offices in France, Spain, the UK and US, who wrote, “Already there! This is the way 100% of our employees work at Revevol, our company; 1Gbit/sec.-minimum networks, wired and mobile, available anywhere, anytime on any device will make this one a no-brainer.”

Susan Crawford, founder of OneWebDay and ICANN Board member, commented, “It’s just how our lives work. Somehow we’ve got to figure out how to fit in 8-9 hours of sleep a night as well, just so we won’t hurl our ever-present handsets against the wall.”

And **Christine Boese**, a researcher and analyst for Avenue A-Razorfish and Microsoft, wrote, “While *I* have few lines dividing my professional from personal time, and I love my life that way, everyone I know has clearly and emphatically communicated to me that they **STRONGLY** demark their personal and professional time, and only allow the professional to intrude with the greatest reluctance. They are not embracing this world I live in, and when I think about it, I have always been this way, long before technology ever came to dominate my life, when I lived as deeply inside books and personal projects that consumed my life then, just as they do now. I could surely do with a little less ‘helpful’ discipline from them telling me to ‘get a life,’ however.”

HYPERCONNECTIVITY ALLOWS PEOPLE TO BE PRODUCTIVE ACROSS MANY ASPECTS OF THEIR LIVES

Respondents who are already integrating work and personal time in jobs they enjoy and as members of families who don’t mind the integration happily responded that such connectedness will be a net positive. “We are enjoying the benefits even when I am at my birth

place, a remote village—Ikrai in Bangladesh,” wrote **Professor Lutfur Rahman**, chairman of the department of computer science at Stamford University, Bangladesh, and a leader of the Association for Advancement of Information Technology.

Havi Hoffman of the Yahoo developer network responded, “Perhaps this is the latest and most distributed version of an aristocracy human civilization has developed. Best-sellers like ‘The Four-Hour Work Week’ are bellwethers of this trend. This rulers’ club though is widening and becoming more diverse. I bet if a person had access to a database of Davos World Economic Forum attendees over the last 10-12 years, one would see a pattern of greater diversity, greater inclusion of people more removed from seats of power, but still connected and influential in part because of their significance in the Social OS that is growing like a social commons of metadata about our relationships, our expertise, our causes and passions. The value of weak ties and the portability of connectedness make this work/play continuum possible if not probable. It won’t be true for everybody and the divide between the elite and the poor/the ‘underclass’ could continue to grow.”

Cliff Figallo, founding member of the first online community, The WELL, now of AdaptLocal.org, wrote, “The world is increasingly characterized by uncertainty, so people refuse to divide their lives into professional and personal. Staying connected and informed is the security blanket that people demand.”

People on both the pro and con sides of hyperconnectivity say it will influence people’s health. While those who fear it say it will cause stress-related illnesses, those who welcome it say the flexibility it offers may improve mental health.

Christine Satchell, a senior researcher at the Institute for Creative Industries and Innovation at Queensland University of Technology, responded, “People can work when they are at their best and by allowing them to mix professional and personal duties they can spend longer periods of time in front of their machines, actually accomplish more work and get less burnt out.” An anonymous

respondent commented, “This is a great vision for knowledge workers, and can cause reduced stress and improved health.”

Micheál Ó Foghlú, research director, Telecommunications Software & Systems Group, Waterford Institute of Technology, noted, “It would be better to think in terms of more people having more professional attitudes to work where more emphasis is on outputs and less on just turning up and signing in. This does not mean that private time disappears.”

Michael Castengera, a senior lecturer at the University of Georgia’s Grady College and president of Media Strategies and Tactics Inc., noted, “Many, if not most, people derive their identity from what they do. It defines who they are. The blending of personal and professional existence will be heightened by the Internet connections.”

Some respondents predicted that the future workforce will prefer a blur of work and personal life. “Flexible, technology-based work environments will be attractive to next-gen workers,” wrote **Michael Stephens**, an assistant professor at Dominican University in River Forest, Illinois. “The benefit of this is improved productivity, happy workers, and increased return on investment.”

And **Hamish MacEwan**, a consultant for Open ICT in New Zealand, commented, “The 9 to 5 of the industrial era was required so worker units, generated by homogeneous ‘education’ that set strict times for functions, would be available to manipulate tangible products. Where we seek ideas and thought, there is no schedule.”

HYPERCONNECTIVITY WILL CREATE UNREALISTIC WORK EXPECTATIONS AND STRESS, AND INTRUDE ON LIVES

Many people see hyperconnectivity as a threat. Among the hundreds of elaborations provided by the respondents, only a few people perceived that blending work and personal time would tilt people’s lives toward more time for family, friends, and personal pursuits.

The vast majority of respondents who wrote elaborations equated hyperconnectivity with more work, not more play. Those who

agreed with the scenario and saw it as a net-positive tended to be people who also noted they enjoy their work lives and find connection to be valuable. Those who predict that work will impinge on personal time primarily perceived employers as profit-oriented, not people-oriented.

Benjamin Ben-Baruch, senior market intelligence consultant and applied sociologist for Aquent, commented, “In 2020...a myth will develop that outside of formally scheduled activities, work and play can be seamlessly integrated in most of these workers’ lives. Employers will attempt to convince us that this is a net positive for people because we will be able to blend personal/professional duties...However the reality will be quite different. Because we can be surveilled whenever we are ‘connected’ and especially because we can be surveilled whenever we are connected using our employer-provided devices, we can and will be controlled. Our employers will gain even more control over work-time discipline and over our lives and will be able to force even more productive working hours from us. Our lives will in fact be increasingly controlled by those who provide us with the devices that will have become increasingly necessary for us in both our work and personal lives as well as those who own and control the networks and network sites that we use and visit. Some companies will try to distinguish themselves as companies that do not actually use their power to watch and control us—but most companies will do the ‘fiscally responsible’ thing of using available technology to assert control.”

Concern over surveillance was also the central concept in the elaboration from **Steve Sawyer**, an associate professor in the college of information sciences and technology at Penn State University. Sawyer’s research includes the uptake and uses of computing by knowledge workers. In his 2020 scenario: “Corporate control of workers’ time—in the guise of work/ family balance—now extends to detailed monitoring of when people are on and off work. The company town is replaced by ‘company time-management,’ and it is work time that drives all other time uses. This dystopia challenges the concept of white-collar work, and unionism is increasingly an issue.”

Charles Ess, a professor of philosophy and religion and research on online culture and ethics at Drury University, responded, “This might be a positive scenario for some in the U.S. and, perhaps, Japan. But, for example, in Europe and Scandinavia, there is considerable resistance to what is seen as the American model of working more and more and having less and less of a life. People may be forced into blurring the boundaries between the personal and the professional for economic reasons, but they're not happy about it and do not see it as a positive. An alternative scenario is to see the well-connected knowledge worker described here as simply a drone in the Borg hive: always connected, never free to be/do anything other than contribute to the collective. Upper-managers who keep their Blackberries and Treos by their side for the 4:30 a.m. phone calls, even during ‘vacation,’ already come close to this depiction. Those on the outside who enjoy at least an occasional freedom from the Net would see such a drone as a slave, not as a free human being.”

Joanna Sharpe, senior marketing manager for Microsoft, commented, “When people are too blended in the mashup between work and play, they are missing valuable time and experiences that probably shouldn't be pre-empted by a work need, i.e., an important event being with your family or friends and working at the same time, so both groups suffer due to lack of focused attention.”

Victoria Nash, director of graduate studies and policy and research officer at the Oxford Internet Institute responded, “The result may be longer, less-efficient working hours and more stressful home life.”

Scott Smith, principal at Changeist LLC and a consultant, futurist, and writer, noted, “Evidence is mounting that blended work/play scenarios enabled by pervasive connectivity aren't a net-positive for many able to experience this blend today. Access opens the door to time pressure, the need to respond, and expectations of 24/7 productivity. It isn't clear how this will change for the better in 13 years' time.” **Hal Varian**, chief economist at Google, shared a

similar sentiment and added, “Institutions will have to be proactive in drawing some boundaries; burnout is real.”

**WE WILL ADJUST, DEVISING NEW WAYS
TO BALANCE LIFE AS WELL AS WE CAN**

Many who expect the future depicted in the scenario commented that social adjustments will be made to deal with the new realities. **Brad Templeton**, chairman of the Electronic Frontier Foundation wrote that he expects people will “develop tools to isolate personal time more effectively, and only have it pierced when truly urgent—people will come to accept that.”

Howard Rheingold, Internet sociologist, university professor, and author, noted, “We’re beginning to see people finally erecting personal and social boundaries around the use of mobile technologies because the colonization of every sphere of our lives—homes, cars, family life, social events, toilets, movie theaters, concert halls, subways, classrooms—of these devices is beginning to make people angry.”

Mary Ann Allison, principle of The Allison Group, predicted, “We will have adapted to this blurring—which might otherwise be termed integration...and, at the same time, will have many widely used and ‘approved’ time-out activities ranging from ‘no-contact’ vacations to official ‘no-schedule’ times in organizations’ workday structures.”

Rollie Cole, director of technology policy for the Sagamore Institute for Policy Research, suggested that the scenario will “not be an unmixed blessing, adding, “I could see a backlash leading to regulations about ‘no-employer-contact’ hours.”

A number of survey participants suggested that the nature of work is going to change for the positive. “I hope that future work activities will become more creative and fun for people,” wrote **Gary Kreps**, chair of the department of communication at George Mason University, formerly founding chief of the health communication and informatics branch of the National Cancer Institute.

Dan Larson, CEO of PKD Foundation a non-profit organization working for patient advocacy and education, responded that young workers today are ready to take a healthy approach to a 24/7 work/leisure mix. “Anyone who has hired younger-generation employees knows they are generally unwilling to work the long hours their grandparents did,” he explained. “They don’t sell their soul to the company store. Rather, they value, greatly—their own personal, non-work time and space. With the accelerated pace of everyday life, the importance and value of rest, relaxation, renewal, and diversion from the work world...will only become greater.”

John Jordan, an associate professor of communications at the University of Wisconsin-Milwaukee, responded, “Blending of work/personal time has been going on for years, and the final removal of the seam is all-but-inevitable. Most of the talk about this right now is focused on how this will result in a loss of personal time: more stress, less time for family, etc. But the other side is just as important, and shows how this likely will balance. Rather than having employers spend time and energy trying to keep employees ‘on task’ and halting them from using company resources for personal use (e.g., browsing Amazon while at work), this barrier will also fall. The focus will be on accomplishing a task, not logging hours. This will make time more flexible for employees, and will allow sufficient management by employers who switch to compensation plans based on work accomplished rather than time spent. This will be a radical new model of employment, but it will happen.”

Ivor Tossell, blogging journalist and technology columnist for the Toronto Globe and Mail, notes that modern tools are just evolving to fit the evolution of human desires. “The rhetoric of employment has shifted from conceptualizing it as a means of sustenance to a vehicle for personal fulfillment. More and more people are saying they’d rather work than retire, even if they could afford it. Technology will not drive this change, but it will enable it.”

**CONNECTIVITY INFILTRATES NATURE AND ARCHITECTURE;
EXISTING HUMAN SYSTEMS WILL BE TRANSFORMED**

Some respondents looked ahead and imagined how human systems might change as hyperconnectivity becomes more prevalent between now and 2020, with its positives and negatives. “Work will be done everywhere, anytime, the barrier between professional and personal time will be fuzzy, and the notion of time will change,” responded **Rafik Dammak**, a software engineer for STMicroelectronics in Tunisia.

“Large existing bureaucracies will increasingly be challenged by this trend,” commented **Ed Lyell**, an Internet pioneer in issues regarding education. “Schools, which I study, are already way behind the opportunity presented by even our current Internet world. Children know that learning can take place, anytime, anywhere, and in multiple modalities. Yet we only acknowledge or seem to respect the learning that takes place in a top-down, time-dependent, school system. I first said this 30 years ago, but it becomes more ubiquitous in the future. Formal schooling is often a barrier to an individual's learning.”

“One of the things I have predicted as a futurist for the last 5 years,” wrote **Robin Gunston**, consulting futurist for Mariri Consulting, “is a major change in employment contracts as a result of this type of scenario. For effective utilization of scarce human resources we have to free people to work on an outcome basis irrespective of location or time. Many of us already do this as consultants, but the vast majority of information and knowledge workers are hidebound to a desk, a fixed location, and fairly inflexible working hours.”

Kathryn Greenhill, an emerging technologies specialist at Murdoch University, commented, “The integration of personal and professional time, however will result in far fewer children being born to people in professions, as they realize that being ‘always on’ is not compatible with children's concepts of time and development. Lives will be lived too fast for people to slow down sufficiently to gently nurture.”

Utopia and dystopia are represented in the ideas of the next two respondents' remarks.

Joe McCarthy, principal instigator at MyStrands and formerly principal scientist at Nokia Research Center in Palo Alto, sees positive outcomes in this realm in years to come. "Concurrent with this shift will be a tendency for people's professional lives to reflect their personal values—work will become meaningful, and thus will seem less like work because 'workers' will be fully engaged in the missions, goals, and activities of their organizations...many of which will increasingly be organizations of size one."

Mary McFadden, a respondent who chose not to share any other personal identification, predicted the following 2020 scenario: "The individual disappears into the corporation. Work rules and regulates lives and every place is a company town. Resorts holidays become popular by advertizing disconnection. The poor have computers; the rich have teachers. We live longer, but only with the use of drugs and technological upgrades. Our emotions are not our own, but part of pharmaceutical biochemistry created to prevent us from being unhappy or able to recognize that we are out of touch."