

2004 Ten-Year Forecast: Perspectives

2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

Always look back
twice as far
as you are
looking forward

Long a mantra at the Institute for the Future, this principle is particularly important in times that serve up more than the usual quantum of surprises and uncertainty. Indeed, this decade has so preoccupied us with surprises that nearly halfway into it, it is the first decade in a century to have no name. Perhaps it is because events are still too new to allow a label to settle in. Or perhaps the name-defining event has yet to occur. Until a name emerges, however, the very namelessness of the decade is itself a compelling indicator of the challenge of making sense of the next ten years.

In the face of this uncertainty, long looks-back can reveal much about what the future is likely to hold. As Mark Twain observed, history doesn't repeat itself, but it often rhymes: cycles thus revealed can put a trajectory on current events and leach the surprise out of possibilities on the horizon. This year's *Forecast*, our 26th edition, thus places particular emphasis on cycles we have discerned, long and short, setting specific issues within this larger context.

Of Long Cycles

Several trends, already visible, represent the leading edge of longer cycles. For example, the rise of “geoweb”s—the overlay of geographical information systems and addressable devices onto the physical world—are rapidly changing the way we move in both physical and virtual space. A new species of “cybernomads” is emerging, transforming human identity and physical landscapes as they begin to link information—and themselves—into their daily routes of travel.

Cybernomads will quickly discover a rich new world of addressable spaces in which devices know where they are, and their human caretakers can use them to leave messages—not just at abstract addresses—but at specific points in geospace. More important, they will inaugurate a deepening man-machine symbiosis, pioneered by the next generation of “cyborgs”—which we have all been from beginning, according to author Andy Clark. People will eagerly augment their physical personae, sometimes implanting machines (and, later, biodevices) directly into their bodies. But even for those who don’t choose implants, intimate machines will proliferate as ubiquitous and unobtrusive companions to daily life, extending our personal reach in the world and perhaps even our ability to think together. How soon will we have machines that think with us? Perhaps sooner than we expect, according to Internet visionary Vint Cerf.



The Addressable World

This forecast charts the path to a not-too-distant future in which information is embedded in objects and spaces; most information on the Internet is linked to a specific geographic location; and location services help find other people, local resources, and even personal property. In a guest interview, Vint Cerf, a founding father of the Internet, considers the transition to IPv6, a new Internet protocol that will support addressable objects as small as ingestible sensors.



Cybernomads

Here we look at the deep cultural transformations that will unfold as mobility tools evolve into natural extensions of the human self, linking us to new focal points in the landscape and changing our basic modes of perception. Guest Andy Clark, author of *Natural Born Cyborgs*, reflects on “the distinctive signature of our species: our ability to enter into profound and self-transforming relationships with our best tools and technologies.”

At the same time, the genomic revolution is gathering speed, and an early impact is the arrival of genetic testing. Long before grand visions of personalized drugs arrive, genetic testing will lead to semi-custom medicine in the form of pre-screenings and pre-testing for drug effectiveness. As humans recognize themselves by their genetic predispositions to certain illnesses—and certain cures—a new kind of “biological citizenship” may galvanize groups into political action, defining new social and medical communities alike. Many fear that genetic testing will create a new genetic underclass, but it is also likely to accelerate the fragmentation of once-unitary notions of citizenship as everyone comes to realize that each individual is less a member of a specific group than a genetic composite assembled from globe-wandering populations stretching back through time.



Not-So-Personalized Medicine

The countervailing trends that will create a new dynamic tension in health care are explored in this forecast. On one hand, engaged health consumers will make more individualized choices about their health care. On the other hand, the benefits of “flocks” for keeping health care costs low and even improving environmental health will need larger infrastructure solutions. An interview with Hal Luft, from the University of California, San Francisco, examines the myriad problems to be addressed.

Already Well Underway

Some transformative cycles are already well underway. Changing notions of capitalism, for example, are already evident and will likely mature into a fragmentation of the global capitalist system into distinct dialects. Whether these dialects will work in a symbiotic harmony or clash over differing values may become the key question for the future of economic globalization. And of course, the present concern with offshoring is but the opening act in a radical increase in mobility of white-collar work that could eventually overshadow the shift of manufacturing to Asia. In cyberspace, there is no distance between two points, and workers once separated by vast geographic distance will literally compete for the same jobs.



The Fragmentation of Capitalism

Three distinctive regional dialects of capitalism—entrepreneurial, cultural, and network capitalism—are described in this forecast. We also include a wonderful conversation with world-renown economist, W. Brian Arthur, who sees a future in which “ideas are dreamed up in the United States, they are interpreted in different ways in Europe, and they’re turned into consumer items in China.”



Redistributed Resources

In this forecast, we compare the shifts in jobs and households to understand the impacts of globalization and the changing roles of nations in the global economy. Scott Vollrath (an economist and environmental engineer who joined IFTF in 2003) examines the different ways that the Wealth Effect and the Specialization Effect are likely to shape the U.S. and Chinese economies over the next decade.

Meanwhile, the very notion of business is changing, and the post-industrial world may be one where work is accomplished as a conversation between machines with humans trying to keep up. In this conversation, creative thinking becomes an icon of human advantage, and the workplace subtly and slowly evolves to tap more facets of human personal expression—from attempts to build on personal interests outside the workspace to efforts to reinvent entire cities as creative hot spots. And let’s not forget the aging boomers who are not simply on the verge of reinventing retirement: they will redefine the economy by redefining the “practice of longevity.” And as they blur the boundaries between retirement and work, they will also blur the boundaries between countries, taking the mobility of retirement to global lengths.



The Growth of Jobbies

Here we take a closer look at how previously excluded faces of the worker—such as the hobbyist, the community worker, the sport enthusiast—are increasingly important in the workplace. An interview with Ellen Galinsky, president of the Families and Work Institute, tracks recent trends in how workers integrate diverse activities across their lives.



The Globally Mobile Boomers

In this forecast, we anticipate the effects that boomers will have as they age into a globally mobile world, where travel is easy and digital intimacy with friends around the world is taken for granted. Ted Roszak, author of *The Longevity Revolution*, joins us for an interview in which he takes a long and inspiring view of the growth in human longevity.

Into the Distance

The longest cycles have impacts that stretch far beyond the nominal decade scale implied in any ten-year forecast. The 20th century opened as the century of the nation-state, but closed with corporations as the most powerful actors on the global stage. What is next?

A power shift appears headed toward granting increased leverage to non-governmental organizations and other cross-border entities that have neither the territory of nation-states nor the formal structure of corporations. Add in fractured citizenship, global mobility, and economic fragmentation, and it no longer seems radical or outlandish to wonder if the nation-state will continue to exist as a meaningful—or at least powerful—entity in the next half-century. Or to put the question in sharper focus, will the United States still exist in 2050? Will the first true “Citizen of the World” be a Winnebago-driving boomer who winters in Mexico, meditates in a cyberspace-based Zen monastery, and vacations in Afghanistan, performing public service in a Doctors Without Borders clinic?



Cafeteria Citizenship

The “unbundling” of citizenship rights and responsibilities and the emergence of new types of citizens—citizens of wealth, of affinity, and of physical-digital places are tracked here. In a deeply insightful interview, Aihwa Ong, author of *Flexible Citizenship*, describes the “latitudes of citizenship” that cut across national boundaries.



Terroirisme

This forecast maps the intersection of water scarcity, bioregionalism, and the growth of green politics to wonder whether new allegiances to watersheds may redraw political boundaries. Paul Hawken, co-author of *Natural Capitalism*, joins the discussion to examine the future of localization.

Looking globally, there seems little doubt that Asia will increasingly become the hub of many forces—economic, scientific, cultural—in the decades to come, fulfilling the old saw that civilization moves steadily westward. But how will this translate into specifics? Will China dominate the global economy? Will it also dominate space as it seeks to build both scientific prestige and an infrastructure for commercialization of earth-observation data?



Space Race



Here we interpret the Chinese plan to put a man on the moon and consider the differences between the U.S. and Chinese space strategies, and how they might impact the economic and political balance of power over the coming decades. In his debut interview as IFTF's new president, Peter Banks (formerly president of the Environmental Research Institute of Michigan and Dean of the College of Engineering at the University of Michigan) takes a broad look at the implications of a second race for space.

Of course, this way of thinking about global politics and economics as a field of competition may itself be what changes most. As humans, we have taken competition for granted and dismissed the notion of the commons as impossibility, absent a Hobbesian leviathan enforcer. But nudged by computing and communications—perhaps, just perhaps—we will see what has been happening all along at the level of physics, biology, and cultural evolution; perhaps we will see that cooperation is as important as competition in the survival and evolution of species. As Ted Roszak suggests, we may be primed for a paradigm shift from survival of the fittest to survival of the gentlest.

We know for certain that cooperation is being transformed by technology, especially with the rise of “social software” that facilitates the formation and tracking of networks as well as the reputations of those in the network. More important, a new theory of cooperation appears to be in the offing—with strategic implications for organizations and societies alike. The bottom line? Perhaps it is a world in which openness wins over closed systems, and as Howard Rheingold notes, Garrett Hardin’s “tragedy of the commons” is transformed into a triumph of the commons. Good guys and gals may just be the ones who definitively finish first in the 21st century.

The Battle for the Commons



In this forecast, we survey the forces that may shape the future of such common pool resources as the Internet and the wireless spectrum—and look at the impact of the growth of social software. In a landmark interview, Howard Rheingold argues that we are on the cusp of a new understanding of cooperation that will transform strategic thinking the way that the discovery of microorganisms transformed medicine.



We explore these long-cycle changes in a new format this year. With all that is unfolding, there aren't enough pages in a phone book to address every important issue on the horizon. Thus in this volume, we have collected a set of perspectives that has the distinct point of view that comes from long-term, year-to-year research by the IFTF staff. Also absent from this volume is a binding. Instead, the individual forecasts are printed separately, so they can stand alone, or be reordered and regrouped. Of course, there is space for more to be added over the coming year, perhaps by us, but hopefully also by you, the reader.

A second volume, entitled *Trends and Data*, will also join the *Ten-Year Forecast* suite this year. Our *2004 Map of the Decade*, a visual summary of the key forecasts and IFTF research, will complete our basic forecast set. Our goal in creating this new set of products is to provide you with flexible tools to explore the implications of these trends in your organization. We hope that you'll mix-and-match the forecasts to think more insightfully about the future of your organization—and its place in a fast-changing world.

—Paul Saffo

Roy Amara

In 1978, Roy Amara, who was then president of the Institute, launched the first *Ten-Year Forecast*. In the years since, he has guided the staff—first as president and more recently as a sage mentor—in identifying issues, pursuing research, and encouraging excellence as we worked together to understand the future. As we now re-envision the *Ten-Year Forecast*, it is fitting to look back over the many years of his commitment and contributions and express our appreciation. We hereby dedicate the *2004 Ten-Year Forecast* to him, honoring his initial vision and looking forward to many more years of his mentorship.



2744 Sand Hill Road
Menlo Park, CA 94025
t 650.854.6322 f 650.854.7850
www.iftf.org

Editors-in-Chief | Kathi Vian and Paul Saffo

Research and Writing | Mary Cain, Eileen Clegg, Rod Falcon, Marina Gorbis, Susannah Kirsch, Lyn Jeffery, Alex Soojung-Kim Pang, Howard Rheingold, Paul Saffo, Andrea Saveri, Bern Shen, Leah Spalding, Kathi Vian, Scott Vollrath

Guest Voices | W. Brian Arthur, Peter Banks, Vinton Cerf, Andy Clark, Ellen Galinsky, Paul Hawken, Hal Luft, Aihwa Ong, Howard Rheingold, Theodore Roszak

Research Review and Managing Editor | Maureen Davis

Creative Direction and Graphic Design | Jean Hagan, with Adrianna Aranda, Robin Bogott, and Karin Lubeck

Overall Production Director | Jean Hagan

With Appreciation to | the IFTF Board of Directors, Bob Johansen, and Nick Ward for their project guidance

A decade and a half after the fall of the Berlin Wall, there is little question that capitalism is the world's dominant economic system. Countries around the planet took note, and moved (as India did, for example) away from command and control models toward a purer form of capitalism. In the wake of this shift, it is tempting to see a global convergence around a single capitalist system. But in fact, after a brief convergence, it appears that the consequence of capitalism's ascendancy is a divergence of capitalist models. Everything is always in the process of becoming something else, and capitalism is no exception.

Capitalism,
having won the
world, will now
begin to show
its diverse and
unexamined
faces

Local Variations: Three Key Dialects

Markets are not just global; they are also very much local and thus influenced by local cultural norms. Beneath its global veneer, capitalism is undergoing subtle but dramatic local mutations. The shape of several capitalist forms can already be perceived, and over the next few decades, these regional capitalist differences will sharpen and mature into distinct dialects that may, in turn, become the source of new frictions. Perhaps in half a century or so, this divergence may even become the source of an entirely new political economic model that challenges "traditional" capitalism. Presently, three variations of capitalism stand out.

Entrepreneurial Capitalism. This is what most people think of when they utter the word "capitalism." It emphasizes the individual entrepreneur and embodies a near-religious belief in free markets. It is most typified by the United States, with Silicon Valley as its most recent icon.

Cultural Capitalism. This is the emergent form of capitalism in Europe, and its focus is less on individuals than on communities—and ultimately on entire cultures. It is typified, in particular, by France.

Network Capitalism. This is the emergent form of capitalism in Asia, and while it celebrates individual entrepreneurs (and above all, wealth created), its focus is not the individual or even the culture, but rather an extended network that often, but not always, maps onto extended family ties.

Regional Styles: Source of Strength and Conflict

The age of one-size-fits-all capitalism is past—if it was ever there to begin with—and the capitalist forms that tie closest to their underlying cultures may prove to be the most successful. That said, it is interesting to consider the strengths and weaknesses of each. Entrepreneurial capitalism excels at nurturing small new enterprises better than the cultural capitalism of Europe, which is sometimes too embedded in local cultures. In France, for example, bankruptcy is a badge of shame while in Silicon Valley, an executive who has had a few start-up failures is considered "seasoned." On the other hand, the European system may have the upper hand when it comes to generating the capital and effort required for large, long-term efforts.

The biggest surprise may be the power of network capitalism in the newly capitalist mainland China. There are no believers so fervent as recent converts, and capitalism in China, blended with traditional network values, has already become a force strong enough to make China the world's largest consumer electronics manufacturer. Within five years, China will also be the world's largest auto manufacturer. The question the world should thus be asking is this: Does China's success mean that network capitalism will ultimately become the leading form?

—Paul Saffo



O V E R V I E W



PERSPECTIVES 2004

SR-829

© 2004 Institute for the Future.
All rights reserved.
Reproduction is prohibited
without written permission.

www.iftf.org

Interview: W. Brian Arthur



Brian envisions a world economy in which the leading edge is the discovery of new functionalities

Q: | You're an economist from Europe who's lived in Silicon Valley. What are the differences in the two economies—especially in the realm of high tech?

I had an insight about Europe's relationship with high tech when I was in Sweden a while ago. Sweden and other European countries have had problems moving into high tech. They have a few high tech companies like Ericsson, but they haven't been able to create the kind of dynamic, entrepreneurial culture that we have here in the United States. Technology and technical skill aren't problems with the Swedes. Their population is quite well educated, and 100 years ago they invented dynamite, held 20% of the world's patents, and had the best steel industry in the world.

What really arrested me was a dinner when someone took me aside and said, "You've been in Silicon Valley more than 20 years. You're an economist. Tell me: what are your usual interactions with labor leaders?" I gulped and said, "Labor leaders? Zero. I've never met one." I was very sincere, but he got so angry, he wouldn't talk to me the rest of the evening, and his friends had to usher him away from the table.

The exchange made me realize that in Europe, "technology" is synonymous with manufacturing. Europeans think in terms of big enterprises like Siemens or Ericsson or Airbus, large factories, and churning out things that are difficult to produce. The European ideal is for innovation and growth to happen in big companies.

Q: | Why is this a problem for European countries trying to move into the high tech economy?

The first economic revolution in the 20th century was mass manufacturing. It started in England, moved to Germany, and was perfected in the United States. This revolution was embodied by the automobile: not only was mass production invented on the auto line; the automobile stimulated demand for oil and profoundly affected urban design, social life, and culture around the world. But since the 1960s, high tech has been defined

less by mass manufacturing. Increasingly, it's what you can put together temporarily to get a lead on the opposition, make a lot of money, then go on to the next thing. The creation of wealth has shifted from manufacturing to discovering functionalities.

European countries have factories, workers, a concern for community, and regulations to make sure that no one falls too far behind or gets too far ahead. It's almost a socialist approach to manufacturing. The European countries that have been most successful at attracting high tech—Ireland, Finland, Hungary, Poland, and Lithuania—were all peripheral countries that didn't have all these institutions and regulations in place when they began to shift to high tech. Finland in the late 1980s and 1990s was going under, Ireland was in terrible shape, and the others were starting from nothing after communism. But even these countries really are only on the advanced end of manufacturing and are not high tech innovators.

Q: | What's different in the United States—and in Silicon Valley, in particular?

In the United States, technology doesn't equal manufacturing; it equals functionality. GPS, Google, Wi-Fi are all innovations that come from stringing together technologies. They're not products, they're functionalities: you ask, what new things can you do with gizmos and gadgets?

The culture of Silicon Valley reflects this view of technology as functionality. The Valley is about combining things to make new things: putting small companies together, small teams together, small components together, small functionalities together. American entrepreneurs think more in terms of building new systems that you license or sell on a monthly basis—not that you try to manufacture in units of 10 million. This is not the Siemens or Ericsson model; it's a hit-and-run model, in which you hit on this combination, sell it, make money, and go to the next thing. The American culture of individualistic freedom lends itself to looking ahead to the

W. Brian Arthur, an economist at the Santa Fe Institute, is the author of *Increasing Returns and Path-Dependence in the Economy*. He was a pioneer in identifying the economics of increasing returns in the world of high technology in the 1980s and 1990s.

next thing. In Europe, when they want do some new thing, large enterprises like Airbus or Siemens retool their factories.

Q: | How do Asian economies compare? It seems to me that, in China, the whole focus is on delivering to the consumer.

Yes, China, Singapore, and the rest of East Asia are organized around the questions, “How do we catch up? How do we provide our communities with these things?”

Japan is a special case because it straddles the Asian and European models. Japan knows manufacturing better than anyone, but that's not going to create the next Google. The Japanese Miracle didn't grind to a halt because of a bad banking system or a consensus style of decision making—those were in place in the boom years—but because the economic edge has shifted to putting things together in a nimble way, not producing consumer electronics in volumes of 10 million at a go. High tech is really about putting functionalities together. Manufacturing is about taking functionalities and translating them into hardware and software. Moreover, Japan doesn't have strong mechanisms for encouraging and rewarding individual creativity. It's very hard to get a Steve Jobs or Marc Andreessen in that environment.

Q: | How do you see these regional differences playing out in world economy over the next few decades?

We're looking at a global economy where the center of innovation will still remain in the United States. But more and more of the manufacturing innovation will be in China and India. Very broadly speaking, it's a world where ideas are dreamed up in the United States, they are interpreted in different ways in Europe, and they're turned into consumer items in China. China will do extremely well because, through sheer volume and low wages, they can't miss—unless something terrible happens politically.

The United States is a special case. We've gone from agriculture to manufacturing; then from manufacturing to the human delivery of services. Now, we're moving from the human delivery of services to the digital delivery of services. We're shifting toward a service economy that is based upon functionality.

Q: | I got religion a year ago when I was at a call center in India, watching the night shift take calls from credit card holders in Connecticut. It was the pure instantiation of the idea that, in cyberspace, there's no distance between two points. So what, in your opinion, is the next step?

Businesses are becoming conversations between technologies, with humans supervising the process. If I want to get an airline reservation, I go online, and I initiate a whole host of conversations between machines—my computer, my ISP, reservations servers, and the like. The bulk of this economy is service, and by connecting everything, we're laying down an enormous neural system for the economy.

In the future, what will count is not the gadgets and gizmos. It's the experience—the experience of executing things remotely in the service sector by devices talking to devices digitally. It's a steady evolution of the neural system for the economy.



Paul Saffo invited Brian to reflect on the implications of different forms of capitalism on innovation.



United States



Europe



Asia

THE UNITED STATES: ENTREPRENEURIAL CAPITALISM

Entrepreneurial capitalism is a capitalism that ultimately measures its success in wealth generated and innovations created. It's the embodiment of the American Protestant faith in the ability of anyone, no matter how humble his or her beginnings, to rise to the top.

This is the capitalism of Bill Gates and Warren Buffett, and also of GE and IBM, for under entrepreneurial capitalism even the largest players do not forget that they, too, once were small. And at its core is the new idea, the new product, and ultimately, the new experience served up to consumers.

EUROPE: CULTURAL CAPITALISM

Cultural capitalism is less than comfortable with showboat solo entrepreneurs; it's suspicious of their intentions and concerned about the larger community implications of innovation. Above all, it is a capitalism that preserves otherwise anachronistic economic activities for the sake of cultural continuity—and above all, identity. For example, the average Swiss cow receives more in annual subsidies than most individuals in the developing world. Swiss cows thus make the most expensive milk in the world, but they also support heritage communities of family farms that, in turn, keep the Swiss countryside looking so very Swiss.

Perhaps the quintessential expression of cultural capitalism is in France. In 2002, the French government ordered a 35-hour work week in response to a job shortage and then very publicly arrested corporate executives caught working late in their offices. Then, following the summertime heat-deaths of retirees in 2003, the government ordered corporations to require their workers to devote one day per year to help the elderly.

So cultural capitalism is, above all, a capitalism that measures progress less in the number of innovations created than in the social and cultural benefits it confers on civil society—and nowadays, in its contributions to the goal of creating a cohesive European community. This is the form of capitalism that has chosen to decorate its currency with images depicting mythical European cultural monuments; it could just as easily be called Monnet capitalism, after Jean Monnet, the father of the European Community.

ASIA: NETWORK CAPITALISM

Network capitalism is a system in which capitalists serve a social unit larger than their nuclear family, but smaller than an entire culture. At its purest, the relevant unit is defined by the extended family. It is thus tempting to label network capitalism “Confucian capitalism” as many did in the latter half of the 20th century. However, this label is wrong-headed (and distinctly un-PC) because explicitly Confucian values are shared by only a small percentage of Asia’s myriad cultures, while the urge toward networked communities can be observed from Japan to India.

China is the obvious candidate to become the leading exponent and beneficiary of network capitalism. But the most compelling present-tense example is Singapore—a hyper-cultural stew of Chinese, Malays, Indians, and others united behind a nationalist identity inextricably linked to commerce. Moreover, network capitalism will probably not be dominated by a country: the most likely unit of this capitalistic form is not the nation-state, but the city-state. When Singapore is eventually passed by, the honors will likely go to the Shanghais, not to China as a whole.

Unlike cultural capitalism, network capitalism prefers pragmatism over cultural continuity. This is a capitalism eager to innovate quickly in the service of its core motivations. Singapore has turned its economy on a dime several times in response to outside imperatives. In the late 1960s, Singapore’s leaders placed a huge (and hugely winning) bet on becoming an electronics manufacturing center. Then as manufacturing challengers emerged, Singapore reinvented itself again. It aggressively encouraged local startups to replace the exiting overseas manufacturers. It cultivated its local knowledge economy. It even marketed itself as a destination for nouveau-riche Chinese tourists.

Finally, network capitalism does not place heavy emphasis on politics, for the role of government and politicians is to clear the way for efficient market and capitalist activities. Again, Singapore is the perfect example. Singapore is nominally a democratic society, but one unfamiliar to Americans in the details. It is, in effect, a one-party democracy. Its inhabitants expect their government to be corruption-free and pro-business, and so long as it is, no one really has the time, interest, or constituency to mount a real opposition to the network in power.

1 Features of Three Capitalist Forms

	Entrepreneurial Capitalism	Cultural Capitalism	Network Capitalism
Typical country	United States	France	Singapore
Key driver	Innovation	Cultural continuity	Pragmatic materialism
Key unit	Individual	Region	Local community network (extended family/city-state)
Key value	Independence	Tradition	Family stability
Timeframe	1–2 quarters	Decades	The present in the service of the next generation
Politics	Free market	Market regulation	Realpolitik
Guiding philosophy	Novelty worship	Cultural idealism	Social and economic pragmatism
Stance toward technology	Push the envelope	Evaluate cultural effects	Use to advance strategic economic and social objectives
Guiding metaphor	Tilt-up building: the pieces come together quickly	Swiss cow: icons preserve cultural meanings	Shopping mall: merchants create a global agora for the local populace

GLOBAL PRODUCTION NETWORKS DRIVE GROWTH

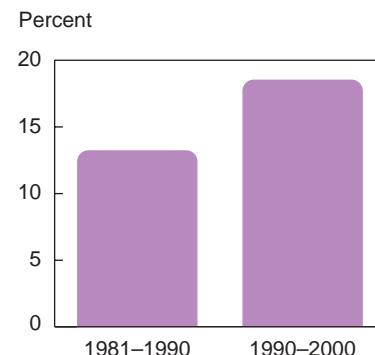
The World Bank reports that a growing share of global trade is happening through networks in which portions of a product are produced by a number of different suppliers globally. And as production networks become the growth infrastructure for the global economy, those cultures that excel in managing networks will likely have the competitive advantage.

Worldwide exports of parts and components—which grew about 2% faster than total manufactured exports from 1981–2000—can serve as an indicator of the growth of international production networks. As a share of all exports, parts and components grew 13.5% from 1981–1990 and 18.5% from 1990–2000.

For United States corporations and their international affiliates, the growth of production networks has been greatest in electronics, transportation equipment, and industrial machinery. Electronics parts imports, for example, grew by more than 5% from 1982–1994. And exports of industrial equipment by U.S. foreign affiliates (as a share of total affiliate sales) grew nearly 20% from 1982–1998.

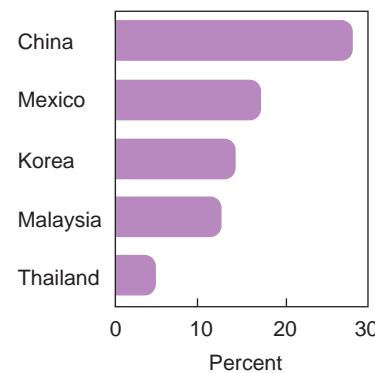
Meanwhile, among developing nations, four of the five leading parts and components exporters are Asian countries, with China leading the way—with nearly 30% of the pie in 2000. Furthermore, China appears to be winning a diplomatic battle in Asia: commenting on the “new affinity” developing between the once-feared China and the rest of Asia, the *New York Times* quotes a Malaysian lawyer and Fulbright scholar as saying, “The American ‘obsession’ with terror seems tedious to Asians. ... We’ve all got to live, we’ve all got to make money. ... The Chinese want to make money and so do we.”

2 Growth of Exports of Parts and Components Worldwide



Source: World Bank, *Global Economic Prospects and the Developing Countries*, 2003.

3 Percent Share of Total Developing Country Exports of Parts and Components, 2000



Source: United Nations, Comtrade; World Bank.

AIRBUS: CASE STUDY IN STRATEGIC ADVANTAGE

Airbus provides insight into how differences in capitalist forms will translate into strategic advantages for some companies or regions.

Long dismissed by the U.S. aerospace industry, Airbus is now at least Boeing's equal—and some argue that it is actually pulling ahead. In 2003, Airbus delivered more airplanes than Boeing; in 2004, it will begin assembling the first A380, a super-jumbo that will dwarf Boeing's 747. Boeing elected not to build a follow-on to the 747 and has derided the A380 as a commercial disaster-in-the-making. But Airbus already has over 120 orders for the A380.

Could Boeing have built a super-jumbo if it had wanted to? Possibly not. It lacks a capital structure that would give it

the long, patient money Airbus was afforded. In fact, Boeing had to abandon its plans to build the Sonic eCruiser, an innovative but risky near-supersonic model, because the company simply could not make the case for profitability in any timeframe that made meaningful financial sense in the U.S. system.

Of course, Boeing has long complained that Airbus was getting unfair subsidies—and points out that were it not for the government monies it received over the first 25 years of its existence, Airbus would have gone out of business. Airbus, for its part, argues that Boeing also receives substantial subsidies, but in the form of lucrative defense contracts.

This small argument hints at the sort of conflicts to come in a world of diverging capitalist systems.

4 Airbus' A380



Source: Airbus



The Airbus A380 builds on the strength of scale and long development timeframes inherent in European capitalism.

5 Boeing's Sonic eCruiser



Source: Boeing



Boeing's Sonic eCruiser was conceived as a bold new vision of an aircraft capable of space flight, but was abandoned for lack of a near-term profitability model.

As capitalism takes a variety of new and unexpected forms over the next few decades, corporate strategy will also need to diversify to respond to new business practices and new political contexts.

Q: | How does the fragmentation of capitalism change the practice of business strategy?

The most obvious impacts of divergent forms of capitalism are differences in strategic viewpoints—and strategic advantages. Clearly strategy will be linked to different critical timeframes for different regions, and learning to work local timeframes into long-term, global strategy will be essential. Similarly, understanding the different goals of different regional forms will help companies establish more successful cross-regional alliances.

No one should assume that capitalism presupposes a particular set of political goals. Furthermore, different political goals will play out in different regulatory standards by region. These standards will often be designed to protect the deep cultural values of the region and will be the source of ongoing conflicts and frustrations for global companies. Learning to anticipate the regulatory biases of a region will be crucial to developing regional strategies.

Q: | How do global companies adapt to differences in marketplaces that are driven by regional “flavors” of capitalism?

A clear trend in global business is the increasing impact of multiple—and changing—contexts on a corporation. Where companies used to focus on core competences, they will need to focus increasingly on contextual competencies, matching their strengths to the markets they wish to succeed in.

In the same way that consumer markets are fragmenting, global markets will also individuate, challenging some basic assumptions about how to organize—and how to measure—their operations. For example, while traditional segmentation of economies into various manufacturing and service sectors may provide a broad-brush picture of the global economy, regional strategies may need to re-think

basic business categories. If Brian Arthur is right that tomorrow’s offerings will be “dreamed up in the United States, interpreted in Europe, and turned into consumer products in China,” what does that suggest for a finer analysis of U.S. industry? Certainly design will continue to grow in importance as a sector, as will novel ways of segmenting and measuring design processes.

Also, do not underestimate the impact at the daily level for individual executives. Accepted business custom in one region may amount to prohibited action in another, with the risk that one’s actions will be judged very differently by management located elsewhere.

Q: | How will the growth of network capitalism in Asia ultimately alter the practice of businesses worldwide?

Asia is on its way to becoming a primary node—perhaps the primary node—of the global economy. (See our forecast on “Redistributed Resources” in this volume.) Its own native inclination toward network capitalism will intersect with global communication technologies that support the rapid formation, deployment, and analysis of social networks, distribution networks, and global production networks. This intersection will challenge global companies to become proficient at networked processes, from individual worker practices to strategic networking.

At the same time, it is clear that technology is beginning to provide the tools for developing this proficiency, while mathematics and other disciplines are providing trenchant new insights into how networks function as emergent phenomena, how they scale, and how they can best be managed to provide ongoing growth and innovation. This is the lasting—and transformative—result of what is often called the dotcom debacle. Far from being simply an over-hyped marketplace, it was the opening gambit in a new epoch of human economic strategy.

Global travel is getting easier every day, and the growing ubiquity of digital media has given entire populations an intimate window on life in the rest of the world. Cybersurfing netizens know vastly more about life in, say, Seoul or Kathmandu than their parents did. As a result, they're not just more inclined to visit; they may well move there.

At the vanguard of the globally mobile are retiring boomers. Their parents may have retired to a golf community in Florida, but these new retirees are considering the entire planet—and golf is not in their game plan at all.

The baby
boomers are
thinking globally
as they retire—
and they're
moving less for
reasons of
money than for
meaning

Retirement: An Existential Migration

Here's an iconic boomer retiree: she's a 50-something paramedic nurse from California, and she is hunting for the right town in Mexico to settle into. Do cost and climate matter? Of course. But what is more important is finding a place where she can pursue a new pro bono career in rural medicine. She shudders at the thought of ending up in a Sunbelt "fogey farm." For her, retirement is reaching out. It is the latest step in a life that has always pushed the edges.

Not all retirees will move to Mexico, or even abroad. But their retirement choices will continue the search for meaning that began with the hippies in the 1960s—and to understand this search is to understand the culture of aging in developed nations.

The Search: A Taxonomy of the New Hippies

The hippies of the 1960s were a small but influential population. The new hippies will have more money and more ways of expressing "hip."

The Fast Rich. These are the young wealthy who can—and will—retire early, but they'll quickly hit an existential "what's next?" crisis. They're the ones who will fail quickly at conventional retirement; after a few months of travel, they'll be at work on new and more ambitious plans. They'll re-imagine retirement with the same agenda-driven hyperactivity they brought to their working lives.

The Keep-Working Folk. These are middle class refugees who haven't saved enough for retirement and realize they must keep working to maintain their lifestyle. But having put off personal goals while working, they will now resolve to have their ideals and their paycheck too. They'll move to low-cost regions that afford both the desired lifestyle and a community of values—and they'll continue working, perhaps by commuting through cyberspace or by concocting an entirely new local career.

The Cultural Seekers. Deferred youthful quests come to the fore with this group. The young hash-toking hippies who searched in Nepal and trekked Afghanistan in the '70s return to these earlier haunts—this time smoking less and searching more. The first wave is already beginning to turn up in the Bamiyan Valley to inspect the broken remains of the Great Buddhas destroyed by the Taliban in Afghanistan.

The Winnebago Tribe. These flocks who migrate north in summer and south in winter are already commonplace. But the increased pervasiveness of the wireless Internet and fuel cells will make them mainstream. With wireless, they need not sacrifice full-time connectivity, and with fuel cells, they can enjoy 110-volt power wherever they are. Nomadism is no longer 12-volt camping, but a full-time lifestyle.

These are the young old, and they will remake culture in the coming decades as surely as they did in their teens.

—Paul Saffo and Alex Soojung-Kim Pang



PERSPECTIVES 2004

SR-829

© 2004 Institute for the Future.
All rights reserved.
Reproduction is prohibited
without written permission.

www.iftf.org



O V E R V I E W

Interview: Theodore Roszak



Ted takes the long view of aging

Q: | Why did you title your book *The Longevity Revolution*? What's "revolutionary" about longevity?

The Industrial Revolution began in the 1700s, but the term "industrial revolution" was not coined until 1884. Only after the term had been invented were people able to get their minds around what their society had been through, and see some of the parameters and problems, successes and failures. What I have sought to do with the phrase "longevity revolution" is to enrich and deepen the Industrial Revolution by giving it a grand climax. I suspect that in another century, people will see the Industrial Revolution as a long run-up to something much bigger, more consequential, and more important.

Q: | What's driving the longevity revolution?

The key factor is demographic. People in the industrial world enjoy lengthening life expectancy and better health, and in the course of this century, most will have a life expectancy of 100 years. If that happens, we'll wind up with a new shape to our societies. Right now, we define our lives in terms of youth, adulthood, middle age, and old age. That's going to become inadequate. We'll have to redefine middle age as lasting much longer than it has in the past, and think of old age as having several distinct intervals.

People will also see aging differently than we do today. Aging will no longer be defined primarily by dependency and frailty, or social marginality. As life expectancy extends, perhaps due to breakthroughs in biotechnology, people will eventually spend more of their lives outside the workforce, outside careerist activities, than they have spent in that period of life. Old age will be a more philosophical, more spiritual phase of life, in which people pay more attention to the meaning of life, will look for more worthwhile things to do with their lives, and will have the health and strength to do them.

Q: | Why will people pay more attention to such lofty things?

Most people don't enter old age in some smooth, continuous way. They go through a medical crisis that brings them very close to death, and then brings them back. It's a profoundly transformative, spiritual experience—even eventually society will recognize it as a rite of passage—and it makes you wonder what you're going to do with the gift of another 20 or 30 years. You cannot approach it along standard careerist or occupational lines. It has nothing to do with earning a living, nothing to do with success in the marketplace.

Another important factor is that the baby boomers are aging. When I wrote my book, everyone from my agent to my publisher defined it as "a book for elderly people." At one point I said, think of the audience for this book as Hillary Clinton. Now, would you call Hillary Clinton "elderly"? Would she stand for it? We're not talking about elderly as you understand it, as broken-down, decrepit, and hopeless. We're talking about a different kind of elderly generation. The boomers are healthier, better educated, better traveled, and better read, and as elders they will be a feisty, fighting, more active generation that will return to some of the ideals and sense of social responsibility that it had in its youth.

Q: | What do you see as the responsibilities of elders?

I took the politics of my book from Maggie Kuhn, the founder of the Gray Panthers. She said that the old ought to be guardians of the young: we should be preparing children for a long, healthy, and independent life. I think her definition of what it is to be a true elder is a noble one. One of the groups I've worked with puts it another way: it speaks of elders as being "the guardians of our civic virtues."

Theodore Roszak is Emeritus Professor of History at California State University, Hayward. He is the author of numerous books, most recently a novel of counter culture and bible culture, entitled *The Devil and Daniel Silverman*.

Q: | So far we've talked about how the longevity revolution will transform the way we age, and think about being elderly. How will it affect the rest of society?

Industrial society is aging beyond the values that created it. The values that created industrial society all have to do with the marketplace, competition, and high material expectations. The irony is that we've now produced a larger and larger older generation that is aging beyond all that, that will cultivate a very different set of values that have to do with companionship, friendship, and family. Our society was pretty much catapulted into prosperity by a kind of terrible Social Darwinism. When you're young enough to live a hard life, competition is fine; but when you're older, you need help from family, companions, and friends, and you see how much they all mean. I suggest in my book that we're moving from a world defined by the survival of the fittest, to the survival of the gentlest. Gentleness, compassion, kindness, and caring will be more important than cunning, or competitiveness, or aggression.

Q: | What are the economic consequences of the longevity revolution?

By the middle of the 21st century, every highly developed industrial society in the world will have a health care economy. It will be putting its brains, capital, best technology, and best business sense into health care. Health care will become the economy: people will make fabulous amounts of money off of it, and it will pay off for everyone in the society—not just in material terms, or physical terms, but in spiritual terms.

Q: | How can we afford all this?

In a sense we've already afforded it. In the beginning of the baby boom revolution, most families were supported by one paycheck, earned by the father, while the mother stayed home and raised 3.7 children. If we could afford the baby boomers when they were babies, we can afford them when they're elders, and have the ability to contribute to society and the economy.

The next 10 or 20 years will be a transitional period in which industrial societies struggle to recognize that a long, healthy life is not a cost, but a benefit. We'll focus a lot on costs and liabilities and painful changes in this period, and some people will fight against aging as if it were a calamity. But finally, like coming out of a fog bank, somebody will say, "Look where we are: we're living over 100 years, we have better health than ever before, and while we still have some problems, we're reaping the benefits of a longevity revolution. This is what the Industrial Revolution has all been about. The strain, the suffering, the sacrifice of eight or ten or twelve generations have finally given us something we had previously only been able to think about in utopian terms: the chance to live a long, healthy life. It's here. This is good." Who's going to take that away from us? Who's going to stand up and say we can't afford that?



Alex Pang, a research director at IFTF, asked Roszak to share his insights about the aging of the counter-culture generation.

MORE ELDERLY WORLDWIDE

Around the world, the share of people over 60 is growing. Europe is leading the way in longevity, with almost one quarter of its population expected to be over 60 by 2030. But even the developing countries of Latin America and Asia, which have much higher birthrates than developed nations, can expect their elderly segments to be twice as large by 2030.

These aggregate numbers, however, mask some important differences by country. For example, the Chinese population over 60 will be nearly 20% of the total population, compared to 12% for Asia overall. And because of the size of China's population, this segment will represent about 290 million people compared to only about 85 million over 60 in the United States (24% of the total population).

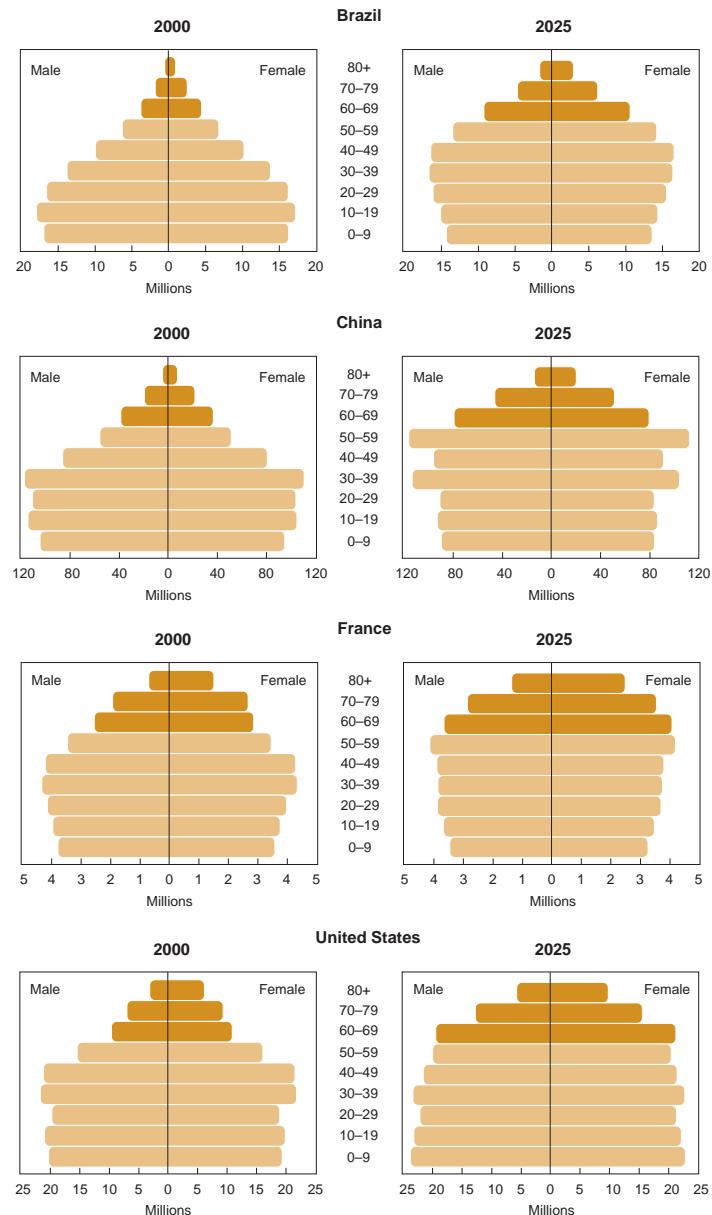
Meanwhile, in France, as in other European countries, the growth of the aging population may justify the reporting of new age cohorts over 80 in the future.

1 Percent of Total Regional Population Over 60

	2000	2015	2030
Europe	16	19	24
North America	13	15	20
Asia	6	8	12
Latin America	6	8	12

Source: United Nations, Population Division.

2 Population Age Cohorts, 2000 and 2025

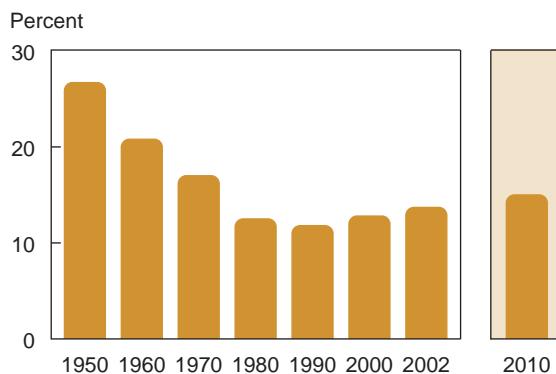


Source: U.S. Census Bureau

THE WORKFORCE IS AGING, TOO

Boomers are not likely to exit the workforce as fast as their parents did. Historically, education, wealth, and health have all been correlated with longer workforce participation. Boomers enjoy all three in greater proportion than their parents did. The result: a slowly aging workforce.

3 Percent of Those 65 and Over in the Workforce, 1950–2010



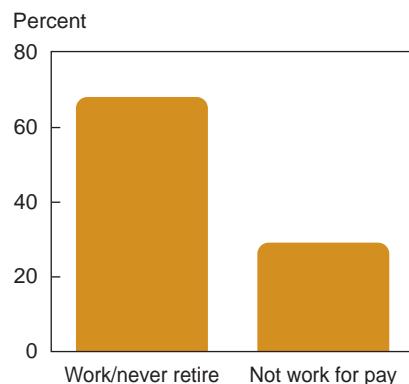
Source: U.S. Bureau of Labor Statistics, *Monthly Labor Review*, Howard Fullerton and Mitra Toosi, "Labor Force Projections to 2010," November 2001.

TODAY'S WORKERS PLAN TO KEEP WORKING

Instead of giving up work, many older Americans are planning to work into their retirement years and beyond. Recent AARP surveys found that most workers aged 50 and older report that they plan to work into their retirement years or never retire, and almost half plan to work into their 70s or beyond. Working offers them an important safety cushion for their financial well-being, especially as the future of Social Security is uncertain, personal savings are on the decline, and few retirees earn pensions.

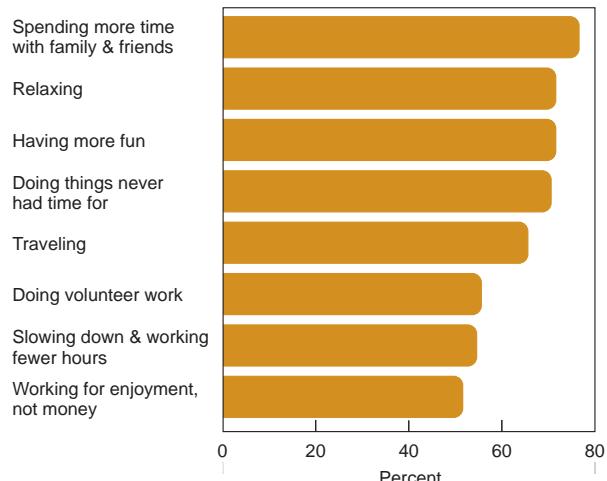
But their reason for continuing to work isn't only to make more money. While the majority of those facing retirement today expect to have some of the traditional benefits of retirement—more fun, and a chance to relax and travel—the most oft-named ingredient of retirement is spending more time with family and friends. And there are other goals as well, such as working for enjoyment rather than money, or doing volunteer and charity work. These may be the early indicators of a shift in retirement values toward "giving back" to society.

4 Percent of Workers Aged 50–70 Who Plan to ... During Their Retirement Years



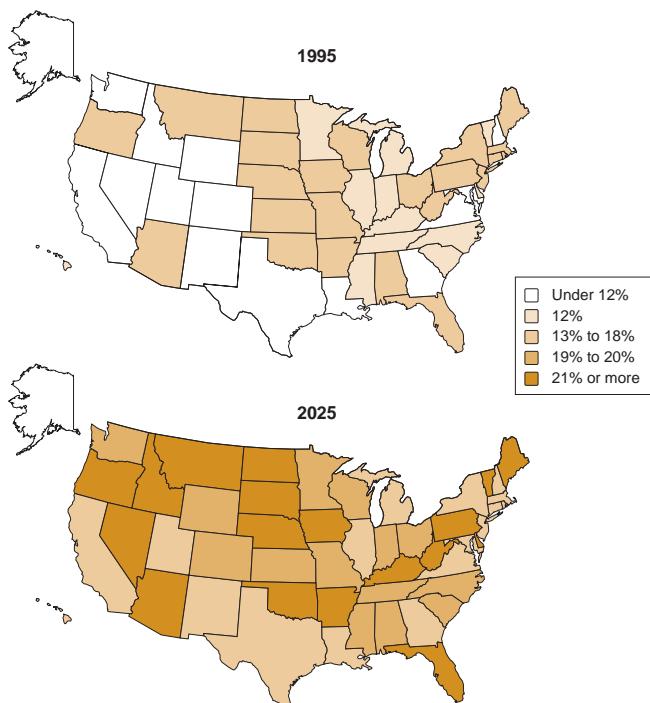
Source: AARP, *Staying Ahead of the Curve*, 2003.

5 Percent of Workers Aged 50–70 Who Say ... Is Somewhat or Very Much a Part of Their Personal Definition of Retirement



Source: AARP, *Staying Ahead of the Curve*, 2003.

6 Percent of State Population 65 and Over, 1995 and 2025



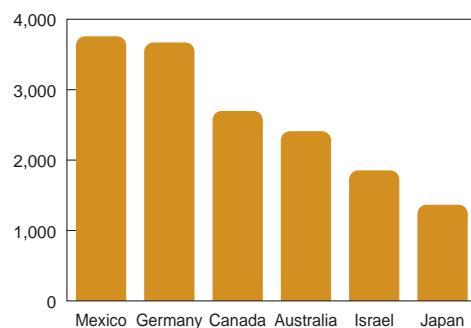
Source: U.S. Census Bureau, *Population Projections: States, 1995–2025*.

7 States with 20% or Greater Increase in Their 65 and Over Population, 1990–2000



Source: U.S. Census Bureau

8 Number of Native-Born Americans Emigrating Annually ... in the 1990s



Source: Gibbs, Harper, Rubin, and Shin, "Evaluating Components of International Migration: Native Emigrants," U.S. Census Bureau 2003.

WHERE U.S. ELDERS WILL LIVE

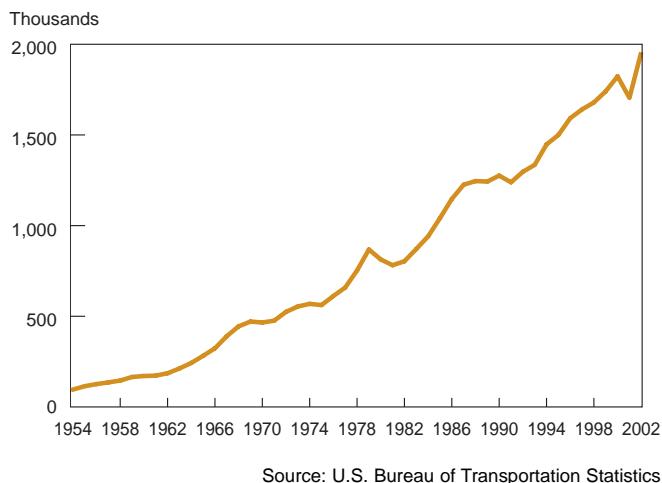
Over the next two decades, virtually every state in the United States will see an increase in people over 65. And the “most elderly states” will not be limited to the traditional retirement states of Florida and Arizona. In fact, many states in the Midwest, South, and Mountain West will rival these retirement states with more than 21% of their population over 65. Already, the Mountain West has seen its elderly population grow more than 20% in just ten years.

These estimates are, of course, based on historical population and migration statistics and don’t anticipate any of the cultural changes that the boomers are likely to introduce.

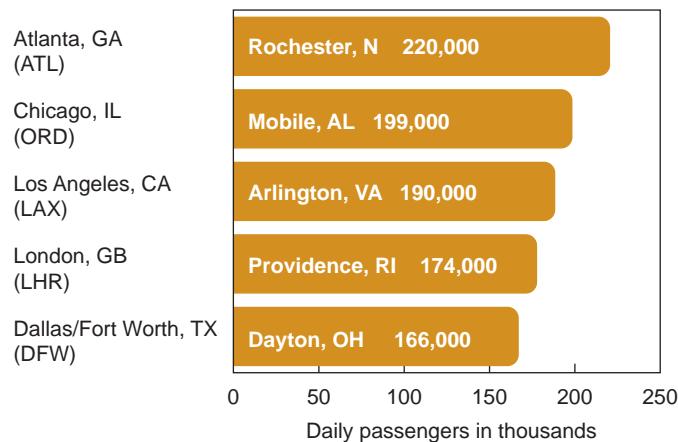
MORE U.S. CITIZENS LIVE ABROAD

While the number of native-born Americans living abroad is quite small—it appears to have grown slightly each year over the last decade or so—reaching an annual total of about 17,000 emigrants in the late 1990s. (It’s difficult to estimate the actual numbers because of the lack of consistent data.) The top destination appears to be Mexico, with Germany a close second.

9 Average Daily Passenger Traffic on U.S. Air Carriers, 1954–2002

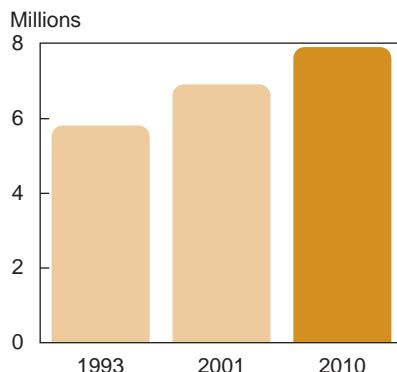


10 Average Number of Passengers per Day in Airports Compared to City Populations, 2000



The typical ▶
RV owner in 2001 was
49 years old, married,
and had \$56,000
in annual income.

11 Millions of Registered Recreation Vehicles



Source: University of Michigan Survey Research Center, *The RV Consumer: A Demographic Profile*. Recreation Vehicle Industry Association, 2001.

CITIZENS OF FLIGHT: AIRPORTS AS CITIES

When the boomers were kids, fewer than 100,000 people flew on U.S. commercial flights on any given day. But those same kids grew up to become part of a horde of nearly 2 million passengers per day today. And as they look forward to retirement, they're likely to continue their peripatetic lifestyle: almost 70% view retirement as providing a "chance to travel."

Meanwhile, airports themselves have become small cities. At any given moment, the busiest U.S. airports have to deal with the same number of people as cities like Rochester, New York, or Providence, Rhode Island.

CITIZENS OF THE ROAD: BOOMERS BUY RVs

Sales of recreational vehicles, already in the millions, are expected to continue to grow over the next decade, driven by boomers. Nearly 25% of households headed by 35–54 year-olds (today's boomers) planned to buy an RV within the next three years, according to a 2001 survey by the University of Michigan Survey Research Center.

Among the top-of-mind services required by aging populations are health, transportation, financial management, and entertainment. These will definitely be top of mind for the aging boomers, but they will put their own distinctive spin on them as they redefine old age as mobile and agile.

Q: | How will boomer mobility change business-to-consumer communication practices?

Without a doubt, online channels will continue to be important for reaching nomadic aging boomers. IFTF surveys find that boomers rival digitally literate youth in terms of Internet connectivity. However, nomads also need physical goods—and therefore a fixed shipping address. As this population grows, companies like FedEx and UPS might well offer the civilian equivalent of the Air/Army Post Office (APO). These fixed addresses would follow individuals wherever they go, and forward thinking companies might anticipate new ways to use these addresses to rationalize marketing, distribution, and services.

Q: | How can companies and communities support “geezer raves?”

A growing mobile retiree population must converge somewhere from time to time—imagine retiree smart mobs descending, like a graying group of Hell’s Angels, on a particular community. Imagine also the challenges to local infrastructures. Locales such as St. Luis Potosí in Mexico already suffer the inevitable tensions of a large ex-patriate American retiree population coexisting with a younger and poorer local population. Within the United States, places like “Slab City” (www.slabcity.org) are springing up with uncertain effects on the local environment.

These migration patterns suggest an opportunity for companies to work with communities to develop ad hoc infrastructures and services that meet the needs of both the sedentary and migrant populations.

Q: | How will volunteer organizations change as retirement patterns change—and what are the implications for businesses?

In the equivalent of corporate brain drain, volunteer organizations that previously counted on retirees may find that their volunteers have chosen second careers or second countries in favor of their local charity. On the other hand, corporations may find that the networks of their mobile alums provide new ways to become community players beyond their local communities.

Q: | What new products and services will boomers need abroad—and how will they open new markets to global companies?

Émigrés almost always want a taste of home. Just as migrant workers in the United States have served as a channel for opening markets in their home countries, ex-patriate mobile boomers, purchasing U.S. goods from abroad, could become nodes in new diffusion networks. They could challenge geographic branding, conferring advantage on those companies that develop network branding.

These émigrés will also become increasingly sophisticated at international trade. Just as corporations did two decades ago, they will learn to game international markets, take advantage of currency differentials, and develop international financial portfolios. To do this, they will need more globally oriented services—from financial services to online bartering. And these services will need to be targeted not to a homogeneous “elderly” population, but to distinct and well-defined segments of the mobile boomers.

New delivery services

Ad hoc infrastructures

New volunteer patterns

International financial services

Fragmentation of the aging population

Over the last half century, large corporations have emerged as transnational organizations—subject to the laws of many countries but also enjoying diverse rights and privileges across nation-states. This transnational status has allowed them to pick and choose among various countries to create a kind of “cafeteria citizenship” that affords them the best legal and political environment for growth.

In creating the infrastructure for their multinational operations—and in managing their global workforce—they have paved the way for individuals to pick and choose in a similar way. Today, the rights and responsibilities of citizenship are being unbundled, and the challenge to states is to build a common civic culture that is inclusive of increasingly complex ways of belonging.

Citizenship, unbundled from geography, is being redefined by new rights and responsibilities

Job Mobility and Migration: Citizens of Economic Self-Interest

The global job market has created a worldwide migration, with many more people from developing nations seeking at least some benefits of citizenship in developed countries. These workers may be rich or poor, and their ability to navigate the cafeteria line of citizenship will vary accordingly. Some will accrue great advantage from their new affiliations; others will struggle to acquire basic protections and services. Both will change the meaning of citizenship in their host countries as well as their countries of origin.

Meanwhile, many workers from the richer nations are looking for ways to convert their retirement pensions into a better lifestyle in less rich nations. Renegotiating citizenship rights thus becomes an opportunity—or necessity—of retirement.

Online Citizenship: Citizens of Affinity

The Internet has created a digital landscape for people of like minds to express their sense of belonging whether to a political cause, an ethnic culture, or a health condition. This technology can help people mobilize global political action, as exemplified by the global peace demonstrations against the Iraq war in February 2003. But it also tends to fragment the collective identity upon which citizenship has traditionally been based. It's not easy to create a common civic identity through the Internet, which tends to favor multiple perspectives over any particular objective truth.

Diversity: Citizens of History

The result of worldwide job migration and a global Internet is not a homogenization of culture but rather increasingly diverse local communities. Today, children worldwide are more likely to share classrooms with those who have different ethnic and lifestyle histories. In these classrooms, the vision of the right kind of education to prepare children to become “good citizens” has changed. Multicultural curricula and language immersion programs in developed countries are indicators of the fragmentation of a once-unified educational vision.

In response, many communities have reached into their history to reinvigorate their identities in the present. The resurgence of local languages is an example: Gaelic, almost extinguished just a decade ago, is once again being taught to children in Ireland. And *even* the way that history is written today favors multiple perspectives—such as women’s history—over a single compelling narrative.

Together, these trends will challenge communities, states, and global organizations to reexamine not only citizenship rights and responsibilities but perhaps even their own sovereignty.

—Lyn Jeffery and Rod Falcon



PERSPECTIVES 2004

SR-829

© 2004 Institute for the Future.
All rights reserved.
Reproduction is prohibited
without written permission.

www.iftf.org



O V E R V I E W

Interview: Aihwa Ong



Aihwa describes the new “latitudes of citizenship” that cut across national borders

Q: | In your 1999 book, *Flexible Citizenship*, you described the complex migration and investment strategies of highly mobile Asian elites—wealthy Chinese from Taiwan, Hong Kong, or mainland China who are very good at leveraging the legal and financial benefits of citizenship in different countries. How is citizenship different for such people?

In general, globally circulating managerial people enjoy a lot of benefits and even rights, regardless of their citizenship to a place. Sometimes their given rights can engender other rights. For instance, if I am an American and I go to Africa, I could get certain rights and benefits automatically because I'm an American and I come from an affluent society. But if I were from a poor country, I wouldn't. There's a disembedding of rights and benefits, or to put it another way, there's a mobility, a portability. You can take your citizenship with you, like you take an American Express card with you, and it has effects in other places. Traditional notions of legal citizenship for many of these mobile actors are actually no barrier to their transnational activities.

So there's a lateralization that cuts right across national borders—what I call “latitudes of citizenship.” We're so used to thinking about citizenship as within the borders of the nation, but I see layers of populations that are floating, that are mobile, that actually carry their rights and benefits with them.

Q: | In your most recent work, *Buddha Is Hiding*, you write about the “other Asians,” people like the Cambodian refugees who work part time as subcontractors for California's high tech industries. You talk about them as having a very different experience of citizenship, regardless of their technical citizenship status. What kind of a position do these populations occupy within those “latitudes of citizenship.”

These other less capitalized citizens often don't even enjoy citizenship rights. This has always been the case. But I think the problem is actually getting worse for poor people because of the stripping down and dismantling of the welfare state and all the many different forms of welfare coverage. For these people who are part-time workers—and their ranks are increasing—they live in a demi-monde, and they work in hidden subterranean situations. They are not unionized. American unions cannot reach them for all kinds of reasons. And they have no rights.

Q: | In *Buddha Is Hiding*, you write, “Asian managers have emerged as ideal citizens for the high tech era. These new ideal citizens may not yet have internalized the values of the Constitution, liberty, and equality, but what seems paramount is their embodiment of border-spanning knowledge, skill, and capital.” Is this what you mean by the spiritual hollowing out of citizenship?

The nation-state is only a few hundred years old, and the whole national project was to habituate and teach people to be similar kinds of citizens. That has totally unraveled. It's too hard. People may insist on this old idea of citizenship, but actually everything has shifted. Governments are realizing that the claims you can make on citizens are no longer the important thing; they are actually constrained and restricted. In fact, governments want to have access to all kinds of populations. The goal is to attract them and bring them in, rather than try to build up a loyal group of people that you have to protect.

Aihwa Ong is Professor of Anthropology at the University of California, Berkeley. She is the author of numerous works on contemporary capitalism, transnational regimes, and citizenship in Southeast Asia, China, and the United States.

So many societies, like Singapore, are not interested in the entire population. The traditional nation-state was absolutely invested, even though it may have failed, in the objective of taking care of the entire population. But increasingly, neoliberal strategies emphasize that you do not do that. It's a waste of time and money and energy. You have people take care of themselves. You have them self-capitalize.

Q: | Are there other kinds of citizenship or alliances that are important to consider?

There arises the need to think of citizenship in other ways, not just as a relationship between citizenship and state. The most obvious rethinking around citizenship is the whole question of how it is defined not only by the state but by civil society. For instance, the rights-driven strategies of NGOs are in fact making citizenship-like claims on behalf of people who are left out of some equation. There's a lot of interest in multilateral agencies and more rights for people who are either stateless or marginalized in their countries.

And then there's also the idea of citizenship vis-à-vis a community. So you may not be an American, but if you live in a community, you may be very active in the PTA, the home association, and so on. If you are very involved in the institutions of your community, you do constitute a sort of cosmopolitan citizenry in a particular site.

Or one can think about citizenship in the sense of being citizens of particular communities that have the capacity to be self-governing. So if you think about your town or other places, they have all kinds of rules and regulations about zoning, access to the freeway, schools, who can buy things, a whole spectrum of things that are actually rigorously regulated. And then they make claims, as a single community, for themselves. In a sense these communities become like citizens. They make claims.

Recently, Nikolas Rose has written about something called "biological citizenship:" citizenship framed in biological terms. If I have Parkinson's disease and I get

together with other patients, it's a kind of community of adversity, but really around our biological condition. We accumulate information on Parkinson's, we form an Internet connection, we read up on the scholarship, we contest findings, we give money for particular research, we network with people in England. So there's a biological citizenship coming out of these patient networks.

I also think that corporations more and more take on the work of citizenship. In advanced liberal societies it is not the state that does this, it is the diversity of institutions, including corporations and NGOs. These are the places where you actually learn to become a citizen. I think that in the future, there's just a diversity of ways to be a citizen. For instance, I belong to my upscale suburban community. Occasionally I may feel I belong to the United States of America but really this town is where I belong. This diversity of ways of belonging attenuates somewhat the significance of traditional citizenship.

My sense is that governments are getting less interested in citizenship in the traditional sense. It is disturbing, but new ways of organizing society are emerging. Maybe there are more efficient ways of doing it. Maybe, in fact, governance and security should be at the community level. Maybe indeed corporations and the local community and local government should get together and help these poor people, regardless of their rights.



Lyn Jeffery, a research director at IFTF, asked Aihwa about the changing meaning of citizenship in a world of globalization.

CITIZENSHIP UNBUNDLING

Transnational forces—from globalization and the Internet to the resurgence of religion—are uncoupling citizenship rights and responsibilities from governments. These rights and responsibilities are being dispersed across a variety of focal points for citizenship. Understanding these focal points, and the shifts they are undergoing, can provide insight into current political debates as well as future directions in social organization.

1 Three Emerging Types of Citizenship

	CITIZENS OF WEALTH	CITIZENS OF AFFINITY	CITIZENS OF PLACE
KEY SHIFT	From Migrant Workers to Migrant Wealth	From a Primary Way of Belonging to Many Ways of Belonging	From Geo-Locales to Physical–Digital Spaces
RIGHTS	<ul style="list-style-type: none"> ▶ Right to prosper ▶ Right to “game” financial institutions and structures ▶ Right to best quality for price ▶ Right to minimize financial risk and liability ▶ Consumer rights ▶ Right to protection of personal wealth 	<ul style="list-style-type: none"> ▶ Right to belong ▶ Right to define membership ▶ Right to belong to multiple affinities ▶ Right to doctrinal education (such as Creationism vs. Darwinism) ▶ Right to lifestyle choices ▶ Right to health choices 	<ul style="list-style-type: none"> ▶ Right to assemble ▶ Right to protect personal, physical, and digital property ▶ Right to communicate and publish ▶ Right to access information ▶ Right to privacy
RESPONSIBILITIES	<ul style="list-style-type: none"> ▶ Generate wealth ▶ Observe official currencies, exchange rates, and international trade laws ▶ Innovate value ▶ Access and organize labor and talent across borders 	<ul style="list-style-type: none"> ▶ Contribute to the commons ▶ Uphold tenets of the group ▶ Manage multiple identities 	<ul style="list-style-type: none"> ▶ Maintain a shared infrastructure ▶ Make new knowledge available in public domain ▶ Allow others access to oneself
PRIMARY SUPPORTING STRUCTURES	<ul style="list-style-type: none"> ▶ Corporations and national governments ▶ Diaspora networks ▶ International trade laws 	<ul style="list-style-type: none"> ▶ Internet and NGOs ▶ Lifestyle laws (e.g., food, tobacco, marriage, funereal) 	<ul style="list-style-type: none"> ▶ Global information systems and local communities ▶ Connectivity standards and access laws

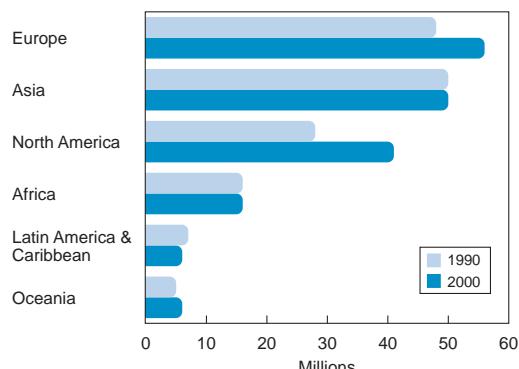
MIGRANTS CHOOSE BOTH DEVELOPED AND DEVELOPING COUNTRIES

The total number of migrants worldwide is 175 million, up from 154 million in 1990. While immigration is growing fastest in North America, Europe has the largest migrant population. The Institute for the Future forecasts that the world's migrant population will reach more than 280 million, or 3.8% of the total population, in 2010.

Immigration is not limited to developed countries, however. In 2000, 40% of the world's migrants lived in developing countries.

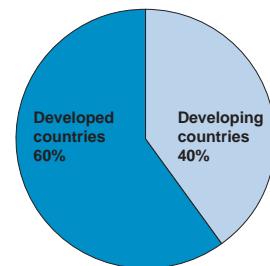
The United States is the country with the largest number of immigrants, about 28 million in 2000, and its migrant population is growing the fastest. The Russian Federation is a distant second, with more than 13 million immigrants living there in 2000. The rapid growth of U.S. immigrants masks some important global facts about migrants: they actually occupy the largest share of populations in Saudi Arabia, Australia, and Canada.

2 Millions of Migrants by Region



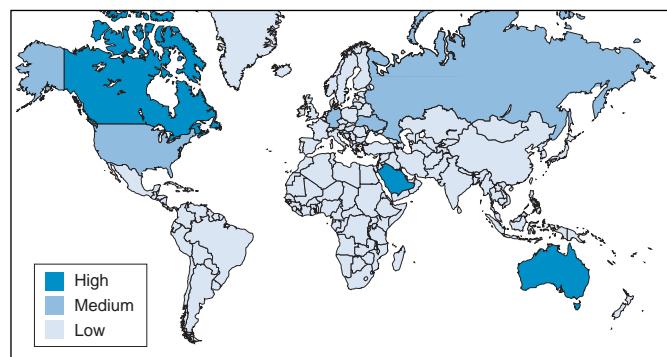
Source: United Nations, *International Migration Report 2002*.

3 Percent of World's Migrants by Development Status of Adopted Country, 2000



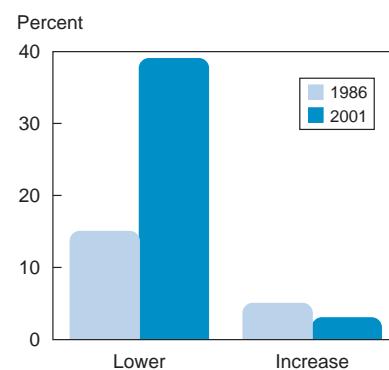
Source: United Nations, *International Migration Report 2002*.

4 Share of Population That Are Migrants, 2000



Source: United Nations, *International Migration Report 2002*.

5 Percent of Countries with Policies to ... Immigration Levels



Source: United Nations, *International Migration Report 2002*.

MORE COUNTRIES TRY TO LIMIT IMMIGRATION

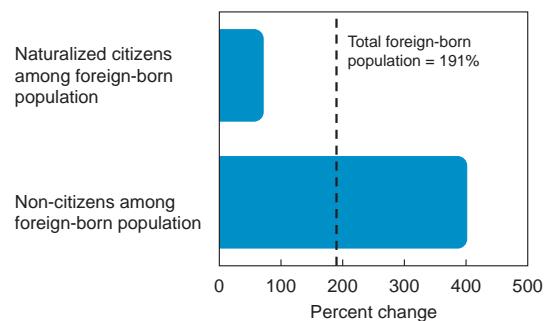
In response to the growth of migrant populations, many countries are implementing policies to reduce the number of immigrants. From 1986 to 2001, the percent of countries with policies to restrict immigration more than doubled.

A small percentage of countries actually have policies to attract the "right" immigrants. H1B visas in the United States that are for temporary workers with certain skills, especially high tech skills, are an example.

FEWER IMMIGRANTS BECOME CITIZENS

As global mobility increases, fewer migrants are becoming citizens in their new country of residence. In the United States, while the total foreign-born population increased 191%, the population of naturalized migrants grew 71% between 1970 and 2000, while those who remained non-citizens grew 401%.

6 Percent Change Among the American Foreign-Born Population, 1970–2000

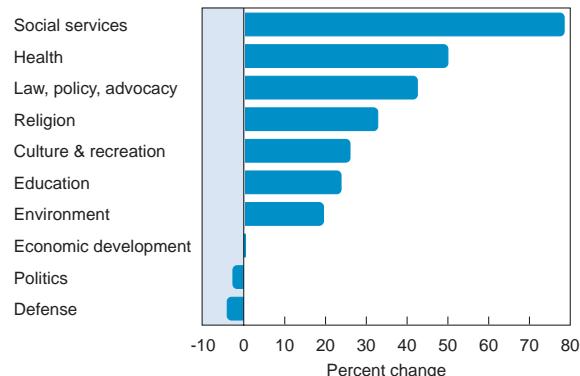


Source: U.S. Census Bureau, *Profile of the Foreign-Born Population in the United States, 2000*.

NGOS TAKE ON CITIZENSHIP TASKS

As welfare states have been dismantled, non-governmental organizations (NGOs) have taken on increasing responsibility for providing some of the benefits formerly associated with citizenship in a nation—such as promoting economic development, providing basic health services, or just guaranteeing food to eat. Overall, NGOs grew at a rate of about 12% between 1990 and 2000. But the fastest growing categories of NGOs may reflect a shift in responsibility for some services from nation-states to international organizations—as well as the need for cultural and religious belonging unmet by many modern states.

7 Percent Change in Number of ... NGOs, 1990–2000



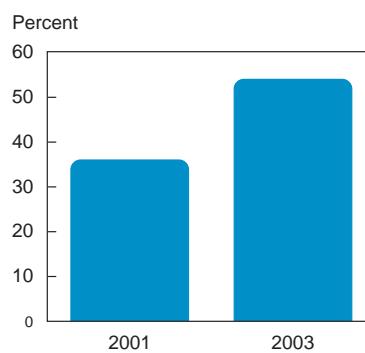
Source: Anheier, H., M. Glasius and M. Kaldor. *Global Civil Society*. Oxford University Press, 2001.

BIOLOGICAL CITIZENSHIP

A rise in chronic disease and obesity, an aging population in many developed countries, and the growing prominence of genomics mean that, increasingly, we are coming to understand and describe ourselves through the lens of biology. Scholars of citizenship are talking about the notion of “biological citizenship,” which refers to communities that advocate for themselves on the basis of a common biological experience or classification.

Massive environmental disasters like Chernobyl and Bhopal have been one catalyst for such bio-citizenship, translating directly into new classes of bio-citizens and responsibilities for local and national governments. Meanwhile, bio-citizens such as those in the HIV/AIDS or bipolar disorder communities seek out specialized scientific and medical knowledge of their conditions and actively campaign for better treatment, an end to stigma, and access to better services. In the next decade, biological belonging will become more and more important as a means of negotiating citizens’ rights, duties, and moral obligations.

8 Percent of U.S. Internet Users That Visit Medical Information Web Sites



Source: Pew Internet and American Life Project, *Internet Health Resources*, July 2003.

CITIZENSHIP EDUCATION RE-EXAMINED

In the next decade, states will be challenged to integrate an increasingly fragmented citizenry into a common civic culture. If they don't figure out how to do this, problems of governance will become more acute.

Activists at organizations like UNESCO's Asia-Pacific Network for International Education and Values Education are at the vanguard of a new network of citizenship educators. Made up of a global patchwork of governmental, grassroots, and corporate efforts, the new citizenship education movement sees a crisis of pervasive ignorance, alienation, and distrust—what the Civics Expert Group in Australia calls the “civic deficit.” A diverse range of responses has emerged, all focused on the question: What kinds of individuals have the capacity to create better futures?

In France and Belgium, civic education is a distinct school discipline, preparing students to live as citizens, in their country, in the EU, and in a complex international world. In China, the state and new enterprises regularly refer to the “low quality” of the citizenry; workers participate in civility training, families participate in local civilization contests. UNESCO sponsors a variety of policy and citizenship curriculum development projects, such as “What Education for What Citizenship.” They focus on “eight citizen characteristics which constitute the traits, skills, and specific competencies citizens of the 21st century will need to cope and manage the undesirable trends and to cultivate and nurture the desirable ones.”

9 Civic Skills Required in the Future

- Ability to approach and look at problems as a member of a global society
- Ability to work with others in a cooperative way and to take responsibility for one's roles and duties within society
- Ability to understand, accept and tolerate cultural differences
- Capacity to think in a critical and systematic way
- Willingness to resolve conflict in a non-violent manner
- Willingness to change one's lifestyle and consumption habits to protect the environment
- Ability to be sensitive toward and to defend human rights, rights of women, ethnic minorities, and so forth
- Willingness and ability to participate in politics at the local, national, and international levels

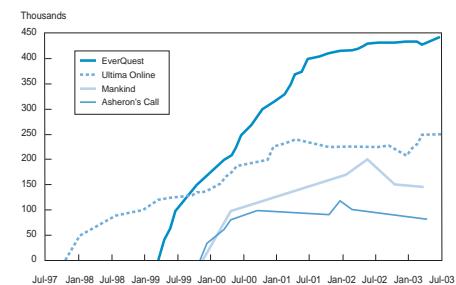
Source: Quisumbing, Lourdes R. Citizenship education for better world societies: A holistic approach. *Proceedings of the 8th UNESCO APEID International Conference on Education*, November 29, 2002, Bangkok.

ONLINE CITIZENSHIP: CLAIMS AND BENEFITS

Online communities are changing the sense of belonging and “citizenship” for millions of people. Online games, for example, create parallel worlds that confer their own rights and responsibilities on participants. Increasingly those rights and responsibilities cross the boundary between the game world and the physical world. As players convert cash they earn in the real world to privileges in the game world, they are experimenting with different kinds of citizenship.

Another impact of the Internet and global telecommunications has been that people don't have to invest in acculturation to their place of residence in the way that they might have in the past. The immediate imperative for new immigrants today is to become integrated into the economic system. With strong communication ties to their home countries or their personal networks, they can postpone broader acculturation or avoid it altogether.

10 Number of Subscribers to Online Gaming Worlds



Source:
<http://pw1.netcom.com/~sirbruce/Subscriptions.html>

As citizenship becomes unbundled—and people negotiate the rights and benefits of new types of citizenship—the legal, political, and market forces that shape today's corporate practice are likely to shift.

Q: | How will consumerism as a citizenship right impact the corporate environment?

In a world where citizenship includes consumer rights—and one in which consumers are actively involved in shaping products and markets—a continued evolution from engaged consumers to politically empowered consumers is likely. And since empowered consumers will be playing in a global marketplace, they are likely to exercise their power across international boundaries, drawing on new rights and responsibilities as citizens of various affinity groups and as citizens of physical-digital spaces. Learning to recognize these cross-border consumer citizens as market segments and adapting products and practices to meet their demands will be a challenge to corporate marketing and legal departments (as will balancing new demands with new and existing consumer laws).

Q: | If social networks are “routes of citizenship,” what issues and opportunities do the new types of citizenship provide for companies?

People increasingly define their sense of belonging by their social networks. These networks, which cross organizational, community, and national boundaries, may be thought of as “routes of citizenship,” and along these routes, people can take advantage of certain rights available in some contexts and not others. This personal picking and choosing will increase the complexity of contract and criminal law as well as copyright and other intellectual property issues, but will also create opportunities for organizations to take advantage of differences in local laws at the individual level as well as the corporate level. Just as companies are beginning to map their enterprise networks as a means to measure their social capital, they might use these maps to examine their networks of citizenship rights and responsibilities.

Q: | How will corporations and NGOs negotiate their responsibilities across the new types of citizenship?

As corporations and NGOs take on more of the traditional burdens of providing for a citizenry—ensuring basic quality-of-life benefits to their members, for example—the opportunity exists for enlightened partnerships in providing for the needs of global citizens. Often these organizations find themselves on opposite sides of the fence, and yet, there are many potentially productive collaborations that could help ensure a healthier economic climate worldwide—once they see themselves as the new civic institutions.

Q: | How can companies avoid the dystopian visions of GATTICA as biotechnology provides a new biological basis for assigning citizenship and other forms of inclusion and exclusion?

Over the next five years, molecular testing will increasingly link people to gene pools that define everything from disease risk to ethnic heritage. In the most positive scenarios, these citizens of genetics will form modern-day tribes that can join together in finding cures to debilitating diseases, in mitigating hereditary disease, and in catalyzing an appreciation for diverse forms of human expression. In the most negative scenarios, these tests could isolate and discriminate against individuals. Companies need to immediately develop policies about gene testing and the use of test results, as well as anticipate the special needs of particular gene pools that they may be required to address.



Global free trade policies are opening the door for more developing nations to enter the world economy—with costs and benefits to both established players and new entrants. Shifting flows of money, goods, resources, and workers are creating new wealth as well as uncertainty and unrest. Even before the dust settles, however, it is already clear that the new global economy will reallocate jobs, shift class structure worldwide, and ultimately alter political leadership in the world.

Jobs, wealth, and political power will shift as the global economy integrates the developing world

Shifting Jobs: Not Just Manufacturing

The United States has seen a steady growth of service jobs for over a half century, while manufacturing jobs have just held their own, often with big slumps in times of recession. Since 1970, however, there has been a slow but real decline in jobs in goods manufacturing as some sectors have moved production to countries with emerging economies.

While the most recent recession has exaggerated the loss of manufacturing jobs, it is clear that some U.S. manufacturing sectors will not recover and will, in fact, continue to lose jobs: the apparel and textile industries are a case in point. In addition, many other sectors are likely to shift their facilities to developing nations, including everything from resin to household appliances.

Meanwhile anecdotes and quantitative data alike suggest that job shifts are not limited to manufacturing. U.S. companies are clearly experimenting with outsourcing and relocating service jobs—such as customer support—to emerging economies. Even high tech jobs have slumped in this recession: computer-system design services (admittedly inflated by the growth of the Internet in the late 1990s) have been the hardest hit. And if the history of manufacturing is an indicator, these lost jobs will not return with recovery.

Shifting Income: New Class Formation

The net effect of this job pattern is to effectively shift the middle class—and its spend-

ing patterns—to developing nations. Here, the growth of even low-paying manufacturing jobs paves the way for the expansion of a middle class, just as it once did in today's industrial nations. Nowhere is this more apparent than in China.

Meanwhile in the industrial world—and especially in the United States—a polarization of income is driving toward a new class structure in which the historical middle class is a smaller share. In its place are two new wealthy classes—the wealthy and the very wealthy—separated by a wide gap from a persistently poor population.

Shifting Leaders: China's Growth

As a result of opening its markets and joining the world economy, China has grown in the 8–10% per year range since 1990, compared to 5% for the United States. If China were to continue this growth, it would have an economy equivalent to the United States today in just 22 years, and it would become the second largest economy by 2020.

While such a sustained growth rate is unlikely, China could be number 2 within a couple decades. Furthermore, its growth is a reflection of the effects of current non-protectionist trade policies. Such policies are likely to continue to shift the wealth and job structures of many nations worldwide over the next 10–20 years—and with those shifts will come new political clout for developing nations, especially those allied with China.

—Scott Vollrath and Kathi Vian





Scott compares growth prospects for the United States and China

Q: | You like to model the impacts of globalization using the principles of the Wealth Effect and the Specialization Effect. Can you explain these principles and how they shape your thinking about globalization?

Globalization and free trade have two direct impacts: the reduction of production costs and the redistribution of resources used to develop goods and services according to relative competencies.

Global corporations are keen on increased globalization to take advantage of the lower production costs, which lead to higher corporate profits. However, consumers also benefit from lower production costs when the savings are passed on to them. So the first impact of globalization is to make both corporations and consumers wealthier. And as they get wealthier, they spend more. The increased spending creates more jobs, in turn. This positive feedback cycle is known as the Wealth Effect.

But globalization also drives a structural realignment of economies along areas of comparative advantage—the redistribution of resources. For example, the United States and other industrialized countries can expect to lose more jobs in low-skilled labor-intensive sectors as laborers in developing countries perform these same tasks for a fraction of the wages. At the same time, the industrialized countries should also experience an increase in jobs where they have a comparative advantage—mainly capital-intensive, highly skilled “innovative” industries such as pharmaceuticals, biotech research, or telecommunication satellites. Developing nations generally cannot compete for these industries, but as their wealth grows, they increase demand for their products. Consequently, this specialization of resources—called the Specialization Effect—will lead to structural changes in the economies of both industrialized and developing nations.

Q: | The United States has been a staunch supporter of globalization and free trade despite its costs. How do you see the costs and benefits—and their future impact on U.S. policy?

The United States, with its mature innovative markets, is a large benefactor of free trade: new highly skilled, innovative jobs will continue to be created via the Specialization Effect. Overall, U.S. consumers will become wealthier as they import cheaper goods and services, spend more on services and high-end products, and thus stimulate the creation of more innovative jobs as well as a service economy.

However, the Specialization Effect also leads to the loss of jobs for many low-skilled laborers, especially from the manufacturing sector. Unfortunately for these workers, the newly created jobs from the Specialization Effect require a highly skilled workforce. As a result, the low-skilled laborers fill the ranks of the unemployed or are forced to accept lower paying jobs in the service economy—already defined as “McJobs” in the *Merriam-Webster Dictionary*.

These laborers—the “structurally stranded”—are the net losers from increased globalization, while the rest of U.S. society experiences net gains. The structurally stranded are very visible losers, while the beneficiaries tend to be less visible; hence, the policy dilemma for U.S. politicians.

Scott Vollrath joined IFTF in 2003, bringing with him a strong background in economics and environmental engineering from MIT and the London School of Economics.

Q: | How will the redistribution of resources impact the Chinese bid for economic leadership?

Since 1990, China's economy has grown twice as fast as the United States'—at a rate of just under 10% per year. This torrid growth rate is due, in large part, to China's increasing economic integration with the rest of the world. Most of its 1.2 billion people are currently subsistence farmers, but China is quickly becoming known as the world's future manufacturing facility. Millions of subsistence farmers are being lured off their land and into urban centers by manufacturing jobs.

There are no structurally stranded in China; low-skilled manufacturing jobs are a step up for farmers, creating an army of wealthier consumers in China. These wealthier consumers spend more, further expanding the country's economic output. The result is that China reaps even larger benefits from globalization and free trade than industrialized countries.

The bottom line is that globalization is causing a structural adjustment to the world's economies. Many of these adjustments have painful side effects such as the loss of manufacturing jobs in industrialized nations and the shift of middle class wealth to developing nations. These losses will, of course, be weighed against the growing wealth of consumers overall, as the redistribution of resources continues with more developing countries entering the global economy.

Q: | Are there downsides for the Chinese? And how will these downsides affect the rest of the world?

The large economic incentive to upgrade labor from the rural agricultural west to the industrial jobs in the urban east is already causing social problems in China.

Migration and relocation of labor are leaving many rural areas underpopulated while urban centers are becoming overpopulated—both fostering undesirable consequences for the standard of living. Also, many NGOs fear the increased exploitation of resources, both natural and human, in China and other developing countries. Higher pollution levels and a net decrease in quality of life are possible. So China, like the United States, will face numerous policy dilemmas as it continues to integrate itself in the world economy.



Kathi Vian, a research director at IFTF, asked Scott how resources might be redistributed as a result of globalization.

U.S. HOUSEHOLD INCOME POLARIZES

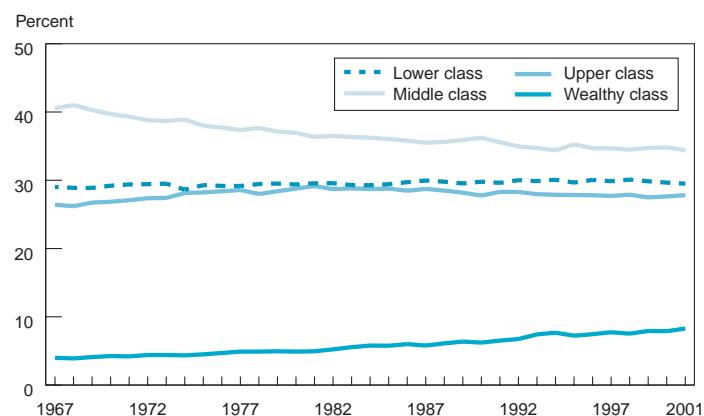
Over the last 35 years in the United States, the wealthy class (defined as households with three times the median annual income) has grown almost as a mirror image of the shrinking middle class. The drop in middle class households is in large part due to the loss of manufacturing jobs due to globalization. Furthermore, the increase in the wealthy class can be attributed to the growth of dual-income households as well as the creation of more high-paying, highly skilled jobs.

This apparent increase in prosperity has been paralleled by an increasingly polarized distribution of wealth in which the top 20% of households have more than 50% of the wealth, and this wealth is disproportionately concentrated in the top few percent.

SERVICES DRIVE THE U.S. ECONOMY

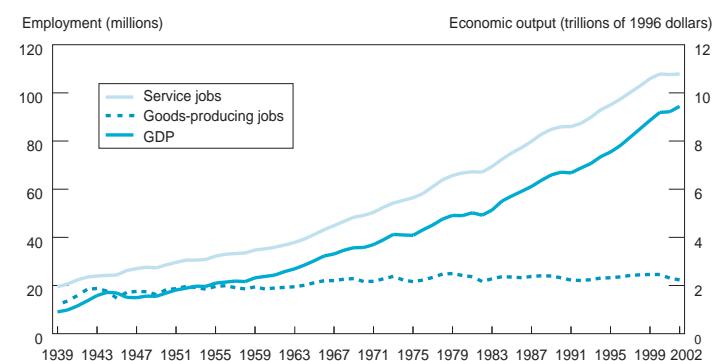
While manufacturing jobs grew nearly 40% over the 20 years following World War II, the real driver of the U.S. economy has been the service sector. Service jobs grew nearly 600% since 1969, with the steepest growth beginning in the 1960s. The United States will continue to build its growth on this sector, but some services jobs—both high-value and low-value—will move to developing countries.

1 Percent of U.S. Households by Income Class



Source: U.S. Census Bureau; U.S. Department of Labor.

2 U.S. Employment vs. Economic Growth



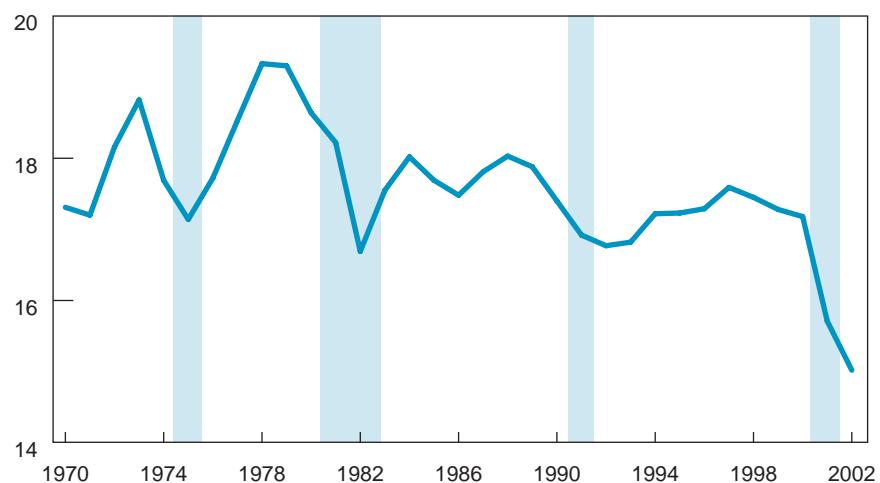
Source: U.S. Bureau of Labor Statistics, 2003.

MANUFACTURING IS SENSITIVE TO ECONOMIC CONDITIONS

Service sector jobs have generally been more resistant than manufacturing jobs to recession losses. Since 1970, the United States has experienced four recessions. During recessions, the manufacturing sector saw a significant erosion of jobs while service sector employment levels remained relatively stable. Upon recovery, both service and manufacturing jobs grew again. However, over the long term, manufacturing employment has been flat, signaling the transition to a high-value service and information-based economy.

3 Manufacturing Employment

Millions



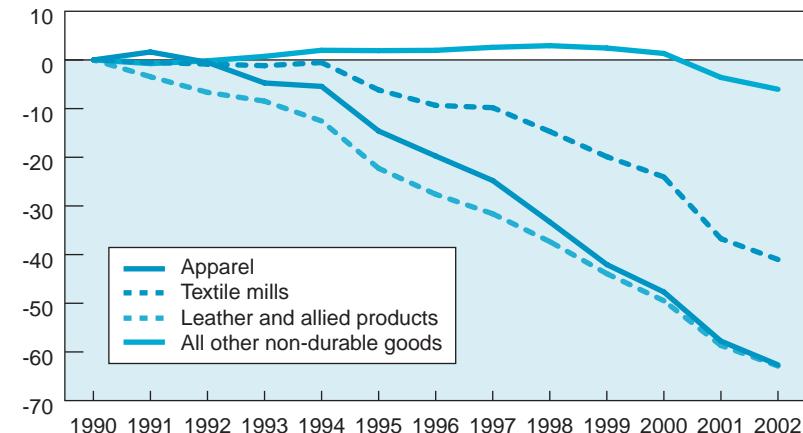
Source: U.S. Bureau of Labor Statistics, 2003.

NONDURABLE GOODS SUBJECT TO GREATEST JOB SHIFTS

The apparel industry is perhaps an example of the fate of many manufacturing jobs in the United States. In 1990, there were 903,000 apparel jobs in the United States. Today there are about 380,000—a decline of 63% in just 13 years.

4 Nondurable Goods Manufacturing Employment

Percent change



Source: U.S. Bureau of Labor Statistics, 2003.

The apparel industry was particularly hard hit because most of its jobs are low-skill and labor-intensive. Cheap global transportation costs and the removal of trade restrictions have created economic incentives for apparel companies to set up shops in developing countries. Related industries—such as textile and leather products—are already following suit. It's highly unlikely that jobs lost in these industries will ever return, absent protectionist policies.

WHICH JOBS ARE MOST LIKELY TO SHIFT?

Industrialized economies cannot compete with labor costs in emerging economies, but likewise, these emerging economies cannot currently compete with the skill set of the labor force in many industrialized nations.

Industrialized nations will therefore continue, over the next decade, to grow their base in jobs that produce innovative or highly differentiated products, where consumers place a high premium on quality. Emerging economies will increasingly take over the production of commodities—products that are differentiated primarily by price.

In the United States, 41% of the sub-industries in the durable goods sector are already experiencing extreme pressure to outsource or relocate. In the nondurable goods sector, the pressure is even greater, with 56% subject to offshoring.

5 Job Relocation: Current and Future

<i>Already Relocated</i>	<i>High Probability of Relocation</i>
Iron & steel mills & ferroalloy production	Clay products & refractories
Other nonferrous metal production	Glass & glass products
Computer & peripheral equipment	Steel products
Audio & video equipment	Alumina & aluminum production
Electronic instruments	Foundries
Electrical equipment	Cutlery & hand tools
Jewelry & silverware	Boilers, tanks, & shipping containers
Dolls, toys, & games	Fabricated metal hardware
Fiber, yarn, & thread mills	Other fabricated metal products
Fabric mills	Commercial & service industry machinery
Textile & fabric finishing mills	Turbine & power transmission equipment
Apparel knitting mills	Household appliances
Cutting & sewing apparel	Other electrical equipment & components
Accessories & other apparel	Office supplies except paper
Footwear	Curtain & linen mills
Leather tanning, finishing, & products	Agricultural chemicals
Pulp, paper, & paperboard mills	Paints, coatings, & adhesives
Basic chemicals	
Resin, rubber, artificial fibers	
Other chemical products	

Source: Institute for the Future

ARE HIGH-TECH JOBS NEXT?

The United States is losing low-skill manufacturing jobs to developing nations while gaining high-skill “innovative” jobs, just as proponents of globalization would predict. From 1990 to 2000, several industry proxies for these innovative jobs showed employment levels doubling and tripling.

However, with the most recent economic downturn, there has been a sharp decrease in the number of jobs in these innovative industries. This dramatic decline could be due to predictable cuts in high-wage jobs during belt-tightening recessions and a natural correction to rapid employment gains. But it could also be a sign that developing nations are beginning to build their base in the lucrative innovative jobs that the U.S. economy has been using to propel itself forward.

For decades, the educational and entrepreneurial opportunities afforded by the United States have led to a brain drain in many developing nations, especially in Asia. Now, however, with increased economic opportunities at home, many

Asians are returning home after gaining their education abroad. Furthermore, as wealth among the developing Asian nations grows, their domestic education infrastructure will also improve. If tens of millions of Chinese and Indian scientists and engineers flood the world labor pool over the next decades, many of the innovative jobs in the current industrialized world are likely to go to them. Thus, although the transition of economic power will take time,

Asia is probably only a couple generations away from becoming the economic hub of the world.

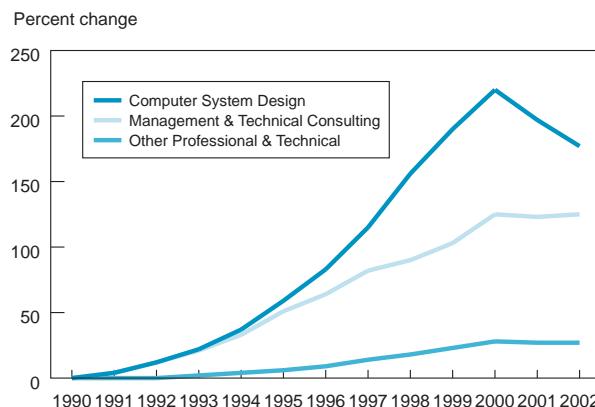
CHINA COULD BE NO. 2 BY 2020

With an annual growth rate of nearly 10% per year, China has tripled its economy in just 13 years and is now the world’s sixth largest economy. Growing at this rate, it would surpass Japan to become the second largest econ-

omy by 2020 and would catch the United States in 46 years (even factoring in the United States’ impressive 5% annual growth rate). Furthermore, due to China’s massive population, it only needs to achieve an average living standard equivalent to \$7,760 for it to equal the current size of the U.S. economy.

Of course, such sustained growth is virtually impossible to achieve. Nevertheless, China is expected to continue to exhibit economic growth that far outpaces any industrialized nation—highlighting its nearly inevitable climb to one of the three largest economies of the world within the next two decades.

6 Professional and Technical Services Employment



Source: U.S. Bureau of Labor Statistics, 2003.

7 Tomorrow's Economic Powers?

	GDP in 2003 (Trillions)	Rank in 2003	CAGR 1990–2003	Projected GDP in 2020 (Trillions)*	Rank in 2020
United States	\$10.9	1	5.0%	\$24.9	1
Japan	\$4.3	2	2.6%	\$6.5	3
Germany	\$2.3	3	3.2%	\$4.0	4
United Kingdom	\$1.7	4	4.4%	\$3.5	5
France	\$1.7	5	2.5%	\$2.6	6
China	\$1.5	6	9.5%	\$6.9	2

*Assuming CAGR equivalent to 1990–2003.

Source: International Monetary Fund, 2003; Institute for the Future.

Shifts in job markets, class structure, and political leadership as a result of global free trade will challenge business strategists with both opportunities and risks.

Q: | How can companies take advantage of shifting job markets in a global economy?

Companies of all kinds will feel the impact of shifting job markets. Strategically, they will have to decide when to take advantage of developing markets, when and how to innovate their offerings, and when to shift their core competencies to remain competitive with emerging players.

In general, jobs that are lower on the value chain will be the best candidates for success in developing countries. In Asia, these will include commoditized products and services, low-skilled labor-intensive jobs, mature industries with little recent innovation, and industries with smaller, lightweight goods. Over time, medium-value service jobs will also be relocated to Asia. Premium high-value jobs will, in general, remain in industrialized nations for the next couple decades. These will tend to cluster in hot spots, such as Silicon Valley, Sweden, Finland, and even Korea, where education and a culture of collaboration among intelligent and talented individuals are keys to success.

For companies in advanced economies, the question of offshoring will arise more often. A good strategy here will be to aggressively examine offshoring but conservatively implement it. Care should be exercised in offshoring higher value jobs in the near term, as the demand for skilled laborers is likely to grow faster than the supply in most countries, and companies could be caught in a web of higher labor costs and lower quality than they anticipate.

Q: | How will companies need to alter their offerings to respond to increasing polarization of income in the United States?

The middle class has traditionally been the mass market for large global companies. As the middle class “moves to Asia,” many global companies will follow. However, in the United States, a growing wealthy class will continue to provide the support for innovative, high-value products—the

kind that tend to be immune to erosion by job markets in the developing world. This class will also continue to grow the demand for luxury products and services, from large homes to financial planning services and cruises. Luxury branding will continue to be a lucrative endeavor.

At the same time, the poor in the United States will also provide opportunities for innovation—many of which could translate into strategies for reaching the poor in developed countries as well. Given the structural changes imposed by global free trade, finding ways to serve the poor will become as important—both economically and societally—as chasing the wealthy.

Q: | How should companies market to China?

China is the sixth largest economy in the world and will be moving up the ranks over the next two decades. Chinese consumers have an insatiable appetite for higher quality imported goods, which are viewed as status symbols. As more Chinese become wealthier, demand for these goods will soar.

However, entering the Chinese market is risky. Limitations placed on foreign firms allow domestic firms to emulate business processes and reverse engineer many products. The result, in the short term, will be a brutally competitive marketplace with little protection. Over time, the Chinese economy will likely continue to open to fairer business practices, but risks remain high. In general, the best way for most firms to enter the Chinese market is to focus on the more open Asian economies first. Japan, Korea, Taiwan, and Singapore are among the sixteen largest economies in the world—large enough to form profitable launching pads from which to expand into China. Furthermore, as Asia becomes the future economic hub of the world, trade among these countries will soar. Companies with partnerships in these non-Chinese Asian countries will be able to leverage their relationships to more easily enter the Chinese market.

Off-shore
service jobs

High-value
hot spots

Growth of both poor and
luxury markets

Risk and growth
in China



Terroirisme is a French word. It is used most commonly to refer to the “native tang” of a wine—the unique taste that derives from the soil of a particular region, such as the Bourgogne. This tie to the soil is both symbolic and real, the source of a wine region’s identity, profit, and politics.

The term is used here to capture the intersection of several trends, the most important of which is the growing politicization of water. This politicization is the result of dwindling water supplies, the privatization of water services, the growth of a movement called bioregionalism, and more broadly, the growth of green politics. The watershed is the physical intersection of these trends. And our premise is that watersheds will increasingly become the ground—or *terroir*—of political re-organization to control the world’s water supplies.

Water, like oil,
will become an
increasingly
politicized
resource—and
perhaps redraw
political
boundaries

Water Supplies: Public and Local or Private and Global?

Worldwide, per capita water supplies are dwindling. In every country in the world, per capita water availability has declined over the last 50 years, and in most, it will continue to decline over the next 20 years due to population growth as well as changes in water use.

Currently, local municipalities manage most of the world’s water as a public service. But increasingly, global corporations are seeking contracts to manage local water. At the same time, they are encountering resistance from both local and international NGOs and activists who take as their starting point the United Nations’ declaration that access to water is a basic human right. So battle lines are being drawn.

Watersheds: Natural Units of Political Organization

Watersheds do not recognize political boundaries. Around the globe, 263 watersheds cross at least one national boundary. Locally, they span municipal, state, and regional authorities. These cross-boundary watersheds are sometimes the cause of violence. (Israel, for example, has struggled repeatedly with its neighbors over water.) But more often, watersheds are the focus of cooperative programs.

An environmentally inspired bioregionalism movement is focusing more attention on the watershed. Advocating for policy that is based on natural ecological regions—often defined by watersheds—bioregionalists are mobilizing grass roots volunteer groups to fill the gaps between administrative entities. They monitor and restore streams; they align themselves with local cultures; and they work for policies that favor the bioregion over traditional political entities.

Green Politics: The Electoral Link to Water Issues

While quite small, green parties worldwide are growing, and they are in a unique position to mobilize votes around watershed issues. With their focus on environmental protection, grass roots organizing, and local elections, they are building a constituency among those who are, in effect, loyal to the watershed. As water becomes more costly, as the debate over privatization grows, and as grass roots monitoring of bioregions increases local awareness of water, this constituency of *terroir* could take on an increasingly important political voice. It may, in fact, be the first step toward redrawing the geopolitical boundaries of a bio-aware world.

—Kathi Vian



O V E R V I E W

Institute for the Future

PERSPECTIVES 2004
SR-829
© 2004 Institute for the Future.
All rights reserved.
Reproduction is prohibited
without written permission.

www.iftf.org

Interview: Paul Hawken



Paul reflects on the prospects for localization in an increasingly globalized world

Q: | Let's begin with terminology. You make a distinction between localization and bioregionalism. How are they different?

Bioregionalism is a biological term. It's based on the watershed and keystone species. Localization, on the other hand, is a natural response to globalization.

I think localization is more important in the near term. While it's often perceived as retrogressive or sentimental, it's really very forward thinking. It's about the second law of thermodynamics (which economics has studiously avoided for a couple hundred years, by the way). Localization is a response to the inefficiencies of globalization.

Globalization arises as corporations reach the limits of their own native markets. In order to meet the imperative to increase profits, they need unimpeded growth; they need a common set of rules worldwide so that expansion can proceed. But that expansion depends on an energy supply that is both abundant and very inexpensive. From a geological point of view, fossil fuels are still abundant, but their cost is very high because they have secondary effects. These include local effects like photosynthetic fog and global effects like global climate change.

Globalization is giantism, and giantism is an evolutionary deme, a species that overshoots its limits. Localization is the movement to create economic equilibria that are actually the most efficient.

The operative principle is that nature always follows the path of least resistance. And so do humans in the end, but first we usually try to overcome or surmount natural limits by using force—whether it's fuel, or war, or corrupt backroom politics.

That said, the biological perspective of the watershed—and the resource flows that are part of it—can help us understand the dynamics of localization and globalization in the economic watersheds of the world.

Q: | You've said that the United States is becoming a sick economic watershed. What makes a watershed healthy and how does localization help restore the health of the watershed?

A healthy watershed absorbs water quickly and releases it slowly so that you have water flowing year round in creeks and rivers, which support an abundance and diversity of life. A sick watershed, on the other hand, absorbs water very slowly and releases it very, very quickly. This is called a flash flood, and it tends to destroy the watershed further.

Americans are beginning to realize that their money, wherever it comes from, is spent and then gone that night. Literally the money you spend at Wal-Mart is in London that night and only 2–3% of it ever goes back into the community in the form of wages. So people are seeing that their watershed is leaky, that these "flash floods" are hollowing out their communities. Then they begin to think: how can we create local jobs? How can we close the loop and plug the leaks?

Now if people begin to ask these questions in the presence of people who think about them in terms of system dynamics or in terms of local flows, they begin to connect the dots. They see that Frank down the road has these Black Angus cattle that he brings into town and sells to the local store, where people buy it directly. They realize that Frank has been farming his place the right way, that the meat tastes great and is healthier, and that Frank also pretty much spends his money in town. He begins to look like a local hero. Control is at the heart of the issue here. People everywhere are experiencing a loss of control—a loss of community control, a loss of regional, familial, economic, and civic control. This loss of control is all about resource flows—energy flows, water flows, capital flows, social flows. Everywhere I go in this country and elsewhere, grassroots organizations are creating new economic webs to regain control of these flows.

Paul Hawken is a business leader, environmentalist, and author of *The Ecology of Commerce*, *Growing a Business*, and (with Amory Lovins and Hunter Lovins) *Natural Capitalism*. He is considered one of the leading architects of corporate reform with respect to ecological practices.

Q: | Can you give an example of a region in which this new kind of local economic web is making a real difference in people's lives?

Vermont has a very interesting, very sophisticated food web. Twenty years ago, you had people trying to grow their own vegetables and live off the land, and they were barely hanging on. Now, they've created local economic webs, so farmers are selling to local markets. They're making sure that their produce goes to the local schools. In the stores, it's not just vegetables that are local. It's everything from chips and salsa to wine and cheese. By localizing their food supply, they're also creating food security.

This is happening in the Northwest, in Canada, and elsewhere. Underlying this impulse to localize is the sense of insecurity that globalization brings to the world.

Especially since 9/11, people are starting to think very seriously about food security, energy security, and other forms of security. And the way you get secure is to distribute resources and power locally.

Q: | Is localization limited to the United States and the developed world? Or will we also see the growth of this kind of alternative economy in developing nations such as China and India?

China is trying to get rich. There we're just going to have to step back and wait for them to hit the wall at 90 miles an hour and hope they survive. India is different. They didn't have the Gang of Four and Mao; they didn't have the deception and political discontinuities that swept across the land and completely obliterated clans and allegiances. So India has a much deeper, a more stable culture with respect to place.

There's, of course, a great mourning, a grief in India. Every Indian I know talks with anguish about what it's like now. They certainly have a vibrant economy and they want to get rich, too, but I do think that they have much more of an identity with place. Out of place comes shared traditions, food, celebrations, festivals, not to mention history. These are what, in turn, tie people to place and each other.

Q: | Do you think there's the political will today to really support an alternative economy based on localization?

Political will is critical, and there's a tremendous political will in this country. It's just not in Washington. This is the most corrupt period in U.S. history. It exceeds the corruption during Reconstruction. You can tell a period is corrupt when people just laugh it off and say, oh well, that's just the way it is. A society is corrupt when the corruption is so embedded, so seeded in the very processes of the governance that it's taken for granted. That kind of corruption always turns into its opposite, usually in the form of populism.

I don't know how this will play itself out, but it doesn't just go on forever. People with smaller means and smaller pocketbooks can always overthrow people with larger means and pocketbooks. Localization is really the way toward the future. It will just take time to figure out what the right tools are.

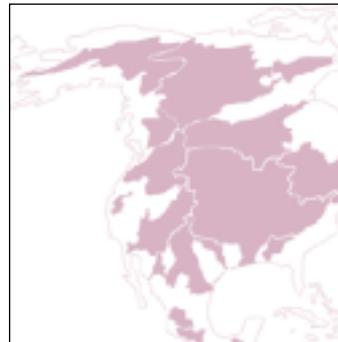


Kathi Vian, a research director with a long-standing interest in sustainability, asked Paul about the political potential of watershed-based grass roots organizations.

BIOREGIONALISM: HOMELAND REDEFINED

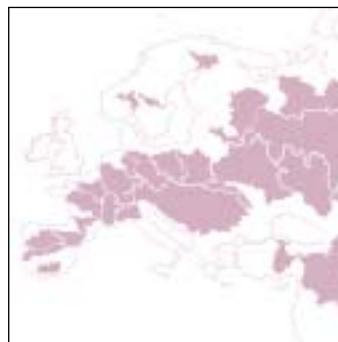
Bioregionalists refer to homeland as “a geographic space that encompasses their water sources and other key ecological features, food production, forests, and wilderness, villages, and infrastructure.”

They advocate integrated management of these spaces, and many favor local administrative control by bioregional characteristics.



Source: World Resources Institute

If political boundaries followed watershed boundaries, North and Central America might be organized around these regions.



Source: World Resources Institute

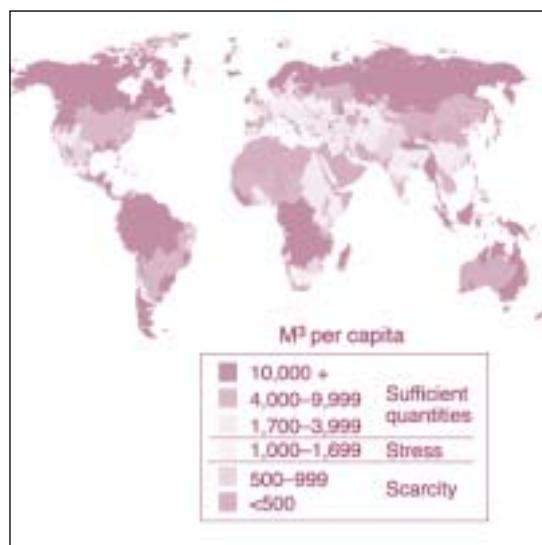
If watersheds gain clout as geopolitical regions, a map of the powerful political entities of Europe and the Middle East might look more like this map.

WATER SCARCITY BY WATERSHED

Water scarcity is defined as annual water supplies falling below 1,000 m³ per person. Water stress occurs when annual per capita water supplies fall below 1,700 m³. Population Action International estimates that up to 40% of the world's population will be living in water-scarce or water-stressed countries in 2050, up from 8% in 1995.

While most water resource maps indicate water availability by country, a watershed view shows how water scarcity and water stress may cross political boundaries.

1 Annual Renewable Supplies per Capita per River Basin, 1995



Source: Revenga et al. from *Pilot Analysis of Global Ecosystems: Freshwater Systems*.

WATER STRESS AND POLITICAL INSTABILITY

While the availability of water per capita is one way to measure water stress, another is to look at the amount of water that's being used as a percentage of the total available. By this measure, both the United States and China will be taxing their water supplies by 2025.

Given available water levels and projected population growth, the United States will suffer a greater drop in per capita water than China over the next two decades—a 20% drop for the United States, compared to 12% for China. Arguably, change in water status could drive as much instability as absolute water scarcity, as consumers, farmers, and industry are confronted with dwindling supplies or higher water costs.

2 Water Withdrawal as Percentage of Total Available, 2025

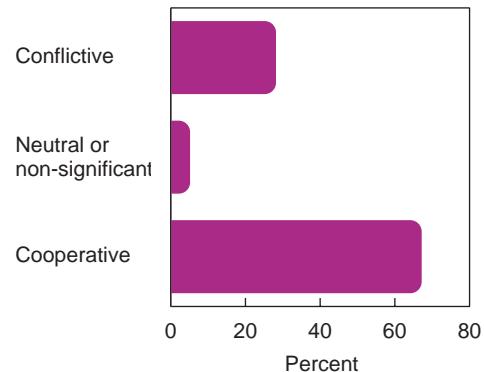


Source: World Meteorological Organization 1996; *Global Environment Outlook 2000*, GEO, UNEP, 1999.

WATER AS A COOPERATIVE ENTERPRISE

It may be that watershed issues engender cross-boundary cooperation. In a study of 1,831 international events involving transboundary water basins, a team of researchers at University of Oregon found that there were more than three times as many cooperative events as conflict-based events. The goal of the study was to better understand the dynamics of cross-boundary water disputes, and the conclusion of the team was that disputes over water have historically tended to be resolved cooperatively rather than through war and violence.

3 Percent of International Watershed Events That Are ... in Nature, 1948–1999



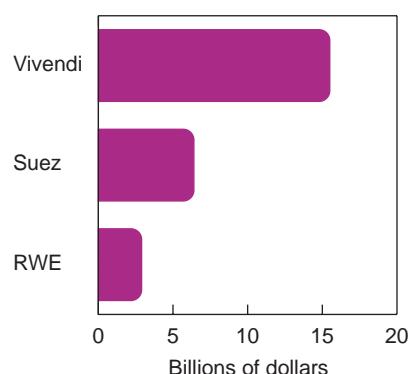
Source: Wolf, Yoffe, and Giordano; University of Oregon, 2003.

PRIVATE WATER INDUSTRY

The need to invest in water development for escalating water needs has driven many communities to turn to the private sector for help in managing water. The upside of this strategy is ready money for development. The downside is generally higher costs to water users—sometimes substantially higher costs that deny water to those who previously had it. At the same time, some companies who have engaged in water development find they can't profit adequately from their investments.

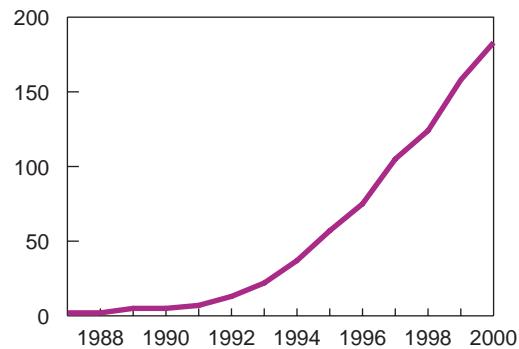
Roughly 14% of U.S. households use private water, as do 22% of Europeans.

4 Revenue from Water Services, 2002



Source: Company reports

5 Private Water Projects in Developing Countries

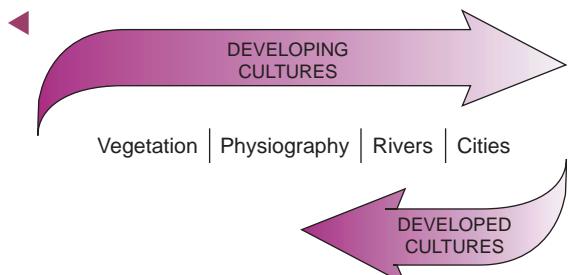


Source: Karen Bakker, "Global Trends in Private Sector Participation," www.geog.ubc.ca/~bakker/globaltrends.htm.

A CONTINUUM OF DEVELOPMENT

Lewis Mumford, in his classic 1938 text *The Culture of Cities*, described how cultures shift as they evolve technologically. Early cultures organize around vegetative and physiographic regions (hunting/gathering and agricultural societies, respectively). Later cultures (industrial societies) shift to river valleys as the waterways are key for transport and power, among other things. Finally, in even later cultures, cities—which come to represent the focus of economic, political, and social life—become the centerpiece of organization without regard to their geographic/environmental position/quality. In environmentally stressed regions, however, the arrow begins to shift back in the opposite direction.

It is not surprising, then, that bioregionalism is growing in the most developed regions of the world—North America, northern Europe, and Australia.



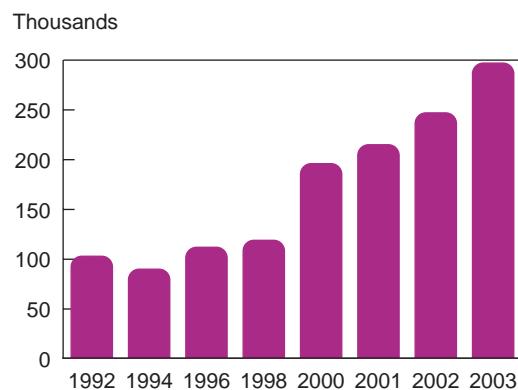
Source: Institute for the Future

GREEN PARTY GAINS

The U.S. Green Party is very small by any analysis, but it is growing and its focus on local governments positions it to play a disproportionately important role in the growth of bioregional movements.

While small overall, the German Green coalition gave the Social Democratic Party the majority it needed to win the 2002 parliament: without the Green seats, the Social Democrats were tied with the Christian Democratic Union.

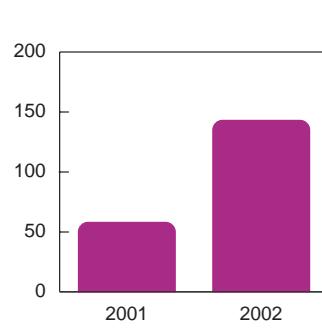
6 U.S. Green Party Members



Source: U.S. Green Party

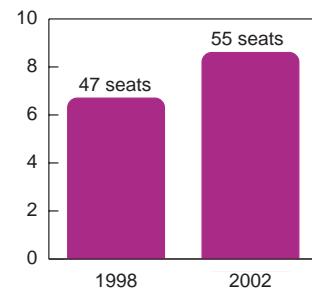
7 U.S. State and Local Seats Held by Greens

8 Percent of National Vote Captured and Number of Parliamentary Seats Held by Greens in Germany



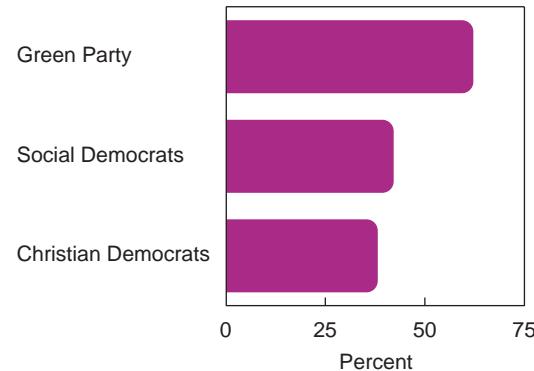
Source: U.S. Green Party

Percent



Source: Wikipedia, 2003.

9 Percent of Party Members with Internet Access



Source: Bertelsmann Foundation, 2002.

CONNECTED GREENS

Green Party members—and green sympathizers—may be more likely than others to use the Internet for personal and political reasons.

In Germany, for example, nearly two-thirds of Green Party members are online, compared to barely more than a third of Christian Democrats.

The Greens are an explicitly grass roots party, with a strategy that aims to build support around local issues. With skills in bottom-up organization and superior online access to their members, they may be in the best position to take advantage of the new forms of collective action. (See “The Battle for the Commons” in this volume).

While water, bioregional loyalties, and green politics may seem distant from the pressing issues of daily business practices in many global corporations, their intersection over the next decade may well change market segments, create new product opportunities, and alter the rules of operation for these companies.

Q: | How might localization re-segment traditional business markets?

Localization will create alternative choices for consumers across a wide range of products and services. Some consumers will make their choices based on explicit local values and loyalties. But even those who don't take up the cause of localization will find that these alternatives subtly redefine local tastes and styles. In an age in which experience drives consumer choice as much as pragmatism, these local aesthetics will play an increasingly important role in who buys what.

Q: | What will be the impacts of localization on facilities and stores?

Some localization advocates take aim at the basic facilities and infrastructure that support big companies. Stacy Mitchell, author of *The Home Town Advantage: How To Defend Your Main Street Against Chain Stores and Why It Matters*, works with towns and cities that want to promote local businesses over global companies. Among the repertoire of strategies that have been implemented are restrictions on the size of retail outlets: less than 100,000 square feet in some communities (ruling out Wal-Mart and Home Depot) and less than 20,000 in others (ruling out Borders). Another strategy is to require an economic impact statement as well as an environmental impact statement before approving development projects. Finally, a handful of towns explicitly rule out formula businesses: Starbucks can set up shop, but the shop can't look like any other Starbucks.

In addition to changing the opportunities and potentially the business models for big retail chains, these restrictions also impact the products that are offered through these chains. Companies who want to reach consumers in these locally oriented markets will need to cultivate relationships with many small outlets—and find ways to work efficiently with them.

Q: | How can the politicization of water impact your business, even if you're not in the water business?

Just as concerns about energy have driven appliance and auto manufacturers to label their products with energy ratings, growing water scarcity may ultimately require a “virtual water” sticker on everything from clothing to electronics and plastic bags. Virtual water is the water embedded in commodities, and in a water-stressed world, it has implications for manufacturing processes, materials, and even trade policies.

Q: | How might bioregional identities impact brands?

Regional planners are getting more sophisticated about the use of “brand” in restoring regions that have suffered ecological devastation. A case in point is the Buffalo Commons. Deborah Popper and Frank J. Popper conceived the term Buffalo Commons as an umbrella phrase for large-scale, long-term restoration of the American Plains. This “brand” of sorts has become a rallying point for all kinds of local planning throughout the Plains states. Such regional identities become part of individual consumer identities as well—and may thus form a basis for a new kind of brand loyalty in the future.

A commons is a shared resource that anyone can use. Shared pastureland in the center of early villages gave rise to the term. But today the concept of a commons extends far beyond real property—to such diverse domains as the Internet, scientific knowledge, and the airwaves. The question for the coming decade is whether these domains will retain a strong commons.

The future
of innovation
depends on
the outcome
of today's
battle for the
commons

Commerce: Commons Drive Innovation

Commons foster innovation. Consider the Internet: at its core, it's a public good. Anyone who follows the technical protocols can use it. But it's also a source of commercial innovation and wealth. Tim Berners-Lee did not have to ask permission or pay a fee to launch the World Wide Web. The founders of Amazon and eBay became billionaires through their use of the Internet commons to create new kinds of private property.

The literature of science is also a commons. Once the law of gravity or the antibiotic property of penicillin mold was discovered, people were free to open ski resorts or start pharmaceutical companies. But Newton's equation and Fleming's discovery entered the public domain—to benefit humankind and enable others to build on their discoveries for both private and public interest.

Politics: New Commons, Same Tragedy?

Today, the advent of technologies that enable global, mobile, many-to-many, multimedia communication and computation among billions of people—together with new understandings about collective action—have brought us to the threshold of a new “cornucopia of the commons,” similar to the wealth and knowledge that became available in the wake of the printing press.

At the same time, a classic commons struggle has begun to enclose and control the emerging innovation commons. Large content distributors have stretched copyright laws into territory that formerly was held in the public domain. Broadband carriers are seeking permission to control the content of the data that moves through their parts of the Internet. Incumbent license holders in the TV and radio frequencies are encouraging the Federal Communications Commission to maintain 1920s-style regulation over the new wireless spectrum (although treating it as a commons instead of private property could potentially enable millions more broadcasters than today—with much more innovative programming and services).

Cooperation: New Understanding

A tragedy of the commons is not inevitable, however. A new discipline is changing our understanding of cooperation—its mechanisms in all kinds of biological and social systems as well as its role in human evolution. This understanding is likely to coalesce in the next decade. As it does, it may offer important lessons in how to structure commons, how to protect them, and how to use them for enhancing our collective human intelligence.

—Howard Rheingold



O V E R V I E W



PERSPECTIVES 2004

SR-829

© 2004 Institute for the Future.
All rights reserved.
Reproduction is prohibited
without written permission.

www.iftf.org

Interview: Howard Rheingold



Howard examines the emerging technology and literacy of cooperation

Q: | In your book *Smart Mobs*, you map a set of new social behaviors—resulting from technology—that suggest a new kind of collective intelligence. What's the next step for society as these new behaviors are incorporated?

The computing power of the devices people carry and wear is growing rapidly—as is the ability of those devices to form ad hoc wireless networks. With these capabilities, people are weaving the individual beginnings of a new realm of collective action, just as the first million people who created Web sites with links to other Web sites wove the World Wide Web.

The aggregate transformative effect of millions of people carrying and wearing super-computing power, with high-speed connectivity, is creating a new threshold of social organization, an unprecedented scale of collaboration. At this threshold, we are seeing the early forms of a new literacy of cooperation.

The technological components—the Internet, mobile devices, and their powerful hybrid—are in place. However, the overarching framework for a new way of thinking about cooperation does not yet exist. The knowledge component is lagging. Nevertheless, we can already begin to glimpse the outlines of such a framework in a number of different realms today.

Q: | One of the places that this new literacy seems to be emerging is in the realm of politics. What are some of the landmarks we should be tracking here?

Start in the Philippines. There, masses of citizens self-organized through mobile text messaging and brought down the Estrada regime.

In South Korea, members of the cyber-generation used Web sites, e-mail, and text messages to get out the vote and tip the election toward now-President Roh Moo Hyun.

In the United States, the Howard Dean presidential campaign has demonstrated unprecedeted grassroots self-organizing power. Using Meetup.com, Web logs, and highly successful online fundraising, the campaign created the first cybergenic presidential candidate. Perhaps this is the equivalent of the Kennedy-Nixon debates in 1960. That was the first election in which the then-new medium of broadcast television created a new kind of campaign. In the case of Dean, the new medium is really smart mobs applied to electoral politics.

Q: | Who are some of the key players involved in building the new theoretical frameworks for cooperation and collective action?

Robert Axelrod, at the University of Michigan, has combined new understandings from biology, economics, and computation. He has focused specifically on questions about the evolution of cooperation in biology by using computerized strategy games such as *The Prisoner's Dilemma*.

Lynn Margulis, at the University of Massachusetts, has demonstrated that the early Darwinian emphasis on competition as an evolutionary engine provided only a partial explanation. Symbiosis and cooperative arrangements undergird much of what is now understood about the mechanisms of evolution.

We should also look at what's emerging in our understanding of armed conflict and peacemaking. Recent field work in El Salvador by Elisabeth Jean Wood, at New York University, on “political violence and robust settlements” offers evidence that both sides of the long, bitter civil war in that country unconsciously used game-theoretic strategies in their mutual withdrawal from conflict.

Howard Rheingold is a long-time commentator—and change agent—in the world of high-tech communities. He is the author of numerous books, including *Tools for Thought*, *Virtual Reality*, *The Virtual Community*, and most recently, *Smart Mobs*.

Finally, in the realm of environmental policy and the political management of common resources, the work by Elinor Ostrom, at Indiana University, and others in the sociology of common-pool resource management has revealed that grazing pastures, hunting grounds, and fisheries need not fall to the “tragedy of the commons.” Rather, they can be managed locally, through ad hoc social contracts that seem to have a general resemblance across eras and cultures.

Q: | These examples tend to focus on the public sector. How is the new literacy of cooperation likely to change the world of business?

One of my favorite illustrations here is a Duncan Watts story from his book *Six Degrees*. A factory in Japan that burned down one night was the sole supplier of a complex brake assembly for the 30,000 automobiles that were coming off the Toyota assembly line every day.

By putting line workers and managers together on jury-like problem-solving teams, Toyota had cultivated a densely linked internal social network that crossed levels of the management hierarchy. Toyota also nurtured cooperative relationships among hundreds of suppliers that made for a densely linked lateral network. Because Toyota’s internal and external relationships were structured in this way, it was able to respond quickly to the loss of the supplier: the process used by the factory was specified, the machinery assembled, the system tested, and production resumed in only three days.

The Toyota organization, whether it had set out to do so or not, knew something important about structuring relationships for flexible collective action.

Q: | You’ve begun a new project with the Institute for the Future to develop the literacy of cooperation. What’s your sense of the task before us?

Our present level of knowledge about the role of cooperation and collective action in human enterprise is scarcely higher than knowledge about disease before the discovery of microorganisms.

Descartes decreed that a “new method” was required to think about the physical world: that new method of thinking—the scientific method—led to biology, and biology created the knowledge that served as the foundation for medicine.

Before we can approach the solution to problems of conflict, cooperation, and governance of an interconnected global world—the “medicine” for social ills, if you will—we need new fundamental knowledge. We need the equivalent of a “biology” of collective action. And for this interdisciplinary understanding to emerge, a new way of thinking across disciplinary boundaries is required.

The technology of collective action provides the infrastructure for its own future evolution. Whether or not the deep understanding of cooperation can be catalyzed to knit together the separate strands of inquiry remains, however, a critical uncertainty. Success likely leads to a scenario of peer-to-peer abundance. Failure—which emphasizes control over cooperation—likely leads to political stalemate and stagnant technology.



Andrea Saveri is leading IFTF’s work with Howard to develop a new literacy of cooperation.





THE VALUE OF COLLABORATION: FROM METCALF'S LAW TO REED'S LAW

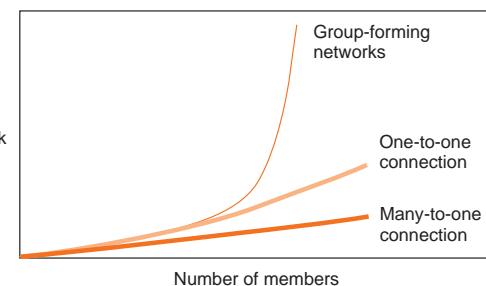
Connectivity has a value, and that value changes with the kind of connectivity. For example, the value of a many-to-one connection—such as a cable TV service—grows as the number of customers grows. If the value of the connection to the cable company is \$10, the value of the entire service is 10 times the number of customers.

But in a one-to-one network, like a telephone network, the value of the network grows much faster as the customer base grows: if there are two customers, they can only call each other; if there are three customers, there are eight possible connections. So the value of a network grows at the rate of $N^2 - N$ —or for all intents and purposes, as the square of the number of customers or nodes. This is called Metcalf's Law, after 3Com founder Robert Metcalf, and it applies to lots of types of networks, including the Internet and local area networks (LANs) that connect devices within an organization or home. It also accounts for the rapid growth of the economy as the Internet became connected.

Recently, David Reed, at MIT's Media Lab, identified a third type of network with an even greater connectivity value. He calls these group-forming networks (GFNs). These are networks that explicitly support affiliations among subsets of their customers. Social software packages, such as Ryze, LinkedIn, and Friendster as well as blogs, are examples of GFNs. Reed argues that the value of potential connectivity for transactions in these kinds of networks grows exponentially.

Here's his logic: Every GFN represents a certain number of possible subsets as small as two people (or nodes). So if the value of the network increases as the number of possible subsets, it increases at $2^N - N - 1$, or approximately 2^N . This potential for creating exponential growth of value is what is driving the rapid growth of social software offerings today. It is one measure of the value of collaboration.

1 Value of Networks Vary with Kind

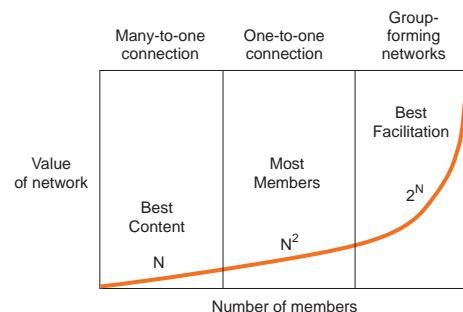


Source: David P. Reed, 2003.



According to Metcalf's Law, the value of telephone-style networks grows as the square of the number of users or N^2 , but according to Reed's Law, group-forming networks, such as Friendster, grow exponentially at a rate of 2^N . Cable TV networks have a much lower growth potential, since their value is basically equal to the number of users, or N .

2 Different Networks Serve Different Needs



Source: David P. Reed, 2003.



Another way of viewing these value laws, according to Reed, is that networks of services aimed at individuals produce the best content; networks that enable transactions among many individuals produce the most members, and networks that enable groups to form produce the best facilitation of group collaboration.

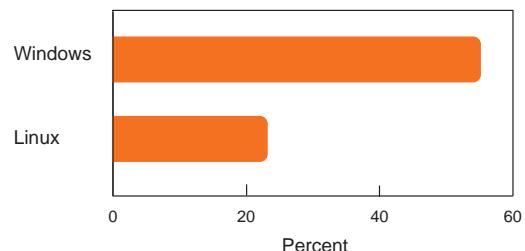
GROWTH OF OPEN SOURCE SOFTWARE

Open source software is a form of distributed software development that continues to grow in popularity. Linux licenses add up to about one-quarter of the overall market for server operating systems, but they likely undercount the number of servers running the software.

A better measure of the popularity of Linux is the number of developers who are targeting it versus Windows. In 2003, about 40% of developers targeted Linux, compared to 50% developing for Windows. Based on a survey by Evans Data Corporation, those planning to switch in 2004 will flip these shares, putting Linux in the lead.

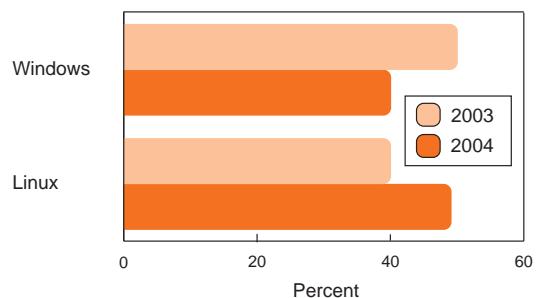
Open source software already dominates the market for Web servers: the open source solution Apache has led market share and market growth for Web servers over the last three years.

3 Share of Server OS Licenses, 2002



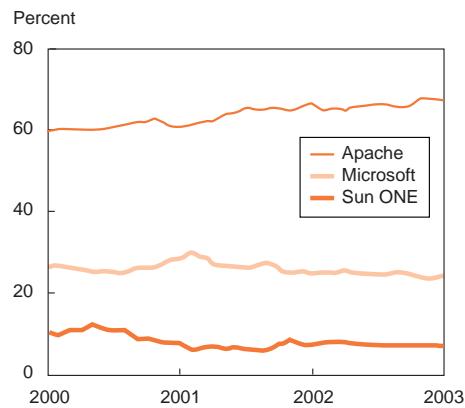
Source: IDC, 2003.

4 Current and Expected Software-Developer Commitments to Operating Systems



Source: Evans Data Corporation, Nicholas Petreley, 2003.

5 Market Share for Active Servers Across All Domains



Source: Netcraft, 2003.

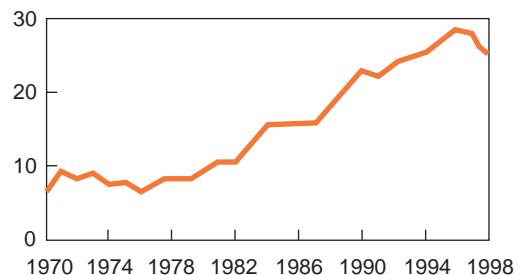
THE ECONOMIC VALUE OF OPEN SOURCE

James Bessen, a visiting scholar at MIT's Sloan School of Management, argues that in order to understand the true economic value of open source software, you need to understand the interplay among custom needs, standards, and property rights. He notes that less than one-third of the overall investment in software goes to pre-packaged software; the rest is custom and self-developed software.

Bessen suggests that complexity is the key variable in the economic value of open source software: "With complex software, standard products cannot satisfy all consumers and proprietary customer solutions are not always offered. Open source allows consumers to meet their needs by customizing the code themselves. When such user-customizations are then shared, open source products grow in quality and features. Open source thus extends the market for complex goods."

6 Investment in Pre-Packaged Software

Percent



Source: James Bessen, 2002.



Less than a third of overall software investment is spent on pre-packaged solutions.

BLOGGING GROWS COLLECTIVE INTELLIGENCE

By now, Web logs, or blogs, have gotten lots of publicity as personal publishing venues for expressing opinions, recounting one's experiences, and linking to the ideas of others. So every blog is, in a sense, a group map of a particular segment of human experience.

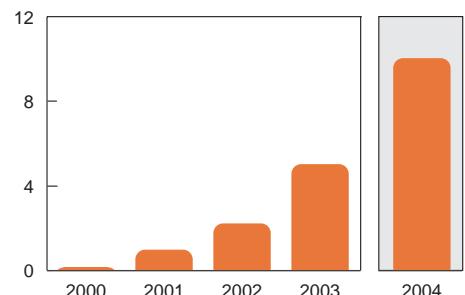
To understand the scale of this new kind of collaborative mapping of the world, consider the size of the "blogosphere" as it's sometimes called: There are currently about 5 million active hosted blogs, with the total expected to exceed 10 million by the end of 2004. (These numbers don't include blogs that are managed from private servers or are inside a firewall.)

Just over half of all blogs are created by young people 13–19 years old. Those in their 20s create another 40% of the blogs. Slightly more women blog than men. But perhaps the most interesting statistic from the point of view of cooperation and collaboration is the number of links between blogs. In its study, Perseus found that 80% of active blogs are linked to at least one external site. And link statistics from Technorati, a service that tracks links to your personal blog, suggest that the overall ratio of links to blogs is greater than 50:1.

While individual blogs may come and go, blogging is likely to become a staple format for online publishing, providing an ever evolving map of human knowledge—from the bottom up.

7 Active Hosted Blogs

Millions



Source: Perseus Development Corporation, 2003.

SOCIAL SOFTWARE: THE TOOLS OF THE TRADE

Social software is not just social. It's a tool for accomplishing everything from finding a job to supporting your favorite candidate.

Here's a quick summary of a few of the most interesting experiments in group-building software.

Ryze | www.ryze.org

Founded by Adrian Scott, who was also a founding investor in Napster.

Focus: Building business networks

Business model: Free basic subscription, added charge for special services

Network growth model: Peer-to-peer matching, with members in more than 100 countries

Friendster | www.friendster.com

Privately held startup founded by Jonathan Abrams in 2002.

Focus: Dating and making friends

Business model: Free during beta, will move to differentiated services model

Network growth model: Invitation by existing members—personal network can exceed 100,000 in first week

Tribe | Tribe.net

San Francisco-based start-up that is replacing Friendster as the software of choice for people who are interested in more than dating.

Focus: Classified ads by referral

Business model: Free membership with fees for some kinds of postings

Network growth model: Creates small networks of high value rather than large networks of low value

MoveOn | www.moveon.org

A software-based political action network started by Silicon Valley Internet entrepreneurs Joan Blades and Wes Boyd.

Focus: Mobilizing grassroots action in response to political issues

Business model: Contributions

Network growth model: E-mail referrals

Web Crawling

As social software has evolved, so have the web crawlers that track links. For example, Technorati (www.technorati.com) is a window on the “cosmos” of blogging. It’s essentially a web crawler that tracks the number of visits to blogs and the number of links to them—and can also show you the company you’re keeping via links. For bloggers, it’s perhaps a big ego trip. For people who are interested in tracking ideas and information, it’s a way to tap into the otherwise invisible, but highly interconnected world of bloggers. Unfortunately, Technorati only tracks hosted blogs, so it misses blogs that are published from private servers or inside a firewall. Google also has a similar service. You just type “link:” before the blog’s URL to get a count of links to that blog.

Socializer | www.alphaworks.ibm.com/tech/socializer

IBM’s entry in the social software arena, combining social networking and location-based services.

Focus: Finding location-based contacts and services using laptops and handhelds

Business model: Free during beta, licensing under consideration

Network growth model: Peer-to-peer matching

Trepia | www.trepia.com

A Silicon-Valley start-up that recently entered into a partnership with wireless ISP provider Telerama.

Focus: Instant messaging with people in close proximity

Business model: Free right now, perhaps to be licensed through wireless service provider

Network growth model: Peer-to-peer matching

Meetup | www.meetup.com

A company that uses online networks to generate real-life meetings among groups of people with similar interests.

Focus: Organizing local gatherings about topics of interest

Business model: Free basic service with a combination of special fee services, text ads, and meeting venue listings

Network growth model: Open topic-based meetings, with simultaneous meetings worldwide (more than 800,000 members, 4,000 topics, 600 cities)

The Vocabulary of Friends

Just as XML vocabularies have been created for a wide variety of purposes—from a Universal Business Language for business documents to a language for medical records—a new vocabulary has been created to help manage distributed communities.

FOAF—or the Friend-of-a-Friend vocabulary—was developed to allow individual users to create their own Web pages with profiles that other services could search to provide contacts, location-based connections, and even filter your e-mail.

The advantage of FOAF over other methods of managing identity across services (such as Microsoft’s Passport) is that it is decentralized.

Individuals control their own profiles, and there’s no central database that could be hacked or misused.

The emerging discipline of cooperation studies is likely to recast strategic thinking over the next few decades, providing insights for global business integration and introducing a number of disruptive innovations.

Q: | How can companies take advantage of bottom-up, distributed systems to solve complex business problems?

One of the promises of the new discipline of cooperation is that it will increase collective intelligence, allowing dispersed groups to rapidly solve problems that would otherwise take a long time or not be solved at all. From the work of Eric Bonabeau in modeling collective intelligence in social insects to the insights of Howard Rheingold about the formation of “smart mobs” in technology-enhanced networks, this new discipline will increasingly provide blueprints for human knowledge-creating collectives. It will also serve as a basis for the evolution of agent-based societies, in which software begins to mimic the smart problem-solving capabilities of social insects.

Meanwhile, the rank and file are gaining first-hand experience in distributed, bottom-up problem-solving from an unexpected quarter—the world of alternate reality games. These immersive experiences (such as *The Beast*) link digital and physical worlds, as well as persistent groups of players, to solve seemingly intractable puzzles and have already demonstrated that self-organizing groups can rapidly solve complex problems. More important, the players are beginning to bring new skills into the workplace.

Q: | How can companies build profits on common-pool resources without privatizing—and therefore limiting them?

Even as the business world rushes to privatize resources—from water to basic science—studies in the management of common-pool resources are demonstrating that, under easily constructed conditions, these resources can be collectively managed to adapt to the changing needs of communities more efficiently, and ultimately more profitably, than through privatization.

For example, the wealth of science increases only if it is broadly shared. This is, in fact, the wealth that will sustain U.S. and world economic growth over the coming decades, providing the basis for innovation that drives high-value products and services. Many current attempts to patent basic science will only limit the wealth that can be generated by it. Similarly, “walled garden” approaches have stalled the growth of wireless and location-based services, while emerging bottom-up strategies to geocoding are building a robust foundation for a new generation of Internet-based innovation.

A science of cooperative strategy for the business sector would begin to identify the models for cooperative and adaptive resource management as well as for building private wealth on a foundation of shared resources.

Q: | How will social-capital audits be used, and what will be their impact on the growth of wealth in organizations, communities, and the economy overall?

Last year’s *Ten-Year Forecast* argued that social capital—the value embedded in networks of social relationships—is a source of wealth that has not been systematically measured and tapped in business organizations. Just a year later, numerous products are available to map and measure the social networks of organizations. These tools are likely to drive new forms of auditing practices—from employee evaluations to investment analyses of the networking potential of companies.

The question is whether these practices—and indeed the commercialization of social relationships as “capital”—will ultimately increase the wealth of business organizations or the economy overall. Certain patterns of relationships—particularly those that lead to creativity and innovation—may function well precisely because they are outside the system of capital. Resolving this question will be essential to a successful long-term strategy of cooperation for business.

Judging from current commentary, personalized medicine—from custom-designed drugs to individualized health care plans—could be the future of health care in the United States. Personal genotyping promises individually tailored regimens for everything from cancer therapy to nutritional supplements. Growing access to personal diagnostics gives individuals more information about their own bodies than ever before. Employers, looking to rein in health care costs, are keenly interested in consumer-directed health plans (CDHPs), and some consumers, armed with the Internet, welcome the consequent increased choice and control.

However, several countervailing forces are at work and while engaged consumers will unquestionably demand more flexibility and choice in health care, they may also decide that flocks get better care than free agents.

Contrary to today's trends, tomorrow's health care may favor flocks over free agents

Bigger Is Cheaper

Individuals have always been able to purchase health services directly. Today, even people of modest means contribute to their own health care. However, the bulk of expenditures is still split more or less evenly between two large pools of funds that are not under the control of individuals: government programs such as Medicare and Medicaid and private health insurance plans. The main advantages of these large pools is that they spread risk and are able to negotiate better rates.

Furthermore, despite the promise of CDHPs to re-connect cost and value by increasing consumers' exposure to the economic consequences of their choices, they pose significant challenges. Recent reports point out that many health care consumers lack the skills to make decisions that accurately weigh the risks and benefits. Complex, technology-based treatments will exacerbate this problem. Fear of financial losses, poor health outcomes, and lower workforce productivity for these consumers will be powerful disincentives for CDHPs.

Databases Decide

Molecular medicine, in which drugs are matched to genetic traits of individuals, promises personalized medicine on a therapeutic level. But ironically, these therapies may shift health decision making away from

individuals. The technology of gene therapy is opaque to the consumer, and the equipment and databases required for its application are highly centralized. Someday individuals may face uncontrollable fiats from insurers or providers: "Your genetic constitution makes you ineligible for XYZ treatment because it won't work for you."

Environment Counts

Finally, consider the growing number of sensor-based technologies that hold the potential for improved personal health diagnosis and monitoring. These tools promise to shift much of the burden of screening and even diagnosis to the individual.

At the same time, conceptually similar technologies can be used to track environments, and it won't be long before people begin to make connections between their own vital statistics and those of the spaces they occupy. Here, as in the arenas of risk pooling and genetic therapies, organizations or communities will have to get involved to achieve the full value of correlating individual and environmental vital signs. Individuals fully wired with internal and environmental sensors are good. But networks of such individuals are better.

—Bern Shen



O V E R V I E W



PERSPECTIVES 2004

SR-829

© 2004 Institute for the Future.
All rights reserved.
Reproduction is prohibited
without written permission.

www.iftf.org

Interview: Hal Luft



Hal gives us a glimpse of how health plans might evolve in the next decade

Q: | You've taken the position that consumer-directed health plans won't solve the problems of the health care system. You point out that risk pooling is decreased and individuals face enormous information costs, especially when they're sick. But what, then, are the alternatives?

Let's look at the problems to be solved. Employers can't control health insurance premiums, so they can't predict their budgets, and they're in a constant battle with unions or employees to negotiate health benefits. At the same time, health care providers are being squeezed by the costs of providing quality care. Meanwhile, consumers face bewildering choice and bureaucracy and worry about losing health benefits, either as a result of a change in jobs, or from employers reducing coverage. Putting them on the "firing line" of decision making, especially when they are sick, does not seem like an attractive model.

Instead, one way to address these issues is a modified health IRA, an old idea whose time may have come. Like paycheck withholdings for Social Security and Medicare, employers could pay, say, a government-mandated flat 8% of payroll toward health benefits and be done with it. They're no longer the bad guys in labor negotiations and their costs are predictable and controlled. Employees, who are already used to the idea of a 401(k), could chip in a tax-exempt contribution, as well. The health IRA brokers perform risk adjustment behind the scenes and then offer a menu of health plans. Providers have fewer entities to dicker with to get reimbursed, and consumers have a simpler set of choices.

Indeed, this might spawn some interesting new business models. Human resource firms which already handle payroll, deal with health plan enrollment, and track sick days, could handle the 8% health IRA payments and also feed back information to the employer about lost work days, segmented by health plan. This would enable employers to engage with the health plans in an informed way to reduce lost work days.

Q: | What are the pitfalls of this arrangement?

It will require more work on risk adjustment to make sure plans are paid appropriately for the risks they enroll, leaving consumers to pay more only for differential convenience or efficiency. Such a plan will cost some jobs—mostly in the underwriting and marketing departments of insurers and among small insurance brokers. Some will be concerned about a massive increase in tax funds under the federal budget, but these could be sequestered in a trust fund much like Medicare. The details of implementation and oversight are complex, particularly in the case of small employers. The relative roles of the federal government versus states, which currently regulate health insurance, may require some adjustment. The transition is clearly complex—and current players may exit before the new system is in place.

Q: | What about large employers, like IBM or General Motors, who have self-insured all along? Why would they go into a mandated 8% program with a standard risk pool?

A large employer might be able negotiate a better rate from the health plans by fostering a healthier workplace. For example, if they implement a program to reduce smoking, they get a better rate. If they price their cafeteria food to favor healthier choices, they get better rates. We're already seeing some companies designing their buildings to promote exercise, for example, by installing slower hydraulic elevators.



Hal Luft is the Caldwell B. Esselstyn Professor at U.C. San Francisco's Institute for Health Policy Studies and a specialist in health economics and policy.

Q: | What's the role of technology in health plan evolution?

We could take a lesson from the Internet. It provides access to all kinds of information, but in the end, a few big vendors provide one-stop shopping where you get a good price, you get customer reviews and referrals, and you get the assurance that you're not going to get ripped off. I could see health plans following this model.

What the health care consumer wants is a friendly face with an organized system behind it that works really well. The point is, not everyone wants unlimited information access and choice. They'd rather have a trusted health coach who can help filter information and assist with health decisions. But for now, we may just be in a transition period where consumers will have to continue to surf the Web for medical information because their physicians can't possibly stay on top of every medical advance. Eventually, technology may enable a virtual organization with a "primary care physician portal" connected to a vast network of specialists.



Bern Shen, Director of IFTF's Health Horizons Program, asked Hal about the pitfalls of consumer-directed health plans.

A TIMELINE OF HEALTH BENEFITS

Accidents of history, tax law, and regulation have created the basic elements of today's U.S. health insurance system—a system that is large, complex, and unstable. Throughout this history, however, there has been a consistent, if ragged, progress toward building a health care infrastructure that protects the consumer. While engaged consumers will widen the domain of health care choices, it is unlikely that they will abandon this infrastructure. More likely, they will add to its complexity by making new demands on it.

1 History of Health Benefits

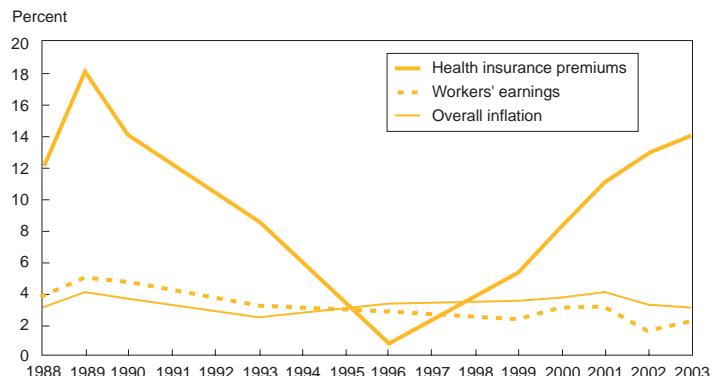
Year	Event
1847	First (short-lived) company to issue health insurance organized in Boston.
1849	New York passes first state law regulating insurance.
1870	Railroad, mining, and other industries begin to provide company doctors, funded by deductions from workers' wages.
1877	Granite Cutters Union establishes first national sick benefit program.
1906	American Association for Labor Legislation founded to promote workers' compensation and social insurance programs.
1912	National Convention of Insurance Commissioners (now National Association of Insurance Commissioners) develops the first model state law for regulating health insurance.
1913	International Ladies Garment Workers Union establishes first union medical services program.
1933	Group-practice, prepaid plan launched, which became Kaiser Permanente.
1935	Social Security Act passed without health insurance provisions.
1937	Blue Cross Commission established.
1939	Blue Shield Plan founded in California.
1943	National War Labor Board rules wage freeze does not apply to fringe benefits.
1947	Taft-Hartley Act requires collective bargaining on wages and conditions of employment for unionized workers in private industry.
1948	McCarran-Ferguson Act gives states broad power to regulate insurance.
1954	Revenue Act confirms that employer-paid health benefits are not taxable as employee income.
1965	Medicare and Medicaid legislation adopted (effective 1966).
1968	Firestone Tire and Rubber Co. becomes first to self-fund health benefits.
1973	HMO Act requires most employers to offer federally qualified HMOs in addition to indemnity insurance.
1974	Employee Retirement Income Security Act (ERISA) enacted to ensure uniformity in administration of multistate benefit programs.
1985	Consolidated Omnibus Budget Reconciliation Act (COBRA) enacted to provide continued coverage after job termination.
1996	Health Insurance Portability and Accountability Act (HIPAA) enacted to enhance continuity of health insurance.
2003	Medicare Prescription Drug, Improvement, and Modernization Act enacted to provide prescription drug coverage for seniors and the disabled.

Source: Institute for the Future

HEALTH COVERAGE COSTS GROW DISPROPORTIONATELY

Compared to worker earnings and overall inflation, health insurance premiums have grown faster—and disproportionately—since 1996. Annual percentage increases are back in the double digits, the level that prompted employers to embrace managed care in 1988.

2 Annual Percent Increase in Health Insurance Compared to Other Indicators



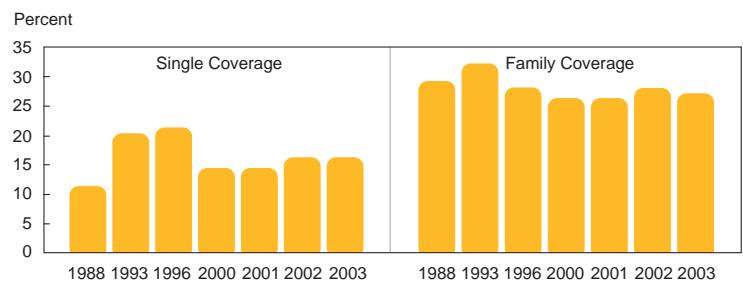
Source: The Kaiser Family Foundation and Health Research and Educational Trust, Employer Health Benefits Annual Survey, 2003.

EMPLOYEES PAY MORE

Employee contributions to health plans rise and fall—depending on factors both inside and outside the health care system. Currently, employees pay 16% of their own health costs and 27% for their family members. And while these percentages haven't changed a lot in the last few years, actual monthly worker contributions have risen steadily.

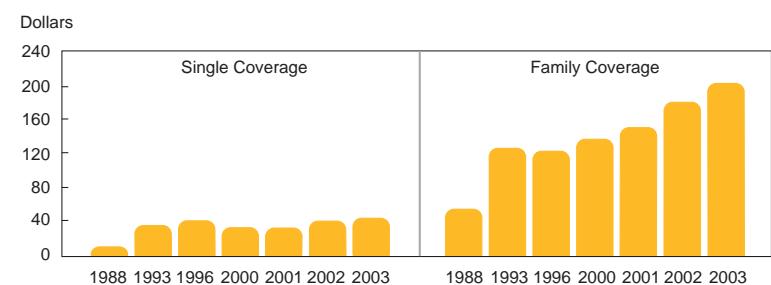
These figures also mask some important differences in the health care coverage that individuals receive. For example, while most companies that offer insurance pay 75% to 100% of premiums, companies with a higher share of low-wage workers pay only 62% of premiums, so the burden on low wage earners is actually much higher.

3 Percent of Health Premium Paid by Covered Workers



Source: Kaiser Family Foundation Survey of Employer-Sponsored Health Benefits, 2003.

4 Average Monthly Contribution of U.S. Workers to Health Coverage



Source: Kaiser Family Foundation Survey of Employer-Sponsored Health Benefits, 2003.

FUTURE OF CDHPs IS UNCERTAIN

While managed care was initially embraced by employers to contain costs—at the expense of consumer choice—it is now experiencing the highest percentage cost increases of all types of health coverage. With an annual increase in premium of 15.2%, HMOs no longer meet their original goal, and employers are shifting the burden of higher costs to their employees.

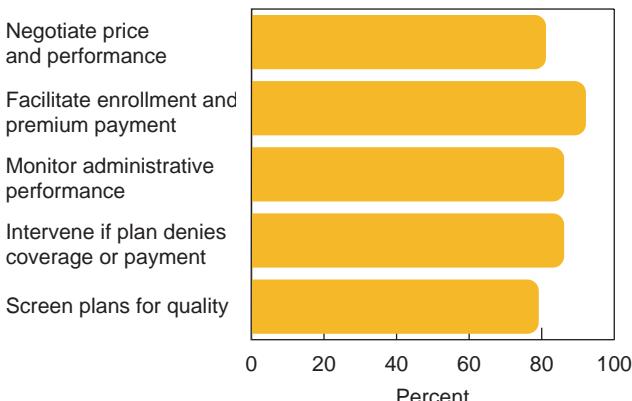
The combination of limited choice and higher costs—together with the change-the-system attitude of baby boomers—is a recipe for consumer-driven reinvention. But consumer-directed health plans (CDHPs) are not necessarily the form that reinvention will ultimately take.

It's true that CDHPs give consumers more choice—and more responsibility.

Unfortunately, the majority of consumers don't want the responsibility. More than 75% want employers to continue to negotiate price, facilitate enrollments, screen plans for quality, and provide other management services.

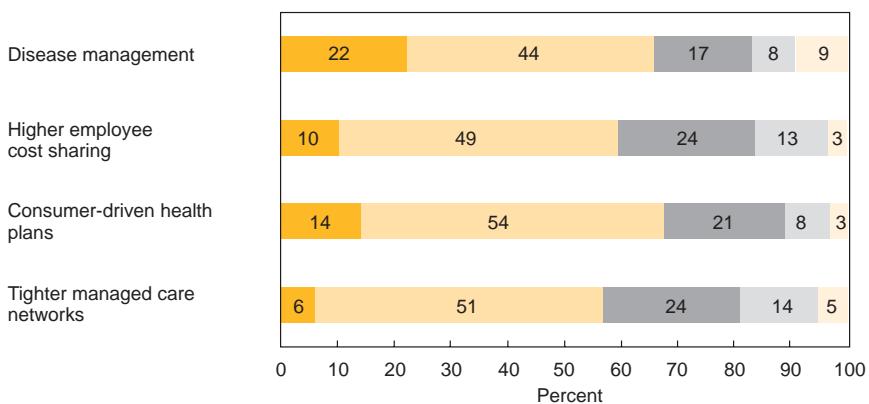
Furthermore companies don't see a clear advantage to CDHPs for containing costs. While 68% believe that CDHPs are likely or somewhat likely to contain costs effectively, more than half also believe that disease management, higher employee cost sharing, and tighter managed care networks will be effective. And disease management is the clear winner in the “very effective” category.

5 Percent of Employees That Want Employers to ...



Source: Watson Wyatt Worldwide, *Maximizing the Return on Health Benefits*, 2001.

6 Percent of Firms That Think ... Cost Containment Strategy Will Be Effective



Source: Kaiser Family Foundation Survey of Employer-Sponsored Health Benefits, 2003.

THE HEALTH CARE PROCESS IS MORE COMPLEX

As consumers are being asked to assume more responsibility, the health care treatment path is becoming more complex. While informed health consumers want a more active role in this process, the complexity increases their risk. And many consumers will not be prepared—or even want—to take on this more engaged role.

OUTLOOK FOR PERSONALIZED MEDICINE

The last couple years have seen an explosion of diagnostic procedures, services, and tools. The markets for these are already huge and will continue to grow. Molecular diagnostics, in particular, will be a boom market: most analysts expect an annual growth rate of more than 30%, with an anticipated market size in 2006 of over \$5 billion.

Molecular diagnostics go hand-in-hand with genetic therapies to create the promise of personalized medicine. At the heart of molecular testing are samples of DNA and RNA. Early tests focused on genetic testing, or identifying single genes. But today's genomic tests focus on collections of genes and their expression as proteins.

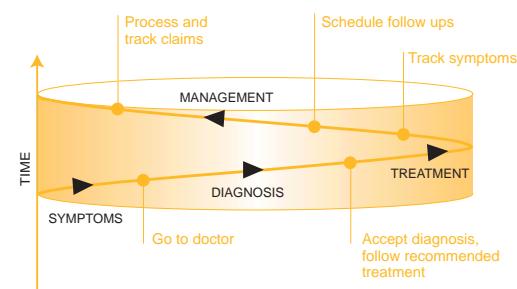
Such tests can provide two kinds of information: deterministic or probabilistic. Deterministic tests signal the presence of a disease, such as Huntington's disease, whether it is symptomatic or asymptomatic. Probabilistic tests suggest a predisposition to a disease, such as heart disease, based on patterns of genes. While the latter is subject to interventions, the former may be seen as immutable and therefore discriminating. Consumers may opt not to be tested in order to avoid such discrimination.

Furthermore, even as the costs of genomic tests drop, the "satellite" costs—such as counseling and ongoing monitoring—may greatly exceed the cost of the test itself.

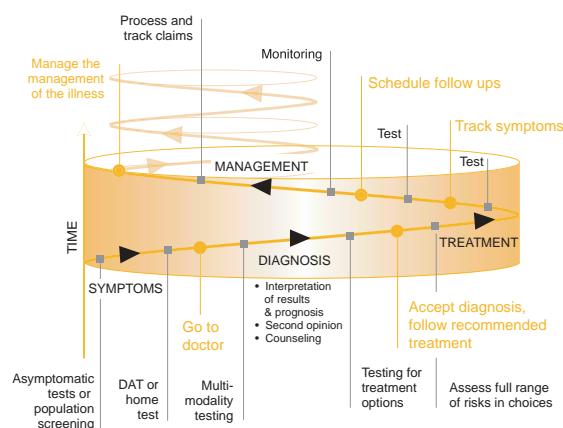
These social aspects of molecular testing are likely to slow the evolution of molecularly based personalized medicine.

7 A More Complicated Path

In the past, the treatment path looked something like this.



But, as diagnostic technologies and tools have proliferated, so have the steps on the treatment path.



Source: Institute for the Future

8 The Diagnostics Marketplace, 2000

	Clinical Chemistry	Automatic Pathology	Molecular Diagnostics
Diagnostic Sample	Blood or urine	Tissue or cells	DNA, RNA, or chromosomes
Method of Extraction	Collected by RN, PA, or self-collected automated blood chemistry and immunoassays	Obtained through a needle aspiration, Pap smear, or surgical biopsy	Extracted from blood or tissue cells in a lab
Diagnostic Technology	Machine automated	MD analysis of slides	DNA or RNA probes, PCR or cytogenic
Market Size	\$28 billion	\$6 billion	\$1 billion
Estimated Annual Growth Rate 1999-2000	2-5%	5-10%	30-50% (circled)

Source: Burrill & Company; Thomas Weisel Partners LLC.



The tension between consumers who are increasingly engaged in their own personal health care choices and the need for large-scale infrastructures to support those choices will place seemingly contradictory demands on companies over the next few years.

Q: | How can companies help their employees manage the “burden of empowerment” in health care—while containing health benefit costs?

One impact of personalized medicine is the burden of empowerment: the health care consumer becomes engaged in a continuous cycle of evaluating care options, trying them, reevaluating, and trying new options. More employee time is spent engaging with the health care system, and health care costs continue to grow. To assure employee productivity while also containing costs, companies need to provide more, not less, help with health care choices. In much the way that dotcom companies provided a corporate concierge to keep employees focused on work rather than errands, tomorrow’s companies may well need to provide a health care concierge service to help employees evaluate, locate, and make the best use of health care services—with adequate privacy protections, of course.

Q: | How can companies protect their employees against health care spam and shadowy practices—while developing their own health-related markets?

In an environment where health concerns are growing—due to aging, environmental degradation, and a new awareness of the genetic roots of disease—there will be many who try to take advantage of the “engaged health care consumer” to pawn remedies that have no real merit. Also, as genetic databases play a greater role in determining who qualifies for treatment, excluded (and sometimes desperate) employees may fall prey to unscrupulous doctors who will offer treatments regardless of compatibility. Companies have two key opportunities in this arena.

The first is to serve as a “trusted agent” in helping interpret and negotiate so-called database decisions, in filtering health care spam, and in tracking real alternatives for their

employees. In short, they can choose to become more involved in employee health care—albeit in a way that honors the individual’s decision-making power.

The second is to provide truly efficacious alternative health strategies—especially preventive and environmental products and services—that give people real choices outside traditional medicine. Consumer spending on complementary and alternative medicine now exceeds traditional medical spending, and thus obviously represents a huge market opportunity for all kinds of companies.

Q: | How will environmental monitoring of health threats impact corporate liability—as well as productivity?

Several studies have found a correlation between certain molds and mildews present in office buildings and the productivity of employees: sick buildings lead to sick workers who miss more days or don’t work as efficiently. As it becomes possible to measure even very small amounts of toxins in the workplace with simple, portable monitors, both workers and insurance companies are likely to place increasing demands on companies to remedy unhealthy environments. And companies themselves may find it in their best interest to become partners in the process of identifying significant toxins in the environment, correlating them with employee disorders, and finding infrastructure solutions rather than subsidizing the costs of employee illness. Defining the most significant toxins will be an important task as monitors are put in place—and companies will do well to participate actively in this task rather than waiting to have the decisions imposed from outside.

Knowledge workers lead multiple lives. They're successful professionals in the workplace. They're committed parents at home. And over the last few decades, they've found ways to integrate these lives. They have flexible schedules, do work tasks at home and vice versa, and at least occasionally telecommute.

As the boundaries between work and family life have become more porous, a new frontier is coming into view: the self. Working on the self—whether it's body building or developing the natural artist inside—is filling all the spare time that workers can find, and it is often here that they feel they do their best and most important work. Meanwhile, companies are realizing that there are untapped skills and passions in these “hobbies.” Self-expression is thus poised to become the next arena of daily life to enter the workplace. With this trend will come the growth of “jobbies”—jobs that build on workers' personal forms of self-expression.

As workers seek personal expression, businesses are learning to incorporate employee hobbies in the workplace

The Self at Work: The Growth of the Creative Class

Workers now have more freedom than ever to inject self-expression into their work. In fact, one of the fastest-growing economic classes is what Richard Florida at Carnegie Mellon University calls the “creative class,” which is composed of workers who add value through their creative input. The emergence of this class points to the growing importance of creative self-expression in the workplace.

Workers are also using self-expression as a strategy for managing uncertain career paths. Many view their hobbies as potential new career directions in an uncertain economy. If laid off, they can leverage the skills and contacts from their hobbies to find or create new work. And because most workers today expect to change their careers several times, they can also use jobbies as a resourceful way to build serial careers without spending a lot of time and money on training. Finally, jobbies are an increasingly attractive option for retirement-age workers who are used to working, want to remain productive members of society, and may need extra income.

The Self at Home: Incorporating Workplace Skills

At home, the self has become a “project,” and workers are increasingly leveraging the project-management skills they learned at work to work on themselves. This self-as-project approach is used to meet a variety of

different personal goals, with objectives and milestones for doing everything from losing weight to honing time-management skills. Just as workers prepared for their careers by turning to the educational system, they are turning more and more to the classroom for personal development. In fact, today's workers are increasingly likely to participate in personal development courses, which have similar rates of enrollment as work-related training courses.

The Self in the World: Creative Movements

The rise of self-expression points to broader social and economic shifts. New values supporting self-expression and creativity are prompting new kinds of social movements. An example is the Church of Craft, a worldwide collective of crafters who affirm the deep spiritual value of creativity; in the United States, this church is seeking federal recognition as a religion. The backlash against mass-produced products and services embodied in the “No Logo” movement is another example. Such movements are perhaps a natural counterpoint to the homogenization of globalization—and will perhaps also drive the expansion of the creative class that will be imperative to continued growth in developed economies.

—Leah Spalding and Rod Falcon



PERSPECTIVES 2004

SR-829

© 2004 Institute for the Future.
All rights reserved.
Reproduction is prohibited
without written permission.

www.iftf.org



O V E R V I E W

Interview: Ellen Galinsky



Ellen shares her insights about the new balance among work, family, and personal passions

Q: | At the Families and Work Institute, you've been tracking trends in the workplace for almost 15 years. What are the big changes you've seen and what are the driving forces behind those changes?

First, men's stress level is higher. Men feel more pull between work and family life. Even though women have had more responsibility, men and women have traditionally been equally conflicted about their work versus their family and personal responsibilities. But now, men have shot ahead of women in terms of stress. I think it's because men are still working longer hours, but they are also taking on more family responsibility. It's the longer hours that statistically explain men's greater level of conflict.

The second thing that I think is new is that the workplace itself really has changed. Supervisors are more responsive when employees have personal or family issues that they need to attend to. Employees see their supervisors as more responsive than ten years ago. They feel that the culture is more supportive of having both a life and a job. Job quality has improved. People have more autonomy and more learning opportunities. But because work demands have escalated, too, these demands trump the positive changes. The net result is more conflict, even though things have gotten better.

Q: | Are the values of workers shifting? Are they changing their priorities? And are workplaces responding to these shifts?

One big change is that men don't want to be stick figures in their children's lives—particularly after 9/11 and in an economy where there has been downsizing and people see that they can't count on work. People feel that if they are going to leave home in a 9/11 world, they want to do something that's meaningful. Pollsters are saying that Americans are becoming more family oriented.

This shift is also showing up in supervisors. We've asked employees to rate how well their supervisors manage them in their work tasks and how they manage them when personal or family issues arise. We've looked for predictors of those that manage family issues well. It's not being female, it's not being male, it's not being older, it's not being younger. The major predictors are having responsibility for kids, or having a spouse who is employed, or having elder care responsibilities. It's having some sort of experience that helps you see the world from both sides.

Q: | You've talked about dual-centric workers. Who are these people and what's different about their lives?

In our study of "Leaders in a Global Economy," we asked the question, how often in the last year have you put your work before your family or personal life, and how often in the last year have you put your family or personal life in front of your work? These were the very top executives in ten multinational companies, and it was a global executive committee—very, very, very senior. We assumed that almost everyone was going to be work-centric. And we found that most were. But there was this group of people we didn't even know we would find, so we didn't even have a name for them to begin with. They were people who were taking better care of themselves and who also felt more successful at work. We came to call them "dual-centric."

Ellen Galinsky is the president and co-founder of the Families and Work Institute. She is the author of the groundbreaking book, *Ask the Children*, which was selected by *The Wall Street Journal* as one of the best work-life books of 1999.

There is something about having your eggs in more than one basket that seems to be healthy. It's like weight training. If you have time for rest or recovery, or if you have an alternate focus, it seems to be very healthy. The people who have one focus don't seem to be doing as well in terms of their health or well-being, or even their effectiveness at work.

Q: | Who is leading the way in this shift to become more dual-centric?

It is the employees themselves. It's an initiative of the employees to say, we are really good at business solutions, so what about our own workplace? What about looking into how we work ourselves?

We brought 90 women from ten companies to Prague for three days. At the end of the meeting, we asked them to come up with some ways to improve their own workplaces. And some of them did. Some of them just took the ball and ran down the court with it.

At Deloitte & Touche, for example, they had programs and policies about flexibility, but they decided that those absolutely were not enough. They needed to create a culture of flexibility, to move beyond formal flexibility to informal flexibility, where managing flexibility just became the way you did business. They are creating tools and all kinds of ways to support this culture of flexibility.

JP Morgan Chase has formed nine task forces, and a lot of their work is around increasing real flexibility.

Q: | What about other outside interests, such as hobbies or individual passions? How do those reverberate through the workplace?

Perhaps we should call our low-stress group tri-centric instead of dual-centric because there could be more than two points of focus. Even dual-centric doesn't necessarily mean just being focused on work and family. It could be work and photography. It could be your community. It could be buried treasure! I worked with a person who was really interested in that and mapped it all over the world, taking his vacations around his interests.

People are actually finding less time for their free-time activities, but they're being more intentional about it. And I see companies beginning to use people's personal passions as a way of thinking about their work. The most eloquent person I've heard speak about this is Sandy Akin at Motorola. She's in human resources. Before her team began to do its work, each person talked about the things that he or she really cared about, and then they looked for ways to use those passions to frame their work. If someone who had a parent who was dying of cancer, they would get involved in something to do with people's health.

I don't know how widespread this trend is. But I do know that the changes we are living through are very big and very fundamental to the way that life and work are structured. We are in a period where the structure of the workplace isn't matching the structure of people's lives outside the workplace. So there are going to be changes. My hope, and the goal of the meetings the Institute has, is to make people more intentional about these changes.



Leah Spalding, research director and survey specialist at IFTF, asked Ellen about leading trends at the intersection of work and home life.



THE NEW "CREATIVE CLASS"

In *The Rise of the Creative Class*, Richard Florida identifies creative professions as those that require self-expression on the job—daily creativity, flexibility, and innovative problem solving. At the core of this “creative class” are scientists, engineers, artists, writers, and entertainers, whose jobs have increased about ten-fold over the last century, and by 25% or more over the last decade.

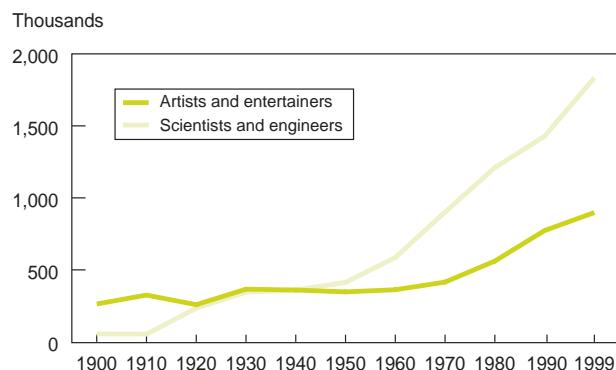
The creative class has wrought profound changes in the workplace as a whole—more flexible work schedules, for example, and a relaxing of old dress codes into the “no-collar workplace.” This casual work environment is attractive to many workers, both in and outside the creative class and is one of many ways that creativity and self-expression are entering the work world.

CREATIVITY, CAREERS, AND AGE

A focus on creativity is also likely to change traditional career paths. The

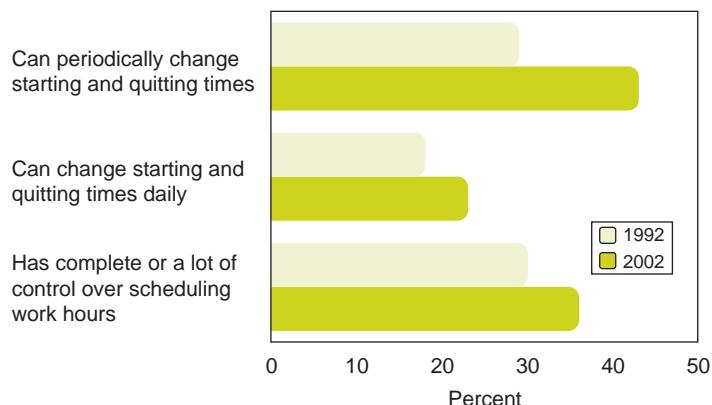
Institute for the Future mapped career path changes in the late 1990s, noting a shift from the career “ladder” to the career “spiral.” Also, in interviews with organizational innovators, IFTF found anecdotal evidence that creative thinkers are likely to seek out courses and experiences outside their normal career paths.

1 Number of Americans Employed in the “Core” Creative Class



Source: U.S. Census Bureau

2 Share of Full-Time Workers with Flexible Work Schedules



Source: Families and Work Institute, *Highlights of The National Study of the Changing Workforce*, 2002.

3 The Nature of “Career” Has Changed

Old Career Model: The Ladder

- Career growth is driven by tenure and performance
- Linear, one direction path
- Hierarchical path moves us
- Long-term, single employer
- Focus on discrete competencies
- Career dependent

New Career Model: The Spiral

- Career growth is driven by diverse experience and performance
- Cyclical or circuitous path
- Horizontal path moves around
- Multiple relationships with employers
- Develop competencies in multiple contexts, portfolio keeps evolving
- Career self-reliant

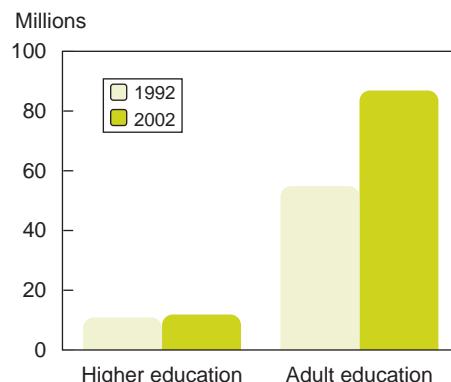
Source: Institute for the Future

LIFELONG LEARNING MEANS CONTINUOUS SELF-DEVELOPMENT

In 1999, an estimated 90 million adults in the United States participated in adult education activities in the preceding 12 months. Participation in adult education has grown from four to six times the enrollment in higher education over the last decade.

Nearly one quarter of enrollment in adult education is in personal development courses, such as hobbies, sports lessons, and personal health. Participation rates in personal development courses increase as overall level of education increases.

4 Participants in Adult and Higher Education



Source: National Center for Educational Statistics

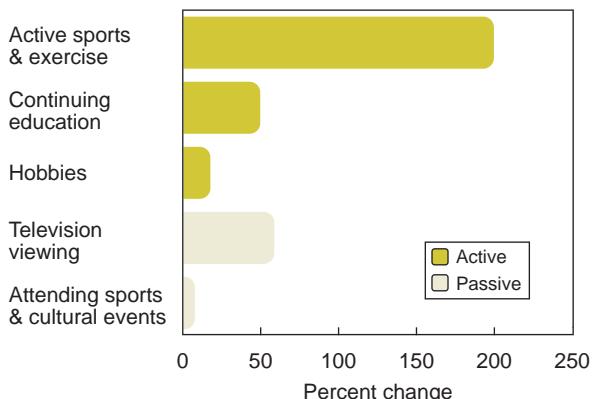
LEISURE TIME IS MORE ACTIVE

Americans are more likely than ever to spend time engaging in hobbies and active pursuits. Time-use research has shown that, in general, Americans spend approximately 40 hours per week on "free time"—in other words, they have roughly as much free time as work time. Over the last several decades, they are increasingly spending it on active forms of entertainment, such as active sports, hobbies, and continuing education.

Behind the seemingly modest increase in hobbies is a great deal of activity. A 2002 online survey by the Hobby Industry Association found that 60% of U.S. households had participated in crafts and hobbies, such as needlecrafts and painting, within the last year. Approximately three-quarters of U.S. households have at least one member who has ever participated in crafting.

The sole exception to this trend of more time spent on hobbies is dual-earner couples with children, who report that they have less free time for their own interests than ever. However, some of the time that parents earmark for their children is also spent on forms of self-expression. Children are spending more time on their hobbies and active interests: the amount of time 3–12-year-old American children spend on hobbies grew 150% between 1981 and 1997, and time spent on art activities increased 148% over the same time period according to a University of Michigan study.

5 Percent Change in Average Time Spent on Leisure Activities



Source: Robinson, John P. and Geoffrey Godbey. *Time for Life: The Surprising Ways Americans Use Their Time*, 2nd ed. The Pennsylvania State University Press, 1997.

6 Popular Culture Provides Intensive Experiences

New and Intensive Experiences	
Television	Interactive television; voting for contestants on American Idol; personal video recorders (e.g., TiVo), "reality" TV
Film	DVD bonus features with extended footage, documentary, and "behind the scenes" materials; films with alternative endings
Shopping	C2C marketplaces (eBay; Yahoo! Auctions); Lucky magazine (comes with purchasing information and sticky tabs to mark items for purchase)
The Home	DIY remodeling: Martha Stewart Living magazine, Trading Spaces and While You Were Out home improvement TV shows
Gaming	Alternate reality games, massively multiplayer games (e.g., The Sims Online, Counterstrike)

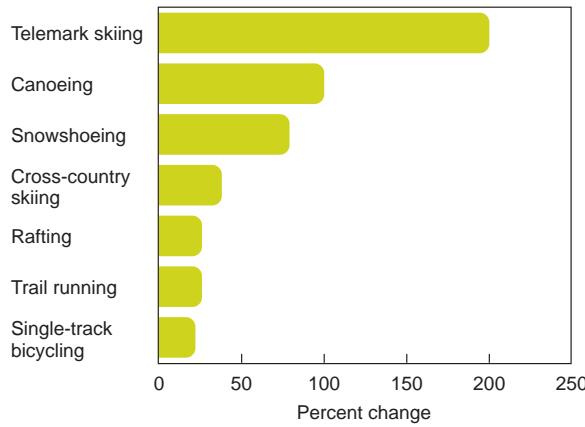
Source: Institute for the Future

THE "EXPERIENCE LIFESTYLE"

Leisure time is not only more active, it is also more extreme and more participatory. Today, popular culture increasingly features experiences that incorporate more media simultaneously, more in-depth information, and larger groups of people. Intensity is built into entertainment products, with the result that consumers have become used to a diet of emotionally absorbing entertainment. The bar is being raised for what is considered a "fulfilling" experience.

Meanwhile, figures from the Outdoor Industry Association of America highlight the shift to so-called extreme sports. Counting people who engage in an activity at least once a year, it found a 200% increase in telemark skiing and a 100% increase in canoeing between 1998 and 2001. These extreme sports are important because they not only bring to light an extremely active segment of Americans; they also emphasize how "feeling more alive" is an important goal.

7 Percent Change in Sport Activities Among Americans 16 and Older, 1998–2001



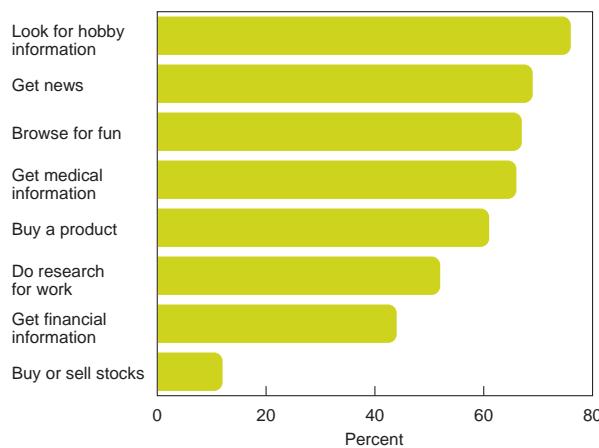
Source: Outdoor Industry Association's Outdoor Recreation Participation Study, 4th edition.

THE INTERNET AS A RESOURCE FOR SELF-EXPRESSION

A lot of Internet activity focuses on hobbies and personal interests. For example, the Pew Internet and American Life 2000 survey found that the hunt for hobby information is the most popular activity on the Internet: 76% of Internet users say they have sought such material. The search for hobby information is especially compelling to younger Internet users, 82% of whom have sought hobby information.

Not only does the Internet provide a resource for information about hobbies and interests, it also allows people to form communities around these topics—communities that can be virtual, or increasingly, also physical. For example, Meetup.com is a Web site that coordinates physical meeting places for local members to meet around their interests, including politics, hobbies, or parenting. Yahoo! Groups is a site for more traditional online communities, but those groups may also occasionally meet in the real world, as is the case with groups organizing recent flash mobs in New York and San Francisco. Sites like Meeup.com and Yahoo! Groups speak volumes about the ability of the Internet to expand networks of people around a hobby or interest.

8 Percent of Adults Who Use the Internet To ...



Source: Pew Internet and American Life Project surveys, 2003.



- ◀ The Internet provides a way for people with shared hobbies and interests to find each other and spend time together—both online and off.

The growth of jobbies—jobs that build on workers' personal interests and sometimes provide alternative economies—will drive both companies and communities to rise to the challenge of the emerging creative class.

Q: | How will the growth of jobbies challenge workers' job satisfaction?

Opportunities for self-expression outside work raise the bar for what is considered fulfilling on the job. Unless there are also opportunities for fulfillment in paid employment, the prospect of finding fulfillment elsewhere can threaten job satisfaction—especially for lower-tier or entry-level jobs. But even high-level employees, who can afford especially distracting hobbies, may feel that the grass is greener on the more creative side. Some will opt to move into jobbies, while others may stay in their jobs but intensify their hobby activity.

As with the dual-focused workers surveyed by the Families and Work Institute, the workers who intensify their hobby activities will spend longer hours fulfilling multiple responsibilities. While we might expect them to be more stressed, the findings of the Families and Work Institute suggest that they may actually be less stressed. Creative expression appears to relieve stress.

Q: | How can companies develop human resources practices that build on the rise of jobbies?

The most innovative HR departments will continually seek to reinvent the workplace and the nature of working itself to respond to workers' desire for challenge and self-expression. Flexible work schedules and support for new learning opportunities will continue to be important. In addition, companies may need to re-constitute job descriptions to include more creative components—and make sure that employee passions as well as skills are well matched to those components.

Q: | How will creative workers respond as a market?

The growth of jobbies means more opportunities to provide products and services to creative workers. The time-starved creative workers will be receptive to offerings such as just-in-time hobby events, mobile hobby supplies and projects, and quick and easy ways to experiment with mass customization. Imagine consumers who can print customized goods on a modified ink-jet printer—from cell phone covers to bumper stickers, jewelry, and wallets—and build an entire trade-based economy on eBay around them. This self-customization will undoubtedly infringe on copyrights—but the smartest companies will find ways to work with the experiments of their enthusiastic market.

Q: | How will companies and cities collaborate to build creative infrastructures?

Some cities, like Memphis, are using the message from Florida's *Creative Class* book to build an infrastructure that will attract creative workers—including cafés, galleries, and art events, and a nightlife. Memphis city and county officials are in the process of revamping their “sleepy” city promotional materials and offering accelerated tax breaks to developers to convert industrial buildings into loft apartments and offer lower rents to galleries and similar scene-builders. Large corporations are seeking to do their part by lobbying for the repeal of laws that aren't friendly to gay men and lesbians (important elements of a creative infrastructure). The goal is to attract an eclectic mix of talented workers with disposable income. The process of building this infrastructure may take years, but organizations who want to get in at the ground level should watch for emerging local “scenes” that can indicate a new pool of creative, innovative workers.

Human experience within a complex set of automated physical and digital webs will create a new extended sense of self



PERSPECTIVES 2004

SR-829

© 2004 Institute for the Future.
All rights reserved.
Reproduction is prohibited
without written permission.

www.iftf.org

The Key Shift: From Boundaries to Focal Points

As our nomadic forbears began to establish permanent dwellings, they changed their perceptions of the landscape, enclosing it with structures that defined their daily lives. This shift encouraged the newly sedentary humans to define themselves and their world by boundaries. They engaged in great feats of architecture—think of the Great Wall. They constructed elaborate social classes and constraints. They developed a fierce sense of belonging called patriotism.

Today, technology is again shifting human perception to include a more global, more abstract landscape that melds cyberspace and geographic space. The result is a new kind of nomadism that will drive a fundamental shift from a concern with boundaries to a concern with focal points—with the question of “what do I pay attention to?”

To understand the evolution of the focal point is thus to anticipate the economic practices, the social interactions, and the patterns of mobility of the future. It is also to understand how humans will redefine their basic identity (or their multiple identities, to be more accurate).

The Web of Being Human: Extensions of the Self

As they traverse physical-digital landscapes and make use of distributed resources for their

everyday business, the new cybernomads will find that they are not just individuals, distinct from the web of information, places, and tools they use. Instead, they will discover themselves increasingly augmented by new sensory devices and by information that seems, at times, to be a part of their personas—and perhaps even part of their bodies.

Already among artists and performers, not to mention science fiction writers, the concept of the cyborg has captured the creative imagination. Films like *The Matrix* echo a deep, subconscious fear of this new interconnectedness. Meanwhile, scholars have, for years been exploring the relationships among devices, techniques, and thinking patterns. From Marshall McLuhan and Quentin Fiore's *The Medium is the Massage* to Peter Wilson's *The Domestication of the Human Species* and Andy Clark's *Natural Born Cyborgs*, they have made the case that human tools and architectures are integral parts of human consciousness.

The early cybernomads—including most global knowledge workers—are actively working and playing at the edge of this new human experience. In the coming decade, their experience with increasingly pervasive connective technologies will provide the first glimpses of the cybernomadic world to come.

—Andrea Saveri



O V E R V I E W

Interview: Andy Clark



Andy looks beyond the cyborg to see the fundamental human-machine symbiosis that has existed throughout history

Q: | Most people associate “cyborgs” with science fiction characters like the Terminator or Borg. You contend that this concept of the cyborg rests on a misunderstanding of the nature of the relationship between humans and technologies. How so?

Well, it's not so much a misunderstanding as an underestimation. The problem is that focusing on these rather scary images of machine-penetrated human flesh diverts attention from what I see as the distinctive signature of our species: our ability to enter into profound and self-transforming relationships with our best tools and technologies. The interface may proceed via the direct wiring of flesh to silicon (the pop-Cyborg route), or via the less direct (but equally effective) interfaces of touch, sight, sound, or smell. Used properly, these ancient interfaces can yield human-machine hybrids as dramatic as any Terminator or Borg.

Q: | What technological developments make it important to correctly understand the relationship between humans and technologies?

Two big things. The first is the generation of adaptive and individualized tools and technologies like “software agents” that can learn about the user and tailor themselves to her specific needs over time, or PCs that learn what major functions you use most, and make those increasingly fast and efficient (at the expense of those that you don't use). In each case, the tool becomes tailored to the individual by a kind of “mutual learning.”

The second is the development of a wide variety of new ways of interfacing between user and technology. In place of the tired, old, low-bandwidth links of mouse and keyboard, folks at the MIT Media Lab and elsewhere are devising ways of making information flow tangible and manipulable using skills that come naturally to human users.

Q: | Can you give an example?

One great example is the U.S. Navy's tactile flight suit. It works by generating bodily sensations (via safe puffs of air) inside the suit. If the craft is tilting to the right or left or forward or backward, you feel a puff-induced vibrating sensation on that side of your body. Your own responses (moving in the opposite direction so as to correct the vibrations) are monitored by the suit and control the helicopter. The suit is so good at delivering information in a natural and easy way that even inexperienced helicopter pilots using the suit can fly blindfolded or perform difficult maneuvers like a stationary hover.

The tactile flight suit also shows how we can achieve extreme intimacy and ease of control even without directly wiretapping the brain. But we are also getting better at constructing neural interfaces that allow direct thought control of technologies.

Q: | Like Miguel Nicolelis' neural interface between monkeys and a robotic arm?

In many ways, Nicolelis' neural interface, which allows a monkey to control a robot arm by thought alone, is a prime example of my book's central theme. But it's also important to note that what makes the tactile flight suit and the robot arm both work is the brain's fantastic ability to adapt to the new devices and opportunities. Yet that ability is also less remarkable than it at first appears: after all, biological bodies grow and alter during normal development, and a brain that was unable to learn to control an altered body would be of little use to the baby who grows to a toddler who grows to a teenager.

Andy Clark leads the cognitive science program at Indiana University and is the author of *Natural Born Cyborgs*, among other books on the philosophy of cognitive science.

Brains like ours are naturally designed to be, in a very real sense, open-ended control systems. That's why bodies matter, while the details of the body do not matter so very much. Embodiment is crucial, yet always and everywhere negotiable. In the future, the body may be biological, robotic, enhanced, extended, multiple, all-in-one place, or spread across several physical locations.

Q: | One emerging trend in information technology is the growth of location-based services, and the intermingling of digital data and computing with physical places. Do you see the growth of smart spaces as affecting human intelligence and identity?

Definitely. One chapter of my book deals with the human potential, via the automatic laying of electronic tracks and trails, to profit from forms of “swarm intelligence.” Wired agents, emitting signals as they move around the world, will progressively overlay the physical world with a new layer of stored information, which will be retrieved by interested agents. To take a mundane example, I might learn that most visitors to this spot last month went on to such and such a bar or café. At a deeper level, advances in adaptive technologies and the creation of transparent user interfaces will make it harder to tell where the human user stops and the rest of the world begins.

Q: | Looking ahead 20 years, how do you think someone born around now will differ from people of our generation?

In some ways, they'll be quite different indeed. We may, for example, quite literally see more than we currently do. Play very novel forms of sensory signal (such as infrared input) into well-chosen parts of our relentlessly plastic brain, and in time that brain will probably learn to make direct and fluent use of them in controlling action. Our species' future is thus as open as anyone could imagine. The human body, human sensing, and human thought are all apt for profound transformations by new forms of intimate technology.

Yet in the most important sense of all, this is nothing new, nothing frighteningly “post-human.” It is simply the elicitation, through technology, of striking demonstrations of the plasticity that always lies at the very heart of our biological being. In the deepest and most important sense, I think we will still be the same old souls we always have been.



Alex Pang, historian of science and a research director at IFTF, asked Andy how new technologies will shape human identity.



CYBERNOMADISM DEFINED

Cybernomadism is that human experience that occurs within the complex set of automated, distributed physical and digital relationships afforded by sensor-based, mobile computing and communication technologies.

THE NEXT SENSORY TRANSFORMATION

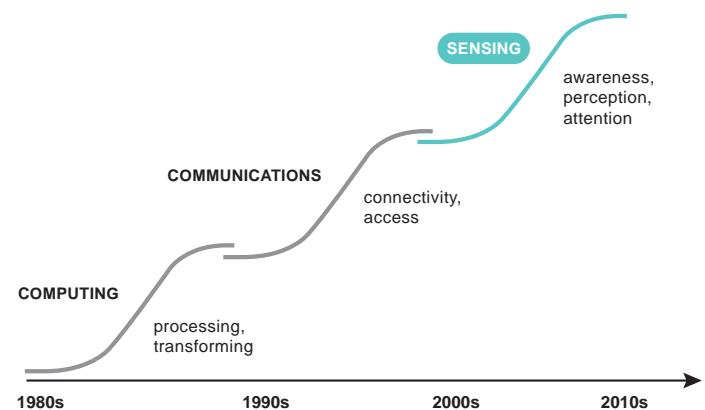
The last 30 years have seen a profound, stepwise transition in our ability to perceive and interact with the physical world. First computing changed the speed and complexity with which we could process information. Then communications broadened our access in both time and space and connected us globally. In the next decade, sensing devices will have the most profound effect yet, as they shape our awareness and attention.

This shift will constitute a sensory transformation on an historic scale, comparable perhaps to the shift from tree-dwelling apes to tool-using hominids. It will change the species—extending the human sense of self well beyond the human biological body. This 21st-century ego will likely have needs, fears, and desires that challenge the traditional Maslovian hierarchy of needs.

THE SHIFT FROM BOUNDARIES TO FOCAL POINTS

The shift in sensory perception over the next decades will loosen the grip of boundaries on human lives. Instead of seeing cyberspace as distinct from the material world, cybernomads will begin to perceive the two as fused. Instead of peering at it through a screen, they will find it embedded in the objects of their daily life and perhaps even in their own bodies. This shift will be reflected in everything from books people write to the way companies interact with consumers.

1 Three Eras of Technology



Source: Institute for the Future

2 Key Shifts in Cybernomadic Culture

	From Boundaries	To Focal Points
Important books	<i>Death of Distance, Virtual Community</i>	<i>Things That Think, Smart Mobs</i>
Infrastructure metaphors	The "net"	The "whuffie"
Business practices	Hoteling	Hot spots
Commerce	Clicks and mortar	Location-based services
Interfaces	Desktops and windows	Augmented-reality glasses
Marketing	Market segmentation	Market lenses

Source: Institute for the Future

WHY NOMADS NEED FOCAL POINTS

In his analysis of hunter-gatherers, anthropologist Peter Wilson laid the foundation for understanding cybernomads as well.

Boundaries, then, do not enter into the matter. Hunter/gatherers revolve around a focus, sometimes physically, always spiritually and socially. The region around the center point fades in its attractive power, in a manner of speaking, or it may "overlap" with the "radius" of another center of attraction. Since these foci and zones are unbounded they can hardly exclude others. But people moving in and out come within and move out of a "zone of influence" or of another's belonging, and it is in this respect that "permission" is asked (and granted) to enter. This is a way of life that emphasizes openness, and I suggest that any notion of closure such as might be imposed by the concept of boundary is foreign. On the other hand, any tendency for formlessness or anarchy is counteracted by emphasizing focus, attraction, identification with, and belonging to.

—Peter Wilson,
The Domestication of the Human Species

SMALL, SMART COUNTRIES LEAD THE WAY

The leading edge of cybernomadic culture may best be found in a handful of small countries that have not only fostered high connectivity but have also excelled in education and knowledge skills that are key to the cybernomad's lifestyle.

The International Telecommunications Union recently developed a Digital Access Index that serves as one indicator for cybernomadic culture. The index measures fixed and mobile phone subscribers, affordability of Internet access, adult literacy and educational attainment, bandwidth available to users, and number of Internet users.

The top ten countries include mainly small European and Asian countries. While traditional measures of economic prowess might discount these countries, they may well indicate a new kind of economic advantage yet to be properly characterized and measured.

3 Countries with the Highest Digital Access Index Scores, 2002

	Index
Sweden	.85
Denmark	.83
Iceland	.82
Korea	.82
Norway	.79
Netherlands	.79
Hong Kong	.79
Finland	.79
Taiwan	.79
Canada	.78
United States	.78

Source: International Telecommunications Union, 2003.

4 Other Scores on ITU's Digital Access Index

	Index
United Kingdom	.77
Japan	.75
Germany	.74
France	.72

Source: International Telecommunications Union, 2003.

◀ The United States ties with Canada for 10th place in the ITU's Digital Access Index—a measure not only of technological infrastructure but also the skills to use that technology.

◀ Many major players in the world economy are slightly behind the leaders, but still rank high compared to most of the world's countries.

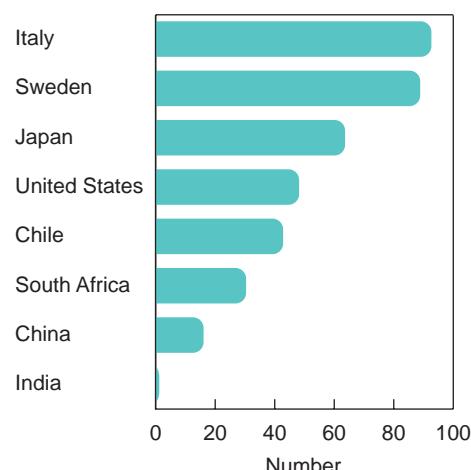
CELLULAR MOBILE VS. WI-FI

While the United States only ties for 10th place among digitally accessible countries, it has pioneered the growth of wireless Internet connectivity in a way that the rest of the world has not.

Europe and Asia have adopted cellular mobile phones and devices much faster than Americans. Most Western European countries have cell phone penetration rates of 75% to 95%, while Eastern European countries have compound annual growth rates of 100% to 200%, according to the ITU. This infrastructure places an emphasis on phone-based access to the wireless Internet.

By contrast only 48% of U.S. consumers have mobile cellular devices. But they can take advantage of more than 3,700 wireless “hot spots” nationwide using other devices like laptops. Hot spot density is thus a competing indicator of cultural and perhaps economic advantage in the world of cybernomadic culture.

5 Cellular Mobile Subscribers per 100 Inhabitants, 2002



Source: International Telecommunication Union, 2003.

Cell phones have had the greatest success in Europe and Japan, laying a foundation for phone-based wireless Internet access in those countries.

6 U.S. Cities Ranked by Number of Hot Spots, 2003

1. Portland (OR)
2. San Francisco/San Jose (CA)
3. Austin/San Marcos (TX)
4. Seattle/Bellevue/Everett/Tacoma (WA)
5. Orange County (CA)
6. Washington (DC)
7. San Diego (CA)
8. Denver (CO)
9. Ventura (CA)
10. Boston (MA)

Source: Intel Corporation, 2003.

In the United States, the top ten “unwired” cities—as Intel called them in a recent study—are good places to begin to track the emergence of cybernomadic culture, American style.

DIMENSIONS OF CYBERNOMADISM

Cybernomads will redefine the key dimensions of human life through new behaviors and new focal points. Many of the behaviors will mirror traditional nomadic lifestyles—with similarities to pastoralists, hunter-gatherers, traders, and craftsfolk. However, reinterpreted for a global physical–digital world, the new lifestyles will have a distinctly 21st-century flavor, with focal points that range from maps of geo-URLs to IP battles.

7 Dimensions of Cybernomadism

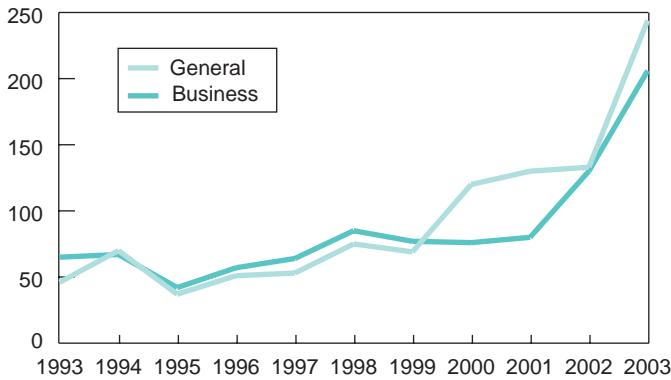
	Key Behaviors	Key Focal Points
Economic	Cybernomads cultivate diverse relationships with a global economy	<ul style="list-style-type: none">• Knowledge workers• Creatives• Designers• Students
Movement	Cybernomads build a systematic and patterned form of mobility	<ul style="list-style-type: none">• Convenience• Social networks• Daily and yearly cycles
Landscape	Cybernomads seek out physical–digital landscapes that are marginal or even hostile	<ul style="list-style-type: none">• Alternate realities• Taxonomies and maps of the landscape
Social Interaction	Cybernomads emphasize cooperative and collective behavior	<ul style="list-style-type: none">• Social capital• Group solutions to complex problems• The “Extended Self”
Social Organization	Cybernomads create a social world that is tribal, local, and neighbor-oriented	<ul style="list-style-type: none">• Degrees of intimacy• Definitions of social proximity
Relationship to Non-Nomads	Cybernomads enter into symbiotic and interdependent relationships with non-nomads	<ul style="list-style-type: none">• IP rights• P2P computing• Online political organizing

Source: Institute for the Future

THE GROWTH OF THE TRANSHUMAN IDENTITY

In the last couple decades, many artists, writers, and commentators have begun to come to terms with the new cybernomadic relationship between human body and technology. Quite literally, coming to terms has meant coining new terms such as cyborg, transhuman, and post-human. A check of LexisNexis shows that articles including “cyborg” have increased significantly in the last few years.

8 LexisNexis Citations for “Cyborg”



Source: LexisNexis

Cybernomads are not just the latest fad in the fashions of information technology. They represent a new way of working, a new way of living, and a new way of thinking that could change world culture for decades to come. Nothing that companies do will go untouched by this new extended self, but the early changes will be noted in marketing and managing the workplace.

Q: | What new opportunities do the technologies of the extended self suggest for creating brand loyalty?

Brands are all about identity—both corporate and personal. This link between corporate and personal identity plays out most intimately in the close-in extensions of the self—the clothes people wear, the devices they can't leave behind, and the information and media they carry with them. In the world of cybernomads, this intimate identity space will grow to include the interfaces between individuals and the information-rich, connected environments that they traverse.

Companies need to understand these emerging interfaces and the opportunities they present for co-creating powerful brands. For example, many participants in virtual worlds request ways to express their real life personas in the virtual world: if they buy a branded shirt in real life, they want to have the same branded shirt available for their online persona. Also, as technology augments performance—both physical and mental—specific brands are likely to be linked to specific types of performance enhancements (as in the case of Viagra).

Q: | How can companies tap new cybernomadic markets, particularly as the traditional boundaries defined by demographic segments give way to focal points?

In the world of cybernomads, focal points are often hot spots of connectivity, transactions, and social interactions, embedded in a particular place and sometimes even at a particular time. Dispersed across both the physical and digital landscape, within and outside of organizations, these focal points can quite literally become the focus of consumer relationships with companies.

One of the first things companies need to do is understand the changing consumer palettes of space—the different ways that consumers adopt places as focal points and how

different markets segment according to these palettes. Companies also need to decide what kind of role they want to play in the ecology of focal points—whether it's to become a focal point themselves or to provide products and services through the focal point. For example, eBay is a place where an object—an auction item—becomes the focal point of buyers, sellers, information flows, and transaction services. This online focal point has now generated real-world focal points, such as drop-off services that accept goods to sell on consignment through eBay. Understanding how these focal points emerge and disperse across the physical–digital landscape will be a key strategic skill in a cybernomadic future.

Q: | How can companies support their employees as they become increasingly cybernomadic?

Companies are co-evolving with their workers as technology shifts the focus of identity to an extended self that reaches into resources, relationships, and physical–digital places as needed. Some of the signal challenges in this shift are: recognizing that work takes place in a variety of environments, not just the office or home; auditing and building the social and intellectual capital that is embedded in worker networks, both within the organization and outside; developing bottom-up collaborative practices that can quickly bring collective intelligence to bear on unanticipated problems; and encouraging distinctively different but symbiotic work styles for mobile and sedentary workers.

A major shift in thinking that most companies will have to make in the next decade will be the workplace infrastructure—which will transform from wired desks to wireless personal wearable networks. Workers' bodies will become the dominant infrastructure of knowledge work; with this more intimate relationship between self and work, people will perhaps bring more aspects of their personal selves to their work. Watch for an increase in modalities of personal expression in the workplace.



Like computers and the Internet, location-sensing systems have been incubated by the military, adapted by civilian industry, and are now spreading into the consumer sector. The declassification of GPS data and systems in the 1990s spurred the growth of location-based services in transportation, agriculture, and supply chain management—and an explosion in the volume of digital geographical data.

Recently, location sensing has begun moving into new arenas, such as roadside assistance systems in cars and new mobile phone services. IPv6—an Internet protocol that makes it possible to give fixed Internet addresses to everything from laptops to street lamps—is being implemented. And efforts are underway to create a “geoweb” that associates geographic location with Web content.

As the Internet connects digital data to physical places, “real-time” data will be joined by “real-space” data

Connectivity: From World Wide Web to Geoweb

Location-based services and geocoded content are interesting, but not very important, when they’re accessed from personal computers. However, trends in displays, flexible electronics, data storage, and wireless point to a much more compelling future in which we’ll carry personal devices that constantly access the Internet, scan our surroundings for interesting things, and communicate with each other and our environments.

We’ve seen this combination of proliferating technology, legacy data, and nascent bottom-up interest before. Location-based services and the geoweb are roughly where the World Wide Web was in 1993. Location-sensing technologies—in concert with other “connective technologies,” such as cheap color displays, flexible electronics, wireless connectivity, and small-scale power—will give every user of cell phones, PDAs, and other mobile devices the ability to access geographically coded data. As content and services are developed that exploit these technologies, the geoweb will take off, much as the Web did after the introduction of the Netscape browser.

Real-Space: Taking Data to the Streets

The result will be a profound change in the way we create and consume information, and in the ways we think about the relationship between the Internet and the world. Cell phones have given us a taste of what happens when communication technologies are able to cut the cord. By unmooring the Internet from our desktops, we will be able to take data into the streets. We’ve long understood the virtues of accessing data in “real-time;” in the coming decade we’re going to discover the power of connecting in “real-space.”

As a consequence of these trends, cyberspace and physical space will cease to be separate universes: the former will become an overlay on the latter. Information will have a physical address; physical objects will have an address in cyberspace. In short, we’ll find ourselves in an immanently addressable world, with everything that such a world implies for communication, community, and colonization.

— Alex Soojung-Kim Pang



PERSPECTIVES 2004

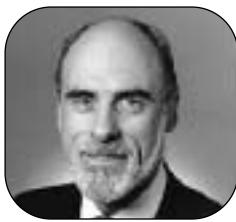
SR-829

© 2004 Institute for the Future.
All rights reserved.
Reproduction is prohibited
without written permission.

www.iftf.org

O V E R V I E W





Vint speculates about the potential for very small devices on the Internet

Q: | There's a lot of talk about connecting all kinds of physical objects to the Internet. As we think about creating an addressable world, what do you imagine to be the smallest device that could benefit from having its own IP address?

A PDA or a video game device could readily have an IP address and thus become part of an interactive broadband Internet environment. It's when you start pushing down much further that it gets interesting. Every time you decide nothing could get smaller or you couldn't possibly build a really small device that has, say, a full Linux operating system, somebody comes along and builds one.

For example, there's a little device called a Cerf Cube. (It happens to be spelled the same as my name, but I don't have any connection with it.) It's a 3"x3"x3" device that runs a full Linux OS; it has an Internet address and an 802.11 transceiver. That's pretty small. And then you've got handheld 802.11 phones with SIP capability selling for \$80. So I don't think there's necessarily an obvious limit.

One could easily imagine sensor systems that have IP addresses associated with them. Unattended or autonomous devices like unmanned aerial vehicles could use IP addresses. Consider a device that you could swallow, something with a radio transceiver and an IP address. That could become a sensor system that you would ingest to keep track of what's going on in your intestinal tract.

Q: | As we think about creating lots of small addressable devices, how soon do we run out of Internet addresses with the current Internet protocol? Is it time to move on to IPv6?

This continues to be a source of some controversy. I don't think anyone is arguing that the pressure will be unbearable before 2006 or 2007. Personally, I'd like to see some significant movement toward IPv6 before then. Sony has announced that it intends to Internet-enable all of its consumer products around that time, using IPv6.

The 3G mobile telephone community also says it prefers to use IPv6 rather than IPv4 in its Internet-enabled mobile phones. Consumer electronics and mobile phones are two industries producing a large number of devices—billions, in fact—so one can easily extrapolate running out of IPv4 within just a couple years. Even today, there are about 1.1 billion cell phones in use.

Q: | What is the current state of IPv6? How many people are using it?

Very few at this point. It has not been widely deployed, though there are pockets of heavier interest. The Japanese are interested, some parts of Europe are very interested, and the Defense Department has announced that it wants to get there by 2008. I'm a strong proponent of IPv6 because of the larger address space that it affords—and the greater security that comes from using the end-to-end principle, which says we don't have to make modifications to the source and destination addresses of the packets in order to communicate since they all have enough address space to have unique IP addresses.

I'm not downplaying the enormous amount of effort that will be required in making the transition from v4 to v6. Most of the successful transitions will happen with devices that are dual stack and dual protocol. Some of the simpler edge devices may only run v4 or v6, in which case some conversion capability has to be developed to allow applications running in one to interact with applications running in the other.

This is a multi-year process. You don't just throw a switch, and suddenly everyone is running v6, and the world is new.

Vinton G. Cerf is senior vice president of technology strategy for MCI. Widely known as one of the "Fathers of the Internet," he is the co-designer of the TCP/IP protocols and the architecture of the Internet.

Q: | When people talk about the addressable world, they often come up with examples of packaging that talks to your refrigerator, which, in turn, talks to the store. How likely are these kinds of scenarios?

These kinds of extreme examples and the degree of autonomy that they confer on a device—whether it's a car or a refrigerator—may exceed people's willingness to let a piece of software do something that they don't necessarily have a lot of control over.

But there is a slightly less extreme position that could be quite attractive. For example, if a refrigerator knows what it has in it, it can also say what it doesn't have in it. So if you aren't sure whether you have any milk, or cheese, or eggs, the system may be able to tell you. It may not be automatically ordering, but it might say, "Historically, you've always had a gallon of orange juice in the refrigerator. You don't have any now. Should I order more?" It would leave you with the option to say "no."

I'm even willing to argue that the idea that the refrigerator knows what it has in it, and therefore knows what you can make for a meal, is attractive. It might suggest that you could make X, Y, or Z for dinner with its contents, and also say, "And by the way, if you want to have spaghetti, you'd better remember to pick up some mushrooms, because I don't have any left." This becomes a more collaborative than tyrannical relationship.

Q: | What role do you see in this world for RFID?

My favorite example is the RFID Internet-enabled wine cork that has sufficient processing capability and memory to record the history of the wine and the wine bottle. More broadly, one could imagine all kinds of conditions where it would be valuable to have information about passive things that might be in need of repairs.

One obvious example might be information about your own health—how many times you've seen the doctor, and under what circumstances. This is particularly important if you've been rendered unconscious and nobody knows

who you are. Now, this gets into the territory of, "Well, I don't know if I want to have a subcutaneous RFID chip that identifies me as so-and-so," though you might choose to have a bracelet that has that chip in it for the same reason that people wear MedicAlert bracelets today. So the idea is that you can associate an identifier with an object whose history is important to know and then have networked databases that contain that information.

There are open questions, of course, about privacy and access to the associated information. If that information is not stored in the object itself but is subject to access control by the server, you have some ability to control access.

One of the interesting philosophical debates that comes up in the Internet world is, "Where should Internet names end?" Should there be some other lower limit? The answer keeps changing, depending on how you treat information, and whether you treat something like an RFID tag as an active object. If you imagine having an active object that you interact with through the Net to extract its information, then it has to have an IP address.



Alex Pang, IFTF research director, met with Vint Cerf to explore the prospects for IPv6, the next generation of Internet standards.

A GLOSSARY OF DIGITAL GEOGRAPHY

AVL

Automatic vehicle locators are devices that make use of GPS (see below) to track the location of vehicles, using the Internet. Transportation and other companies with large fleets have typically used AVL technology to manage their assets more effectively.



E911

Electronic 911 is an enhanced emergency phone service, designed to augment traditional 911 service by electronically routing emergency calls to the proper authority; by providing the phone number of the calling device; and by showing the cell location from which the call originates.



Geoweb

Geoweb is the term applied to the body of information on the Internet that is geocoded—which means that it can be accessed and sorted by location as well as content.



GIS

Geographic information systems use computers to store, retrieve, analyze, and display spatial data. GIS systems have been in use in many fields for about 30 years, creating a wealth of legacy data that can now be drawn into a geoweb.



GML

Geographic Markup Language is a general-purpose XML standard for linking data to specific geospatial locations. The most recent version, GML3, also includes language for related metadata such as topology, time and processes, and observations. See also RDFMap below.

(see below) recently released version 1 of its OpenLS location services specification, designed to assure interoperability among equipment manufacturers and network service providers.

OGC

The Open GIS Consortium is a standards group working to develop a broad set of open standards for incorporating geographic information into location services, sensor networks, and critical infrastructure systems.

RDFMap

The Resource Description Framework is a high-level system for processing metadata, such as the tags in various XML languages. Because it works across languages, it assures interoperability across many different domains, such as business and health. RDFMap is a vocabulary for describing location. It is an alternative to GML (see above).

IPv6

Internet Protocol Version 6 is an expanded standard for Internet-based communication designed, among other things, to expand the number of available Internet addresses. With this protocol comes the ability to assign addresses to virtually anything that can communicate, from computers and phones to smart appliances and tiny networked sensors.

URL

A Universal Resource Locator, familiar as a Web address, is the unique pathname to a file or other resource on the Internet. Geo-URLs associate a particular URL with a geospatial location.

LS, LBS, and OpenLS

Location services, also known as location-based services, are information and communication services that are linked to a particular location. Several organizations have developed proprietary standards for such services, but the OGC

LOCATION-BASED SERVICES WILL SHAPE THE GEOWEB

The growth of the geoweb—and diffusion of practices that merge physical and digital space—will be shaped in part by the growth of location-based services. AOL and CompuServe helped turn the World Wide Web from an academic tool to a popular phenomenon, and generated tens of billions of dollars of revenue in the process. Estimates of the future market for location-based services run into the tens of billions of dollars.

In the long term, the most successful evolution of this market is likely to be a bottom-up geoweb in which content is created and geocoded by a wide base of users—much like the World Wide Web—while commercial vendors make money from devices and services with highly effective interfaces and filters to the geoweb.



Source: <http://labs.google.com/location>



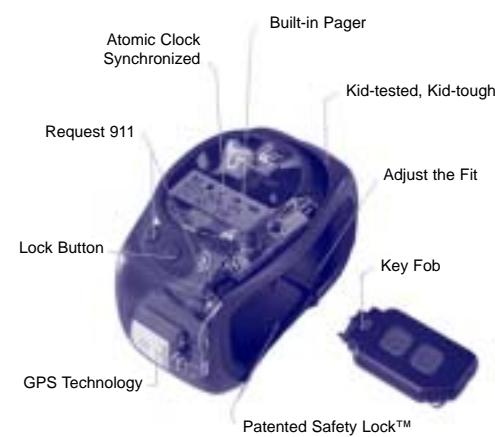
Google recently introduced location-based searching of the Web.

A TYPOLOGY OF EARLY LOCATION SERVICES

Matthew Mankins at MIT has suggested a framework for location-linked information that includes the following types of applications:

- **People location** services are likely to include child monitors and displays of IM buddies or social network contacts who are in close geographical proximity. If you think of your pet as a family member, you can include pet trackers here, too.
- **Resource locators** could map out the nearest restrooms, Wi-Fi hot spots, bus stops, or other public facilities—in addition to commercial facilities such as restaurants, theaters, and shops that have style B vacuum bags in stock.
- **Event locators** might track historical events such as auto accidents, ski accidents, or crimes, providing a kind of warning system for people who happen into potentially dangerous territory.
- **Device locators** are likely to include not only personal property but also tiny, sometimes invisible devices. RFID tracking services are already available for tracking tags by their ID number. See RFtracker.com.

1 Wherify's "Child Watching" Technology



Source: Wherify Wireless



Products like this child tracker suggest the emotionally charged concerns—both pro and con—that will shape the future of location-based services.

LOGISTICS AND SECURITY DRIVE GEO-TRACKING

For several years, the U.S. military has been developing a sensor-based network to manage the movement of munitions and other military supplies around the world.

Known as the Total Asset Visibility (TAV) program, it provides tracking of more than 350,000 containers at 750 sites in 40 countries worldwide.

The military is now making this network available to commercial companies on a trial basis. In addition, an initiative known as Smart and Secure Tradelanes is under

development by shipping, port services, and communications companies. The system is patterned after the military TAV program, and is designed to enhance both the efficiency and safety of moving products through a global supply chain.

AUTOMOTIVE TELEMATICS GROWS

The automobile is one of the brave new frontiers of mobile computing. The OnStar GPS system for cars now has more than 2 million subscribers, and is available on a quarter of new General Motors cars. The platform is also being leased to other manufacturers and is moving down market from luxury automobiles.

Industry analysts estimate that the telematics hardware and services markets will grow to \$20 billion by 2005 and serve 17 million vehicles; by 2010, it will be a \$32–\$40 billion market serving over 100 million vehicles—that is, 70% of new cars. The major challenge to this growth is the possible competition from GPS-enabled handheld devices.

The adoption and use of the technology will differ from region to region. In the United States, systems are sold for security (particularly to women). In Europe, they help navigate national and linguistic borders. In Japan, they're essential for basic navigation through large cities with complicated (or nonexistent) street and numbering systems.

ADDRESSABLE INFRASTRUCTURES

The Open GIS Consortium (OGS) has launched a “Critical Infrastructure Protection Initiative” to provide rapid access to geospatial information about critical infrastructures, including telecommunications, transportation, energy, banking, water supply, emergency services, health services, and government services.

OGS has developed a series of open web services for online processing of geodata as well as open interfaces. As data about the physical infrastructures become geocoded, these services can be used to rapidly render multi-layer maps of infrastructures to support crisis decision making. And with the cost and size of sensors dropping, self-configuring sensor networks—tiny communicating sensors that are dropped in place or painted on surfaces—may provide the input to real-time analysis of the state of these infrastructures within the next 10 to 15 years.

2 Geo-Tracking Through Seaports Will Be Important in the Shipping Industry



Share of U.S. imports arriving through seaports

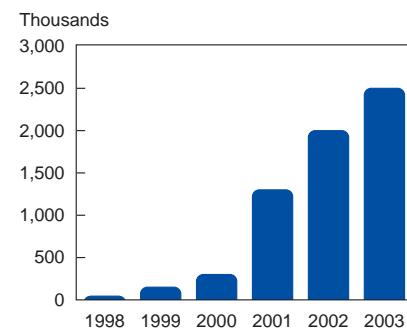
80%

Shipping containers arriving daily at U.S. seaports

17,000

Source: Strategic Council on Security Technology

3 OnStar Subscribers, 1998–2003



Source: News reports

GEOBLOGGING: BUILDING THE GEOWEB FROM THE BOTTOM UP

Geoblogging links personal publishing to real-world geography. It's a bottom-up way to build geocoded content.

The main portal for the geoblogging movement is www.geourl.org. This service maintains a database of blogs that users have self-coded with their longitude and latitude, using XML tags. Other services can use the GeoURL output as a resource for their own services. Localfeeds (<http://localfeeds.com/>), for example, creates an RSS feed of blogs in a specific area.

As of November 2003, GeoURL had 52,038 blogs in its database—a tiny percentage of the roughly 5 million active blogs in existence. However, if popular blogging services like Blogger and AOL Journals add easy-to-use geocoding features, geocoding is likely to take off, feeding GPS-enabled cell phones and other devices as they reach critical mass in the next few years.

GEOCACHING: GPS FOR FUN

To get a sense of the potential of the geoweb in bottom-up, user-centered activities, consider the rise of geocaching, a sport that combines GPS and the Web to create a high-tech treasure hunt. Geocache players use GPS coordinates and other clues to find a “cache” of objects; they then register their discovery in a logbook, take an item from the cache, and leave one.

The sport is entirely self-organizing and supported by enthusiasts. It receives some indirect encouragement from GPS equipment manufacturers like Garamin and Magellan, but there is no association or governing body regulating the sport or creating caches. It bears less resemblance to traditional sports than to open source software (or possibly birdwatching). As such, it has grown to include more than 70,000 caches in nearly 200 countries worldwide in just three years.

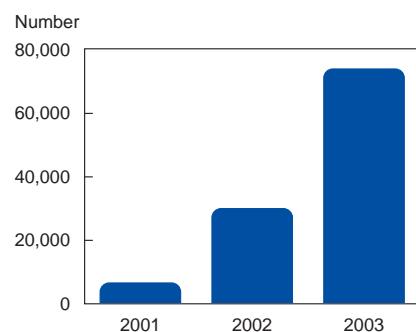
In the early days of the sport, geocaching was described as a hobby of GPS geeks. In the last year, most popular articles have described it as a healthy, outdoor activity suitable for the entire family. This suggests that geocaching has reached a tipping point, moving from a niche activity for a technical elite, to a widely accessible popular sport.

4 Density of Geocoded Blogs Worldwide



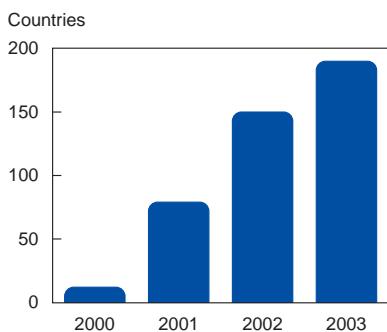
Source: www.geourl.org

5 Geocaches Worldwide, 2001–2003



Source: News reports compiled by geocaching.org.

6 Countries with Geocaches



Source: News reports compiled by geocaching.org.

Linking information to places and objects will create a “fourth dimension” for products and services, which companies and consumers will mine to their own benefit over the next decade.

Q: | How real are location-based services and when will they begin to change business practices?

Location-based services got off to a rocky start as lots of companies rushed to fill bandwidth with privately generated, location-based information. Lack of robust information meant a lack of meaningful applications. This situation is likely to change over the next few years as the geoweb begins to build out and self-organizing information spaces begin to emerge.

The impacts will cut across business sectors and functions, changing everything from the way people think about merchandising to the way they organize production and work teams. Location-based narratives are likely to influence where stores are sited; within stores, the art of display will begin to take into account the narratives that emerge around products and places, creating a constantly shifting info-geography of retail and consumer participation in branding at a new scale. Meanwhile, as location-based information intersects with the globalization of production, organizations will be able to make smarter, faster choices about outsourcing, relocating plants, and managing the flow of goods and services across communities, nations, and world regions. Many of these innovations will be in full swing by the end of this decade.

Q: | How will consumers turn RFID to their own benefit?

To date, RFID has had its strongest proponents among supply chain gurus—and its loudest critics among privacy advocates. Little thought has been given to how consumers might turn RFID to their own benefit. Yet, as information gets linked to objects, consumers will likely get tools for accessing that information and begin to turn RFID codes to their own advantage.

In fact home inventory and tracking systems are likely to turn up before item-level tracking by manufacturers and retailers, providing everything from insurance inventories to sophisticated closet organizational aids. However, real consumer applications are likely to be focused elsewhere. In particular, they are likely to show up in the three Ps: presence management, privacy management, and productivity management. (For example, while early hawkers of the technology offer monitoring devices, savvy consumers may prefer to adopt “fake-a-location” devices to protect their privacy and also convey their presence in places they perhaps want to be but can’t quite make.) These practices will ultimately influence life more in the workplace than life in the retail outlet.

Q: | How will social software and location-based information intersect to change opportunities for business communication?

As companies and their employees begin to use friend-of-a-friend (FOAF) software to build and track their social networks, new opportunities arise for linking these networks to specific locations. Already, some offerings help people walk into a hotel or convention center and find people in their network. It’s easy to see how such software could be extended to track historical patterns or even future plans, linking calendars to locations. Ad hoc meetings in ad hoc spaces may extend current practices by youth of “planning by approximation.” Workers can also use this information for strategic planning as workspaces diffuse into the environment and workers—as well as customers and suppliers—become “cybernomads.” Learning to use this information creatively and effectively will be a key workplace skill in the coming decade. (See also our forecast for “Cybernomads” in this volume.)

Linking information to places and objects will create a “fourth dimension” for products and services, which companies and consumers will mine to their own benefit over the next decade.

Q: | How real are location-based services and when will they begin to change business practices?

Location-based services got off to a rocky start as lots of companies rushed to fill bandwidth with privately generated, location-based information. Lack of robust information meant a lack of meaningful applications. This situation is likely to change over the next few years as the geoweb begins to build out and self-organizing information spaces begin to emerge.

The impacts will cut across business sectors and functions, changing everything from the way people think about merchandising to the way they organize production and work teams. Location-based narratives are likely to influence where stores are sited; within stores, the art of display will begin to take into account the narratives that emerge around products and places, creating a constantly shifting info-geography of retail and consumer participation in branding at a new scale. Meanwhile, as location-based information intersects with the globalization of production, organizations will be able to make smarter, faster choices about outsourcing, relocating plants, and managing the flow of goods and services across communities, nations, and world regions. Many of these innovations will be in full swing by the end of this decade.

Q: | How will consumers turn RFID to their own benefit?

To date, RFID has had its strongest proponents among supply chain gurus—and its loudest critics among privacy advocates. Little thought has been given to how consumers might turn RFID to their own benefit. Yet, as information gets linked to objects, consumers will likely get tools for accessing that information and begin to turn RFID codes to their own advantage.

In fact home inventory and tracking systems are likely to turn up before item-level tracking by manufacturers and retailers, providing everything from insurance inventories to sophisticated closet organizational aids. However, real consumer applications are likely to be focused elsewhere. In particular, they are likely to show up in the three Ps: presence management, privacy management, and productivity management. (For example, while early hawkers of the technology offer monitoring devices, savvy consumers may prefer to adopt “fake-a-location” devices to protect their privacy and also convey their presence in places they perhaps want to be but can’t quite make.) These practices will ultimately influence life more in the workplace than life in the retail outlet.

Q: | How will social software and location-based information intersect to change opportunities for business communication?

As companies and their employees begin to use friend-of-a-friend (FOAF) software to build and track their social networks, new opportunities arise for linking these networks to specific locations. Already, some offerings help people walk into a hotel or convention center and find people in their network. It’s easy to see how such software could be extended to track historical patterns or even future plans, linking calendars to locations. Ad hoc meetings in ad hoc spaces may extend current practices by youth of “planning by approximation.” Workers can also use this information for strategic planning as workspaces diffuse into the environment and workers—as well as customers and suppliers—become “cybernomads.” Learning to use this information creatively and effectively will be a key workplace skill in the coming decade. (See also our forecast for “Cybernomads” in this volume.)

On October 15, 2003, China successfully launched its first person, Yang Liwei, into space and announced its intention to go to the moon. Earlier in the year, the U.S. manned space program suffered the loss of a crew on the space shuttle *Columbia*. Neither of these events is commercially significant in the near term, and yet they may have set in motion the global dynamics for the commercialization of a new generation of technology—one in which space information is more important than rocket power.

Space
technology
is poised to
open new
commercial
markets for
information—
and Asia may
take the lead



PERSPECTIVES 2004

SR-829

© 2004 Institute for the Future.
All rights reserved.
Reproduction is prohibited
without written permission.

www.iftf.org

The Emerging Space Ecology: Conflicts of Interest

Space is currently being colonized by a few key applications: telecommunications, earth-observation systems, military intelligence and weaponry, and space exploration and industrialization. Among the key players are government agencies in the United States, the European Union, Russia, Japan, China, and India.

The headlines focus on a new race for human landings on the moon—and even Mars. The key to understanding the likely evolution of this second race for space, however, is the underlying motivations of the two main players. The United States wants to secure its military superiority; China wants to build its economic prowess.

Space Information: At an Inflection Point?

In the long term, China may come out on top. Over the last ten years, the tension between military and commercial uses of space data has been resolved through a series of international agreements about restrictions on resolution and other controls that protect U.S. military interests. However, China has shown little interest in acceding to these.

Meanwhile, commercialization is proceeding apace. Several companies now offer products based on space imaging, and a wide range of applications are likely to take off in the next few years. Satellite photographs will help companies target neighborhoods

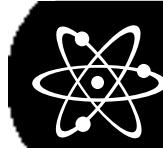
for everything from direct mail to new real estate development. Mobile Earthlings will even use satellite imagery to map their surroundings in real time—“seeing” the crowd at the cineplex from four blocks away and finding their friends in the line, for example. Access to such detailed data will, of course, push all the privacy, security, and civil rights buttons of the Information Age. But a society such as China’s, in which the expectation of these rights is perhaps lower than in the West, may be able to move more nimbly to implement the new applications—and sell them to Western customers.

A New Paradigm: Infrastructure, Not Exploration

Finally, it will not be the power of rockets to reach the moon and Mars but rather the power of intelligent networks in space that will be the lasting contribution of the newest initiatives.

Spacecraft and stationary planetary gear, designed to serve as nodes in planetary and interplanetary networks, could begin to create an infrastructure not unlike the fixed and mobile communication towers on Earth. They could provide a new capacity to look both back toward Earth and out toward the future of space. With this shift, we will begin a transition from pure exploration of space to a phase in which we can imagine a permanent extraterrestrial presence of our human intelligence, if not our human bodies.

—Kathi Vian and Alex Soojung-Kim Pang



O V E R V I E W

Interview: Peter Banks



Peter anticipates the strategies—and global implications—of China's manned space program

Q: | In the fall of 2003, China launched its first manned space rocket. Is this new Chinese initiative a signal for a second race for space—á la the Soviet-U.S. space race in the 1960s?

It takes two to race, so you have to ask who will join the race. The Russians and Chinese are not going to get into a race because the Russians can't afford to right now, and the Chinese are actively working with the Russians to develop their own space program. The European Space Agency is not pursuing manned space flight except through the U.S. program. India is focused on various types of communication and remote sensing and depends upon France for its launch capability; it has indicated little interest in going to the moon. So the only suitable partner in a space race—the only one with deep pockets—would be the United States.

And indeed, the United States has—at least symbolically—thrown its hat in the ring. The question is whether the announcement of plans to send U.S. astronauts to the moon and Mars is a serious commitment to a new era of manned space flight or simply a necessary political stance in the face of the Chinese success and the criticism of the U.S. space shuttle.

With its current military obligations overseas, the United States probably doesn't actually have the money to invest in a major space initiative. Yet it probably can't afford not to take up the challenge, either, given China's growing economic strength. Keep in mind that all eight members of the Chinese Politburo are engineers, and they have officially stated that, "Natural power stems from economic strength which comes from technocratic strength." While manned space flight doesn't really address the main uses of space today—satellite broadcasting, telecommunications, integrated military earth observing systems, industrialization, and exploration of space—it will develop China's technocratic power.

Q: | How would the Chinese approach differ from the U.S. program, and how quickly could they actually send someone to the moon?

The Chinese have purchased a lot of the basic infrastructure from the Russians. They will most likely adopt an approach based on incremental progress something like this: you go into near space with the equivalent of the *Progress* cargo ship and set up a small laboratory. You get direct experience working in space in that lab. But then instead of a massive single shot at the moon—in which you get people there and keep them on the lunar surface for 48 hours and then bring them back—you use the relatively low cost of smaller launches to take up fuel and apparatus, and you do an on-orbit assembly of a much less complex system that would probably be a lot safer than blasting off in a *Saturn 5*. Then you send automatic probes to orbit the moon, set up a moon station, and do a transfer instead of a direct shot. In other words, you go to a low earth orbit, transfer to a system that's been put together in space, take a relatively leisurely flight to the moon, orbit the moon, de-orbit to the surface, put down automatic equipment, and then maybe people. With this strategy, humans are not so much the focus but rather a "tool" that is superior to the automated tools you already have available on the moon.

That sort of program could be initiated within five years, and it would probably take seven to eight years to get to the moon beyond that. But if their leadership decides that they want to engage the United States—without getting into a military standoff—they could be there in a period of time that would be very difficult for Americans to match.

Q: | What would make it difficult for the U.S. to compete?

The United States has had commitments to more sophisticated, very large, heavy-boost technology, which is expensive. Boeing, Rockwell, and Lockheed have lots of ideas for space planes and large technology demonstrations, but they are all new and risky and quite expensive.

Peter Banks joined IFTF this year as its president, having served as Dean of the College of Engineering at the University of Michigan and Director of the Space, Telecommunications, and Radioscience Laboratory at Stanford University.

There were many alternative ideas for the current space platform, going all the way back to the 1970s. But despite the cheaper, better, faster technology that the Discovery program was intended to promote for unmanned space flights, there's just no money for using these relatively simple technologies for the manned space flights. When it comes to putting humans in space, the big contractors have had the money tied up in complex, large-volume, heavy-mass systems. The new initiatives do, in fact, suggest a reorientation toward cheaper, lighter solutions, but it's unclear whether there's the political will to follow through.

Q: | Suppose that the Chinese succeed in the minimum time—say, 10 to 11 years. What would be the global economic and political impact of a successful program?

The Chinese are climbing out of 200 years or more of technology lag. So what they are doing now is very calculated. The space program is not just a small group of people who are going off and doing something in their own sphere of interest. It's part of a national effort to extend their list of technological accomplishments.

But it's also about training, about growing their expertise and skills in materials, high-energy burning systems, rockets, and fuel stations. To do that, they will build an economic system that will enhance what they are already doing in manufacturing to become a true global power with a broad economic base.

Q: | If they succeed in building a lighter, cheaper, faster route to the Moon, what kinds of innovations—especially commercial innovations—are likely to result?

Hydrogen-fueled engines for large-mass projects don't translate readily into commercial applications. But if you adopt a program that's going to use microelectronics and very lightweight equipment, you don't have to invest in these heroic technologies, and the ones you do invest in are better adapted to commercialization. So one of the interesting questions is whether the Chinese have learned that there is an easier way to get what they want from

space without having to undertake very dangerous, very expensive, very time-consuming projects.

They have an opportunity to do something very agile and, also build a technological base in several important areas. One of the first things they'll learn is how to operate safely in a large, complex, and remote space, taking care of humans in environments without the normal support systems and atmosphere of Earth—for example, by developing artificial diets. More important, however, would be the commercialization of space data. A space-savvy China could quickly launch an integrated earth information system for business intelligence, national planning, and environmental protection. Such a system is on their list of goals, and they could commercialize it in a way that the Western powers haven't been able to.

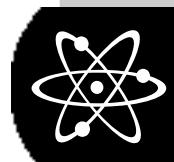
Q: | Who will be their allies in this quest?

If China solicits allies in this process, it will be to separate the Asian countries from the West. A Japan–China alliance might be the starting place. It would exclude India but would probably try to include countries that are now under the wing of the United States: Korea, Taiwan, Vietnam, Cambodia, Thailand. Because of their limited national resources and inability to develop the technology, these smaller countries could rapidly be brought into a Chinese program—even given their fears of China.

So ultimately, the Chinese manned space program isn't just about putting someone on the moon. It has to do with the national ambitions of China, and from that point of view, it's a very logical next step.



Kathi Vian, research director at IFTF, asked Peter to reflect on the trajectory of space exploration, given China's recent initiatives.



THE USES OF SPACE: EMERGING APPLICATIONS

Most current applications of space technology are in telecommunications markets. But over the next decade—and beyond—commercial opportunities are likely to expand, especially in the arena of earth-observation data.

An early player to watch in this arena is ESRI, which has already bought rights to commercialize much of the U.S. government's

GIS data and is likely to expand its offerings to include new products based on earth-observation data. Among academics, a leader in linking earth-observation data to socio-economic statistics

is the Center for International Earth Science Information Network (CIESIN) at Columbia University. Meanwhile, markets will include everyone from oil companies to real estate agents and even community planning boards—for example, the town of Dublin, OH, has adopted the IKONOS satellite's high-resolution space imaging technology to help monitor its rapid urban growth.

Meanwhile, a few companies are starting to offer value-added applications using earth-observation data. For example, Zoomify, Inc., a technology company with products that create high-resolution, interactive images for the Web, combines its technology with space-imaging data to generate applications for science and business alike—including a prototype “Paris Concierge” program to find apartments in the city.

1 Promising New Commercial Applications of Space Technology

Telecommunications & GPS

- Location-based services
- Global navigation services
- Broadband wireless services
- Asset tracking
- In-flight fax and Internet
- Telemedicine

Earth-Observation Data

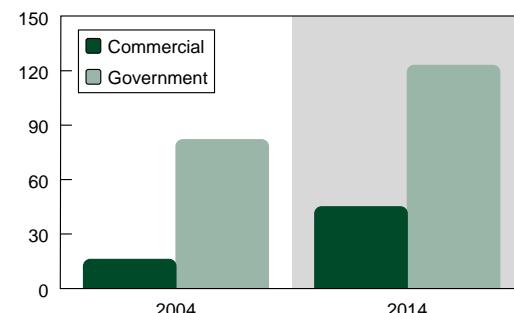
- Epidemiology
- Environmental land management
- Critical infrastructure protection
- Oil, gas, and other resource exploration
- Early warning for natural disasters

Exploration & Industrialization

- Persistent space agents and robots
- Space-debris management
- Asteroid detection and diversion
- Extraterrestrial resources (helium-3 and liquid oxygen)
- Hazardous-waste disposal

Source: Institute for the Future

2 Annual Satellite Launches Worldwide



Source: Futron Corporation, 2001.

COMMERCIAL SATELLITE LAUNCHES GROW DISPROPORTIONATELY

Satellites are the basic hardware for many space applications, and annual launches of satellites worldwide have continued to grow, despite the problems of the telecommunications industry and economic recession. The majority of these launches are for government-owned satellites—with even poor African nations investing in their own satellites.

However, the ratio of commercial-to-government satellites is likely to increase substantially over the next ten years as the number of commercial launches approximately triples and commercial applications proliferate. At present, about 60% of commercial GEO satellite bandwidth is used for video broadcasting; in the next decade, mobility applications and commercialization of earth-observation data may drive much of the growth.

REMOTE SENSING: FROM 2D TO 3D INFORMATION

While space radar has created a capability to provide topographical imaging of the Earth's surface, a new remote sensing technology, known as interferometric synthetic aperture radar (ISAR) may improve on space imaging options—without going into space.

The technology, pioneered by Environmental Research Institute of Michigan (formerly run by Peter Banks) and commercially offered by Intermap Technologies Corporation, uses a LearJet, which can get under weather conditions that sometimes obscure satellite images and can make multiple fast passes over a region in question, rather than having to rely on a single-pass radar satellite. More important, it is able to provide much more accurate measurements of the vertical surface of the earth. It can thus capture subtle changes in the earth's surface (accurate to 30 centimeters) as soon as they happen.

Intermap is now among a few leading-edge companies marketing applications based on earth imaging—in this case, using a combination of satellite imaging data and ISAR. The applications range from photographic-quality flight simulators using actual earth terrain to programs that help insurance companies evaluate environmental risks, such as flooding.

This image of Shrewsbury, England, uses the vertical precision of ISAR surface data to plot a floodplain—taking into account various flood defense features.



Source: Intermap Technologies Corporation, 2003

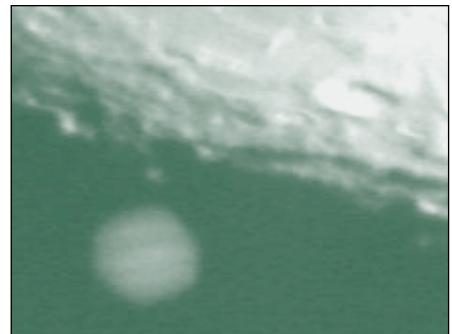
AGENTS AND GRIDS DRIVE "FAST ASTRONOMY"

Two technologies—intelligent agents and peer-to-peer computing—are intersecting to create new opportunities for astronomers to track “the most rapid and violent events in the universe.” In 2003, a team of astronomers announced a project, called eStar, to create Internet-linked networks of robotic telescopes that can respond to changes in the night sky within seconds.

“The universe currently does things faster than we can respond to them,” according to Alasdair Allan on the eStar team at the University of Exeter in the United Kingdom. Astronomy has long been a distributed science. But while older collaborative systems were designed to deal primarily with backlogs of data, eStar’s goal is to support rapid collective action around unique and unexpected events in the universe—incorporating a degree of intelligence and decision-making power in the network itself. As Allan told the BBC: “What is so important here is that we have developed an intelligent observing system. … It thinks and reacts for itself, deciding whether something it has discovered is interesting enough to need more observations. If more observations are needed, it just goes ahead and gets them.”

The project uses the Grid, a cross-industry, peer-to-peer computing network, running on the Internet, for sharing and processing data for very large, complex applications.

This photograph of the occultation of Jupiter by Earth's moon was captured using an eStar robotic telescope.



Source: The eStar Project, 2003.

THE INTERPLANETARY INTERNET: VINT CERF'S VISION

Since 1957, when the Soviets launched Sputnik, humans have sent several hundred spacecraft on missions to the moon and planets. Each has spoken its own language, as engineers tailored the communications systems and protocols of each mission, depending on their equipment and goals. Highly efficient in the short term, this strategy contributed to a long-term problem: though human space travel is 40 years old, there is only a slender permanent infrastructure for future space exploration.

Now, a new mission has begun to take shape: the Interplanetary Internet. It is intended to create a permanent network for interplanetary and deep space communication, and Vint Cerf (one of the founding fathers of the Internet) is a leading exponent.

A Network of Internets

The idea of an interplanetary Internet (also called the Interplanetary Network, or IPN) evolved in the late 1990s, building on the work of the Consultative Committee for Space Data Systems (CCSDS). Since 1982, the CCSDS has worked to standardize space communication. Several dozen nations have adopted its standards, which have now been used in over 200 missions. CCSDS has been most successful in standardizing the handling of data after it leaves the spacecraft; the IPN focuses on guaranteeing reliable data transfer between objects in space, on other planets, and between deep-space objects and Earth.

As conceived, the Interplanetary Internet would be a “network of Internets,” just as the Internet is a “network of networks.” Each planet would have its own network, which would operate using Internet protocols and be designed for relatively low-noise, low-delay communications.

A Tolerance for Delays

An interplanetary backbone would connect the planets and other deep-space objects—such as spacecraft following comets, or craft traveling between the outer planets. As Cerf notes, “There is a multitude of problems associated with communication in deep space: size, weight, and power, and the fact that communication with these distant devices is very disrupted.” As a result, the backbone would have to be designed along radically different principles than today’s Internet: it would have to work despite “intermittent connectivity, huge propagation delays, and noisy data channels.” Cerf notes drily, “TCP/IP tends not to work very well when there’s a 40-minute round-trip time. ... Doing DNS from that distance will be counterproductive because whatever you’ve cached will be outdated the next time you send a message.”

Earth’s global Internet and the Interplanetary Internet will be mirror images. The global Internet will consist of a large number of delay-tolerant networks and ad hoc networks, all connected together by a stable backbone operating TCP/IP. The Interplanetary Internet, in contrast, will consist of stable networks connected by a delay-tolerant backbone.

Delay Tolerance on Earth

Building an interplanetary data network isn’t just rocket science. As Cerf notes, “There are an increasing number of contexts in which the techniques developed for the Interplanetary Internet could be applied to Earth.” Mobile devices, ad hoc networks, and smart dust all face the same kinds of power management and intermittent connectivity problems that the Interplanetary Internet must be designed to deal with. Engineers trying to bring computing to the Third World also face similar challenges. “One thing you learn when you go to Africa or India is that the power goes out a lot,” Cerf says. “Part of the interplanetary network is designed to deal with exactly the problems of interrupted communication and repeated rebootings of the operating system” that engineers in the developing world confront. Indeed, developers of the Interplanetary Internet now see their work as part of a larger body of work on delay-tolerant architectures—networks whose members are in intermittent contact with one another, or that may have to power down unexpectedly.

3 The Benefits of an Interplanetary Internet

Lower Cost and Better Control

A permanent communications network operating on common standards would reduce costs of future missions.

Cerf says, "It will make spacecraft a lot more effective in their data-gathering, and their ability to sustain principal-investigator control over their target instruments."

It will also increase the ability to manage data from concurrent missions, and provide a basic framework for more intelligent, agent-based cooperation between spacecraft.

Better Data Management

Universal adoption of common standards would also make it easier to analyze decades-old data, despite changes in hardware and software.

According to Cerf: "If the protocols are adequate to their purpose, they might last a while. Stability helps create a consistency in the data, formats, and protocols. You won't have such variations that you can't make use of older software and formats."

Extended Life for Spacecraft

After spacecraft complete their research missions, they could be placed in synchronous orbits or parked in libration points, and serve as relay points, becoming orbiting routers.

"We're not suggesting that we should build an Interplanetary Internet and hope that somebody will come," Cerf says.

The IPN would make it possible to design useful lives of spacecraft measured in decades rather than years.

Source: Institute for the Future

As China and the United States gear up for a race to the moon—whether friendly or not—the outcome will be a fresh infusion of new technology and new opportunities in the commercial sector.

Q: | What are the opportunities and risks for companies who want to take advantage of earth-observation data?

Earth-observation data is at the intersection of space technology and the emerging revolution in GIS data and the geoweb (see our forecast for “The Addressable World” in this volume). Here will be a host of new applications—from information management to visualization tools to end-user applications such as land-use planning software, infrastructure monitoring, and resource identification and tracking. These new products will create entirely new ways for companies to analyze their markets and gather other strategic data; they will create new indicators for basic variables that companies of all kinds need to track, linking them to the geophysical world.

At the same time, business platforms that build on data from space—whether they are products or internal strategic processes—face a number of risks. Much of this data is subject not only to government control but also to international treaties. In an uncertain, unstable world, the policies governing the use of this data could change on a moment’s notice. Even more significant, however, are the issues surrounding privacy and civil rights. The same tools that can support land-use planning can also be used for crowd control in the streets—which can easily shade into violations of the right to assemble. The same tools that can help roofing companies identify roofs in need of repair could also allow overly zealous building inspectors to track the most minor code infractions. So uses of earth-observation data are likely to be hotly debated and subject to shifting political winds.

Q: | How quickly will the broader range of commercial space-based applications diffuse?

Like all new technologies, space-based commercial applications will follow an S-curve of diffusion, and companies will need to find the sweet spot on the curve for their applications. We anticipate the first growth markets will be those that support the development of the space infrastructure,

including satellites, radar and other sensor technologies, and hardware and software for inter-space networking and communication.

Next on the curve will be companies that provide innovative ways to use information that is currently available through government and other commercial sources. These will be closely linked to the rollout of the geoweb and other GIS applications—which are on the threshold of explosive growth, comparable to the growth of the World Wide Web in the late 1990s.

Further out—beyond our ten-year horizon—will be opportunities for those who want to pioneer the use of space resources. China and the United States have targeted 2012–2015 to put humans on the moon, but even before then, both countries may explore robotic missions, which could begin to provide demonstrations of the feasibility of extracting moon resources. Still, any serious commercial applications are likely at least two decades away.

One key indicator to watch for all these applications is the cost of satellite launches: for significant extensions of commercial space applications this cost will need to drop significantly.

Q: | How will new space technology and new space programs alter the way that ordinary Earth-bound organizations manage their projects and products?

One of the near-term impacts of the space race may be basic changes in the way organizations get things done. Space projects, from basic science to commercial services, have generally required widely distributed workgroups, technology, and information. They also take an inherently global perspective. The growth of space programs could have a secondary effect of providing experience and technology for novel ways of working together to address complex global tasks.

