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Experts and analysts assess the future of the internet in a new survey

A survey of internet leaders, activists and analysts shows they expect major tech advances as the phone becomes a primary device for online access, voice-recognition improves, artificial and virtual reality become more embedded in everyday life, and the architecture of the internet itself improves.

They disagree about whether this will lead to more social tolerance, more forgiving human relations, or better home lives.

Here are the key findings in a new report based on the survey of experts by the Pew Internet & American Life Project that asked respondents to assess predictions about technology and its roles in the year 2020:

- 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 is connected, and the results will be mixed in their impact on basic 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.

"The internet is now used by 1.6 billion people, with another billion expected to be added soon," said the report's principal author Janna Anderson, director of the Imagining the Internet Center and associate professor of communications at Elon University. "These experts' answers reflect continuing concern over the tension between security and privacy issues. They emphasize the importance of enhanced and enlightened cooperation between the leaders involved in decisions about internet architecture and policy."

Responding to an invitation to participate in an online survey, 578 leading internet activists, builders and commentators submitted their ideas about the impacts networked technologies may have on world societies by 2020, with an additional 618

stakeholders also participating, for a total of about 1,196 participants sharing their views.

The report entitled "Future of the Internet III" is built around respondents' responses to scenarios stretching to the year 2020, and hundreds of their written elaborations address such topics as: the methods by which people will access information in the future; the fact that technology is expanding the potential for hate, bigotry and terrorism; the changes that will occur in human relationships due to hyper-connected communication; the future of work and employer-employee relationships; the evolution of the tools for and use of augmented reality and virtual reality; the strength of respondents' concerns that the global corporations and governments currently in control of most resources might impede or even halt the open development of the internet; and the challenges to come as issues tied to security, privacy, digital identities, tracking and massive databases collide.

"A strong undercurrent of anxiety runs through these experts' answers: They are quite sure the internet and cell phones will continue to advance at an amazing clip, but they are not at all sure people will make the same kind of progress as they embrace better, faster, cheaper gadgets," said Lee Rainie, Director of the Pew Internet & American Life Project. "The picture they paint of the future is that technology will give people the power to be stronger actors in the political and economic world, but that won't necessarily make it a kinder, gentler world."

The Pew Internet/Elon University survey was conducted online by invitation to experts identified in an extensive literature review and to active members of several key technology groups, among them: The Internet Society, The World Wide Web Consortium, the Multistakeholder Group on Internet Governance, ICANN, Internet2 and the Association of Internet Researchers. Many respondents are at the pinnacle of internet leadership. Some respondents are "working in the trenches" of building the Web; most of the people in this latter category came to the survey by invitation to those on the email list of the Pew Internet Project. The survey was an "opt in," self-selecting effort. That process does not yield a random, representative sample.

Full results of the survey, including engaging quotes from hundreds of respondents and brief biographies on many of these people, can be found on the Web at http://www.imaginingtheinternet.org by using the "Predictions Surveys" link. Visitors to the site are invited to share their own visions for the future of the internet in the section of the site labeled "Voices of the People" (http://www.elon.edu/predictions/RecentPredictions.aspx).

The Pew Internet Project is a nonprofit, non-partisan think tank that explores the social impact of the internet. Support for the project is provided by The Pew Charitable Trusts. The Project is an initiative of the Pew Research Center: www.pewinternet.org. The Imagining the Internet Center at Elon University's School of Communications 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 under the direction of Janna Anderson. Elon University's site: http://www.elon.edu/.

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
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 2007.	**Of 578 Experts 77%** Of 1,196 total respondents 81%	**Of experts 22%** Of total respondents 19%	**Of experts *%** Of total respondents *%
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.	**Of 578 Experts 32%** Of 1,196 total respondents 33%	**Of experts 56%** Of total respondents 55%	**Of experts 13%** Of total respondents 13%
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.	**Of 578 Experts 31%** Of 1,196 total respondents 31%	**Of experts 60%** Of total respondents 61%	**Of experts 9%** Of total respondents 8%
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.	**Of 578 Experts 45%** Of 1,196 total respondents 44%	**Of experts 44%** Of total respondents 45%	**Of experts 11%** Of total respondents 10%
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."	**Of 578 Experts 55%** Of 1,196 total respondents 56%	**Of experts 30%** Of total respondents 31%	**Of experts 15%** Of total respondents 13%
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%

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.

The following is a brief selection of a few of the most provocative future visions shared by respondents to the survey scenarios – these do not represent majority views.

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, 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*

"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*

"I agree, but I don't see this as entirely positive, as it perpetuates 'soundbite' dissemination and thinking, and the continuing move toward shorter attention spans and dumbing-down of content." ***—Anonymous respondent***

The evolution of social tolerance:

"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." ***—Matt Gallivan****, senior research analyst for National Public Radio*

"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*

"Perhaps in the wired elite there will be less strife, but those who generally lean toward picking up a brick to solve a problem will continue to do so." ***—Jeremy Shapiro****, professor of critical social theory at Fielding Graduate University*

"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*

"Most people still don't understand the question and will only wake up when it's too late. I foresee a time where NOTHING is free and things like potatoes, chickens, counseling, clichés, and Scrabble will not be able to be accessed without paying a toll at every point." ***—Anonymous respondent***

"Governments will be strongly influenced by 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 National Science Foundation*

"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 Metafuturing Second Life, formerly of CERN*

The evolution of privacy, identity, and forgiveness: "We will enter a time of mutually assured humiliation; we all live in glass houses. That will be positive for tolerance and understanding." ***—Jeff Jarvis****, top blogger at Buzzmachine.com and professor at City University of New York Graduate School of Journalism*

"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****, senior editor for product development at Yahoo and blogger*

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*

"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*

"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 Infothought 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*

"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*

"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*

"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 evolving concept of time for work, leisure:

"Corporate control of workers' time—in the guise of work/family balance—[in 2020] 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 real-world interaction of the internet and the 'long tail' of the Semantic Web will enable everyone to find the perfect job for them, the right opportunity, so that people in general are happier, healthier, and more productive." ***—Anonymous respondent***

"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*

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