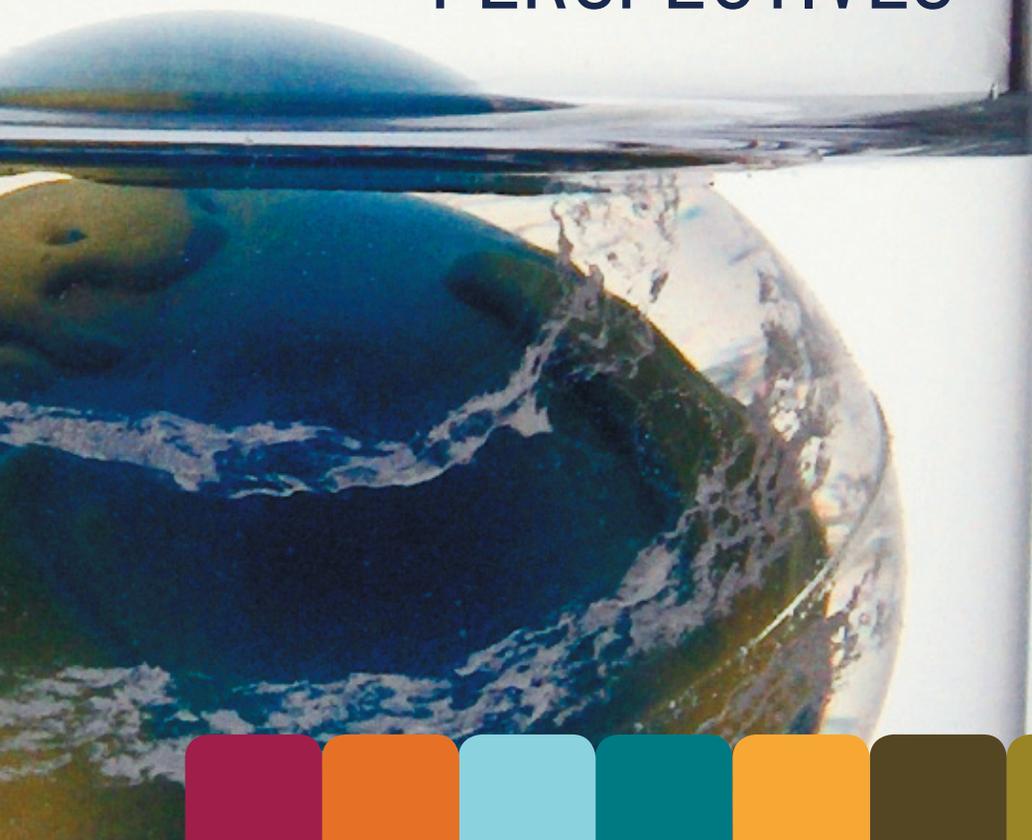


2005 Ten-Year Forecast PERSPECTIVES



**Truth-saying:
troubling currents,
liquid hope**

The truth is that we humans face tough times ahead—not 50 to 100 years from now, but by the end of this decade. Whether or not we believe that CO₂ is a pollutant responsible for global climate change, the truth is that extreme climate events will increasingly threaten crops, ocean-side properties, city infrastructures, and human life within the coming decade. Megacities will sprawl across the developed and developing world alike, their ecological footprints stepping all over one another. China's rapid growth, with setbacks along the way, will redraw not only the global economic map but also the global political map. A biodisaster—natural or human-made—lurks the horizon. And technologies designed to manage these problems may well collapse under their own complexity.

However, without resorting to cheerful euphemisms like “challenges” and “opportunities,” it's possible to catch a glimpse of some countervailing forces. Perhaps the most profound of these is a new level of sociability in human society—a growing intelligence about how to share what we have, know, and do in ways that benefit not only individuals, but whole communities and perhaps even entire ecologies. We're perhaps climbing toward a new plateau of human cooperation, comparable to our early steps toward hunting as tribes. The question is: can this new human sociability provide the survival fitness we need to make peace with the limitations of our planet?

In this year's *Ten-Year Forecast*, our 27th edition, we tackle this question by zooming in on three zones of disruption and innovation—economic experimentation, social intelligence, and extreme environments.

GRAND EXPERIMENTS IN AN UPSIDE-DOWN ECONOMY

A nonlinearity is a surprise—not just a blip in a trend, but a trend turned on its head or sucked through a worm hole. The global economy may be on the edge of such a worm hole right now, and when it comes out the other side, the world may look a little upside down.

This is a world of bottom-up economics, a world where economies of scale are achieved by economies of connectivity, where smartly connected individuals rely on relationship and reputation to get things produced and distributed, where commons proliferate and create the foundation for new kinds of wealth. It's a world that challenges existing property models. It challenges the basic consumer paradigm that has defined the marketplace for the last 50 years. If it seems like an economic revolution, it probably is: the social revolution of the 1960s–70s has combined with the technological revolution of the 1980s–90s to create a major transformation of the global economy.



Economics: The Grassroots Revolution

Can marketplace experiments in open source, peer-to-peer exchanges, and new kinds of commons reorganize the way society manages its production, distribution, and ownership of goods? This forecast examines these early experiments, with help from Steven Weber, author of *The Success of Open Source*, to interpret the lessons for larger economic change. **Andrea Saveri**

The political economic world may also take a flip in the next decade. Almost certainly China will continue to grow its manufacturing markets as well as its financial prowess. Working hard to build an Asian alliance that pulls its neighboring developing countries up with it, China will see itself as the forward-facing superhero, optimistic where the West is fearful, able to leap old infrastructures in a single bound, and devoutly committed to global success in the world of business.



Globalization: Chinese Futures Thinking

As China turns to face the world beyond its borders, can it keep the focus and collective will that has allowed it to step through 50 years of 5-year plans to achieve unprecedented economic growth rates? In this forecast, we probe the fragmentation of futures thinking in China to see what its emerging constituencies will strive for and how their ambitions may clash with one another and with the larger world. In her guest interview, dissident Chinese environmentalist Dai Qing weighs in on the growing conflict between marginalized groups and China's current boom economy. **Lyn Jeffery**



SOCIAL INTELLIGENCE IN THE AGE OF SOCIAL MACHINES

The thread that weaves through the social revolution of the 1960s–70s, the technological revolution of the 1980s–90s, and the emerging transformation of the global economy is the smart networker—that individual who embodies the person-centered values of the counterculture and the skill to use the new tools to express him or herself in a hundred different ways in the suddenly accessible public sphere.

Smart networkers seem driven to express, to take on do-it-yourself projects, to advise others about everything from good products to good health. They cultivate a host of public identities, equally at ease with podcasting their favorite tunes and their favorite religious messages. Lest you think that the counterculture roots of these smart networkers will tend to align them with one political party or another, be advised that smart networkers cut across political, religious, class, and educational boundaries. The only traditional demographic that distinguishes them is age: 24 to 35 is the “zone.”



Consumers: Do You Know Kevin Bacon?

If humans are becoming more sociable, if social software and networking tools are redefining our social identities, can we measure our progress with something like a networking IQ? This forecast analyzes IFTF’s 2004 American Lifestyles Survey to identify the factors that make a smart networker and to uncover how we’re testing out. [Jerry Michalski](#), former writer of Esther Dyson’s Release 1.0, adds his voice to the forecast, with his distinctive take on how smart networkers might displace the consumer paradigm altogether. **Kathi Vian, Rod Falcon, Mani Pande**



Culture: Sacred Technology

What happens to religion—that most sacred of social bonds—when it enters the lives of the continuously connected, the mobile, the expressive? In a broad scan of religious innovation in a world of pervasive connectivity, this forecast finds that religious practice is becoming more portable, more public, and more personal. [Genevieve Bell](#), an anthropologist and Intel’s expert on the topic, joins us to explore the ways in which technology is both reinforcing and reinventing religion. **Marina Gorbis**

It’s ironic, or perhaps not, that the smart networker’s passionate focus on the personal—on the “me-node” at the center of a networked universe—might also flip in a nonlinear way to create a new kind of collective sensibility and ultimately collective intelligence. And yet, inherent in the tools of smart networking are cooperative practices that redefine not only the individual but also the whole. This is not the classic view of machine intelligence, a Matrix-dominated society of bodies enslaved to a collective brain. Rather it is a profoundly sociable view of intelligence, and as our friend and mentor, Howard Rheingold, likes to say, “All of us are smarter than any of us.”



Workers: Visible Minds

If groups of people know and can act on things that individual members do not, how will the workforce of tomorrow organize this collective intelligence? This forecast proposes that new practices will replace technocratic, top-down tools with ethnographic bottom-up applications like wikis, folksonomies, and reputation systems. In our guest interview, [Peter Hessel-dahl](#), Danish author of *The Global Organism*, speculates that, our technologies of cooperation not only make us more fit for a complex world, but also remove the sense of separateness between us. **Alex Soojung-Kim Pang**

TOUGH REALITIES IN A GLOBAL ECOLOGY

One of the basic premises of cultural evolution is that human societies create more complex forms of organization in order to improve their chances of survival. If our social practices, our collective toolkits, and our economic structures are reorganizing themselves for more adaptability to complex environments, it's perhaps not a moment to soon.

Our environments will challenge us over the coming few decades in unprecedented ways. Cities will grow into megacities, becoming more like the wilderness that propelled us into complex cultural forms in the first place. Resembling the most extreme ecologies in nature, the urban landscape will inspire a host of adaptations and perhaps even speciation of the human race. People will experiment with tools—digital, pharmacological, and biomechanical—that extend the human body beyond what we think of as human today.

Then there's the climate: uncertain, but almost certainly more extreme in its hurricanes, droughts, floods, and wildfires. In a gambler's frenzy, we will have to decide if we want to act on a one-in-ten chance that what we do today could trigger an irreversible threat to the human species by the end of the century. With only probabilities to guide us, we will have to act now to mitigate and adapt.



Demographics: Cities as Wilderness

As the world population becomes predominantly urban, how will it adapt to the diverse ecologies to be encountered there? This forecast profiles the new world cities, and considers the implications for urban infrastructures, urban health, and human identity. [Roger Kennedy](#), former director of the U.S. National Park Service and author of the forthcoming book, *Living with Limits*, assesses the dangers of urban migrations in our guest interview. **Rod Falcon, Susannah Kirsch**



Environment: Weather Betting

What are the short-term impacts—and strategic implications—of global climate change? This forecast looks at the probabilities, in the near and long term, for severe climate impacts of already demonstrable climate change. Guiding us through the debates that surround the issue is Stanford University's [Stephen Schneider](#), who received the McArthur Fellowship for his ability to integrate and interpret the results of global climate research. **Peter Banks, Kathi Vian**

And in the crucible of these changes—literally, in the heat of the global ecology we're creating—we face perhaps the greatest near-term threat: biodisaster. The probabilities of some kind of pandemic, whether natural or initiated by terrorists, have been ratcheted up by radical global connectivity, on one hand, and the ability to tinker with basic genetic material of life, on the other.



Wild Card: Biodisaster

If a worldwide pandemic is lurking in the shadows of the coming decade, how prepared is society to cope—medically, socially, ethically, and technologically? Assessing five key drivers of the threat, this forecast explores the difference between a biodisaster and other natural disasters. [Eric Noji](#), a CDC physician detailed to the Office of the Secretary of Defense at the Pentagon, outlines the scope and complexity of the biodisaster threat in his interview. **Bern Shen**

Can technology rescue us? As we take our social tools in hand to improve our collective intelligence, to create more resilient economic and social structures, and to extend our capacity to cooperate in complex environments, we also glimpse the potential for technological collapse. At a minimum, we will most likely traverse a period of disinvention, in which we clear the ground for a new material reality that draws its inspiration from quantum physics and the biological sciences. Come 2015, quantum computers, biosensors, and artificial life will begin to cast their shadows on the technological landscape.



Technology: Disinvention

Much is known about the path of diffusion of new technologies, but what is the path of disinvention and decay? In this forecast, we consider the endings of technology as a way to anticipate a possible collapse as a new, more biologically oriented technology finds its way into our lives. In our guest interview, [Kevin Kelly](#), author of “New Rules for the New Economy” and co-founder of *Wired* magazine, uses his recent research among the Amish to reflect on these questions. The forecast also contains a new map of the technology horizon. **Paul Saffo**

AND ALWAYS LOOKING AHEAD

As we anticipate this complex and troubling future, we also reflect on our own forecasting tools. As Paul Saffo has suggested, we may have come to depend too much on strong information, narrowly focused at a time when we might do better with broad webs of weak signals. And as our thinking tools tie us into social webs, perhaps our vocation is also becoming a vocation of the many, not the few.



Methodology: Weak Signals

Navigation has always been a strong metaphor for forecasting, but have we been using the wrong navigational tradition? In this methodological retrospective/prospective, we explore the Oceanic tradition of ethno-navigation as an alternative metaphor, and consider the different kinds of map projections that can make sense out of the future. In our interview, [David Rumsey](#), map collector extraordinaire and member of the board of The Long Now Foundation, tells us how old maps might inform what we do. **Paul Saffo**

In the spirit of “Weak Signals” and “Visible Minds,” we are opening our forecasting workspace to our TYF members this year with a newly re-launched Ten-Year Forecast blog (<http://blogger.iftf.org/tyf/>). In this more open workspace, we hope to launch into a broader investigation of the potential of grassroots economies and smart networking to help society adapt to the daunting challenges that face us in the coming decade. A focal point of the research this year will be modeling the impacts of the grassroots economy on global GDP over the coming decades. In addition, we will delve more deeply into extreme environments and our human, technological, and social adaptations to them. We’ll track the growing signs that we’re becoming a sick herd, and also explore the “end of cyberspace” as virtual and physical worlds blend in ways perhaps no one anticipated.

The Ten-Year Forecast Team

Kathi Vian, Program Director
Maureen Davis, Program Manager
Lyn Jeffery, Asia
Mani Pande, Statistics
Alex Soojung-Kim Pang, Science & Technology
Paul Saffo, Senior Advisor
Jason Tester, Artifacts
Jean Hagan, Creative Direction & Design
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For more information about the Ten-Year Forecast Program and our offerings, contact **Maureen Davis** (mdavis@iftf.org).

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**We look forward to working with you as
we navigate this future together over
the coming year.**

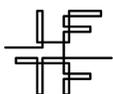
**Kathi Vian, Program Director
Ten-Year Forecast**



Recent marketplace experiments—from eBay to Interra, from Linux to BIOS—pose surprising challenges to traditional economic practices. They offer new structures for production, new webs of exchange, and new processes of value creation that together form an alternate framework for organizing economic life in society. In the next few decades, these innovations are likely to create a global economic revolution, intersecting with the rise of developing nations and the challenges posed by an increasingly distressed natural environment.



Today's experiments in bottom-up economic systems will transform the global economy over the next several decades



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Grassroots Structures: Building Scale from the Bottom Up

In much the way that limited liability corporations and the founding of stock exchanges defined today's economic ground rules, grassroots economic experiments are creating the structures for a new kind of economy, with new ways of organizing key economic processes:

- **Production:** Open-source practices create a volunteer workforce of millions. Starting in the world of software, this model is now expanding to pharmaceuticals, agro-biotechnology, and media.
- **Distribution:** Peer-to-peer exchanges engage individuals at all levels of the supply chain, allowing them to make their own value and efficiency choices more directly.
- **Property:** Alternate property regimes, based increasingly on the concept of a commons, create new resources for building wealth as well as a new understanding of how to protect a commons.
- **Valuation:** Commons-based systems define a new model for valuing complex ecologies—both natural ecologies such as coastal waters or human-made ecologies such as the Internet—developing business models that can harvest that value without depleting the commons.

Grassroots Accounting: Sustaining Broad Participation

If eBay buyers doubted they would receive their goods, they would never come back as repeat buyers. There would be no Apache or Linux software if coders didn't trust in the system to recognize, value, and make good use

of their contributions. A crucial component of grassroots economies is, in fact, a mechanism for rating the participants in the system.

At eBay buyers rate sellers, establishing a way to identify reputable sellers and secure transactions. Slashdot, a public online knowledge base, uses a rating system to elevate the most relevant articles to the top page of its Web site, providing value to readers and rewarding the efforts of quality contributors. Such experiments with social reputation and rating software point to a new kinds of broad-based, distributed accounting systems.

Grassroots Monitoring: Sharing the Burden of Management

Like any economic system, commons-based systems are subject to gaming, piracy, and free-riding. One well-recognized strategy for avoiding these pitfalls is mutual monitoring, and several bottom-up experiments have developed such monitoring mechanisms.

Wikipedia allows anyone to create, add to, or edit a page in this open online encyclopedia, providing for a rich diversity of expertise, but also exposing it to abusers who could deface pages and destroy credibility. By archiving every revision, alerting volunteers when changes are made, making it easy to restore previous versions, and distributing responsibility for monitoring across the community, Wikipedia has found a formula that greatly reduces monitoring and quality-control costs. Such innovations are benchmarks for emerging practices in the management of grassroots economies.

—Andrea Saveri



Steven reflects on innovations in property regimes—
different ways of structuring property ownership and rights

Q: | We recognize a range for property regimes, from private property to public property to common-pool resources. How does an organization or society know which resources are better managed under different property regimes?

Probably the single biggest lesson here is that there really is no natural state of property rights. Property rights are a social convention. They can move and they can be moved. They're designed by people, for people, and for a set of purposes that can be redesigned.

Most people think they know where their product or industry fits, but you can almost always choose to reallocate resources into a different structure of property rights. I have this conversation with people frequently. They kind of get it, but not in their own industry. In their industry, it has to be a certain way, even technologically determined or somehow determined by nature. There seems to be something about the resource that it must be structured this way. You couldn't possibly have communal ownership over oil fields, for example. But why not? It might not work and might not be economically efficient, but there are a lot of things in the economy that are not economically efficient.

Q: | How do property regimes shape incentives for innovation?

In the pharmaceutical industry people will regularly complain, "Why is the pharmaceutical industry investing in yet another statin drug when we already have five, and yet we're not making enough flu vaccine, not researching malaria vaccine, not spending enough money researching other vaccines?"

The answers to these are clearly tied to the incentive structure that's created by the current property rights regime.

If you're a huge pharma company, here's the sort of thing you're worried about. If you create a drug that is significant for certain public health needs—let's say a cure for cancer, breast cancer—you're going to invest huge amounts of money into the discovery of this drug, and you're going to want to have patent protection on it and sell it at a high price to protect that investment. Choice number one: you invest in a drug for breast cancer knowing full well that if you should succeed, that drug will be compulsorily licensed by Brazil

and China and others who have high rates of breast cancer and would like to sell that drug. Even the United States government might say, well, you can't tell this person who doesn't have health insurance and can't afford \$100 a pill that she can't start her breast cancer treatment. So there is a likelihood that your property rights are going to be infringed in some form or another because it is a great public health need. Choice number two: you have an opportunity to invest those same dollars in a drug that treats baldness or other kinds of lifestyle conditions. Is anyone likely to nationalize that drug on the basis of a public-health argument? So as a big pharma company you're actually safer in investing in drugs that are less essential to human life.

Q: | We're seeing a lot of experimentation now with alternate property regimes, though. Where do you see this experimentation emerging and how is technology shaping it?

Certainly you see it in software, clearly in entertainment content, music, and movies. You're going to start to see it more aggressively around the value chain in pharmaceuticals and almost anywhere where there are significant knowledge components to production or value chains. People are going to start to experiment with elements of shared databases and what we used to call pre-competitive collaboration—the early stages of basic science and knowledge creation. So much of what we know about the way in which ideas and knowledge inputs are generated means that, in many parts of the value chain, it really is dysfunctional to lock things down.

In the 1980s, transaction-cost economics helped people think about the make-or-buy decision. It didn't actually make the decision for them, but it gave them a common language to talk about the decision. There is no such common language yet for the top-down versus bottom-up decision. So what I suspect is that people will experiment and someone will come along with a principle of organization, similar to the principle of transaction-cost economics for the make-or-buy decisions. These experiments will give people a common language for talking about what's at stake when you decide whether to organize from the top down or from the bottom up.



Q: | What are some of the things you need to think about to make that bottom-up or top-down decision? What should leaders look for in their organizations or their industries?

One interesting thing is the nature of the search problem for the knowledge that you need to pull together in order to solve a problem. Suppose I have a small crack in my foundation and I don't know whether it's a serious problem or trivial one, but someone in Berkeley does. My search problem is to find the person who knows how to solve that problem. That's one kind of problem. I don't think open-source solutions are terrifically applicable in those kinds of settings where the answer to the question is already out there and my problem is how do I find the person who has that information and the right credential.

The second kind of problem is this: I'm trying to write an article about property rights in pharmaceuticals, and I have a set of questions that I need to ask about. There is no single person out there that knows the answer to all the questions I have. In fact, there are little bits and pieces of information that I need that are scattered in lots of different places and people and in different forms and in different parts of the world. What I need to do, somehow, is to pull those pieces of information together. And by the way, the valuable information sits in a sea of noise, some of which is irrelevant and some of which is actively wrong. So my search problem is to separate the wheat from the chaff. But it's also to get the pieces of wheat that will fit together to make up the solution. That is a harder search problem, and I think it is something more amenable to open-source solutions, which are very good at getting more distributed pieces of knowledge into a pot and coming up with a peer system of editing them so you can separate the good knowledge from the bad knowledge.

There is a third kind of search problem, in which nobody knows the answer to that question I have and some significant piece of information needs to be created to solve that problem. I don't know whether that kind of problem would benefit from open source.

So the nature of the search problem is one key organizing principle. Another is the nature of the barriers to entry. Are there areas where innovation has become stultified and you want to find ways to actively reduce barriers to entry so others can play? These are also possible candidates for open-source solutions.

Q: | In the last chapter of your book, *The Success of Open Source*, you discuss possible future directions for an open-source method of organizing. Where do you see open-source methods going?

I'm interested in how we value the things that aren't traded in markets—like creativity, community, distribution, health, and well-being. I think the way that technology gets applied to those kinds of things and what people can conceptualize is really quite interesting.

Q: | What is your big hope from this kind of innovative economic thinking for the next 10–15 years?

I think that people, society, companies, and organizations all do better when they are willing to experiment, but change is always fear inducing. The fear instinct that makes you want to close down and protect what you know is probably the most dangerous. I think, for companies, it is really self-defeating because the ecology is open and someone else will come along and eat your lunch. My hope is that people will be open to experimentation and recognize that we're wealthy enough and robust enough to afford mistakes along the way.



Andrea Saveri, Research Director, leads IFTF's work on cooperative technologies and practices.

AN ERA OF ECONOMIC TRANSFORMATION

The 1960s–70s were an era of social transformation, as disempowered members of society—women, ethnic minorities, the disabled, and the gay–lesbian community—challenged such traditional institutions as families, universities, and corporate workplaces. This period of social disruption was followed by a period of technological disruption in the 1980s and 1990s, in which personal computers entered the marketplace with slogans like “the computer for the rest of us” and the Internet laid the groundwork for new kinds of many-to-many communication networks, challenging traditional mass media.

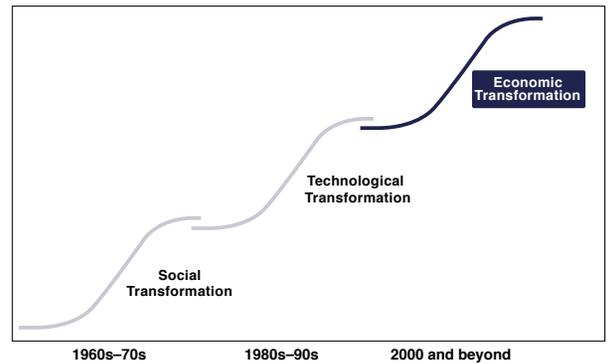
In the coming decades, these two movements will combine to transform the economic landscape. Social networks will be integrated with transactional networks, and a wide range of grassroots economic experiments will use the new technologies to express the values of social equity and commons-based wealth that were keystones of the counterculture movement.

REALLOCATING GDP

One effect of the grassroots economy will be to deflate GDP in certain categories and spur growth in others. In some cases, entire markets that previously generated income may find themselves gutted by open-source, peer-to-peer, or simply free products. In other cases, new categories of products and services, built on a commons, will redefine existing sectors, generating unforeseen wealth.

GDP will not only be reallocated among markets and industry sectors, but also among communities and nations, depending on the availability of bottom–up technologies and personal economic practices. For example, Interra is a citizen-based model of community philanthropy and economic development. The Interra card, which connects cardholders to a network of community members, merchants, and other locally owned organizations, will allow individuals to dedicate a small percentage of their transactions to local organizations—retaining \$10 billion worth of commerce at the local level within five years.

1 Three Eras of Transformation



Source: Institute for the Future

2 World GDP and Consumer Power to Reallocate It

Total world GDP, 2004	\$36.4 trillion
Estimated consumer-controlled share of world GDP	70%

Source: World Bank; Interra.

3 Impact of Open Source on Key Markets

Linux's share of enterprise OS market by 2008 (IDC)	28%
Apache's share of Web-server software market, 2005 (Netcraft)	68.8%
Cost of Apache Web-server market to Microsoft in 2009 (IFTF estimate)	\$16.4 billion
Drop in Microsoft Internet Explorer browser market share, June 2004–Jan 2005 (OneStat.com)	5%
Growth of open source Firefox browser market share, same period (OneStat.com)	5%
5-year CAGR of packaged Linux software (IDC)	44%
How long it would take RIAA to sue 1 out of 10 music file traders (Michaela Stephens, www.theinquirer.net)	2,192 years

ALTERNATIVE PROPERTY REGIMES

The way we organize, share, protect, and create value from resources is influenced by two primary characteristics of the property: its rivalrousness (how much someone's use of it diminishes its availability to others) and its excludability (how easy it is to set up barriers around it). These two dimensions define a set of four key property regimes.

However, the dimensions of rivalrousness and excludability are seldom fixed and innate characteristics of a resource. They can change over time as a result of technology and social innovations—or even redefinition or reuse of the resource in a new context. One of the impacts of grassroots economic experiments is to shift existing perceptions of rivalrousness and excludability to create new, more dynamic ways of thinking about property regimes.

CREATING VALUE ON THE INTERNET COMMONS

The Internet is a new kind of public good, providing many opportunities for creating other public goods and common-pool resources, such as open knowledge repositories like Wikipedia, the Creative Commons for open art and cultural resources, and open-source software. Despite the lack of protective barriers, considerable wealth has been generated from the Internet, as indicated by the market capitalization of eBay, Amazon, and Google. The Internet thus not only serves as a commons for future growth of the grassroots economy, but also as a model for managing other kinds of commons-based resources.

INVESTING IN NATURAL COMMONS

The grassroots economy, with its emphasis on commons-based property regimes, will likely provide innovations in the way society manages and values natural commons, such as oceans, forests, mountain ranges, and gene pools. Robert Costanza, of the Gund Institute for Ecological Economics, prepared a ground-breaking paper published in *Nature* in 1997 that estimated the total net worth of the biosphere at \$33 trillion. He has since updated this work, adding that the original estimate was conservative and that an investment of a \$1 into the preserving intact ecosystems yields a return of \$100.

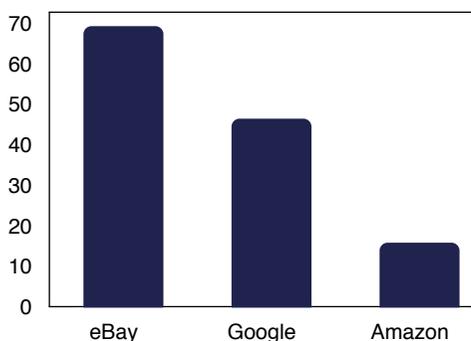
4 Four Basic Property Regimes

	Rivalrous	Non-Rivalrous
Excludable	private good	toll good
Non-Excludable	common-pool resource	public good

Source: Institute for the Future

5 Value Creation on the Internet Commons

Market capitalization, in billions \$US*



* As of November 2004

Source: Yahoo Finance

6 Ecological Goods and Services

	Area (Million hectares)	Total Value (Dollars/ hectare/year)	Global Flow Value (Billion dollars/year)	Global Value (Percent)
Marine	36,302	577	20,949	63
Open ocean	33,200	252	8,381	25
Coastal	3,102	4,052	12,568	38
Terrestrial	15,323	804	12,319	37
Global	51,625	n/a	33,268	100

Source: Robert Costanza et al., "The Value of the World's Ecosystem Services and Natural Capital," *Nature*, 15 May 1997.

UNLOCKING CAPITAL IN THE DEVELOPING WORLD

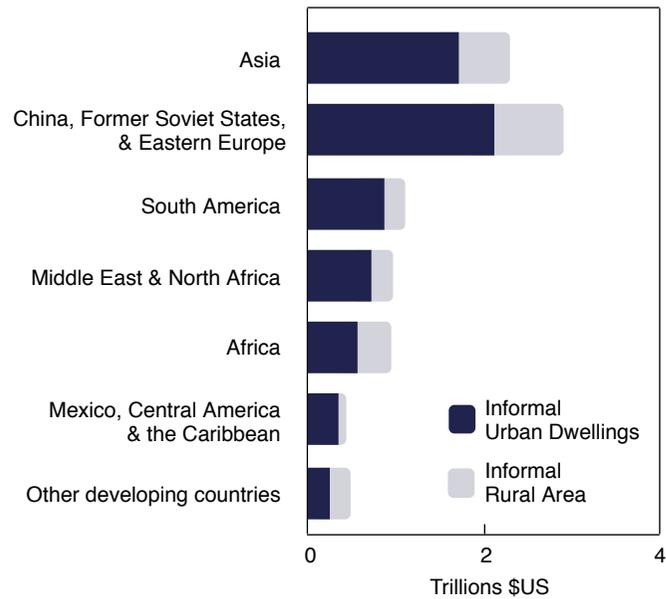
Hernando de Soto, in his book *The Mystery of Capital*, claims that the developing world is disadvantaged in producing capital because the majority of the population lacks access to an efficient and coherent system of property rights that allow so called “dead capital” to be converted into active capital.

Active capital, according to de Soto, is the engine that creates value and wealth. Without access to a formal system that represents ownership of property, the working poor of the developing world are excluded from access to the mechanisms that help capital multiply—such as collateral for loans and mortgages, deeds to secure transactions, documented boundaries to protect investments in land and assets. A change in the ownership structure of assets that would integrate the informal capital sector into the formal one would help millions of micro businesses expand beyond the scope of family and friends and contribute to national wealth.

BOTTOM-UP ADVERTISING: SHIFTING POWER TO PUBLISHERS AND CONSUMERS

A new concept, brewing on Web logs, is flipping the traditional advertising business model upside down. Sell-side advertising advocates pushing decision making about online ad placement down to publishers and readers. Also known as bottom-up advertising, this model suggests releasing ads on the Internet and letting publishers and bloggers select ads for their own sites, which can then be viewed and picked up by other bloggers—thus propagating an advertising meme through social networks or networks of influence (as Ross Mayfield suggests). Bloggers are paid as ads get selected and move through the network. The ads themselves are tagged and can “talk” to their owners (the advertisers) and tell them how they are doing.

7 The Value of Dead Capital in Real Estate



Source: Hernando de Soto, *The Mystery of Capital*, 2000.

8 Alternate Models for Ad Pricing on the Internet

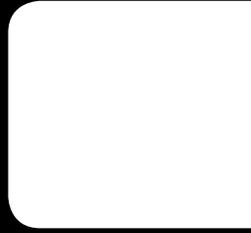
CPM	Cost per 1,000 impressions	Rewards sites for traffic
CPC	Cost per click	Rewards sites for click-through
CPI-1	Cost per influence, 1st degree	Rewards sites for reputation
CPI-2	Cost per influence, 2nd degree	Rewards sites for rewards for reputation

Source: Ross Mayfield, *Many2Many*, July 12, 2004

TECHNOLOGIES OF COOPERATION: THE TOOLS OF THE GRASSROOTS ECONOMY

Technology	Definition	Economic Implications
Self-Organizing Mesh Networks	Devices or nodes in a network that can serve as both receivers and relays or routers, eliminating the need for centralized control	<ul style="list-style-type: none"> • Defines architectural principles for tools and processes that grow from the edges without obvious limits • Enables open spectrum for radio communications • Could support distributed power grids • Supports peer-to-peer digital exchanges
Community Computing Grids	Networks of computation created by volunteers who share excess CPU cycles to produce massive processing power and solve complex problems	<ul style="list-style-type: none"> • Provides structure and resources for problems that require massive computation (e.g., folding@home) • Supports peer-to-peer analysis collectives to solve complex problems such as species extinctions • Enables ensemble forecasting using multiple models for forecasting complex phenomena
Peer Production Networks	Ad hoc, emergent networks of actors who cooperatively create goods or resources without central control or management	<ul style="list-style-type: none"> • Creates a resource commons for diverse open-source development efforts, including software, media, and biotechnology • Promotes distributed innovation and design projects (e.g., MIT's ThinkCycle) • Allows widespread sharing of digital content
Social Mobile Computing	A complex of mobile communication, computing, social-network applications, and aware environments	<ul style="list-style-type: none"> • Enables real-time, real-place, person-to-person commerce • Could drive pervasive-gaming industry • Supports location-based services
Group-Forming Networks	Social-technological networks structured to support many-to-many networks (such as friend-of-a-friend networks)	<ul style="list-style-type: none"> • Multiplies the social and economic value of human-computer networks much faster than television, telephone, or cable networks • Uses affinity groups to create locally meaningful value
Social Software	Tools that make social networks visible, providing metadata about network dynamics, flows, and traffic	<ul style="list-style-type: none"> • Catalyzes social groups that function both as producers and consumers of value • Provides measures of the value of social connections • Builds a platform for automated "syndication" of services
Social-Accounting Systems	Mechanisms for building trust among strangers and reducing the risk of transactions, including rating, referral, and reputation systems	<ul style="list-style-type: none"> • Automates word-of-mouth • Supports broad-based quality control systems for products and services • Adds explicit social-rating schema to invisible market processes
Knowledge Collectives	Emergent online structures and processes for "information hunting and gathering"	<ul style="list-style-type: none"> • Defines an alternative commons-based framework for organizing knowledge work • Enables large, self-correcting knowledge repositories (e.g., Wikipedia) • Creates emergent "folksonomies" instead of top-down taxonomies (e.g., del.icio.us) • Provides effective alternative to expert-refereed publications

Second Life is an online world where players co-create 3D characters, sets, animated film sequences, and the game play itself.



X HEALTH & HEALTH CARE
Develop strategies that treat health as a public good

The new grassroots economy experiments could provide a way to reframe the social dilemma of health care. Today, both employees and employers are losing as health care costs rise: employees are bearing more of the burden of cost, making poorer health care decisions, and getting sick more often, while employers who are caught in the vice of rising health care costs are resorting to drastic measures—such as firing sick employees—in order to keep their costs down.

Clearly a healthier population would be in the interest of everyone. So could health be treated as a commons, with a variety of open-source, peer-to-peer contributions to a healthier herd? After all, medicine is a knowledge-based industry. Furthermore, at least half of human illnesses are the result of behavioral choices. If organizations or communities set up incentives and rewards that seek to build health as a common resource—with peer-to-peer exchanges and open-source tools for feeding that commons—could an alternate framework for managing health emerge?

X MARKETS
Reconsider property regimes and rights to leverage new value structures

Over the next decade, much of value locked into existing property rights is likely to be dispersed by bottom-up social processes—as property that was previously held privately is converted to a commons. The media industry has been the first to feel the impacts of this shift, but pharmaceuticals, agro-biotech, and even education are likely to follow in short order. The cost to continue to protect old property rights in the face of new commons-based experiments may diminish their value to the point of bankrupting companies or whole industries.

A critical strategic choice—and a basic skill set for leaders in the coming decades—will be structuring property

regimes to take advantage of both the commons and private property. Central to this choice will be a deep understanding of the social side of the equation—rather than focusing on individual consumers, companies will need to see social networks as their unit of analysis in evaluating a market and then recognize that these networks are both units of production and units of consumption. They will need to understand how social processes change the way value flows through these networks and how they can use these social processes—or enhance them—to create their own unique value proposition. Finally, as Steven Weber suggests, they will need a new language to talk about the algorithms for success. Every experiment in the grassroots economy helps define this language, and thus bears careful watching.

X COMMUNITIES/POLICY
Look for new sources of local wealth in social processes

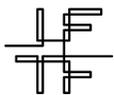
Communities have always relied on volunteers and charity to provide many of their services, but these philanthropic efforts have always required organizations to manage and disperse funds. Increasingly, the tools and principles of grassroots economics will provide alternatives for providing some of these services. The Interra experiment is one example.

But in addition to organizing philanthropic and volunteer services in new ways, current experiments in grassroots economics provide an important lesson for communities: social processes are themselves a source a value in any community. Identifying and nurturing these processes, whether through new network tools or simple social practices, is a way to build a commons on which other kinds of wealth—money, knowledge, and culture—can be built.

IFTF is currently investigating each of these themes. Contact Andrea Saveri (asaveri@iftf.org) for more information.

During the next decade, a profound shift in the world's population distribution will occur. For the first time, more than half of humanity will live in cities. New cities, mostly from the developing world, will be added to the ranks of New York, London, and Tokyo as key nodes in the global economy and as marketplaces for people, ideas, money, and technology. Yet these new cities will be fueled less by economic dynamism than by high fertility and rural poverty. And the new city dwellers will find themselves in a world that is, in many respects, wilder, more alien, and more unpredictable than a natural wilderness.

As the world's population becomes predominantly urban, cities may well become the new wilderness



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Urban Wilderness: The Nature of Extreme Ecologies

The new urban wilderness, whether it's Bombay or Rio de Janeiro, will resemble the most extreme ecologies in nature—inhabitable places where only highly adaptable species can survive. For many, the urban landscape is already an inhospitable place full of environmental, economic, health, and social risks. Emerging megacities in the developing world will suffer these same problems, but on a larger scale. Many already face serious pollution problems. Human settlements are often in areas prone to natural disasters. Population density facilitates the spread of disease. And migration to the city accelerates family dispersion, eroding community.

Despite these risks, the urban wilderness continues to draw people. Some define a niche in the economic and social networks of the city. Some will look to technology or innovate by creating new identities. Others will be excluded, surviving only at the margins. All will have to relate to the environment in a more intelligent way.

Urban Adaptation: New Strategies for Survival

Watch for these key innovations.

Urban swarming: One of the worst urban risks is economic exclusion. Looking at the excluded and marginalized, a story of persistent and repeated cycles of poverty emerges. However, when we aggregate individual efforts, a different picture emerges—vibrant bottom-up economic structures. Dharavi, a slum near Bombay's airport, is home to 100,000 people who produce goods (mostly by recycling the trash of others) worth over \$500 million each

year. You might see entrenched poverty and the need for redevelopment here; but if you shift your lens just a bit, you also see entrepreneurs and a thriving small-business environment where people create value from nothing.

Urban computing: People are starting to use mobile technology to tag the location of risks—such as pollution and crime—in the urban landscape. The SARS outbreak in Hong Kong provided a preview: using SMS messaging to track new cases and infected buildings, mobile-phone users were able to avoid exposure. As new megacities build technological infrastructures that leapfrog those in the developed world, expect new forms of urban computing to emerge.

Urban hybrids: As developing cities enter the global economy, their citizens will create hybrid identities at the boundaries of intersecting markets, geographies, cultures, and disciplines. Today, we see these hybrids emerging in the global outsourcing of labor. Indian outsourced laborers not only learn “American” English, but also watch American TV to learn speech and mannerisms. Some take on American names and personas during work hours and then transition back to Indian cultural mannerisms after work.

Urban speciation: People have always looked to technology for an edge, and technology has reshaped human bodies and culture. The extreme urban landscapes will create a genuine potential for speciation as people experiment with tools—digital, pharmacological, and bio-mechanical—that extend the human body, protect it, augment it, distribute it, or connect it to the rest of the world.

—Rod Falcon

INTERVIEW: ROGER KENNEDY



Roger assesses the dangers of modern human migrations, from environmental impacts to loss of community rituals

Q: | In this decade, for the first time, just more than half of the planet will live in urban areas. The estimate is that 75% of the world's population will be in cities by 2050 and then at some point, it asymptotically approaches 90% within this century. What do you think that means?

The experience of density or propinquity or crowdedness is not new. But being lost without definable emotional landmarks will be new for a lot of people. The non-city landscape, for most people, was village life. Villages are little knots of population that have their own cellular structures, their own memory, their own continuous institutions. Those knots do not transport into the great, sprawling Mexico Cities and Juarezes and Cairos. So we have lots of people crowded together without a nucleating set of associations and reference points that permit them to treat each other as members of the same village, tribe, even nation. Loneliness and viciousness come with that.

Q: | What happens, then, when we've gotten two or three generations in the city, when they are totally rootless but still have the mythology of the family who lived back in the village?

In the American experience, gangs or mobs emerge under those circumstances. Recently, new institutions have emerged, too, such as immense evangelical churches and evangelical mosques, each providing a new village. The difference from old villages is that these new villages tend to be antithetical. That is to say, they are built upon *not* being another one, on not having other sorts of people in it with other sorts of ideas. Indeed, many of these villages treat everyone outside them as "other." Each defines itself by what it isn't.

So, the estrangement that comes from the rupture of traditions is exacerbated. And it may be more dangerous because these passionate antitheses—these hostilities—are very much in the interest of people who replace the village chief. Here I'm thinking about Ireland, incidentally; I'm not thinking about Uganda. I'm thinking about Lower Broadway, not about Palermo.

Q: | That's the social side of the story, but what about the environmental side? It's not just that we're building these big cities, but we seem to be building them in the most dangerous places. What happens to these cities over the next decades?

We move into dangerous places because those are places where people can move in relatively cheaply. The most heralded of these are built at or near sea level. So what can we expect when global warming melts ice and raises sea levels? The New York subway system goes under water. Or in Bangladesh, I suppose, one-third goes under water. Great portions of Florida and, presumably, New Orleans go under water, too.

Solving the problem is complicated: too much water when the sea level rises leads to too little water where population crowds into the increasingly dry, hot fringes of the mountain ranges. Look at the front of the range in Colorado that extends down the Sangre de Cristos in New Mexico. Those areas that have burned with greatest frequency with high-intensity fires are the areas that are receiving the greatest in-migration. This is true state-by-state. It's also true county-by-county within states. It's true zip code-by-zip code. The safe zip codes are emptying out in the Colorado flatlands, and dangerous fire-prone mountain slopes are filling up. That's true in New Mexico, Nevada, Montana. In this country, migration flows uphill out of the flatland and onto the fringes of the mountains, which is pleasant for a while until the fire comes.

The constants are long-term trends toward highly erratic weather behavior and increases in sea level and in the propensity to burn of the mountainous areas. We should be immediately noting and declaring those areas that are most dangerous, not quite so dangerous, and not very dangerous at all. There is no mystery about frequency of fire and flood, for example, and probability of repeated disaster. We should be reversing those of our current panoply of subsidies that drive people into the most dangerous places. Mortgage insurance, highway subsidy, developer-assistance programs all do that when they are promiscuously granted wherever they might be used, in dangerous or safe place. We should mete out subsidies so that they do good, not ill. Then we would diminish the pace at which we're making things more terrible for the next generation and perhaps the longer lived of the current generation.

Roger Kennedy is a historian and author of several books, including his forthcoming book, *Living with Limits* (working title). He has served as Director of the U.S. National Park Service, Director of the Smithsonian's National Museum of American History, and Vice President of the Ford Foundation.



Q: | What happens when disaster strikes the emerging megacities? Do we lose 20 or 30 million people in one storm, say, in Bangladesh? And what happens in the aftermath?

A terrible example of where that happens is Iraq—a thousand years later. The societies that were grounded in Iraq—the Babylonians, Assyrians, and the luxurious Persian conquerors—all lived in great cities. The people who ran those great cities did not consider the limits of what the earth would accept. Salinization set in, with degradation through excrement that would not flow away. Those pressures collided; large numbers of people came to hate each other. Much of the Bible is a history of a vicious world from which people were crying out for redemption. On Ireland, the Aegean Islands, and Sicily, forested islands were reduced to eroding and poverty-stricken colonies—with more people hating each other. I think that is where whole continents are again.

It seems to me that perhaps the great lesson of the 20th century is the recognition that there are irreversible environmental consequences. There are places that don't come back. In the United States, those that just can't be sustained in the face of fire and flood are shrieking their message to us as did the Dust Bowl in the 1930s. We are being summoned by the presence of our own past to recognize that there are limits to what nature will permit us to do.

Because we have worldwide visual communication, we can observe what's happening in Greenland as if it were anticipatory for the rest of the globe. The rate of warming in Greenland is ten times the estimate of five years ago. The rate of actual water production, the rate of melt, is a high multiple of what it was projected to be. We're having plenty of warning, and I suppose one could say that we're having plenty of warning in the Middle East of the kind of behavior that ensues when hopelessness becomes the disease of a disrupted people.

We have to build communities. We have to recognize what the natural circumstances are. We need to address the problems of re-nucleating human societies in places which today are nothing but agglomerations of vast numbers of dissociated people.

Q: | The intensity of urban experience is so great that people really can close-out the natural world completely and any awareness of it. Are we plugging our ears just as the environment is screaming messages at us? And how do we change that?

I think that there are positive responses: First, we can treat nature, whether in small patches such as gardens, or in large ones such as wilderness areas, as offering sabbaticals and Sabbaths. Central Park is a place you go to renew yourself, the little green place.

The other is to recognize that an urban culture has its immense virtues: "civic" has the same root idea and connotations as "citizen" and "civilized." Cities are places in which intelligent discourse can be carried forward with informed people around to help, people whose training permits them to see beyond the immense urban conglomeration.

The world is now like Texas: it has big cities, and some of the most prosperous, such as El Paso, are built next to Third-World slum-cities such as those of Houston itself and Juarez. These, taken as composites, are the new Babylons and Ninevehs. Unstable. Beyond the cities and their exurbs there is in the world an awful lot of uninhabitable terrain and soon-to-be uninhabitable land engulfed by brackish sea. Both the cities and the countryside, whether inhabitable or not, need our informed care. Dealing with cities and the countryside will take leadership. It's going to require truth-saying. But we're a resilient species. We can even survive our own temporary refusals to pay attention to what is happening in the neighborhood—the climate neighborhood and the world neighborhood.

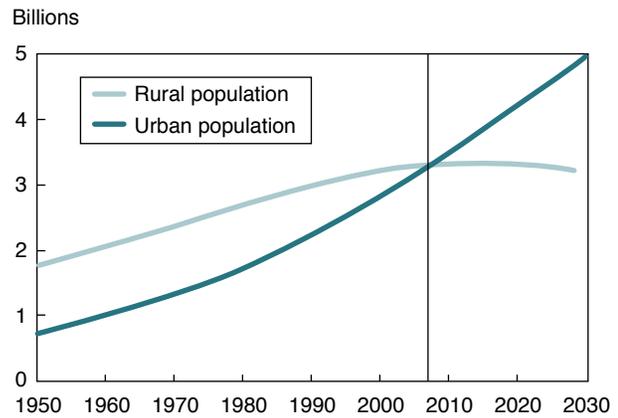


Paul Saffo, Research Director at IFTF, asked Roger how the world will change when more than half its people live in cities.

THE DEMOGRAPHIC CROSSOVER: FROM RURAL TO URBAN

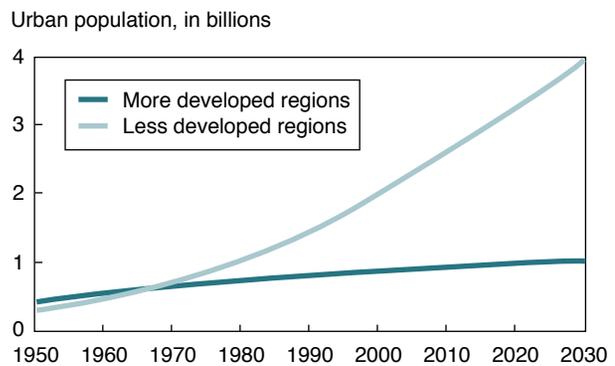
With most of the world's total population growth between 2000 and 2030 expected to occur in developing countries, cities in the developing world will rapidly expand their boundaries and consume more natural resources to absorb this unprecedented growth in population. Indeed by 2007, the world will reach an important crossover point as the number of urban dwellers begins to exceed the number of rural dwellers.

1 Urban and Rural Populations of the World



Source: United Nations, *World Population Prospects: The 2003 Revision*, 2004.

2 Urban Populations in Developed and Developing Countries



Source: United Nations, *World Population Prospects: The 2003 Revision*, 2004.

THE URBAN CENTURY: MEGACITIES WORLDWIDE

Given the number and types of cities expected to emerge over the next 10–20 years, some have declared this the Urban Century.

Particularly new to human experience will be the growth of megacities—those with more than 20 million people.

Today, the world has only one megacity—Tokyo. By 2015, it will be joined by several others including Mumbai, Delhi, Sao Paulo, and Mexico City. Beyond these megacities, the number of cities with 5 million or more inhabitants is also expected to increase from 46 in 2003 to 61 in 2015. Most of these large cities—45 out of 61—will also be in the developing world.

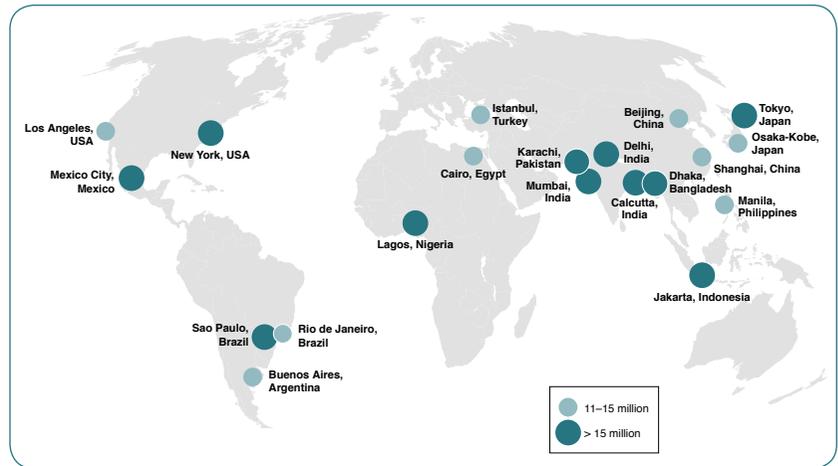
SMALL CITIES: SOME VANISH, SOME BOOM

While megacities overwhelm with their sheer size, they are not the fastest growing cities. In the United States, that honor is reserved for the smallest cities, mostly under 50,000—with growth rates of the 100 fastest growing cities ranging from 16% to 75% between 2000 and 2002. These cities tend to be predominantly white, but with more Hispanics, higher incomes, lower-cost housing, and younger populations than their state averages. Most of them are west of the Mississippi River, with the exceptions clustering in Illinois and Georgia.

At the other end of the spectrum, other cities under 20,000 are rapidly shrinking, with the majority of the decline among those with 5,000 to 10,000 people. They tend to be cities in the Midwest and South, with older, poorer populations.

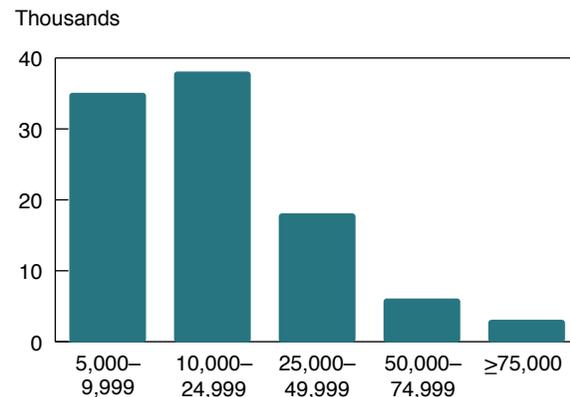
Both will create tax imbalances: fast-growth cities will pay disproportionately less in state property taxes while declining cities will continue to lose their income producers to larger urban centers.

3 The World's Largest Cities, 2015



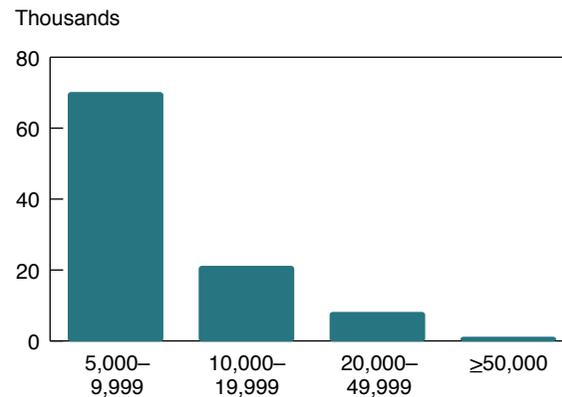
Source: United Nations, *World Population Prospects: The 2003 Revision*, 2004.

4 Distribution of the 100 Fastest Growing U.S. Cities



Source: City-Data.com, 2002

5 Distribution of the 100 Fastest Declining U.S. Cities



Source: City-Data.com, 2002

DISASTER-PRONE CITIES

As population aggregates in large cities, concentrating economic value in those areas, the potential of natural disasters to take lives and disrupt the global economy increases dramatically. Ironically, many of the world's largest cities are in areas that are most prone to multiple natural disasters.

The Center for International Earth Science Information Network has mapped the history of six natural hazards—earthquakes, volcanoes, landslides, floods, drought, and cyclones—to identify regions at high risk. The results show serious economic threats to the areas that are expected to have the largest concentrations of human population in the next few decades including much of South and East Asia.

CITIES: HOW SUSTAINABLE ARE THEY?

Human populations tend to grow to the carrying capacity of their environments, but many populations actually grow beyond the carrying capacity of the territory they occupy—extending their ecological footprints far beyond their geographical boundaries.

The ecological footprint of a population is defined as “the area of land and water ecosystems required to produce the resources that the population consumes, and to assimilate the wastes that the population produces, wherever on Earth the relevant land/water may be located.” And as footprint analyst William Rees puts it, “In ecological terms, urban regions are parasites on the global hinterland.” Hong Kong requires 303 times its land area to support its population; London requires about 120 times its actual size.

While cities in less developed regions have tended to have smaller footprints than cities in developed nations, urbanization increases the overall ecological footprint of humans. The higher the percentage of urban population in a country, the higher its ecological footprint is likely to be. Urbanization thus accelerates the threat posed by population growth to the planet's carrying capacity.

6 The Risk of Economic Loss as a Result of Natural Disasters



Source: Institute for the Future, “Artifact from the Future”

7 Impact of Urbanization on Ecological Footprint

	Footprint (Acres/person)	Urban Population (Percent of total)
United States	24	81
United Arab Emirates	24	86
Australia	19	93
Estonia	17	70
Finland	17	61
Sweden	17	83
Canada	16	82
Denmark	16	86
Norway	15	81
Ireland	15	60

◀ Of the ten nations with the largest ecological footprint, seven have more than 80% of their population living in cities. Across all countries, there is a strong positive correlation between percent urban population and ecological footprint (correlation coefficient= +.646).

Source: Global Footprint Network, 2003–2004; United Nations, *World Population Prospects*, 2004.

TEMPORARY CITIES: BLACK ROCK CITY AS PROTOTYPE

It's difficult to separate Black Rock City (BRC) from Burning Man, the annual gathering of artists, techno geeks, and seekers of all sorts who make the city come alive. What began in 1986 when two men gathered their friends on Baker Beach in San Francisco to burn a wooden sculpture of a man has grown to 30,000+ "burners" from around the world who descend on the playa, a dry desert lakebed of Black Rock Desert, Nevada, to form the temporary community of BRC. For many, life in BRC is about entertainment, art, and indulging pleasures. It's a balance between embracing the rhythms of the desert and defying them entirely, from lantern-lighting rituals and howling at the sunset to dancing all night in a rain or dust storm accompanied by experimental techno art.

Temperatures reach over 100° Fahrenheit in the day and dip to as low as 35° at night. BRC has no natural shade or infrastructure for water or electricity. Weather is unpredictable and can shift in minutes. Volunteers and paid staff set up an elaborate infrastructure for its temporary inhabitants, and the mantra of "leave no trace" is ever-present. People bring all they need—generators, RVs, gallons of water, food, and box trucks, as well as elaborate shade structures and art installations. But many camps will help strangers satisfy their most basic or most indulgent needs: a layer of sun block, a hairwash, or a draw of fine tobacco from a hookah.

BRC is, in fact, built on a gift economy. The only financial exchanges are for the price of admission (from \$145 to \$250 a person), and the essentials—ice (\$2 a bag) and coffee (no decaf, sorry!). Planners now map concentric circles of roads for its inhabitants to stake out when they arrive. Key focal points are the Man (a large structure at the center of the city), Center Camp and its satellites, and the porta potties. Black Rock City has its own Department of Motor Vehicles, which registers art cars (for example an old Studebaker station wagon transformed into a 30-foot Chinese Junk); a health system, including an emergency airlift to Reno's hospitals; an airstrip; street-watering system (which helps to mitigate the dust); an Art Department (the largest arts funding organization for independent artists in the San Francisco Bay Area); and even a small cadre of patrol-people. There are busy, noisy streets and suburbs, seedy areas, and neighborhood hangouts.

Places like BRC represent the extreme of the "creative city" and are at the core of innovation and new ideas. Trying something new and experimental and pushing the boundaries of what is possible is often valued more than the final piece itself. In this environment, almost anything feels possible.

—Susannah Kirsch

8 Black Rock City, Nevada



Landmarks and resource centers help people orient themselves and navigate the evolving landscapes

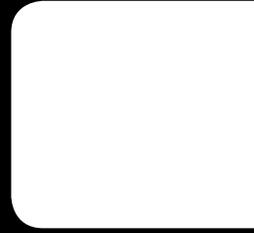
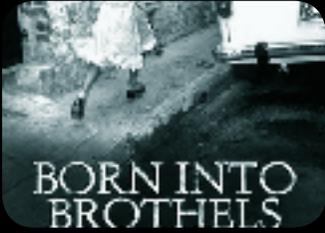


Center Camp is the hub in Black Rock City for socializing and exchange



Photos by Susannah Kirsch

In *Born into Brothels*, children use cameras to capture—and sometimes reinvent—their identities in an extreme city.



X INFRASTRUCTURE
Design for the changing nature of urban infrastructures

One of the greatest challenges to cities in the coming decade—both megacities and fast-growing small cities—will be meeting the growing demand for basic infrastructure in a world with scarcer resources and less space for waste. The era of ubiquitous city services for water, power, fuel, communication, and waste removal may be coming to an end, as rapid growth drives innovations in the way people use these services and the way they are supplied.

Expect the new infrastructures to be lighter weight, less expensive, more portable, and more individually tailored. They are also likely to draw on new mixes of public, commons-based services and private-enterprise solutions. Increasingly, they may be seen as temporary, ad hoc solutions, and they will almost certainly rely more on information and sensing capabilities to achieve their goals. The best of these solutions may emerge in developing nations, such as China and India, which increasingly have the technological and manufacturing resources as well as the motivation to find alternatives to traditional urban infrastructures.

X COMMUNITIES/POLICY
Develop new social measures of urban health

While traditional measures of urban health—per capita wealth, property values, crime, education, and mortality rates—will continue to be important in guiding city policy, those concerned with assuring vital urban environments will increasingly need to look to new measures that are inherently more social and cooperative in nature. Processes like the ecological-footprint analysis—which links choices throughout the hierarchy of individuals, households, cities, nations, and the planet to sustainability—reflect the growing urgency of understanding the interdependence of cities and the world around them if they are to continue to support human life.

At the same time, new experiments with grassroots economics point to the growing importance of social networks and social capital as fundamental resources for communities in the coming decade. If Roger Kennedy is right that the most pressing need is to “re-nucleate human societies,” then perhaps we should also develop ways to measure the social footprint of a neighborhood or city as a way of understanding its potential to support meaningful human life.

Essential to both of these types of analysis is engagement of the public. Participatory planning is undergoing a revival in many communities today, enhanced in many cases by the Internet. There are probably also opportunities to take advantage of new urban-computing practices—from pervasive gaming to geo-annotation of neighborhoods—to update the processes for participatory planning and engage a wider community.

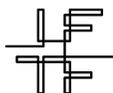
X NEW PRODUCT DESIGN
Design for extreme environments and hybrid identities

It’s no accident that one of the most successful new magazines for urban males is called *Gear* and resembles a cross between an REI catalog and *Gentleman’s Quarterly*. But while the meme of urban city as wilderness has already penetrated the world of advertising, the reality of more extreme city lifestyles—physically, psychologically, and socially—will also rewrite the rules for product (and service) design. And in fact, wilderness products are a good place to look for defining features of new urban products: mobility, light weight, durability, “leave-no-trace,” personal safety, and ability to track where you are, what the current conditions are, and how they’re likely to change.

Products for extreme urban lifestyles must also recognize and adapt to hybrid identities. Everything from scents to ring tones may need to change as people move through their days. And products that help people carry their multiple identities with them—from backpacks to smart cards—will have high survival value.

From religious doctrine to military plans, visions of the future inform what people deem possible, desirable, and actionable. Indeed, China's modernization over the last 50 years is due, in large part, to the whole-hearted participation of millions of Chinese who aligned their futures with views expressed by the Chinese Communist Party (CCP). But all that is changing today. China's economic success has, ironically, fragmented the CCP's centralized, top-down vision of the future and polarized social relations, making it difficult for the government to mobilize those who are increasingly "left out."

China's view of the future is fragmenting, threatening its continued phenomenal growth over the next decade



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Fragmentation:

More Voices, More Visions, Less National Unity

Five-year plans and 20-year goals, borrowed from the former Soviet Union, remain key features of central planning in China. They signal the long-term strategic perspective that has China where it is today. Newly empowered social groups have weakened the CCP's ability to monopolize national debates about where China should go, and about who should take it there—without yet having amassed the social and political power to implement the changes they envision.

Most notably, business owners are busy inventing the Chinese multinational corporation, capable of swallowing up large global companies. For individuals and families, too, it's all about business. Whether they like it or not, the vast majority are working toward a future dominated by market institutions. Meanwhile civic groups and NGOs are raising a more persistent voice in China—however poorly heeded—to protect the environment and disadvantaged populations. Most volatile are two distinct kinds of "smart mobs:" angry have-nots who don't see themselves in the national plan for the future; and tech-savvy Chinese bloggers who focus attention on news and events that are not reported in the mainstream media.

The differences among these groups will create increasingly harsh clashes, reshaping China's social and business environment over the next ten years. Where they do converge, however, China will see continued success.

Convergence:

Global Engagement, Ambition, National Pride

One thing all these groups have in common is a future in which China faces enthusiastically and proudly outward, strengthening its ties to—and its leadership in—the rest of the world.

The CCP's big future plays are the 2008 Olympics and China's space program—both meant to establish China's image as a global leader with world-class cities and technologies. Meanwhile, Chinese businesses are pursuing global independence by purchasing big pieces of global industries; Lenovo's acquisition of IBM's PC division is only the most recent signal that Chinese companies are focused on developing their own global brands—as well as a powerful and profitable global presence. And scratching the surface of the ordinary Chinese worker's interest in business, one finds a deeper desire to engage the world outside of China.

Fragmented But Future-Oriented

Even if the debate on China's future is fragmenting, the CCP's focus on long-range planning continues to mobilize many minds in the country to think about the Chinese future. In contrast to the United States, where planning horizons are short and planners widely dispersed, China is keeping a more collective bead on a more distant horizon.

Also in contrast to the United States, China's futures thinking is optimistic. What they see for themselves is an ambitious expansion—a future in which they will engage the world, not in war, but in commercial and cultural leadership.

—Lyn Jeffery



Dai describes the inevitable clash between environmental limits and China's current boom economy

Q: | What vision of the future did you have when you were growing up in China in the 1950s and 60s?

China was completely shut off from the rest of the world. All we knew about was American imperialism, British imperialism. And we really were happy. In 1960, when I first went to university, “Long live Chairman Mao” was what was in all of our hearts and minds.

Then in 1964, when China tested its first nuclear weapon, we had a nuclear bomb parade. They woke us up in the middle of the night and had us all go out and march. I wasn't proud or happy. It was a killing thing. They forced me to march, but I was very obviously not happy about it.

Still, in 1966 or '67, I remember writing in my diary, “How great it would be if scientists could invent a way to take a year of life from each student and give it to Chairman Mao. How happy we would all be to make that contribution and then Chairman Mao could live forever!”

Q: | How did those ideas of the future start to change after economic reforms?

It's very upsetting and painful to me. The 1980s was a period of healthy reform. But we lost a very valuable chance in [the Tian'anmen Square Movement of] 1989. We lost a very good leader in Zhao Ziyang. Deng Xiaoping's reforms have become a kind of oligarchic capitalism. Especially from the Jiang Zemin era on, everyone from the leader at the top to the poorest peasant at the bottom is thinking only about how to make money. It's all about money. There's nothing else left in China. Everything that happens in China—especially the important events—is about money. Money is their God. You can't blame the Chinese people. You have to blame the CCP, the ideology.

Q: | You have the choice to be in China or outside China. You've succeeded in your profession. And yet it sounds like you feel less optimistic about the future than at any time in the past?

In terms of my personal life—even though I have so-called success—it's meaningless compared to my worries about this country and these people. In front of our eyes, we've seen our people, once so full of hope, throw away one opportunity after another. It's all ended up in the hands of the politicians. I see it getting worse day by day, and there's no way to turn back.

There's a saying in Chinese, “*zuochi shankong*,” which is literally, “sit idle and eat up a mountain.” It refers to the wealth of a family, when the sons and grandsons don't work hard and waste all of what the older generations have accumulated. Today in China, our culture, our public will, and especially our environmental resources look like a mountain from the outside, but inside it's already empty. And it's still being eaten away. We can't change those who are doing it. You can't fight them. They have the army. They're too strong. They don't listen to us.

Q: | You've written books and you're very visible to the outside world as an environmentalist and journalist. What effect do you think you can have on China's direction?

It's like this: people like me, we describe ourselves as “active pessimists.” We're pessimists because we are not the least bit hopeful about the future; but we remain active. We all hate “revolution.” We don't want to upset society—we think that's an even greater tragedy. We think society can only change bit by bit. And even though it's too late for that kind of gradual change to move Chinese society toward a bright future (that's why we're pessimists), we still do the little bit that's in front of us.

For instance, we've leased a small mountain on the outskirts of Beijing. I wasn't able to stop the Three Gorges Dam. I can't protect big rivers like the Yellow River or the Yangtze. But I am protecting a stream. Maybe I won't even be able to protect it, but I'm doing something.

Dai Qing is China's best-known environmental activist. As a journalist, she focused global attention on the human and environmental costs of China's massive Three Gorges Dam project on the Yangtze River. Dai grew up with great privileges in a prominent military family, but was arrested and jailed after the Tian'anmen incident in 1989.



Q: | China is working on its 11th five-year plan. The CCP is looking toward 2020, and there are specific goals to raise people's income, enhance education, and develop western China. What do you think of the plan?

No one believes they'll be able to reach those goals. The Party also likes to say how happy the Three Gorges migrants are, but I well know how bitter and hard the migrants' lives are. It's the opposite of what the government says.

The CCP has promised so many things that have not come to pass. Mao Zedong used to say that the most important problem in China was the education of the peasants. Now we are saying the most important problem is the education of the rich. What are they doing with their money?

Q: | Lots of foreign commentators are talking about the Internet. How might it provide an opportunity for people to organize and build up a different set of values?

I have a very high opinion of the Internet. It has given people some rights they should have, but don't. We've had several small victories. Chinese have few opportunities to study, and the Internet is a classroom. Chinese don't have the freedom to read what we like, so it's like a library, though limited. It's fantastic.

The Internet is making things very different for young people today, compared to when I was young. Today's youth are not willing to be tools for the authorities; they're not willing to sacrifice themselves for a leader. They are relatively independent in spirit. But because of the control [the CCP has over] the Internet and the Web, they will not become a larger force. If you express your opinion online, you can say a lot of different things but you can't say: "Let's meet together and do something." Then you'll be visited immediately by the authorities.

The only hope for this regime, for China's political reform and China's political future, is some kind of watchdog. It would keep watch on the party in power, the leaders, their individual actions. But there's no space for that in China. Everything is tightly controlled. Every time the media starts expressing an independent viewpoint that stands in the way of the leaders getting rich, stealing from the national treasury, and privatizing publicly owned assets, they shut it down.

So we're waiting until the mountain goes down. The rich ones will have already gone abroad; the ones who will be crushed are those who can't get out. We are facing this kind of tragedy.



Lyn Jeffery, Director of IFTF's new Asia Futures Network, translated this interview from the Chinese.

A HISTORY OF LONG-TERM PLANS

It's tempting to see China's remarkable economic growth over the past decades as the effect of a globalization that came from outside Chinese borders. But in fact, the foundations of the Chinese powerhouse were laid early in China's socialist period, in large part through the creation of a unified national strategy for a better future.

Emerging victorious after the horrific experience of foreign occupation in World War II, Mao Zedong and the CCP sketched a futuristic vision of strength and revitalization that inspired millions in the 1950s. "Dare to think, dare to act" was only one of many slogans that called upon ordinary men and women to use carefully scripted visions of the future as fuel for their daily actions.

And while Mao's "Great Leap Forward" was more science fiction than rational planning—the attempt to turn farmers into steelworkers resulted in three years of devastating famine—the idea that the central government should set and implement ambitious national goals persisted long enough for Deng Xiaoping to institute the Four Modernizations in the late 1970s.

In 1978, *Time* named Deng Xiaoping the Person of the Year, writing: "The Chinese, their primitive economy threadbare and their morale exhausted by the years of Mao [Zedong]'s disastrous [policies], hope to have arrived by the year 2000 at a state of relative modernity, and become a world economic and military power. They may not arrive, or arrive on time, but their setting off is an extraordinary spectacle of national ambition."

As we now know, the Chinese did arrive on time.

1 China's Long-Term Plans

1949–57: Socialist Construction and Transformation

- Collectivize private ownership, gradually and step-by-step, in industry, handicrafts, and commerce
- Establish agricultural cooperatives
- Invest heavily in industrialization
- Build and strengthen mass organizations like the Youth League and Women's League

1958: The Great Leap Forward

- Build and strengthen the CCP against domestic critics
- Mobilize mass labor power via construction of large-scale agricultural and urban communes
- Use both traditional (e.g., backyard steel smelting) and modern means of production
- Devalue expertise and formal education in favor of whatever might produce better, faster, cheaper results



1978: The Four Modernizations: Science, Industry, Agriculture, Defense

- Introduce foreign technology, attracting and using foreign capital more actively
- Refocus on education and expertise
- Restore material incentives via rural responsibility and free markets
- Establish Special Economic zones
- Double the 1980 per-capita GNP average to US\$500 by 1990 to solve food and clothing shortages
- Quadruple the 1980 figure by 2000 to attain an average per-capita GNP of US\$800
- Promote an "open-door policy" toward the outer world



CHINA 2020: MOBILIZING THE NATIONAL SPIRIT IN A GLOBAL WORLD

Increasingly unable to call on the people to sacrifice much for the greater good, the CCP's future-oriented projects emphasize the transformation of China's standing in the international community. The 2008 Olympics are being touted as a race for gold medals between China and the United States; young Chinese athletes treated the 2004 Olympics as a training ground to gain experience for 2008. And the space program puts China in the ranks of its largest competitors from the past (the Soviet Union) and the future (the United States).

CHINESE BRANDS: BUILDING IMAGE AND PROFIT

"The Chinese invented gunpowder but it was the Western powers who used it to conquer us," said a Chinese businessman in 1996. "Now we Chinese will take capitalism and do the same thing to the West."

Not content to simply manufacture products for foreign companies, Chinese corporations want to supply the hungry consumers of the world with Chinese-designed and branded products. It's all about national pride. The Chinese waited for years to win the Nobel Prize for literature; now they wait for the coming of the Chinese Bill Gates. When and how this will happen is debatable, but the future plays of Chinese businesses are wholly in line with the CCP's desire to enhance the nation's image abroad.

Indeed, the most powerful corporations are closely entwined with the CCP and its administrators. Business and government entities are trying to lock in a future of Chinese technological dominance by setting standards in wireless LAN communications, mobile telephony, and Internet capability. And in December 2004, China launched what is thought to be the single largest Internet Protocol version 6 network in the world, angling for a lead in the race to build the next generation of the Internet.

While China continues to be a magnet for foreign investment, drawing \$60 billion in 2004, its own foreign investment program—\$33 billion in 160 countries by the end of 2003—is symbolic of the global aspirations of big business in China.

2 The Current CCP 20-Year Plan

- Build a "well-off society" in an "all-round way" by 2020, quadrupling the 2000 GDP to US\$4 trillion, with a per-capita GDP of US\$3,000
- By 2020, become the fourth-largest source of tourists in the world and the top tourist destination
- Eliminate absolute poverty from the population
- Achieve 20% forest coverage in 2010 and 23.4% in 2020
- Further develop the economy, improve democracy, advance science and education, enrich culture, foster greater social harmony, and upgrade the texture of life for the people
- By 2020, achieve a trade volume equal to 10% of the world total, becoming the second major trading country from the present sixth
- Increase per-capita schooling years and life expectancy
- Double energy consumption by 2020
- Achieve space docking and space walking by 2010, establishing a permanent space station by 2020
- Provide an apartment for every household and a room for everyone, with housing "well equipped and fully functional" for residents by 2020. Increase per-capita floor space to 23–30 square meters for urban residents and 37 square meters for rural people

3 Timeline of China's Big Acquisitions



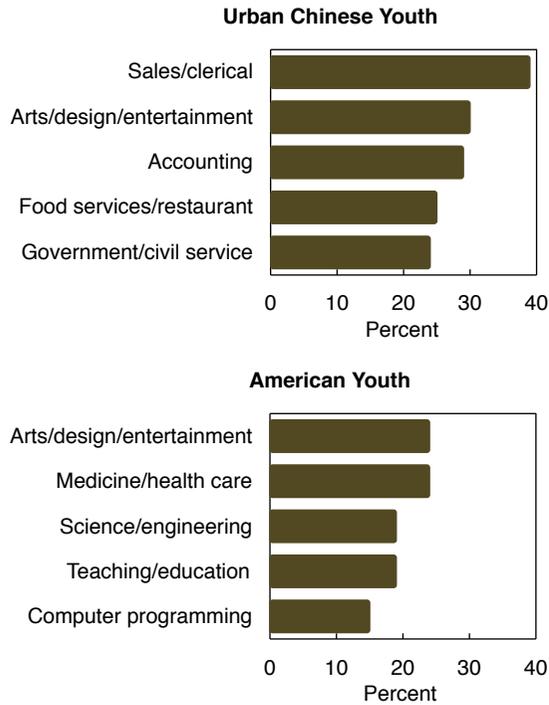
**BUSINESS IS US:
PERSONAL FUTURES IN CHINA**

As consumerism has taken the place of socialism over the last few decades in China, Chinese of all ages have turned to the nuts and bolts of business in order to ensure their futures. According to research on 14–21 year olds by Deloitte and IFTF, doing business is “cool” among China’s younger urban generation—whether in its purest form as a salesperson, as an entrepreneur in the restaurant business, or ideally, as a government official.

China’s youth also appear to be more entrepreneurial than youth in the United States, probably because they have less faith that institutions will support them in the long term.

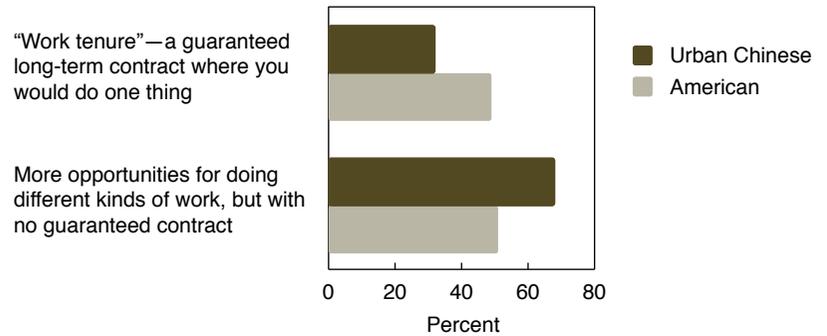
One result of this new focus on business is the growth of MBA programs in China. While many Chinese still choose to attend Western institutions, student enrollment in Chinese MBA institutions grew by 700% from 1997 to 2003.

4 Top-Five Professions Youth Have “Started Thinking About or Pursuing”



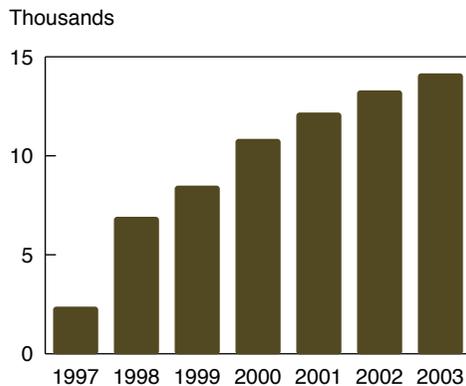
Source: Deloitte/ITF Youth Surveys, 2003 and 2004

5 Faced with a Choice, Youth Would Rather Have ...



Source: Deloitte/ITF Youth Surveys, 2003 and 2004

6 Growth in MBA Enrollment in China



Source: Zhao Chunjun, Tsinghua University, 2004

SMART MOBS: SPONTANEOUS COMMUNITIES TAKE ON CORRUPTION

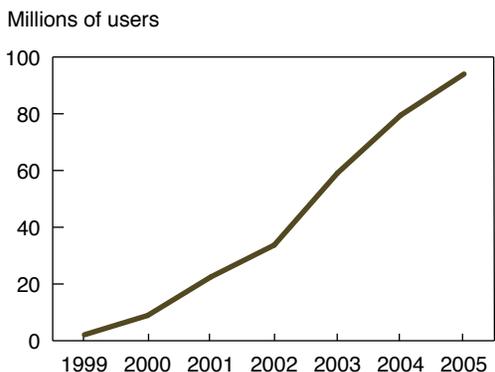
With cell phone and Internet use rising rapidly across China, two distinct types of “smart mobs” are poised to shape China’s future via rapid-response pressure on recalcitrant Chinese officials.

The first is China’s online population. Online Chinese represent the most successful in the population. Mostly elite and comparatively well-educated, they have brought their influence to bear on a number of local cases of injustice and corruption. For example, such online protestors have forced an investigation into possible judicial corruption, after the wife of a wealthy Chinese businessman, who struck and killed a peasant while driving her BMW, received a suspended sentence.

The second type of smart mob is composed of farmers, laid-off workers, and manual laborers in China’s smaller cities and towns. With few effective NGOs to advocate their causes to the government, “mass incidents” involving tens of thousands of rioting protesters have become increasingly common over the last five years, and will continue to explode in the coming decade. Amplified by mobile phones and text messages, they also appear to be increasing in size and becoming better organized. Such incidents often spring up within hours or a few days at most, fueled by rage at local corruption, unfair taxation, unpaid wages, privatization of land, and basic maltreatment of the poor.

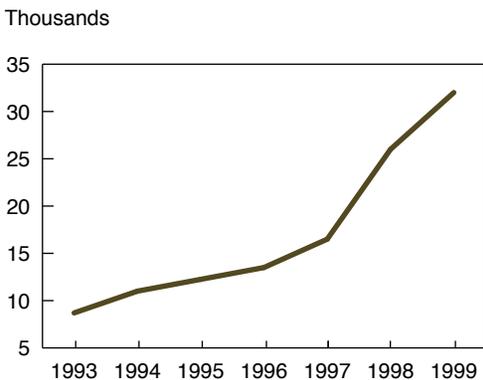
For instance, in late 2004, a man who was taken to be a tax official beat a worker on the street in Sichuan and broke his leg. The official was detained on the spot by crowds of onlookers. In a few hours, the crowd had swelled to tens of thousands, who smashed and burned local government buildings. Raised on a steady diet of pro-proletarian rhetoric and socialist ideals, China’s farmers and workers are not likely to acquiesce to a future that doesn’t include them—and the glory of the Olympics will not be enough to distract them.

7 Growth of the Chinese Internet



Source: China Internet Network Information Center

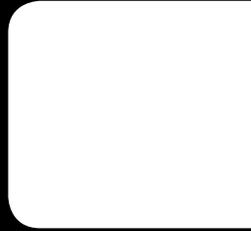
8 Growth of So-Called “Mass Incidents” in China*



*Statistics beyond 2000 are not available, though Chinese police report continued increases in the number of mass incidents at growth rates between 20% and 40% per year.

Source: Murray Tanner, *The Washington Quarterly*, 2004

Hero, a box-office hit in China and the United States, is unrelentingly nationalistic—an excellent vehicle for expressing the sense of today's Chinese of themselves as heroes in an inevitably Chinese global future.



X COMMUNITIES/POLICY

Lengthen the planning horizon and widen target inclusion

An unmistakable lesson from China's experience with futures thinking is that long-term plans can radically reshape a community—even one on the scale of the Chinese nation. The willingness to set specific long-term targets and invest systematically in them has the power to change the world.

In the West, futures thinking is much more distributed throughout society, and has a more diverse set of participants, from corporate strategic planners to media pundits, from urban planners to foundation boards. With limited purview and without obvious coordination mechanisms, these players can hardly hope to achieve the kind of alignment that the central government of China has achieved over the past decades. And yet the success of that centralized process should at least be a signal to the distributed players in the West, as well as the emerging factions in China, that coordination is probably essential to solving the massive global problems that await us in the coming decades as we cope with extreme impacts of an ever-growing human population within an adaptable, but ultimately bounded ecosystem.

X MARKETS

Leverage Chinese brands

As large Chinese companies build their brand images abroad, elements of Chinese culture will likely be exported along with Chinese products and their logos. These exports will shape market preferences and behaviors in both subtle and in not-so-subtle ways.

Now is a good time to begin to understand how marketing practices will need to adapt to these new global players. In addition to understanding how Chinese brands are perceived in different parts of the world, today's strategic marketers should begin to think about how to build co-branding and co-marketing programs with Chinese global companies.

X PRODUCT DESIGN & PROTOTYPING

Know your Chinese symbology

Even as young Chinese set their sights on a global future, they will also bring much from their own history, including a deep symbology and a pride in things Chinese. For those trying to reach Chinese markets—as well as those trying to ride a Western wave of interest in Chinese aesthetics—it will be important to develop more than a surface understanding of Chinese symbols. Already, global companies have paid the price for carelessness in this arena. Nike, for example, was recently forced to pull TV ads from the Chinese market which depicted NBA star LeBron James defeating a kungfu master and a Chinese dragon—the dragon being a symbol of Chinese national pride.

X HUMAN RESOURCES/PERSONAL DEVELOPMENT

Learn Chinese

Chinese is the fastest growing language on the Internet: by the end of 2005, the total number of Chinese Internet users will equal almost two-thirds of the total number of English speakers. By the end of the decade, the numbers are likely to be reversed. Chinese-language skills will be essential business skills.

The shift to Chinese language dominance will obviously have cultural ramifications, as well. A man named Jin is the first Chinese-American rapper to gain popularity in the United States. This is his vision of the future:

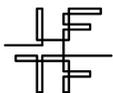
Yeah, I'm Chinese and what?
Yeah, you know who this is, Jin
Let me tell you this
The days of the pork fried rice and the chicken wings
coming to your house by me is over

Y'all gonna learn Chinese
Y'all gonna wanna be Chinese
Y'all gonna learn Chinese
When the pumps go off, y'all gon' speak Chinese

Global climate change has been cast as an incremental phenomenon with uncertain impacts in the relatively long term. And even as short-term warming trends become more certain, the impacts will be felt largely in sporadic events, such as more extreme natural disasters. All of this uncertainty will tend to encourage a gambler's mentality to strategy and policy. Yet a one-in-ten probability of a globally catastrophic outcome by the end of the century puts climate change squarely on the table for discussion, and the relatively low economic cost of mitigation makes it a candidate for immediate action.



Global climate change will create increased extremes in random events—with social costs out of proportion to the economic costs



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Where We Stand: Unavoidable Consequences

The world has passed a climate change threshold: the impacts of global warming will begin to play out over the next two decades. These impacts are, at least in part, the result of human choices over the last 100 years, during which average planetary temperature has risen by about 1° Fahrenheit (F). Furthermore, the rate of increase of temperature per year since 1976 is three times greater than the average over the last 100 years. This is a rate of increase unprecedented in human history.

These changes will produce unavoidable consequences. Already animal and plant migrations have been linked to temperature changes—with implications for human food, habitat, and disease. And even with strong and immediate interventions, the average temperature will rise another 1° F within the next decade or so as locally higher temperatures are integrated into the global system. This higher temperature will interact with natural weather events to create more extreme hurricanes, floods, droughts, and forest fires.

Short Term: Local Mitigation and Adaptation

The risks posed by these events are largely unpredictable, sporadic, and local. In wealthy regions, the economic costs will be high but localized. In poorer regions, the social costs will be greater still, as injury, disease, and death disrupt communities and drive populations into even more marginal lifestyles, typically in poorer and, ironically, disaster-prone urban areas. In a vicious cycle, such disasters will suck dollars into repair and away from more positive social investments.

Given the sporadic nature of these climate impacts, the responses will tend to be local and limited. Absent a strong commitment by leading nations to global mitigation policies like the Kyoto Protocol, distrust will mount among nation-states that are differentially responsible and differentially affected. This distrust will make it more difficult still to mobilize the global community to act.

Long-Term: The Specter of Irreversible Damage

The potential for irreversible damage grows with the delay in global mitigation measures. Particularly worrisome are so-called non-linear events, such as the rapid melting of Greenland's glaciers or large-scale species extinctions. While extinctions are truly irreversible, large glacial meltdowns are restored only on very-long time scales, measured in thousands of years.

Mitigation will require the reduction of greenhouse gas emissions as well as economic and technological innovations. The good news is that the cost of reducing greenhouse gas emissions is relatively low—it won't erase global economic growth. The economy might grow more slowly, but given the odds, slow growth seems the more prudent course of action.

—Peter Banks and Kathi Vian



Stephen looks for the canary in the coal mine and finds it quivering

Q: | You've been very active with international and governmental bodies. If you were speaking with ordinary citizens, what would you say about climate change and the situation we find ourselves in right now?

The first thing I would tell them is that what they hear from Michael Crichton, Rush Limbaugh, and the *Wall Street Journal's* editorial page is, for the most part, nonsense. What these guys do is select from the wide range—the end-of-the-world and the good-for-you stories—which are the lowest-probability outcomes. I'd tell people, "Don't get fooled by this debate because you're not being told the truth. You're being given a caricature of the most extreme views."

There are things we know very well. We know that we have increased atmospheric carbon dioxide by 30–35%. We've increased methane by 150%. We know the world is more than 1° Fahrenheit warmer than it was a century ago. Plants and animals are moving around. Glaciers are melting all around the world—a preponderance of them. We know that there was an incredibly disastrous heat wave that killed 30,000 people in Europe, and while a 1°F increase in the mean temperature doesn't directly add up to a heat wave, we know that the shift in the mean temperature can do this, that it adds the extra oomph that can increase the death rate.

We also know that the climate effects projected by our models—which include cooling the stratosphere and warming the surface, warming mid-continents more than mid-oceans, warming the higher-latitude land masses more than the lower latitudes—all of that has happened. Nature in the last few decades has cooperated with theory, and the fingerprints are very strong. So what we're looking at now is the canary in coal mine, and the canary is starting to quiver.

Q: | What do these changes mean for the average person in the next few decades? What will our average citizens see?

The main thing they're going to see is an increase in the intensity of hurricanes and the number of droughts and floods. The elevation of the snow pack is rising on average, and that means you probably will have an increase in fire frequency. But that is going to occur variably. The analogy

I like to use is that we're loading the dice, and we're loading them toward more extreme heat waves and intense weather events. Yes, nature makes these events, but we soup them up.

Q: | There's been increasing speculation about nonlinearities, abrupt changes that surprise us. What is the potential for these unexpected events?

The problem with abrupt nonlinearities is that we have little half-born views of them. We have no idea whether those are just little fluctuations or the beginning of a big event. The most recent results suggest that there's under-glacier melt in Antarctica that nobody had anticipated, which means the west end of the ice sheet may be more unstable than we realized. It may not take 500–1,000 years for it to de-glaciate; it could be much quicker. This is going to rock the climate community, assuming that these observations are sustained by the next round.

Possible nonlinearities include the Greenland ice sheet, the oceanic thermohaline circulation, the west Antarctic ice sheet, the North Atlantic oscillation, or El Niño, and the collapse of the Amazon ecosystem. As the Amazon gets warmer and warmer, all of sudden it flips to where it gets so dry that forests burn down. The British HadCM3 model predicts that forests take up CO₂ as a negative feedback for 50–75 years, and then it crosses a threshold where the evapotranspiration is more than the rainfall. And then the forest collapses in decades, pumping out a tremendous amount of CO₂, 50% of the current amount in the atmosphere.

But I'm not as worried about CO₂ feedback as I am about the destruction of the incredible biodiversity reserve that would represent. Basically, creatures currently threatened in narrow habitat ranges are by far the most vulnerable because, when the climate changes, it forces them to move up mountains or poleward. And if their way is blocked by factories, farms, thruways, and urban settlement, their probability of extinction goes up. These narrow habitat ranges are what we call unique and valuable systems—small island states, low coastal areas, and ecosystems at the margins already. They're threatened with the warming already, and they'll be increasingly threatened by what's in the pipeline.

Stephen Schneider is a Professor of Biological Sciences at Stanford University, the author of *Climate Change Policy*, and the founder of the interdisciplinary journal, *Climate Change*. He received a McArthur Fellowship in 1992 for his ability to integrate and interpret the results of global climate research.



Now what about us? Well, if we were a billion very resilient people, capable of moving around, sharing technology, viewing the environmental stress, we would get through it. But we're not. We're on our way to reaching 7 billion people worldwide, most of us tightly locked in to national boundaries, with a billion or more on nutritional margins and in a state of distrust and violent stress. It's going to be very difficult to get through that without some nasty dislocations in a lot of places.

Q: | What about economic impacts? What will climate change cost us, and what will it cost us to mitigate it?

I'm not really worried about what climate change is going to do to the economy of the world. That's at the level of a few-percent GDP loss. That's made up in two years of growth rate. I'm not worried about the cost of fixing it either. The total macro-economic hit from severe climate policy is hundreds of dollars per ton in carbon tax. It may be the end of the SUV industry and the end of coal industry, but that amounts to just a few GDP points. At a 2% per year growth rate, that's a few years' delay in being as rich as you otherwise would have been.

Q: | You've said that, in talking about climate change, two things are important to you: being clear about the science and being clear about your values. What values are really important to you?

The first concerns causing harm to someone else. I believe my personal behavior and that of my country and fellow rich countries is doing harm to three groups: other poor people and countries in hotter parts of the world that are less adapted and more vulnerable; the future generations who aren't here to vote; and the plants and animals who never vote.

The second principle is irreversibility. A flipped Gulf Stream, a melted Antarctic, the collapse of the Amazon, and extinct species—these are for a very long time, if not forever. So considering the fact that you can fix the problem for under 2% loss of GDP in 100 years, let's fix it.

Now, you've got to worry about coal miners and auto workers and energy costs in China. You can't impose a \$300/ton carbon tax the day after tomorrow. So you say, "Okay, we're not going to do anything other than Kyoto for the next 5–7 years, but then, after that, we're going to have a planetary carbon tax. That includes you, China and India, but because you haven't developed, we're going to recycle the tax revenues back, targeting them at low-emitting power plants."

Here's the scariest part. The poor countries say, "You rich countries, you colonialist pigs, you enslaved us. You stole our resources at cheap prices. You used the Victorian industrial revolution to get rich. You corrupt our officials. You buy your resources below market value, steal our biodiversity, and now you want us to take equal targets with you?" And then the rich world says: "Well, you don't have the markets. You have corrupt leaders. There are no incentives to develop and deploy. There's no good governance and you're overpopulated." Guess what—they're both right.

So, Kyoto is a step away from pointing fingers toward the beginning of a cooperative solution. Kyoto is a generation-long learn-by-doing experiment in global cooperation to protect the commons and set up a transfer mechanism. Without hundreds of billions of dollars a year going into sustainable development, this world is not safe—environmentally, socially, or politically. It's going to take cooperation. It's going to take rich countries taking the initial hits harder and then developing alternatives that can be transferred to poor countries. And, as rich countries do so, they'll have big markets for the next set of projects and products. So this is not a lose. This is a potential win-win.



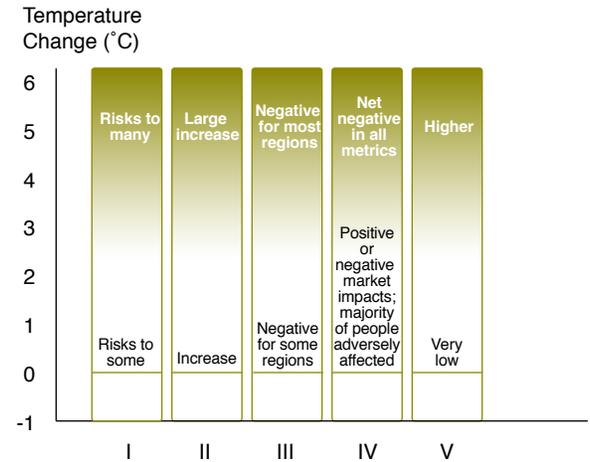
Peter Banks, IFTF's president, asked Stephen to put the climate change debate into perspective.

**GAUGING THE THREAT:
RISKS INCREASE WITH TEMPERATURE**

One of the difficulties of assessing the threat of global climate change is the complexity of impacts. Several different kinds of threats exist, and the risk associated with each is measured on a different scale. Furthermore, the risks increase at different rates for each threat. There are also regional variations.

Most of the climate models forecast an increase over the next century between 1–6° Celsius (C). While threats to unique ecosystems and the risk of extreme events increase rapidly as temperature rises even slightly, virtually all threats become severe with a 5° F-degree increase. More important, while the potential for non-linear events—for example, a major shift in the Atlantic currents that could lead to extreme cooling rather than warming in Europe—increases more slowly than other risks, those events themselves tend to be game-changing. If they occur, they can be expected to produce very large, very rapid discontinuities.

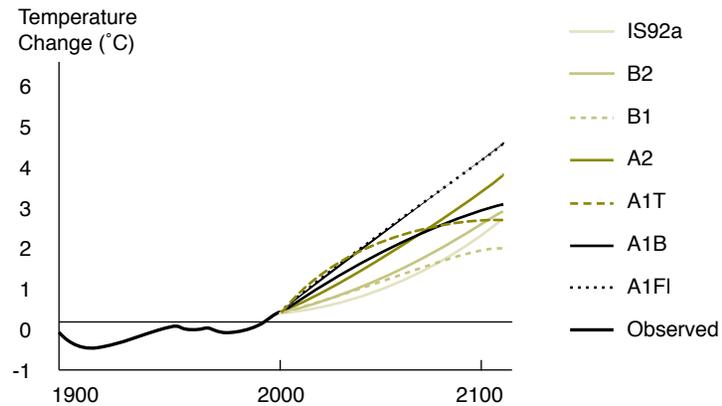
1 A Five-Scale Gauge for Assessing the Threat of Climate Change



- I Risks to unique and threatened systems
- II Risks from extreme climate events
- III Distribution of impacts
- IV Aggregate impacts
- V Risks from future large-scale discontinuities

Source: Intergovernmental Panel on Climate Change, *Climate Change 2001: Impacts, Adaptation, and Vulnerability*, 2001.

2 Multiple Model Projections for Future Levels of Warming

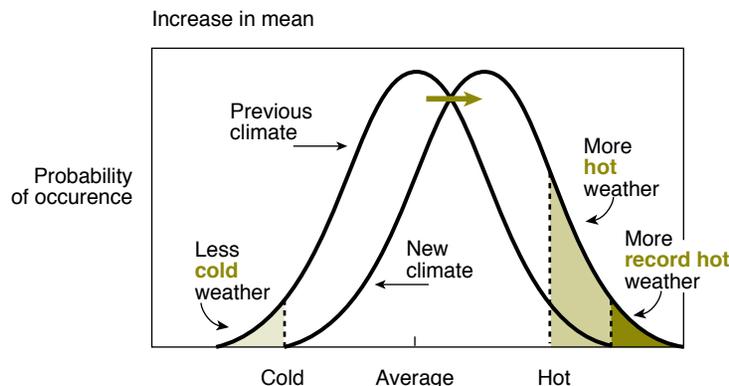


Source: Intergovernmental Panel on Climate Change, *Climate Change 2001: Impacts, Adaptation, and Vulnerability*, 2001.

**DISTRIBUTION OF RISK:
HOW SMALL CHANGE CREATES LARGE IMPACTS**

A small increase in the mean global temperature translates into large impacts on day-to-day weather. If you think of daily weather as a standard distribution around a mean, moving the mean just slightly to the right means that many days will be much hotter and more record hot days will occur. Furthermore, as Stephen Schneider points out, “What matters to society isn’t the shape of the distribution. It’s that there’s a threshold above which they’re hurt: 100° weather in the Midwest reduces the corn yield by several percentage points.”

3 What Climate Change Means for the Weather



Source: Intergovernmental Panel on Climate Change, *Climate Change 2001: Impacts, Adaptation, and Vulnerability*, 2001.

**IMPACTS:
PROBABILITIES AND CONSEQUENCES**

If the average global atmospheric temperature continues to increase incrementally over next several decades, the world will begin to experience a range of related climate impacts—and associated impacts on humans and their environment. The likelihood of these impacts, as shown here, was determined by the Intergovernmental Panel on Climate Change.

4 The Social Impacts of Likely and Very Likely Climate Impacts

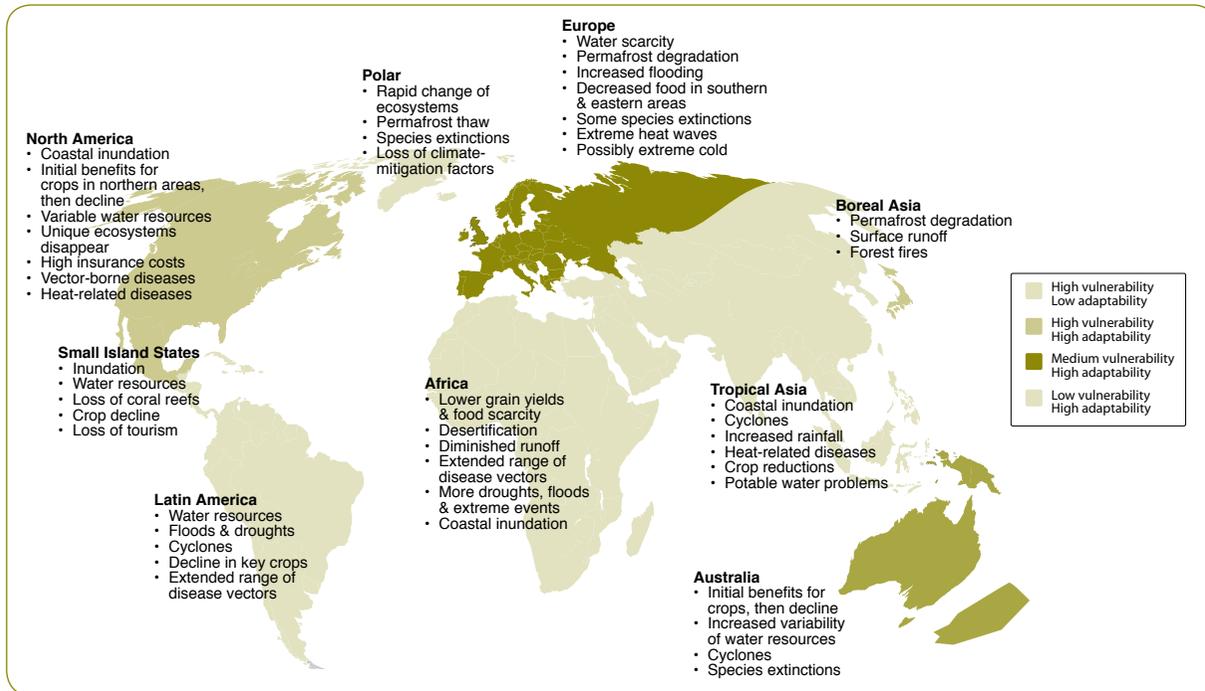
CLIMATE IMPACTS	SOCIO-ENVIRONMENTAL IMPACTS
<p>More Heat Higher maximum temperatures, more hot days and heat waves over nearly all land areas</p>	<ul style="list-style-type: none"> • More deaths and serious illness in older age groups and urban poor • Increased heat stress in livestock and wildlife • Shifts in tourist destinations • Increased risk of damage to some crops • Increased demand for electric cooling • Reduced reliability of energy supply
<p>Less Cold Higher minimum temperatures, fewer cold days, frost days, and cold waves over nearly all land areas</p>	<ul style="list-style-type: none"> • Decreased cold-related human morbidity and mortality • Less risk of damage to some crops, and increased risk to others • Extended range and activity of some pest and disease vectors • Reduced demand for heating energy
<p>Wetter Storms More intense precipitation events</p>	<ul style="list-style-type: none"> • More flood, landslide, avalanche, and mudslide damage • More soil erosion • Increased flood runoff, increasing recharge of some floodplain aquifers • More pressure on government and private flood insurance systems and disaster relief
<p>Drier Summers Increased summer drying over most mid-latitude continental interiors and associated risk of drought</p>	<ul style="list-style-type: none"> • Lower crop yields • More damage to building foundations caused by ground shrinkage • Decreased water quantity and quality • Greater risk of wildfire
<p>Stronger Cyclones Increase in tropical cyclone peak wind intensities, mean and peak precipitation intensities</p>	<ul style="list-style-type: none"> • Increased risks to human life • Greater risk of infectious-disease epidemics • More coastal erosion and damage to coastal buildings and infrastructure • More damage to coastal ecosystems such as coral reefs and mangroves
<p>Stronger El Niño Effects Intensified droughts and floods associated with El Niño events in many different regions</p>	<ul style="list-style-type: none"> • Decreased agricultural and rangeland productivity in drought- and flood-prone regions • Decreased hydropower potential in drought-prone regions
<p>Variable Monsoons Increased Asian summer monsoon precipitation variability</p>	<ul style="list-style-type: none"> • Increase in flood and drought magnitude • More damage to infrastructure and ecosystems in temperate and tropical Asia

Source: Intergovernmental Panel on Climate Change, *Climate Change 2001: Synthesis Report*, 2001.

DIMENSIONS OF RISK: VULNERABILITY AND ADAPTABILITY

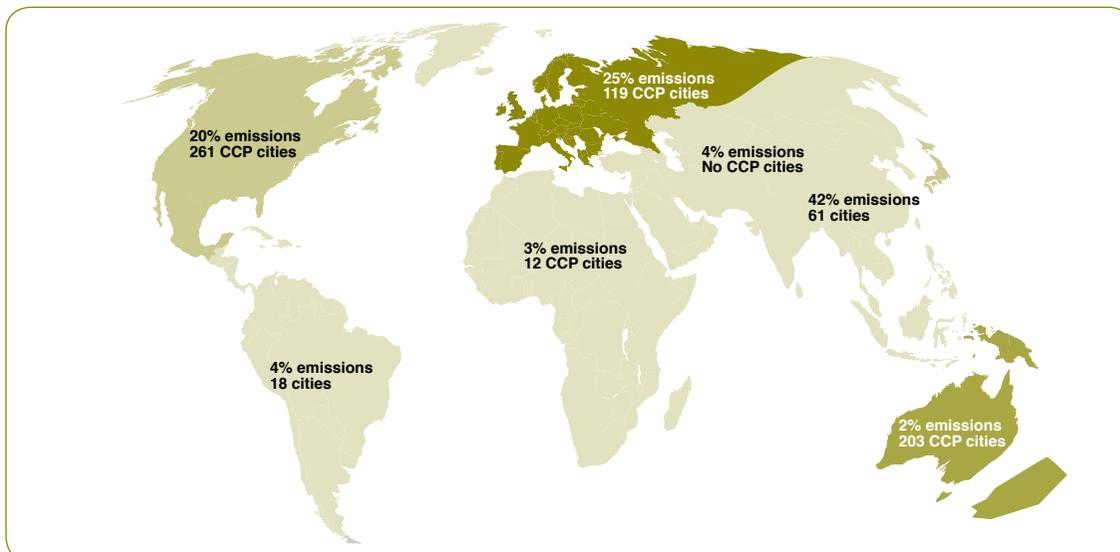
Two key dimensions define the risk that climate change poses to the world's major regions: vulnerability and adaptability. Vulnerability is a measure of how susceptible a region is to climate impacts, such as water scarcity or increased cyclone intensity. Adaptability is a measure of the resources—social, economic, and technological—that a region can mobilize in response to climate impacts. The hardest hit will be those who are most vulnerable and have the least adaptability. These are the tropical, less developed regions, which are also the regions where the world will see the fastest growth in megacities. The combination of urban migrations in these climatically threatened regions is a recipe for human disaster on a huge scale.

5 Vulnerability, Adaptability, and Likely Impacts



Source: Intergovernmental Panel on Climate Change, *Climate Change 2001*.

6 Regional Share of CO2 Emissions and Participation in Cities for Climate Protection



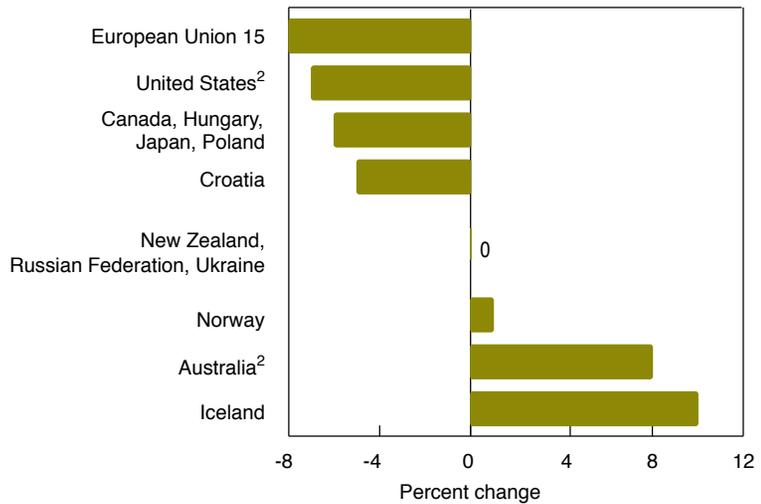
Source: International Council for Local Environmental Initiatives, 2005; John Gate, IEA Greenhouse Gas R&D Programme, 2002.

**KYOTO:
BALANCING THE COST OF MITIGATION**

The Kyoto Protocol, which went into effect in February 2005 without ratification from several key countries, is designed to limit the growth of greenhouse-gas emissions through the next century and set up a framework for trading carbon credits. It is a complex set of targets designed to place more of the burden on today's heavy polluters and allow less developed countries to continue to build their economies. Thus developed nations have binding targets while less developed do not, and the most polluting nations must reduce their emissions, while less polluting nations may actually increase theirs.

The contentious elements of the Protocol include, among others, compliance and national reporting, flexibility mechanisms (such as carbon trading), land use and forestry rules, and assistance to developing countries in dealing with the impacts of climate change.

7 Allowable Emissions Changes, 1990–2008/2012¹



¹ According to Kyoto protocol Binding Targets
² Have not ratified

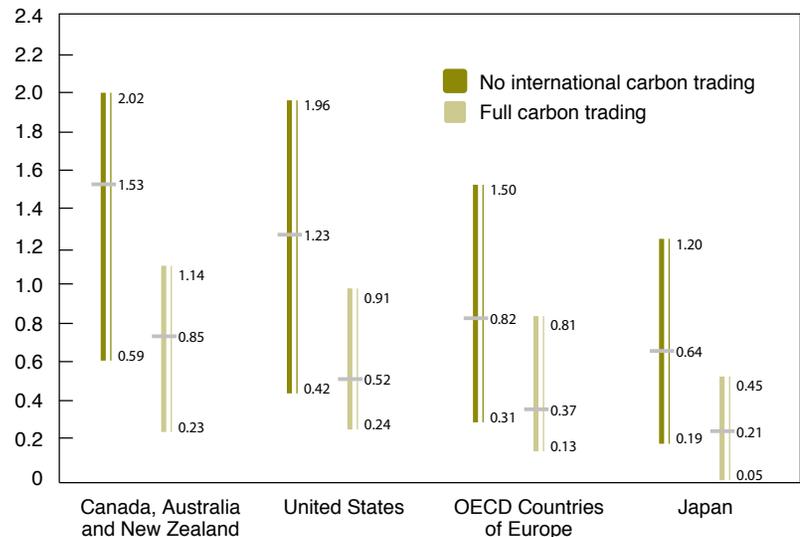
Source: United Nations Framework Convention on Climate Change, 2005

**COSTS OF MITIGATION:
2–4% OF GLOBAL GDP IN 2010**

Numerous international energy-economic models have been used to estimate the potential cost of CO₂ mitigation at the levels targeted by the Kyoto Protocol. The consensus of these models is that the cost to reach the Kyoto 2010 targets ranges from 0.2–2% for industrialized countries, and from 0.05% to as much as 25% for developing countries, with the highest costs for oil-exporting countries. (These high costs to developing oil-exporters could be addressed by emissions trading, the elimination of fossil fuel subsidies, and the use of a carbon tax.) The total global impact, under different mitigation scenarios, ranges from 2–4% of GDP.

8 Range of Potential GDP Losses as a Result of Compliance with Kyoto Protocol

Percent loss in GDP in 2010



Source: Intergovernmental Panel on Climate Change, *Climate Change 2001: Synthesis Report*, 2001.

In its extreme view, *The Day After Tomorrow* distracts from immediate needs to reduce vulnerability.



X INNOVATION

Experiment with new climate-targeted economic structures and incentives

The climate problem is of a scale and scope that humanity has never faced. It is a global, long-term problem that crosses natural, economic, societal, institutional, political, cultural, and technological boundaries—all in the context of a high degree of uncertainty. Our current decision-making systems are not tuned for this kind of problem solving.

It's critical that we begin to experiment with alternate forms of economic, institutional, and community organization that can respond more sensitively and intelligently to the kind of world defined by the climate problem. Such experiments are beginning to emerge—from peer-to-peer processes for ensemble forecasting among climate scientists to grassroots economic strategies that could add resilience to the global economy in the face of climate-based dislocations and new collaborative tools that could actually increase human collective intelligence and cooperation. At the same time, we must not shy away from very specific economic experiments—such as carbon taxes and carbon trading—that could strongly incent immediate innovation on all levels of society.

X NEW PRODUCT DEVELOPMENT

Lead with sustainable products and services

On a very practical level, every company can—and should—be reorienting its products and services toward climate-sensitive solutions. It's unlikely that the climate problem can be solved without technological innovations in energy-efficient, low-carbon products and processes. And if carbon taxes are enacted, such investments will pay off for both companies and consumers.

The sheer interdependence of factors in the climate problem also means that virtually everyone can find innovative ways to link their products and services to its solution—however unlikely the connection might seem at first glance. And with a one-in-ten chance of planetary disaster by the end of the century, it just makes sense to take the cautious route and begin to lead consumers rather than rely on them to “let the market speak.”

X COMMUNITIES/POLICY

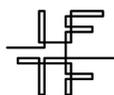
Develop local plans for both mitigation and adaptation

Although climate change is a global problem, it will require local commitment to both mitigation and adaptation. As mentioned, many cities are already setting their own targets for reducing greenhouse gas emissions and developing plans for meeting those targets. In addition, they should seek local incentives to reduce vulnerability to weather extremes—from more cautious development policies to infrastructures that are resilient to failure and more responsive systems for large-scale, weather-related emergencies. Communities also need to recognize that they face an increasingly disrupted global population; migration may be one of the most serious climate-related challenges they face. Planning now for the legal, social, and economic structures to handle such migrations will mitigate inequity and violence in the future.

At the same time, the world will not solve the climate problem if communities in less developed regions are left to struggle with climate impacts on their own. While the localized nature of near-term climate impacts will tend to focus attention on local security and local solutions, community leaders have an unprecedented opportunity to function as nodes in a cooperative, intelligent network through which unanticipated solutions may emerge.

The symbiosis of technology and religion is not new. Every generation of technologies, however, inevitably changes many aspects of religion itself, often resulting in new interpretations of religious doctrine, creating new means for distributing religious ideas, and enabling new or reinvented religious practices. Today, an emerging sensor-rich connective technology infrastructure is beginning to shape the religion of tomorrow, making it more portable, more personal, and more ubiquitous. Ultimately, these connective technologies will also make religion a more visible part of public society.

In a world
of pervasive
connectivity, religion
will become more
mobile, more
personal, and
more visible



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Portable Religion: Always Connected to the Sacred

Mobile religion is already here. Mobile phones show the direction of Mecca so worshippers can kneel in the right direction during prayer. Ring tones sound calls to prayer. Daily inspirational messages from the Vatican are delivered on personal mobile devices.

With these technologies, the human connection to the sacred will no longer be confined to traditional places of worship—mosques, synagogues, temples, or churches—or to particular times of the day or week. The sacred will be increasingly portable, and technologies will enable persistent connectivity to religious faith and religious communities for those who choose it. The sacred will become a consistent presence in these people's lives, not something they only connect with during traditional services or religious ceremonies.

Religious Media: Everyone Is an Evangelist

Just like music and videos, religious content can be modified, meshed, and repurposed. And people are increasingly turning from pre-packaged and mass-produced religion to religious content that they create. For example, an excommunicated priest can set up a cyber-church and continue to preach. Worshippers can pick and choose different parts of religious scriptures, interpret them, and publish their ideas using online media. Thousands of religious publications, sites, and blogs are flourishing, each offering a unique religious perspective.

In the online world, more Internet users report activities related to personal spirituality and religiosity than those related to traditional religious functions or organizations. Such a trend is perhaps not surprising—the Internet provides

information, symbolic resources, and opportunities for networking outside the boundaries of formal religious bodies. Centuries ago, Martin Luther seized the power of the printing press to spread his ideas, managing to print copies of his *Ninety Five Theses* faster than they could be destroyed and spurring the Protestant Reformation. Today, anyone with access to the Internet can be a Martin Luther, spreading personal religious ideas at speeds measured in kilobytes per second.

Religious Affinities: Weak Links to Strong Faiths

While more personalized religion and many smaller and alternative religious communities are likely to grow, a countervailing trend is also likely. Mega-churches and mega-religious organizations will be able to use the power of technology to diffuse their ideas broadly and reach new recruits. Such is the effect of the network Power Law: connectivity enables the strong to grow stronger while at the same time enabling a thousand smaller forms to emerge. In social networks, the hubs with many links attract even more links as people swarm to already rich hubs. A few popular blogs attract swarms of readers while hundreds of others remain largely invisible.

Today we're seeing the emergence of mega-churches and growth of evangelical movements in the United States and Latin America. These organizations effectively use the Internet, wireless technologies, and mass media to increase the ranks of their faithful. Over the coming decades, such big voices will co-exist with a much greater number of small and largely invisible religious and spiritual communities.

—Marina Gorbis

INTERVIEW: GENEVIEVE BELL



Genevieve shares her observations of the way people are using today's technologies in traditional religious practices

Q: | You're an anthropologist and you've been cataloging lots of uses of mobile phones and the Internet in religion. How did this intersection between technology and religion come into your thinking?

I remember interviewing a woman in South China about her use of technology. At the end of the interview, I turned to her and asked, "Is there something you want to tell me that we haven't talked about?" A classic anthropologist's question. She laughed and said, "Well, we haven't talked about religion, sex, or politics." Now I had to laugh. "I am conscious of this being China," I said, "I didn't want to upset you." "If you had asked me about this, I would've told you all these exciting things," she responded. So then we talked about religion, sex, and politics. And she told me all these things about technology and religion, like going to a local Buddhist monastery and having her cell phone blessed.

This was not a complete eye-opener but an interruption in the way I was thinking. I started paying attention to that aspect of people's lives.

Q: | Was there something unique about Asia that brought up the connection between religion and technology, something we would tend to miss in the West? Is it because we view religion as something private, not to be discussed?

Yes, religion is a private thing in the United States, although it is beginning to change. For a long time, religion has been a part of the private domain, and most importantly, something you don't bring to or talk about at work. We are also wedded to the notion of technology being rational, modern, and leading to progress.

In fact, technology has always been used for religious purposes in the United States. It was amazing to find out from the Pew survey that there has been enormous consumption of religious experience via technological means. If the Pew report is correct, you have *128 million Americans* using the Web for religious purposes! It's hard to think of that many people doing any other activity in such numbers. And yet, I am struck by the fact that this still doesn't register on the radar when we talk about experiences of technology.

Q: | What are some of the ways in which technology and religion intersect in people's lives? What are the most important themes that stood out for you as you began to pay attention to this confluence?

There are two threads that are particularly interesting for me. First, religion is a key pathway for naturalizing technology. That is, people use religious practices to make technology less "technology" and more a part of everyday life. Religion is a way for making technology a natural artifact rather than a technological or scientific artifact. Blessing a cell phone at the Buddhist church makes it acceptable as an everyday artifact, along with other objects such as one's house.

The second important thread is that of technology being seamlessly integrated into people's lives. The story here is about burning paper technology amongst Chinese families in Malaysia. As a part of the traditional Chinese funeral practices, which happen during the annual festival of the "hungry ghost," there is a series of ritual practices where you burn paper objects. In the burning process, paper replicas are transformed into "real" objects in the other world, the world inhabited by your dead ancestors and others. Now technology is being included in what people burn, including paper cell phones, paper laptops, and paper PCs. Here technology is seamlessly woven into the fabric of people's lives, both the living and the dead.

Q: | Do you see conflicts emerging between technology and its use for religious purposes? Do you see such conflicts emerging in people's lives?

No, I didn't find that. In some ways, this notion of technology being modern and anti-religious is a very Western idea—and in peculiar ways, a particularly American idea. America is a young country, and technology is so implicated in the story of the nation-state in the United States that there is no way people here can think about technology without it being a cause for social change in this country.

These notions just fit so well together in the United States. And they are so evident in the kinds of anxieties around the introduction of any new technology. Most of such anxiety

Genevieve Bell is a cultural anthropologist who has worked for the last few years at Intel Labs interviewing 100 households throughout Asia to understand the way people are using new technologies.



is really about social change—“Oops, change is coming, so how do we feel about it?” In a lot of other places, by contrast, people just don’t think there is a contradiction between using technology to support social practices that would continue without technology.

Q: | Over the centuries, technologies have enabled the re-invention of religious practices and activities. For example, the printed Bible allowed private worship and fostered alternative interpretations of the Christian doctrine. How do you see the current generation of technologies reshaping or reinventing religious practices?

People always ask about today’s technology making religious practice more private, kind of pushing it more toward an individual. I see it differently. As much as technology enables individualization, technology also is allowing people to create communities. It allows people to find other people like them, people they can’t find otherwise. There is a long and interesting history of Usenet groups, bulletin boards, chat rooms and even faith-based dating services with religious functionality.

Q: | For a long time now, technology companies have been thinking of strategies for the connected home or connected office. No one has been asking, what is our strategy for a connected church or a connected mosque or synagogue?

Absolutely. However, I know of at least one or two organizations that are operating here. There is an organization in New Mexico called Next Scribe. They’ve been selling themselves for 5–7 years as a Web-development house helping religious organizations integrate digital media into their operations. Their tag line is, “Network is the church.” They are advocates for making digital media the instrument of spirituality. They support sophisticated human–computer interaction research in the service of religion, the use of wise agents and AI (artificial intelligence) to build spiritually and culturally aware systems in the attainment of spirituality.

There are also churches all over the United States that are incorporating a whole host of new technologies into their buildings and their practices. Places like Willow Creek Church in the suburbs of Illinois—they are using wireless technologies, the Internet, mp3 files, PowerPoint, and video-conferencing to connect the main church with satellite facilities, to deliver more impactful sermons, and to support greater community engagement and outreach. In many ways, this deployment of technologies is not so different or unfamiliar—it resembles much of what happens in U.S. work places, community groups, and even homes.

Q: | How does Intel incorporate your research and findings into what it’s doing as a company?

The biggest implication of my work is to increase awareness within the company, to put these religious uses on our radar. I am not sure that we would want to be in the business of designing technology for a particular religious community, but we do want to think about religion as a part of people’s daily activities. It would be really unfortunate if we were to design technologies that would make religious practices in these environments difficult or impossible. So we’re thinking of it at the meta level—how do we design technologies that make this possible?



Marina Gorbis, Director of IFTF’s Technology Horizons Program, asked Genevieve about the role of technology in religion—and vice versa.

SECULAR VS. RELIGIOUS: THE BALANCE SHIFTS

After several centuries of increasing secularization, the beginning of the third millennium may be remembered as the time when the Western society came to a jolting recognition of the importance of religion in society. In many industrialized nations—perhaps most importantly in the United States—religion has increasingly moved from the private domains of home life to become conspicuously intertwined with a number of much more public domains. The key word here is *conspicuously*. Religion, whether in the form of paganism or Christianity, has always been deeply intertwined with most aspects of human life. However, Western societies have, over a few centuries, erected laws and social institutions to separate religion into a private domain, distinct from other political and social institutions.

This trend is changing now, with religion playing a more important role in the public domain in the United States and increasingly in many developing countries. In politics, the religious right has played a decisive role in American presidential elections. In the realm of international security, fundamentalist Islam is challenging global geo-political boundaries. In education, France has debated the acceptability of religious symbols in public schools while, in the United States, educators are increasingly rejecting curricula that teach evolution.

Helmut Anheier—a sociologist and co-author of the *Yearbook of Global Civil Society*—tracks global values and argues that while Western Europe over the decade of 1990s has become more secular, the role and importance of religion in people's daily lives has grown substantially in the Middle East, Africa, Latin America, and moderately so in the United States.

1 Percent of Population for Whom Religion Is Important



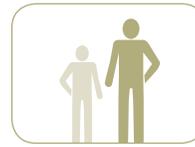
Source: Helmut Anheier

INTERNET BECOMES A RELIGIOUS DOMAIN

Genevieve Bell pointed out that religious uses of the Internet are third only to music and pornography. The IFTF 2004 American Lifestyles Survey found that, overall, 31% of U.S. Internet users turned to the Internet to communicate about religion, narrowly defined. In their more expansive definition of religious use, the Pew report *Faith Online* found that 64% of Americans used the Internet for religious purposes. Both studies found similar distributions across age, region, and race.

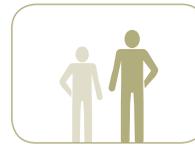
However, these first impressions of the data can be misleading because they reflect the compound effects of many variables operating at once. If we want to understand the real relationship between Internet religious use and other variables, we need to isolate the individual variables. When we do so, we can make five predictive statements about who is more likely to use the Internet for religious purposes compared to other groups.

2 Five Predictive Statements



People who use the Internet more often and from home are more likely to use it for religious purposes. When we control for other variables, we find that two overall Internet-use patterns influence how likely it is that people will use

the Internet for religious purposes: how often they use it and where they use it. Those who use it several times a day and from home are 1.272 times as likely to use it for religious purposes compared to someone who uses it almost every day from home.



Older people are more likely to use it than younger people. As age increases so does the likelihood for communicating online about religion. Someone in the age group 35 to 44 is thus 1.146 times as likely to commu-

nicate about religion online as someone between the ages of 25 and 34—and so on for each age cohort.



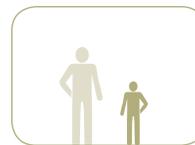
Internet users in lower income groups are more likely to use it for religious purposes. As income increases, the probability of communicating online about religion decreases. A person who earns between \$25,000 and \$35,000 is

0.905 times less likely to communicate online than someone who earns between \$15,000 and \$25,000.



African Americans are more likely to use the Internet for religious purposes than Hispanics.

African Americans are 1.886 times more likely to communicate online about religion compared to Hispanics. There are no predictable differences between Whites and African Americans or Hispanics.



People who live in the West are less likely to communicate about religion online than those who live in the South. When we control for other

variables, we find that people who live in the West are 0.641 times less likely to communicate online about religion compared to those living in the South. Other regional comparisons are not predictive.

Source: IFTF American Lifestyles Survey 2004

INTERNET RELIGION: AN EXTENSION OF THE CHURCH

The Pew report, *Faith Online* (based on a survey conducted in November and December 2003), suggests that the Internet is perhaps an extension of the Church, a way to stay connected to one's religious practice between regular services. Those who attend services weekly are more likely to use the Internet for personal spiritual purposes; for institutional purposes such as making donations and planning church meetings; and for getting religious news. These activities decrease as regularity of church attendance declines.

PERSONAL FOCUS: RELIGION VS. SPIRITUALITY

People make a distinction between being spiritual and being religious, and these distinctions make a difference in the way they use the Internet. Those who define themselves as religious are more likely to use the Internet for a range of religious purposes, from personal to institutional. However, according to the Pew survey, more than half of those who consider themselves spiritual but not religious also use the Internet for personal spiritual purposes. These include requesting prayers, downloading spiritual music, sending faith-related greeting cards, and using e-mail for spiritual purposes.

EXPANDING RELIGIOUS HORIZONS

The Internet has the potential to expand people's religious horizons and even support the evolution of alternative religions. While just over a quarter of the online faithful in the Pew survey use the Internet primarily to get information about their own faith, nearly the same number go online for information about traditions other than their own. Of those, 31% are doing so as part of their own spiritual growth, and 13% do so exclusively for this reason.

Perhaps not surprisingly, those who are not regular church-goers are slightly more likely to seek information about other religions online than they are to seek information about their own religions.

3 Church Attendance and Religious Uses of the Internet

	Get Religious News Online	Use Internet for Personal/Spiritual Purpose	Use Internet for Institutional Religious and Spiritual Reasons
Church Attendance			
At least once a week	39	67	51
Once a month	36	56	45
Several times/year	27	50	26
Don't attend services	23	38	16

Source: Pew Internet & American Life Project, *Faith Online*.

4 Religious vs. Spiritual People and Uses of the Internet

	Get Religious News Online	Use Internet for Personal/Spiritual Purpose	Use Internet for Institutional Religious and Spiritual Reasons
Personal Description			
Religious and spiritual	36	66	47
Spiritual, not religious	34	51	31
Neither	23	28	10

Source: Pew Internet & American Life Project, *Faith Online*.

5 Church Attendance and Religious Information Seeking

	Information About Own Religion	Information About Other Religion
Church Attendance		
At least once a week	37	30
Once a month	25	21
Several times/year	20	28
Don't attend services	15	17

Source: Pew Internet & American Life Project, *Faith Online*.

A punk student is only one of the many very personalized guises of God in the sleeper hit series, *Joan of Arcadia*.



X **WORKPLACE**
Foster dialog about religion in the workplace

As people carry their religion with them—and use what have traditionally been workplace tools for religious purposes—religion will become increasingly visible in the workplace. Combined with a notable trend toward workplace worship groups, this new conjunction of work and religion is likely to spawn debate and require new workplace policies. In the extreme, it could trigger lawsuits about “hostile work environments,” similar to sexual and ethnic harassment in the workplace.

Organizations should find ways to foster dialog among workers about the appropriate boundaries of religious practice as technology extends the reach of religion into the work lives of people and they should be prepared to establish policy for the level of visibility of tech-supported religion in the office.

X **PRODUCT DESIGN**
Track changing role of religious symbology

As new tools and technologies are incorporated into religious practices, religious symbols will increasingly be used for branding products and services. Those who design these offerings—as well as the basic tools themselves—will increasingly need to understand religious symbols, their meaning in different regions and communities, and their appropriate use in different settings. They will also need to provide the opportunity for people to customize their tools and services with religious symbols—from ring tones to desktop displays.

X **COMMUNITY TECHNOLOGY INFRASTRUCTURE**
Think beyond the connected home and office

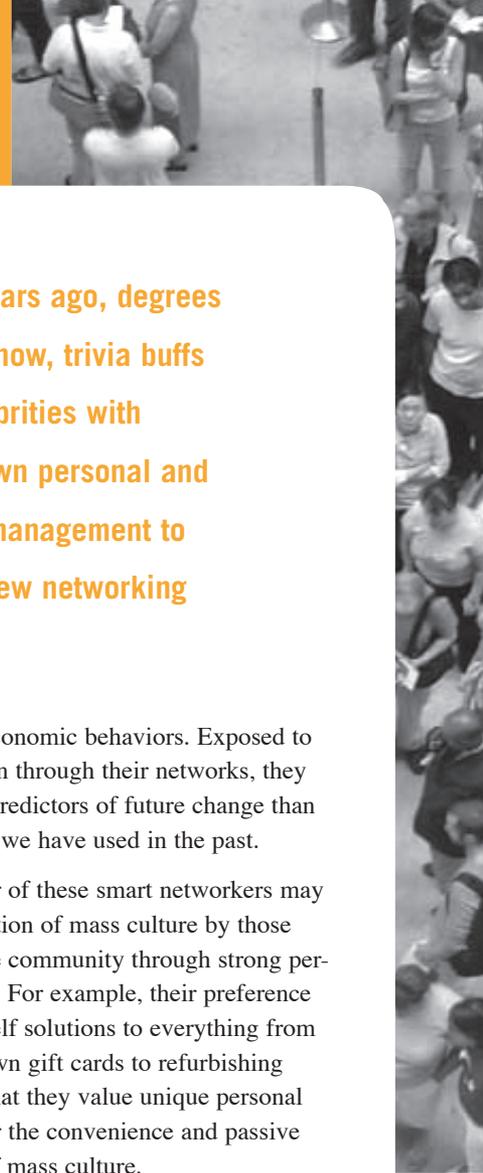
For the last decade, companies have been developing strategies for the “connected home” and “connected office.” Now, communities are becoming the next horizon of connectivity, and religious institutions will be a distinctive new consumer of technologies in this space.

Places of worship will not only become embedded with connectivity, allowing more continuous connection to the church; but religious connectivity will also reach into a variety of new community spaces. Religious organizations will take advantage of the new tools to share their gospels as well as minister to their flocks. And the flocks themselves will take advantage of embedded religious content in places to support their spiritual needs in a more continuous way.

This is an opportunity to think beyond traditional boundaries for building technology infrastructure and explore what a strategy for a connected church, synagogue, or mosque might look like.

X **PLACES & SPACES**
Anticipate religious visibility in public spaces

As the sacred becomes portable and connection to religious content and community becomes ubiquitous, any place may be converted into a sacred space. Worship, whether silent meditation or receiving benediction from a priest, may take place on a train, in a restaurant, or a public square. Just as workers have appropriated public spaces such as cafés and trains for traditional office tasks, religious practices may begin to appropriate similar public venues. Branded spaces—such as restaurants, hotels, and even gyms—could come to be associated with religious uses that attract some customers and discourage others. A more visible religiosity will increasingly color the character of public spaces—and potentially create more contention about the uses of those spaces.



Six Degrees of Kevin Bacon is surely a game of our times. Until a few years ago, degrees of separation were the domain of esoteric mathematical sociologists. But now, trivia buffs everywhere sort through them like obsessed social auditors—linking celebrities with actor Kevin Bacon through a network of co-stars in movies. And in their own personal and professional lives, they embrace tools for personal network building and management to create their own degree-of-separation profiles. The question is: will this new networking sophistication change the way they behave as consumers?

Networking intelligence will change the choices people make about everything from health to entertainment

Networking IQ: Six Measures

An answer to this question requires a measure for networking intelligence. To this end, IFTF has conducted a nationwide survey in the United States to construct a Networking Intelligence Index. This index exposes six key measures of networking IQ:

- » Group participation
- » Referral behavior
- » Online lifestyle
- » Personal mobile connectivity
- » Locative activity
- » Computer connectivity

These indicators define a range of networking IQ scores for survey participants, and their scores do, in fact, correlate with other behaviors. For example, those with higher networking IQs tend to have broader definitions of health and seek more alternative health care; they are more likely to take on do-it-yourself projects, more likely to engage in alternative shopping behaviors, and more likely to work in teams and use group tools for team work.

Three Interpretations: Early Adopters, Individualists, Smarter Consumers

We can interpret these correlations in several ways. If the correlated behaviors are leading trends—for example, if the entire health industry is moving toward a broader definition of health in which alternative modalities will become more widely accepted—then smart networkers are early adopters, not just of communication technologies but of a wide range

of social and economic behaviors. Exposed to more innovation through their networks, they may be better predictors of future change than other segments we have used in the past.

Or the behavior of these smart networkers may point to a rejection of mass culture by those who experience community through strong personal networks. For example, their preference for do-it-yourself solutions to everything from making their own gift cards to refurbishing cars suggests that they value unique personal expression over the convenience and passive consumption of mass culture.

Or they may simply be smarter consumers, able to draw on the collective intelligence of their network to undertake do-it-yourself projects, evaluate a wide range of health alternatives, and use multiple channels to get the best deals on products they buy.

And of course, all three interpretations of the data may be true simultaneously.

Forecast: Higher IQs, A Cultural Shift

One thing is fairly certain: more people will adopt network-enhancing tools over the next decade, and as they do, they will likely move up the ladder of networking intelligence. At the same time, they will extend the networking culture, both in scale and scope. Networking culture, even as the dominant culture, will not be a mass culture. It may not even be a consumer society in the way we've come to think of it.

—Kathi Vian, Rod Falcon, and Mani Pande



Jerry examines the impact of smart networking on the consumer paradigm

Q: | The consumer paradigm has grown hand-in-hand with mass media like newspapers, radio, and television. But today's smart networkers are using a new set of communications tools. How will these new personal networking media—and the practices of smart networkers—change consumer society?

Consumer capitalism is the socioeconomic system that has framed our entire culture. It isn't just about toilet paper and diapers. It has, in fact, been about our educational system, health care system, government, and the business of culture, whether it's TV, movies, music, books, or newspapers. All of it has been pervaded by what I would call the consumer paradigm. And I think it has peaked.

The consumer paradigm depends on barriers and scarcity and amnesia. In cowboy language, what you want to do is create a corral. You want to rope up those eyeballs and bring them to your site, store, or product, and preferably not let them see other sorts of things. You want to create barriers to competition, which are perhaps some kind of monopoly or oligopoly status, exclusive distribution arrangements, copyright, IP, and other sorts of protections that nobody else can touch. You create these barriers so that you can create artificial scarcity. That's what makes a sound business in our traditional worldview now.

Then finally you create a kind of cultural amnesia. The businesses of culture would fall apart if we didn't have a cultural amnesia. If we could store stuff and remember it whenever we wanted to, we wouldn't then have to watch the TV show that has commercials sprinkled through it. The business models of culture depend on our not being able to really remember, recall, and reuse the artifacts of our culture.

Q: | So what happens to these business practices when individuals—consumers in the traditional model—turn into smart networkers?

The first big deal is they perforate all the barriers in different ways, and the artificial scarcity rushes out like the wind. You peek into many, many billion-dollar markets today, and you see that a lot of these barriers are being perforated, and the wind is coming out of the balloon that has been keeping whole industries aloft. Another thing it does is hook up all these people. Sure, it's cool that you can now comparison

shop on the Internet, but that's one individual getting one thing. With the network effect, though, you get the compound benefits of sharing information and being connected to other people. You get humans helping humans. You get good human judgment and good human relationships built over time through trust and through performance of activities leading to interesting outcomes, including things like purchase behavior.

The third thing that smart networking does is create persistence. Until the advent of the Internet, your average mortal couldn't leave a document out in the world for other people to bump into and use. You can't unpublish my Web site. And you can't unpublish someone's opinion of whether I should buy a Sony or a Phillips, for example. So smart networkers aren't just connecting to other people to shop a little more wisely. We're moving to a world where inevitably there's more shared stuff, more people talking to more people, and more shared opinion.

Q: | How will the smart networker filter this world of abundance?

I think this group is also developing a new degree of critical thinking. I was recently in some conversations about Wikipedia, and the first question that came up was, "Well, who authenticates? Who validates the data? What if there are misstatements?" An experienced user of the Wikipedia said, "So what? There are mistakes in the *Britannica*. Opinions are in everything that's been written. At least, with Wikipedia, there's a recourse." You can turn to people and say, okay, where did this come from? This creates a more skeptical frame of mind. You know enough to go do some more research. Family dinner conversations around the world have been shifted dramatically by the presence of an open machine with Google running. One of the kids asks, "Why do buildings work this way?" and they can go find out then and there.

And of course, right now, we're seeing an explosion of creativity in the tools and the widgets and the processes for this filtering—tools like del.icio.us, Flickr, and Furl. When you think about persistence and you think about these simple tools being used by thousands of people to harvest and collect and weed and sift, you see a new version of Adam Smith's invisible hand at work.

Jerry Michalski is a consultant to large and small corporations, helping them understand the emerging network economy. Formerly, he wrote Ester Dyson's Release 1.0 newsletter on technology.



Q: | What does this do to the creation of economic value? What happens to profit when barriers, scarcity, and amnesia are replaced by connectivity, abundance, and persistence?

The sources of value in our economy are on the move—quite literally. The most productive thing that can happen to a story or a novel or a photograph is that it gets shared and amplified through incorporation in something else. In a network society, when the media links us to one another, there's no greater good than for something not be consumed, but to be put to use.

It's also important not to over-monetize this emerging economy. We need to look at the intersection of the traditional commercial economy with the gift economy—how they intersect and intertwine. A lot of companies are beginning to understand that by building public resources and contributing to the commons, they become trustworthy entities. When I first started in the technology analyst business 15 years ago, IBM was as secretive and proprietary as any company. IBM today is an astonishingly different company. It's a fair player in open-source communities. It has been searching its patent portfolios and contributing patents to the public domain. It's creating an atmosphere in which other things can be built.

Q: | Is there something inherently innovative about networking—about good networking tools and smart networkers—that might generate new sources of value?

Yes. Podcasting is a great example. It's basically a subscription service for audio feeds from the Internet. The feeds are automatically synchronized on your iPod or other MP3 player. Podcasting wasn't invented by a large company. It was invented by two small entrepreneurs. It is now roaring across the Internet, and people are falling all over themselves to create work products and services and Web sites and news feeds and do-it-yourself radio shows, all using podcasting.

What made podcasting possible is a network and a programmable environment. The phone system is a network environment, but the default for the phone system is a single connection. Also, the phone doesn't let you browse.

When was the last time that you picked up the phone book and started randomly dialing somebody's number? Then finally, the phone system is not persistent. The only thing I can leave in the phone system is my answering machine message maybe, and that's not very interesting, and it certainly doesn't let anybody do anything with it.

When you add persistence to the ubiquity of the network and the intelligence of applications, you suddenly create the potential for a thing to be created out of thin air. Right now there's a furious innovation on this decentralized grassroots platform. At the same time, there's a concerted effort to do what I call "defensive innovation." Vested interests can create defensive legislation and mandate defensive technology instead of trying to figure out where the new models are going and how to use those to fulfill some of the unmet needs people. What I think we're looking for in these new economic structures is a truly humane capitalism.

Q: | We've been talking about business and markets, but how do you see local communities changing as a result of smart networking?

I think that we have an opportunity to reclaim governance with a small "g" and in some sense, to heal the consumerization of our governments and communities. If you explore the worlds of deliberation and discourse and other sorts of group process that lead toward collective decision making, you find that there are many people trying to figure out how to help people talk with one another again. Communities should take back communications entirely. As we move into a world of healthy discourse and frothy network activity, we will see emergent solutions that are often counterintuitive, that don't solve the problems we think need to be solved, but where the solutions then cascade back and solve larger problems. In unexpected ways, we'll begin to heal different parts of our society.



Kathi Vian, Director of the Ten-Year Forecast Program, asked Jerry what happens when consumers turn into smart networkers.

THE IFTF NETWORKING INTELLIGENCE INDEX

The IFTF Networking Intelligence Index was created from data gathered in our 2004 American Lifestyles Survey. The survey sampled 2,014 adults, aged 18–74.

We identified a range of possible indicators of networking intelligence, including social history (such as schooling, job mobility, residential patterns), social technology infrastructure (such as Internet access and mobile device ownership and use), and technology-assisted social practices (such as the use of instant messaging and the sharing of online content).

We then performed a factor analysis to identify the key components of networking behavior. This analysis revealed six significant components. The first two are traditional networking practices of group participation and referral behavior. The remaining four, however, are all technology-related components and indicate the ways in which new technologies are shaping networking practices.

1 The Six Factors of Networking Behavior

FACTOR 1: GROUP PARTICIPATION
Personal development
Political or religious
Sports or exercise
Hobby
Professional or industry
Student or alumni

Factor 1 captures group participation behavior. The question focused on groups that meet at least once per month and asked respondents how many groups in each category they currently belong to. This is a basic measure of sociability, independent of media choices.

FACTOR 2: REFERRAL BEHAVIOR
Job contacts to friends/acquaintances
Service providers to friends/acquaintances
Stores/Web sites to someone with shared hobby
Job contacts to someone with shared hobby

Factor 2 reflects the frequency and type of referrals that people make. The questions asked how many times people made a variety of types of referrals in the last 12 months. Referral behavior has long been recognized as a way that people build social capital and social standing.

FACTOR 3: ONLINE LIFESTYLE
Play massively multiplayer online games
Contribute to blogs
Maintain a personal, household, or family Web site
Post family or personal pictures online for others to view
Leave e-mail or instant messaging open
Use wireless hotspots in public places

Factor 3 is a measure of the extent to which people have developed a broad-based online lifestyle. The questions focused on regular participation in these behaviors, which are emerging as significant new skill areas. Note that a relatively small share of the respondents (roughly 15–25%) currently engage in these activities.

FACTOR 4: MOBILE COMMUNICATION
Own a mobile cellular device
Use SMS
Use mobile devices to locate family and friends
Tell friends and family where I am

Factor 4 provides a fairly narrow definition of mobile communication, focused on mobile cellular devices with both voice and text services for keeping in touch with friends and family. This factor indicates the increasing importance of persistent rather than episodic connectivity and, ultimately, the ability to manage presence.

FACTOR 5: LOCATIVE ACTIVITY
Participate in sports or physical exercise groups
Own OnStar or an embedded GPS device
Own standalone GPS device
Use GPS to find location and get directions

Factor 5 links physical activity to locative devices; this link probably reflects two types of early adopters: outdoor enthusiasts who own “adventure” cars and geocaching enthusiasts who use hand-held GPS devices as part of their outdoor adventure. As GPS devices are more widely adopted, other kinds of group activities may be more strongly linked to these locations and devices that track location.

FACTOR 6: COMPUTER CONNECTIVITY
Have wireless access to Internet at home
Have high-speed Internet connection at home
Leave computer connected to Internet
Leave e-mail or instant messaging system on

Factor 6 defines the role of the home computing infrastructure in networking practices. It's the weakest of the six factors, and we might thus project that the home computer will become a less important indicator of networking prowess as other tools and modes of supporting an online lifestyle become available. This shift has important implications for thinking about larger social issues, such as the digital divide.

NETWORKING IQ SCORES DEFINE A DISTINCTIVE NEW SEGMENT

Using the Networking Intelligence Index, we scored each person's responses to the key questions, creating an overall score for all six components. We used this score for networking IQ. Distributing the scores across percentiles, we created five IQ groups. We used these groups to test correlations with a wide range of other behaviors and attributes, including health, workplace, shopping, and do-it-yourself behaviors, political and religious preferences, and standard demographic characteristics.

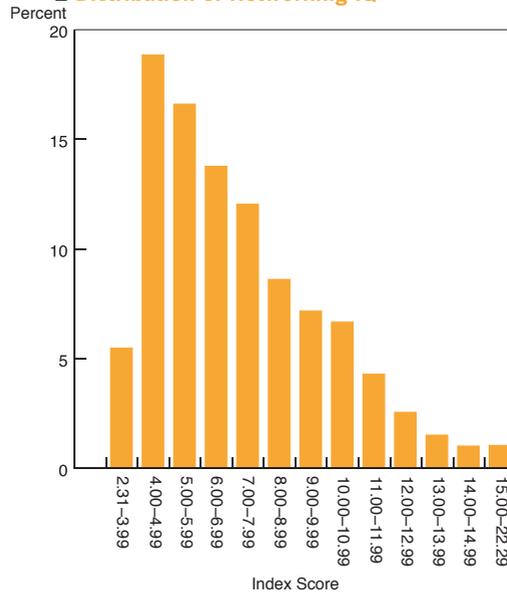
While there were significant correlations with behavior, there were no significant correlations with political, religious, or standard demographic segments, except age: the smartest networkers were 25 to 34. This correlation allows us to begin to forecast the growth of smart networking over the next decade. We know, however, that the new technologies supporting smart networkers tend to foster group-forming networks, which grow exponentially. So these linear forecasts based on age really represent a bare-minimum growth scenario.

WHAT THE CORRELATIONS MEAN

Correlation coefficients measure the linear relationship between two variables. The correlation coefficient may be any value between plus and minus one.

Correlations may be positive or negative. A positive correlation means that as one variable increases or decreases, so does the other—for example, the more you eat, the more weight you gain. A negative correlation coefficient indicates that as one variable increases, the other decreases.

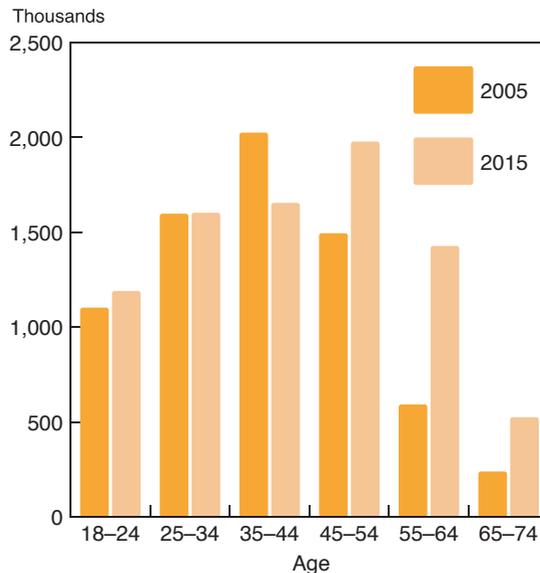
2 Distribution of Networking IQ



Source: Institute for the Future American Lifestyles Survey 2004

◀ The scores for networking IQ range from 2.31 to 22.29. In this distribution, a person has to score above 9.61 to get into the top 20%.

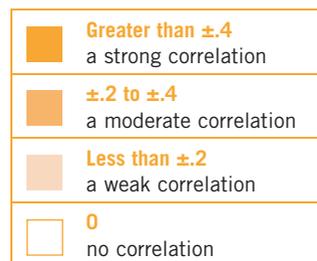
3 Projected Growth of Smart Networkers (Top 20%), 2005–2015



Source: Institute for the Future using U.S. Census Bureau population projections.

◀ Even without assuming a general diffusion of networking skills, we can expect smart networkers to grow by 18.8% overall in the next decade based on population growth in these age groups. The biggest gains will be among those 45–64.

4 What the Correlations Mean



SMART NETWORKERS DO IT THEMSELVES

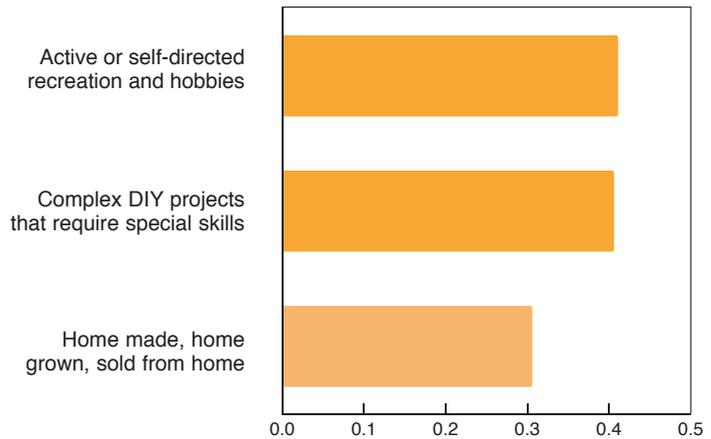
Smart networkers are more likely to engage in do-it-yourself projects. These include a tendency to make their own, grow their own, and sell their own products. They are also more likely to undertake complex DIY projects at home, such as remodeling their houses, setting up home entertainment and computer networks, and organizing complex filing systems for documents and personal memorabilia. When it comes to recreation, they are more active and self-directed in their choices. Their online communication supports these activities as they are more likely to seek and share information about these kinds of projects online.

HIGH NETWORK IQ POINTS TO INNOVATIVE HEALTH PRACTICES

Much of the innovation in health practices over the coming decade will be the result of the expanding definition of health—which leads to health-related practices that go beyond the bounds of traditional medical and pharmaceutical care. Those with higher networking IQs are likely to have these broader definitions of health, emphasizing a wide range of healthy behaviors from seeking complementary health care solutions to eating healthy foods. They are more likely to try out new products that promise health benefits (such as water filters, air filters, exercise equipment, personal health monitors, and skin products). They are also more likely to engage in communities of health-related topics and feel a responsibility to share their health-related knowledge with these communities.

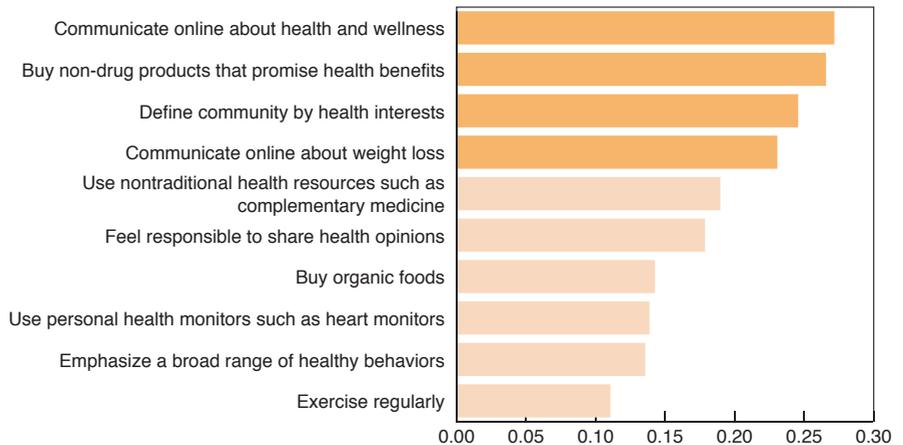
Smart networking did not correlate with some of the basic health care practices such as visits to medical doctors. Nor are smart networkers less likely to smoke than the rest of the population.

5 Correlations with DIY Activities



Source: IFTF American Lifestyles Survey 2004

6 Correlations with Health Behaviors



Source: IFTF American Lifestyles Survey 2004

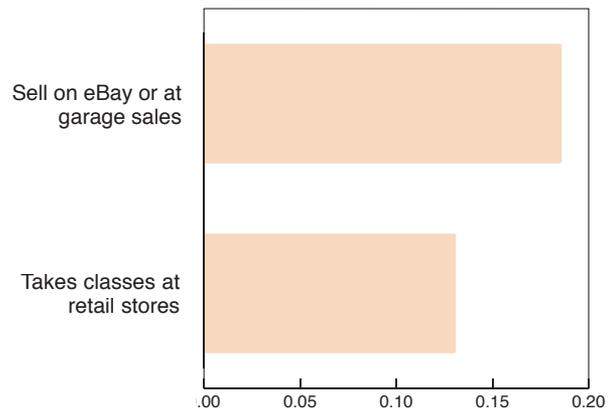
NETWORKERS TRY OUT NEW RETAIL RELATIONSHIPS

As part of their distinctive do-it-yourself and health behaviors, smart networkers have differentiating buying patterns and preferences, from buying organic food to getting online information about DIY projects. Beyond these specific shopping differences, however, they also appear to be more willing to try out innovative retail relationships, such as participating in peer-to-peer markets like eBay or turning to the retailer for learning new skills related to their purchases.

NETWORK INTELLIGENCE SUPPORTS ONLINE WORK

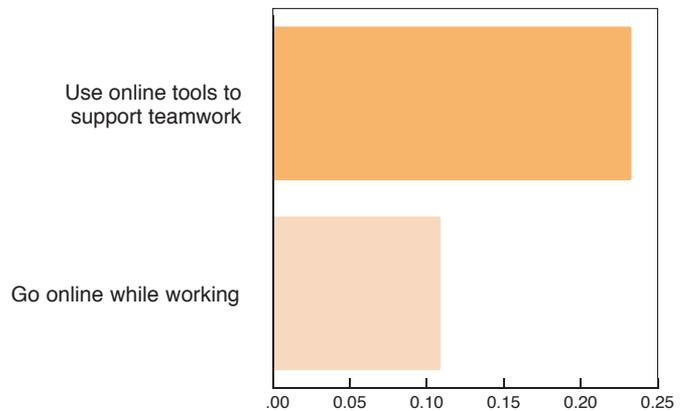
The IFTF survey queried participants about a wide range of work practices, from flexible working places and hours to working in teams. While most of these practices showed positive correlations with networking IQ, only two were statistically significant in the survey population. These concerned—not surprising—online work. Smart networkers are more likely to go online while at work and are also more likely to use online teamwork tools, such as shared calendars, shared digital archives, virtual meeting software, and group e-mail addresses.

7 Correlations with Shopping Behaviors



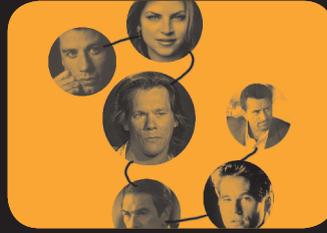
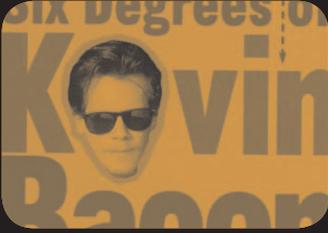
Source: IFTF American Lifestyles Survey 2004

8 Correlations with Work Practices



Source: IFTF American Lifestyles Survey 2004

Hollywood celebrities provided one of the original databases for the six-degrees-of-separation analysis that has focused global attention on personal networks.



X **COMMUNITY/POLICY**
Reinvent the vision of community assistance

If smart networkers are more likely to be engaged, to take on more do-it-yourself projects and use their increased social reach to make better decisions in the marketplace, they're just as likely to bring that same engagement and skill to the communities where they live—and even to the global community as a whole. Bloggers at tsunamihelp.blogspot.com have provided an impressive example of a grassroots effort to mobilize support for the victims of the 2004 Indian Ocean tsunami, independent of most of the big names of international aid. The Tsunamihelp wiki likewise demonstrates the use of open-source information tools to provide an alternative to conventional media for providing up-to-date information about the disaster.

The growth of smart networking clearly represents a vital—and perhaps challenging—alternative to traditional ways of organizing community aid, setting community agendas, and managing public resources locally and globally. Grant-making institutions and local governments alike need to recognize the resources that smart networkers represent and to reinvent themselves as partners in this new wave of engaged citizenship. Otherwise, they may find themselves in the same kind of position as the IMF and World Bank, attacked by the very people they set out to serve.

X **MARKETS**
Track the movement of economic value

If we're right about them, smart networkers are going to redefine competitive strategy and perhaps forever change the rules for creating value in the global marketplace. Already they are altering the patterns of wealth in entire industries and altering the global balance sheet by deflating GNP in some areas and re-inflating it in others.

One of the most pressing analytical problems is to begin to monetize this economic revolution—to use our understanding of smart networkers to forecast their impacts on industry sectors quantitatively. IFTF is undertaking a portion of this task in its Ten-Year Forecast agenda for the coming year, and in the spirit of smart networking, we will be experimenting with an open-source model for this forecasting effort. If you are interested in joining the experiment, please contact Program Director Kathi Vian at kvian@iftf.org.

X **SUSTAINABILITY**
Target users, not consumers—usefulness, not consumption

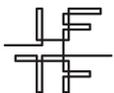
It would be a mistake to target smart networkers as just the next influential consumer group on the horizon, attempting to build traditional competitive advantages around them. In our conversation with Jerry Michalski, he argued that the true opportunity of the era of smart networking is to shift from an emphasis on consumption to an emphasis on utility. He said, “Companies need to start making useful stuff, not just distracting stuff. And when you start seeing the world this way, you realize how many things nobody has built yet, how many new business opportunities are there if you forsake the old sources of value and look for new sources of value in hosting trusted relationships, in customizing, in offering privacy and security.”

Such a strategy clearly has implications for a sustainable economy and a sustainable environment. As Jerry argued, “There's no greater good that can accrue to something than for it not to be consumed, but to be put to use. One of the greatest standards of goodness is usefulness.” A starting point for adapting to the world of smart networkers is thus perhaps to shift from thinking of them as consumers to thinking of them as users—with all that suggests for business models.



Groups of people know and can act on things that individual members of the group do not know. Hunting parties, sports teams, army platoons, and string quartets can all possess collective intelligence; it's one thing that sets brilliant groups apart from good ones. It may also be the key to our distinctively human evolution: we have evolved into today's complex culture because of our ability to extend and amplify our collective intelligence. Now it appears that we've taken another leap in our evolutionary Olympics—and we're about to make our individual minds more transparent and our collective mind more powerful.

New tools and practices are making the flow and evolution of knowledge more visible—and easier to share, use, and extend



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New Paradigm:

From Machine Intelligence to Social Systems

Computer scientists have long tried to create tools that make groups smarter. In the 1960s, Doug Engelbart's Augmentation Research Center (ARC) at SRI did pioneering work in groupware. ARC's work was better known for its hardware spinoffs—the mouse, the graphical user interface—than its software, which required months to master.

In the 1980s, the diffusion of personal computers and the knowledge-management movement spawned a new generation of tools. These were simpler, but still required extended training to use competently, forced users to change or adapt their working habits to the system, focused on particular projects and groups, and were closed, proprietary systems.

Now a new crop of tools is changing how we conceive of and cultivate collective intelligence. Put most simply, these new tools are *ethnographic and bottom-up* in design and intent, not *technocratic and top-down*. And they are inherently sociable.

New Practices: From Knowledge Management to Intelligent Networking

These new tools reflect a different understanding of knowledge and intelligence:

- **Collective intelligence isn't a database** of best practices or a fixed body of information, but rather intelligent humans engaged in social interaction—it's a performance, not a resource.

- **Collective intelligence is often tacit**—impossible to codify into formal rules, but imminently possible for groups to express. Rather than ignore tacit knowledge or try to crystallize it into zeros and ones, the new tools augment the social processes of sharing.
- **Collective intelligence can't be designed** but emerges from the well-integrated interactions among humans. The new tools follow existing practices and plug into familiar programs, rather than force users to adopt new technologies and processes.

In this active, sociable view of collective intelligence, the new core competency in the workplace—and the economy at large—will be *linking*. Both tools and people will become increasingly skilled at identifying and facilitating new connections among ideas, among Web sites or articles, and among people. Content and human links will point to one another. And the patterns of individual minds will become increasingly visible as metadata emerges from human interactions—naming them, graphing them, and using them as scaffolding for the next set of collective performances.

—Alex Soojung-Kim Pang



Peter envisions an emerging global organism —
a result of tools that remove the sense of separateness between us

Q: | Peter, your book *The Global Organism* postulates a growing collective intelligence. Why is collective intelligence such a popular subject these days?

Because collective intelligence is real, and it's a necessity for dealing with the circumstances we are in today. The world has reached a whole new level of complexity, and old solutions are not adequate for dealing with reality. Of course, people have always collaborated and in that sense created slow-moving collective intelligences. But we're experiencing a quantum leap that takes us to a new level.

It's not just a product of the Internet, mobile phones, or TV. You see it in global markets, in leveling tariffs and trade barriers. You see it in democracy and new ways of governing, in the whole European Union project. These are all examples of this new global level of cooperation and intelligence that I talk about in my book.

We're moving to a new level of intelligence, one that's created in the interaction between global humanity and technology. The network of machines does a lot of information processing, but it also enables us to engage in new forms of collective activity and develop new forms of collective thinking.

Q: | There are many varieties of intelligence. You postulate it as a global organism. Are there things that this global organism is especially smart, or dumb, about?

Emergent, collective intelligence can find solutions in complex and rapidly changing contexts. But I'm not convinced that it's always superior to hierarchical or centralized governance. A few years ago, smart mobs appeared during the petrol strikes in Britain and France. People used SMS and Web sites to organize, the drivers drove out in front of the refineries to protest against the taxation of petrol in those countries, the issue exploded, and in a matter of days traffic was paralyzed all over Europe. But once it was evident that the government was not going to bend, it all just fizzled out. Geoff Mulgan, a strategic advisor to Tony Blair, told me that the hard thing about dealing with this sort of collective is: with whom do you negotiate? How do you find out exactly what they want?

I think that this sort of collective intelligence has some of the same shortcomings that the marketplace has. It tends to work short term, and it's best in responding to a range of already given choices. But emergent decisions such as those of the market or smart mobs seem to have a harder time coming up with a directed intent, or opting for solutions that have benefits that are not immediate, and may even take an initial sacrifice from the individuals.

The trick will be to find a combination of the qualities of chaos and structure, of top-down and bottom-up. Movements still need someone like Nelson Mandela, a figure who everybody can look to and who embodies them. But a bottom-up initiative often will distrust any kind of leadership.

There's another thing that limits the power of smart mobs, and this is a very, very central point for me. The level of commitment and the degree to which you can ultimately depend on a community is rooted in the necessity of that community. But the Internet's techno-libertarian culture celebrates flexibility, immediate change, speed, and personal freedom. I wonder to what extent these virtual or emergent communities have a collective understanding of the necessity of commitment. You can very easily forget the meanings of words like commitment, dependency, and accountability in an electronic world. If you are on top of things, no one and nothing really seem necessary—and I think that illusion is a general characteristic of the modern Western life. The collective intelligence that we feel part of may turn out to be shallow when we really need it.

Q: | How global a phenomenon is the global organism? Is the importance of collective intelligence clear, for example, in Third World countries being forced to dismantle their welfare states or privatize industries, and struggling with the social dislocations that result from a rapid shift to capitalism?

As I see it, humanity is increasingly becoming a global organism, linked in an ever tighter web of interaction and interdependence. It's continuously affecting and drawing in new people, new realms of reality, and new aspects of our everyday existence. It's visible in every creative area, and is

Peter Hesseldahl is a Danish journalist and futurist. He is the author of several books, including *The New Nature* and *The Global Organism* and is currently developing new ways of teaching and understanding science and technology at Danfoss Universe, a science park in Nordborg, Denmark.

spreading to every corner of the globe. If global intelligence is a product of the greater depth of the relations we create and the greater frequency with which we interact, then you will see ever more people becoming part of decision making, and sharing a global consciousness of what's going on, and what could and should be done in this world.

Q: | Isn't talk about collective intelligence and global minds Orwellian? Doesn't it represent a profound loss of human agency and autonomy and individuality?

I think it's completely the opposite. The defining characteristic of collective intelligence is that it's a bottom-up phenomenon. It emerges as a sum total of a lot of different individuals. It's not some central authority imposing anything on you. It's you and everybody else acting and then seeing what happens.

Q: | Peter Senge argues that groups become more intelligent when their members are different.

I think diversity is important, too, but collective intelligence also demands individuals be willing to subject themselves to the common good or the emergent consensus. You have to recognize that you are not an absolutely sovereign individual being, but a being whose freedom arises from the possibilities that you get from subjecting yourself to the community.

Q: | So you're not a perfectly solitary agent in a political sense, and you're also no longer an autonomous intellectual or cognitive figure in the Cartesian sense. Interdependence and broadening happen not just at the community or political level, but at the mental level as well?

Yes. Collective intelligence is real, it's not an esoteric point. You can see it in business every day, or in scientific global collective endeavors like decoding the human genome.

Q: | Where do you think this might go in ten years? How might the world be different as a result of the growth of collective intelligence?

In a practical sense, we will start to blur the lines between here and there, between me and you. This blurring is part of the process of becoming one global organism. What broadband and pervasive computing and other technologies will do is remove this sense of separateness between us and create a more integrated being that stretches out across the globe. This is a way of conducting dialogue and dealing with problems that, I think, go hand in hand with a recognition of interdependency: recognizing not just that we *affect* each other, but that we *need* each other. Having a sense of our interdependency, and being held accountable in a system that works; of being part of an emerging global consciousness and having a global sense of where I have to go and what would be the right action for me to do in my community—it is absolutely essential for us all, and I think that it will happen.

Collective intelligence is a skill. Most of us have been brought up with the industrial, hierarchical paradigm. We have to learn how to work in more flat, networked, peer-to-peer relationships. It's a different approach. We have many more opportunities now to be co-creators and take part in decisions. But it's also an obligation. We're expected to interact and think creatively, and consequently we have a much greater responsibility. If you are used to simply taking orders and passively accept what others decide, you need to learn a more active, participatory attitude. And, correspondingly, if you are used to ruling over others, you'd better learn to turn the involvement of others into an opportunity rather than a threat.



Alex Pang—Research Director, blogger-in-chief at IFTF, and avid user of social software and folksonomies—asked Peter to characterize the collective intelligence that is emerging from social networking tools.



THE OTHER: FROM FOREST SPIRITS TO SWARM SMARTS

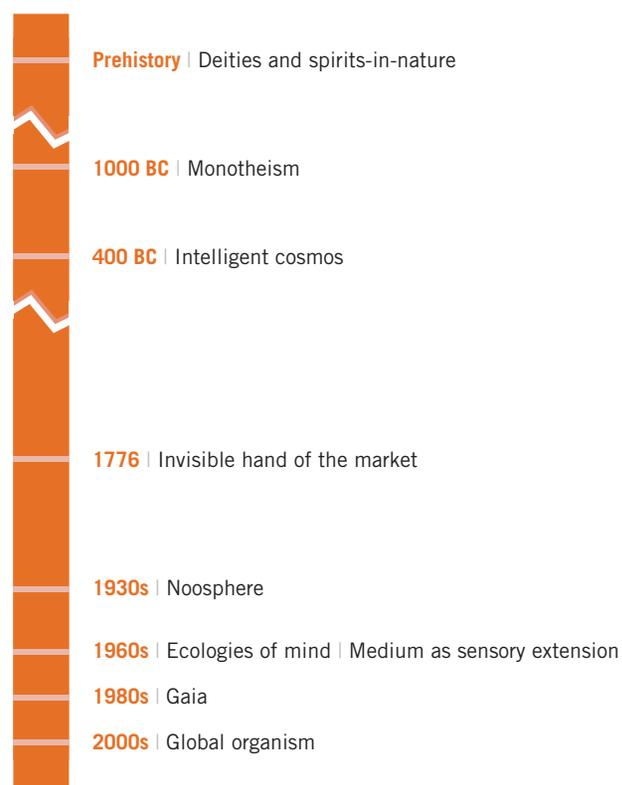
The belief in nonhuman intelligence is an ancient invention, but collective intelligence is surprisingly modern. Ancient deities, whether forest-dwelling local spirits or the God of Abraham, interacted with humans but were no more the product of human intelligence than the weather. Plato toyed with the idea of the cosmos itself being intelligent, but this intelligence was independent of humans. In the Enlightenment, Adam Smith's notion of the marketplace's "invisible hand" is similar to collective intelligence, but Smith focused on the actions of individuals and never saw markets as autonomous intelligences. (Indeed, in the wake of the French Revolution and countless local labor actions and riots in the 1800s, the idea of smart mobs was inconceivable.)

The notion of collective intelligence, particularly as facilitated by communications technologies, turns out to be a 20th-century invention. In the 1930s, the French Jesuit Teilhard de Chardin, in his *Phenomenon of Man*, articulated the concept of the "noosphere," a planetary consciousness that would evolve to encompass the entire world. For de Chardin, the radio and telephone were the key technologies of this noosphere: "the extraordinary network of radio and television communications," he wrote, may perhaps "already link us all in a sort of 'etherized' universal consciousness."

In the 1960s, writers Gregory Bateson and Marshall McLuhan, argued that new technologies—television, computers, or mind-altering drugs—were bringing into being a new, human-driven consciousness. Neurologists and philosophers began to wrestle with the question of how billions of relatively simple neurons, following a few rules, might be the foundation for things as complicated as consciousness and personality. Likewise, biologists have seen how organisms as simple as ants and termites can create complex structures, solve problems, and evolve group personalities. And technologists have extended the concept to a transhuman consciousness, binding humans and machines together.

The varied roots of the idea help contribute to its popularity today. Its egalitarian, democratic overtones make it appealing to L.L.Bean-wearing New Hampshire conservatives, tie-dyed California radicals, and wired knowledge workers. In an age of deep cynicism about leaders, the idea that followers know what's best—and if given the right tools, could take care of things themselves—is a powerful one.

1 Timeline of Larger Intelligences



Source: Institute for the Future

KNOWLEDGE TOOLS—OLD AND NEW

One of the central challenges of knowledge management has been to accommodate tacit knowledge—knowledge that the most effective groups somehow acquire and pass on but that eludes description and formalization. Many groups can't describe in detail what they know, or how they work. The saying that “all of us are smarter than each of us” captures the core of collective intelligence; the frustration about its elusiveness is nicely expressed by the lament of former Hewlett-Packard CEO Lew Platt: “If HP only knew what HP knows.”

Tacit knowledge has been the Achilles Heel of knowledge management. Social software tools offer a new method for building, sharing, and exposing tacit knowledge. Many of these tools use XML. Thus, either by design or happy accident, the content they create is highly fungible. They often let users define metadata and keywords, giving rising to “folksonomies” that lack the precision of formal taxonomic systems but reflect how real groups think and communicate.

They also feed on difference. Knowledge-management systems promoted common approaches to problems; they were tools for teaching and enforcing standard practices. Collective intelligence tools, by contrast, tolerate heterogeneity of practices. Many of them are what Frans Johanssen, author of *The Medici Effect*, calls “the Intersection”—the meeting ground of varied people, ideas, and skills from which many innovations spring.

These new tools will challenge existing IT organizations in several ways. Because they are bottom-up rather than top-down, they suggest very different management and service models. Because they're components, not systems—often drawing on a variety of widely available online sources—they are difficult to standardize across an organization. Because they are inherently social, they blur the boundaries both within organizations and across organizations. They thus challenge some of basic responsibilities of traditional IT groups.

2 The Shift in Strategies for Building Shared Knowledge

OLD MODEL	NEW MODEL
Central, closed systems	Decentralized, open tools
Manages work processes	Tolerates diversity of processes, focuses on standardizing output formats
Helps existing groups, usually within organizations	Develops new groups that cut across organizations
Uses/enforces formal metadata structures and categories	Relies on rough-and-ready, user-defined colloquial categories (folksonomies)
Promotes standardization and common practices among users	Feeds off diversity of skills and interests
Supports familiar tasks and problems	Works in new areas
Views knowledge as a resource to be managed	Views knowledge as practices and people

Source: Institute for the Future

THE TOOLS OF COLLECTIVE INTELLIGENCE: A QUICK TOUR

Diversity and innovation characterize software for promoting for collective intelligence. There is no winner-take-all platform, and the tools are marketed primarily to individuals rather than organizations. Combined with peer-to-peer exchanges, open-source platforms, and personal media tools, they define a rapidly evolving field of technologies of cooperation. Here's a look inside today's basic toolkit.

3 About Collective Intelligence Tools

THE TOOL	THE BASICS
Recommendation agents	One of the foundational technologies of next-generation collective intelligence programs, recommendation agents analyze large aggregates of data about purchases, and look for patterns that generate suggestions to users for related objects. Made famous by Amazon.com, recommendation agents are starting to appear in noncommercial systems, and to analyze preferences and practices (for example, what music people are listening to, or what books they're reading).
Social software	Systems like LinkedIn and Friendster construct associations between people. Some light social-software elements, borrowed from these early entrants, are beginning to appear in other collective intelligence tools.
Web logs	Blogs combine user-created content, RSS aggregation, and the development of services that let users add lists of favorite books, current reading, friends, and other content. Blogs have been heralded as an alternative to traditional journalism. But the real power of blogs comes from their evolution into platforms that bring together a variety of content for identity projection, all of which is either easily distributable or machine-readable—making them the raw material for social software and collective intelligence tools.
Photo blogs	Flickr is an example of an online photo-sharing service. Its most innovative element is that it allows users to add metadata tags to pictures: for example, attendees at a wedding can look at each other's pictures, and identify who is in pictures taken by other attendees. It also allows users to create "streams" of photos that can be reposted to blogs, or accessed as RSS feed.
Social bookmarking systems	The defining entrant in this category is del.icio.us, a service that lets users bookmark Web sites and "tag" them with categories—much as you do with traditional Web bookmarks. But del.icio.us also lets you see who else has bookmarked sites that have interested you; set up "watch lists" to follow what they're reading; and create categories. Extensions allow you to see what tags other users have already assigned to pages, allowing for the rapid adoption of common tags—which improves the social-software functions of the service. In other words, it builds collective intelligence atop already familiar and very personal reading and information management practices.
Blog syndication services	Among these services are RSS—Really Simple Syndication—and various competitors, such as Atom. They allow users to automatically harvest XML-tagged content from blogs. For heavy blog readers, this is far more efficient than visiting sites. Originally developed for blogs, RSS feeds are now available for Flickr photo collections, del.icio.us user and category pages, and many commercial sites; readers are also being integrated into e-mail programs—for example, the WebGator plugin for Microsoft Outlook—and Web browsers, most notably in Mozilla's Firefox.

Source: Institute for the Future

THE EXPONENTIAL GROWTH OF SOCIAL KNOWLEDGE TOOLS

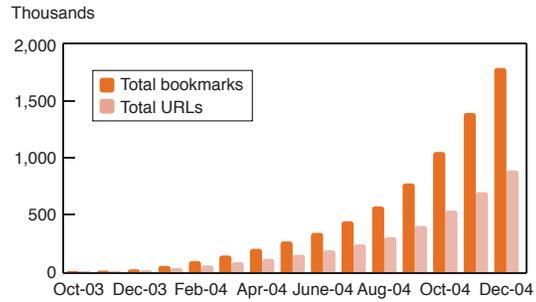
Many of the tools of collective intelligence fall into the category that David Reed calls group-forming networks—and according to Reed, the value of these networks grow exponentially.

Social bookmarking services have followed exponential growth curves. The del.icio.us service launched quietly in late 2003. In just over a year, it has grown from a few hundred users to over 25,000. Users have created nearly 2 million bookmarks, but fewer than a million URLs.

GROWTH OF FLICKR

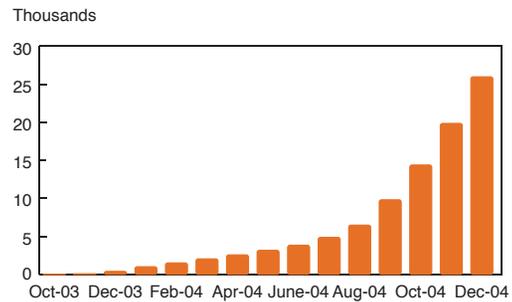
The photo sharing service Flickr was founded in 2004. In contrast to iPhoto, Snapfish, and other online photo companies that are photo-finishing services—letting people upload pictures for free, and making money from printing—Flickr is more like a photo-blogging service: its aim is to serve people and groups who want to share digital images from camera phones, digital cameras, and the Web. In the year since its founding, its subscriber base has grown ten-fold, and the number of pictures online has increased a hundredfold.

4 The Growth of the del.icio.us Database



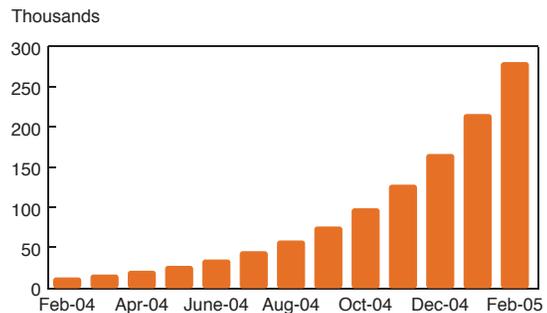
Source: Joshua Schachter (founder of del.icio.us), in e-mail correspondence with the author, January 2005.

5 The Growth of del.icio.us Users



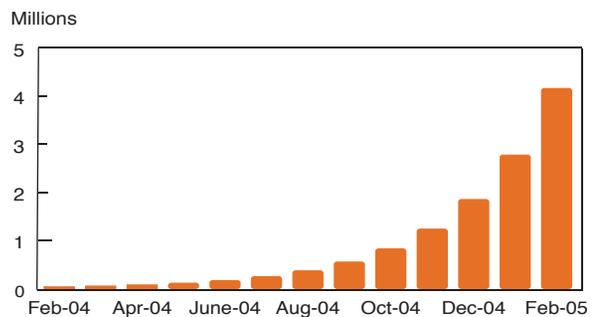
Source: Joshua Schachter (founder of del.icio.us), in e-mail correspondence with the author, January 2005.

6 Growth of Flickr Users



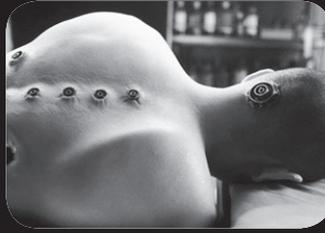
Source: Richard Koman, "Stewart Butterfield on Flickr," O'Reilly Network (4 February 2005).

7 Growth of Flickr Database



Source: Richard Koman, "Stewart Butterfield on Flickr," O'Reilly Network (4 February 2005).

Widely referenced, *The Matrix* articulates the challenge a machine-mediated collective intelligence poses to individuality.



X IT MANAGEMENT

Use social software to build stable long-lived groups

Emerging collective intelligence tools are powerful because they extend beyond traditional organizational boundaries, allow like-minded individuals to find each other, and build common knowledge without formalizing work processes. While some large organizations may create versions of these systems as “walled gardens,” with the purpose of better harnessing skills across organizational lines, they will need to think about when it makes sense to let employees build networks beyond company lines—or more reasonably, think about how to deal with the fact that they’re going to do so.

However, if they choose to use the tools, organizations should remember two important points. First, much of the knowledge that groups possess is informal and only fully expressed in practice, not in writing. Documents capture only a portion—and often the less valuable portion—or what groups know. Second, the aim of these tools is not to create highly modular, virtual groups with short lifespans, but longer-lived, smart groups. They will thus be less useful as a tool for outsourcing, for example.

X PROFESSIONAL IDENTITY

Renegotiate the boundaries of authority

The Internet has challenged the authority of several professions. Bloggers have challenged both individual journalists and the journalism profession. Patients armed with information from Web sites challenge the authority of doctors. Open-source software developers have taken on commercial developers. Wikipedias are eroding traditional reference works.

Professionals will thus need to renegotiate the boundaries of professional authority and find ways to bring amateurs into their activities. Reference publishers, for example, need to

appropriate the wikipedia movement and show how professional expertise still has a place in a world of swarming amateurs. Social software may present a second challenge to professional silos: Lewis Rosenfeld speculates that one consequence of the popularization of such systems will be that “interdisciplinary knowledge will finally be recognized as a necessity for just about any creative project.”

X NEW PRODUCT DEVELOPMENT

Focus on people, content, and context—not tools

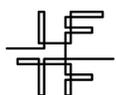
Social software is ultimately not about the software. As Danah Boyd puts it, “The term social software is probably going to be a fad, but the practices aren’t.” To which Clay Shirky adds, “The value of social interaction will be folded into a large number of applications, sometimes as built-in features, sometimes as external services that get integrated in the manner of Web services.”

Integration of social software will parallel a growing sophistication of data-mining and searching tools, thanks to the growth of Semantic Web capabilities. But as David Weinberger points out, social software will still make our tools smarter about context and relevance: “I think most software will be social because apps are going to need the social to figure out what’s relevant and what we want to do.”

Most broadly, though, the growth of these capabilities will be matched by a decline in the visibility of software itself. “Ultimately, the software itself really isn’t that interesting,” Louis Rosenfeld says. “It will recede into the background. We’ll focus more on the information provided and relationships enabled by increasingly socialized software, among other things. Content and people are just more interesting, important, and a lot more fun than tools.”

Technology conjures images of path-breaking innovators and shiny marvels, but technology also grows old. It rusts. It rots. It decays, is discarded, neglected, lost, and forgotten, sometimes even consciously abandoned. Invention may fascinate us, but the larger force behind innovation is disinvention. And in the next decade, disinvention will play a particularly potent role in preparing society for a new era rooted in biology and artificial life.

The disinvention
of technology
in the next decade
will clear the ground
for a new
material reality



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Outracing Technology's Consequences: The Growth of Remedial Inventions

Disinvention is largely an implicit process of choice and change, but increasingly, it is overt and explicit. Bans on everything from DDT to CFCs provide well-publicized examples. This kind of disinvention goes hand-in-hand with new technologies to deal with the unexpected consequences of the old. Thus, the size of the entire environmental remediation industry, now about \$800 billion globally, provides a possible proxy measure for the scale of overt disinvention.

Of course, remediation is not always a mirror image of its triggering technology. The growth of the fertility industry, for example, is arguably a remediation of the consequences of environmental toxins. (DDT is known to cause anomalies in developing ovaries of pubescent girls, and infertility increased as much as threefold in the couple decades following its introduction.) But the ability to intervene in the fertilization process also opens the door to a host of genetic interventions that go far beyond repairing the damage of environmentally induced infertility.

Luddism: Neither Extreme Nor Futile

Named after a grassroots movement opposing the introduction of knitting machines in 18th-century England, Luddism has become synonymous with naïve opposition to technology's advance. However, a closer look reveals a rational response to extreme disruptions introduced by the factory system. While the knitting machine won that particular battle, the Luddites at least changed the course of the war, creating a compelling meme that can still challenge corporate practices in the Third-World clothing factories of the 21st century.

Today's neo-Luddites focus on two extreme disruptions: the threat to "natural" life and the loss of individual autonomy. Resisting stem-cell research, genetically modified organisms, and even the abortion pill, they engender debate around the basic question of what constitutes "natural life" and to what extent humans should intervene in it. Resisting global interconnectivity, they illuminate the possibility of autonomous technology—and ultimately the cyborg. Such technologies will not come to a screeching halt, but Luddism will raise critical questions that societies will need to address as biological know-how begins to reshape human cultures and even the human species.

Collapse: Technology's Seeds of Self-Destruction

The vision of the autonomous machine seems to creep closer with every passing day. Software is routinely written by machines that evolve programs by employing genetic algorithms, and though the programs work flawlessly, no human can make sense of their component code. Meanwhile, ink-jet printers can easily create and manufacture genetically novel organisms in a graduate student's dorm room.

While much is said about this trajectory toward a "living" autonomous technology, technology also contains the seeds of its own destruction. Today's computer-supported infrastructures, from international banking to the electric grid, are all quietly vulnerable to "info-terrorist" attacks. And a slight genetic modification of a virus—the kind a student might do—could initiate a life-challenging epidemic.

These are ground-sweeping changes; they clear the socio-technological landscape. But in the rubble, the world will find its next identity.

—Paul Saffo

INTERVIEW: KEVIN KELLY



Looking through an evolutionary lens,
Kevin asks if it's actually possible to eliminate a technology

Q: | What happens to technologies when they're old? I know you've explored the biological evolutionary metaphor. What does that tell us about how technologies change over time?

On first glance, there's an amazing similarity between the evolution of technology and the evolution of life, but what's more interesting to me is actually where they differ. Niles Eldredge, the co-inventor with Steven Gould of punctuated equilibrium, has mathematical models showing that there are indeed evolutionary trees of technology, but they differ from biological evolutionary trees. You can quantitatively distinguish them. Technology is not biological evolution; it's idea evolution.

In biology, evolutionary trees always diverge and never come back. Technology is more like a thicket, a braided tree rather than a diverging tree. I have a Sears Roebuck catalog from the turn of the century, and I was curious to find out how many of the technologies in that catalog are extinct today. If anyone in the world is still using or making them, they're not extinct globally. I couldn't find any that were extinct. There are now more blacksmiths making horseshoes than there have ever been. I just heard that the number of people farming with horses is actually increasing for the first time in a century. People are making swords. People are still grinding telescopes by hand. They're making new parts for steam cars.

On a global scale, it's very rare for a technology to go extinct.

Q: | What makes technologies different? Why do they seem to weave themselves continuously back into the mix?

Technologies are bound into an idea; they are an idea made concrete. So there are always two strains to a technology: the ideation part and the material part. As long as the ideation part is continuing, half of it is there. It's actually very easy for technology to get a new body. The ideas about these things can circulate in books and people's minds or even, in a certain sense, in other technologies.

Q: | The way I think of it is the difference between the artifact and the *culturfact*. The *culturfact* is that indefinable thing that carries it forward. But this raises the question about whether it's actually possible to get rid of technologies we don't want. You've been looking at bans, prohibitions, and resistance. How effective are those?

The answer is that they're not very effective at all. There are probably about 60 bans that we can verify from beginning to end throughout history. Some are peculiar: the crossbows outlawed by the Pope, the woven cotton cloth prohibited in France, and of course, the Luddites and their looms. Railroads were prohibited at certain times. None succeeded. Then we can look at more contemporary bans, such as GMOs and abortion. While there are certainly regions where they're prohibited today, globally there ain't no ban.

I've spent a lot of time recently with the Amish. I was asking them how they decide what technologies to accept or reject. The short conclusion is that the Amish are total hackers. They love to hack everything. They have rules that they kind of adhere to, but they're permitted and, in a certain sense, encouraged to do the best they can with these rules. That's an invitation to hack.

There are actually Amish early adopters. The bishop says, Amos, you can do anything you want, use any technology you want, as long as you're ready to give it up when the bishop says so. So this guy is out there trying all kinds of things, and he has some sense about where the edge is, and he'll keep going. What's happening is the rest of the community is watching. The reason they have their church in their homes is so they can check out what's happening. They're watching how it affects Amos, his family, his community, his stance in his church, his relationships. If they don't like what it's doing, they shut it down. The Amish never say "yes" to technology. They never approve it. They only prohibit it. Things are permitted until prohibited.

Kevin Kelly has been tracking leading-edge technology trends as a writer and publisher for nearly three decades, starting with the *Whole Earth Review*, and then co-founding *Wired* magazine. He is the author of numerous books, including “New Rules for the New Economy.”



But the Amish have electricity, which is pneumatic. They have shops that retrofit appliances like blenders, sewing machines, and washing machines to make them pneumatic. They're slowly adopting these technologies on their own terms. In Lancaster County, they're accepting things like LED lights. They're totally pro chemicals, GMOs. They've never had any problem with those because they don't challenge their values—which focus on being connected and building community.

Q: | So what do you conclude from the Amish stance toward technology?

The conclusion I reach is that it is very hard to get rid of technology. You can postpone it, in a local area for a time with great effort, but overall, it can't really be stopped. But what you do get is what I call the neo-Amish. We have people creating their identity by what they don't use. I ask people to tell me things that they've personally rejected. It's really amazing to see what I call the Amish answers. The Amish have diesel-powered combines pulled by horses. Everyone looks at that and says that's completely insane. But this is like someone who uses e-mail and rejects TV. That's neo-Amish. And it's completely personal.

The difference between the neo-Amish and the Amish is that the Amish choice is a collective, social decision, whereas the neo-Amish is the typical American individualistic thing. What they're doing is essentially the same, saying all this technology is out there, I'm just going to make a personal decision about which ones I accept and which ones I don't.

One of my hypotheses is that, over time, there will be fewer and fewer technologies that have universal penetration. Technology wants to be personal. It wants to become very specific and specialized, which is what evolution does. It starts off with a general cell and, over time, you get more and more specific cells that do specialized things. I think the general-purpose computer is also going to continue to diverge, and more and more functions will go into specialty interfaces. The idea that we have a single interface for all that we want to do is wrong.

Q: | Are there some technologies that are metastable, in the way that John Conway's *Game of Life* suggests? Are some technologies more persistent than others?

Yes, certain forms are stable. But I would go even further and argue something completely controversial and much more outrageous—I believe certain forms of technology are inevitable. I've been looking at the sequence of technologies coming along in parallel in different continents. I would say that the phase changes, the major transitions, are inevitable. So if we were able to do the *Star Trek* thing and visit other planets, we would likely find writing. We would find mass production. We would likely find the things they're engaged in right now, this sort of connection to everything, the planetary neuron. The Web, in its broader sense, is inevitable.

The question I would ask is: are other kinds of associated soft technology, like open source, also inevitable? Do we also have to go through those transformations. That's the question at hand.



Paul Saffo asked Kevin to share his latest insights from new research on the adoption and rejection of technology.

TECHNOLOGY TIMELINE: 2005–2015

This map represents a scenario for socio-technological development over the next decade or so—a collage of the views of more than a dozen technology experts.

In this scenario, a build-out of the connectivity infrastructure provides the ground for a new complexity infrastructure that combines biological and silicon technologies with new kinds of self-organizing properties. This new set of technologies, which belongs more to the world of biology than electronics—and more to quantum physics than Newtonian physics—begins to have significant social effects within the coming decade, perhaps inaugurated by a major discontinuity toward the end of the mid term.

2005–2008: COLLABORATIVE CONNECTIONS

The near term will be dominated by a full-fledged connectivity infrastructure. Mobility and media will be integrated into every aspect of daily life, with an emphasis on collaboration both inside and outside traditional institutions and markets. In this richly connected context, the emphasis will be on bottom-up innovations:

- **Bottom-up economies** in which people explore new ways to find and buy goods and services in real space
- **Bottom-up media** that combine personal media, gaming, and blogging in collaborative efforts that rival traditional media
- **Bottom-up infrastructures** that build on the principles of mesh radio and peer-to-peer computing to provide low-cost, ad hoc access to people and resources

2009–2012: CHAOTIC COMPLEXITY

The connectivity infrastructure of the near term increasingly enables a complexity infrastructure in the mid-term—and society will begin to manipulate both biology and physics at finer and finer levels to extend the performance of humans and their artifacts:

- **Body extensions and implants** that will blur the boundaries of the natural self and change the concept of the human body
- **Context-aware environments** that will combine do-it-yourself tools with user-malleable pervasive-computing technologies
- **Sensor networks**, enabled with RFID and other communicating sensors that embed “cyberspace” in physical objects

2013–2015: SOMETHING COMPLETELY DIFFERENT

Something like a phase transition may well occur as society adapts to the rapid emergence of self-organizing technologies. This phase transition may take the form of a major technological or economic collapse, or it may ride the wave of global conflict or biodisaster. In either case, what follows is likely to test the limits of present-day imagination as we truly begin to view the world through the dual lenses of deep biology and quantum physics.

COMPLEXITY

COMPLEXITY COLLAPSE

2009

2010

2011

2012

Agriculture

Constitutional amendment adds basic privacy rights

Social Deconstruction



Dynamic Packaging

DIY Bioweapons

Open Cell Phones

- Phone companies lose lock-in

CONNECTIVE INFRASTRUCTURE

Virtual Presence

- Real-life target shooting via the Internet

"Kids Today"

- Hyper-unfocused
- Too broad
- Illiterate
- Techno-leashed

Biodisaster

- One billion people worldwide die in a few months

Internet hobbled

- Duopoly established
- Functions restricted
- Openness pushed underground

Educational Deconstruction

- Home schooling
- Open resource
- Lifelong learning

DIY Nano-Bio-Mechanics



Electro-Polymer Muscles

Designer Babies

Source: Jet Propulsion Lab

Biotech Divide

Who survives?
Who lives to be 200 years old?

Displays

- Large
- Cheap
- Disposable

DIY TECHNOLOGY

Disposable Computing

Augmented Reality

- Head-up displays

Designer Bodies

Neuromarketing

Palpable Computing

- User-malleable
- Visible

Video Fashions

- Personalized t-shirts, jewelry, backpacks

BIOEXTENSIONS

Exoskeletons

- Military applications
- Extreme environments

Genetic Modifications

- Individualized gene therapy
- Self-treated stem cell therapy
- Gene doping

Artificial-Life Process Controls

- Manufacturing
- Distribution

Major self-organizing disaster



Source: BLEEX

Biophysical Systems

Bioinformatics

- Stem cell research
- Designer drugs

Performance Implants

- Restore body functions
- Enhance body functions

SIM-X

- Everything is simulated
- Real-time visualization

Extropian movement grows



Embedded Brain Chips



Zero-impact legislation responds to cascading environmental disasters

Multi-Sensory User Interfaces

- Speech technology
- Aromas
- Skin impedance
- Gestural interfaces

Split Presence

- Divided sensory experiences

Smart Dust

- Agriculture
- Resource management
- Environmental monitoring
- Security

EMBEDDED SOCIETY

Integrated Power Management

Biophysical Systems

Self-Adapting User Interfaces

INFRASTRUCTURE

Item-Level RFID < 1 cent

Ad Hoc Security Islands

Artificial Organs

Closed-End Manufacturing

Nanomaterials

- Beware of backlash

Large-Scale Object Tracking

Security Implants

- ID chips
- Tracking

The Extended Self



HUMAN-MACHINE HYBRIDS

Petroleum Substitutes

Carbonless Fuel Systems

PERSONAL ROBOTICS

Biomachines

Large-Vocabulary Speech Recognition

2009

2010

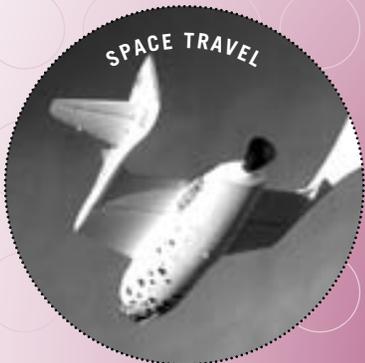
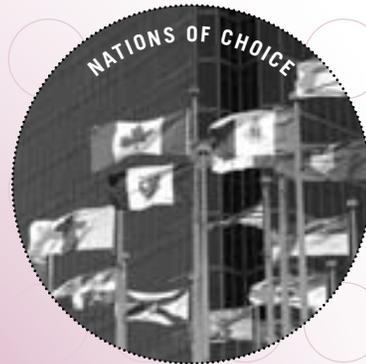
2011

2012

2013

2014

2015



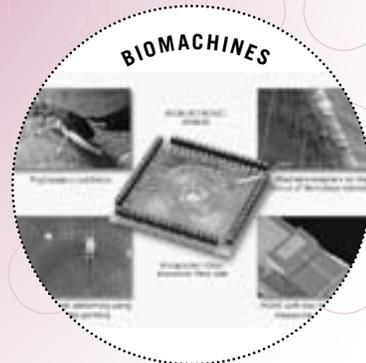
INTELLIGENT ENVIRONMENTS
SELF-COMPOSING SOFTWARE

QUANTUM-EFFECT DEVICES
INK-JET MATTER COMPILER



AUTONOMOUS DATA REPAIR
SELF-ORGANIZING SENSOR NETWORKS

SELF-HEALING INFRASTRUCTURES
BIOMETRIC NANOMANUFACTURING



2013

2014

2015

An odd contender for a box-office hit, *What the Bleep Do We Know!?* begins to build the bridge to a world of quantum realities.



X COMMUNITIES/POLICY Develop community-based technology assessment

Among the ideas that deserve re-invention 30 years later are technology assessment and participatory planning. And a perfect starting place is community-based planning for the emerging geoweb. The geoweb is inherently linked to places, and the inhabitants of those places need to take an active part in helping define its uses—public, commercial, and private.

Geoweb applications have the ability to distinctly define a neighborhood or a city. Web-based spatial narratives become part of the living architecture of a city, while real-time/real-place health or crime maps can provide guidance in health and safety choices, as well as a basis for understanding long-term trends. And just as the Internet spawned tremendous economic growth in virtual spaces, the geoweb is poised to spawn growth linked to specific communities. The big opportunity here is for local public agencies, community foundations, and commercial interests to collaboratively engage the public in choosing and implementing the kinds of applications that will best serve the local community.

X NEW PRODUCT DEVELOPMENT Learn the art of bricolage

Technological change lurches from failure to failure, abandonment to abandonment, and nothing symbolizes our technological order better than the vast heaps of dead computers found in the recycleries of China or the huge ship-breaking yards of Alang, India or Bangladesh. Paralleling these physical repositories is an intellectual boneyard of cast-off ideas, forgotten processes, and inventions still in search of an application.

History reveals that even the most mind-wrenching novelties are comprised in large part of cobbled-together bits of old technology. Invention and innovation are a process of bricolage, and innovators are, above all, clever bricoleurs—

dumpster divers pawing through the technological wreckage for shiny bits that can be recombined with new knowledge to create new wonders.

The emphasis here is on new knowledge—as in looking at the rubble through the eyes of new problems and new science. The most compelling innovations ten years from now are likely to emerge from the intersection of the junk yard, a host of pressing environmental problems, and a new scientific paradigm.

X HUMAN RESOURCES Prepare for the transhuman worker

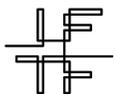
At the fringe of the future is an organization called the World Transhumanist Association. A year ago, it listed its mission as “laying the foundation for a society that would admit as citizens and companions intelligent robots, cyborgs made from a free mixing of human and machine parts, and fully organic, genetically engineered people who aren’t necessarily human at all.” It has recently updated its mission statement to “support the development of and access to new technologies that enable everyone to enjoy better minds, better bodies and better lives. In other words, we want people to be better than well.”

As human technological extensions have become more real, the transhumanist’s mission appears more moderate. But the original statement starkly captures the issues that lie beneath the surface of the co-evolution of humans and technology, however moderate it may seem. Increasingly, organizations and communities will need to confront these issues. At a minimum, it is worth considering the human resources demands that are suggested by the goal of wanting people to be “better than well.”

The poet R.S. Merwyn once wrote, “We are lost with compasses in our hands,” an observation that neatly captures the mood of anyone trying to peer into the future today. Our traditional forecasting tools sometimes seem all but useless in the face of unprecedented uncertainty, and even our metaphors for thinking about the future are looking rather frayed in the face of the buffeting winds of change. But do we need more definitive tools? Perhaps not.



A new set of tools and practices may revive the art of ethno-navigation, focusing on weak signals rather than definitive forecasts



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Navigation as Metaphor: The Western Tradition

Navigation is an oft-used metaphor for forecasting and one that has undergone a profound shift, pregnant with implication for those who would peer into the future. Unfortunately, it often focuses on the artifacts of Western navigation—instruments and black boxes.

The story of modern navigation is one of ever greater precision and ever more powerful tools. The compass-card turned the north-finding lodestone into a precision course-reckoner in the 16th century. In the 18th century, the double-reflecting octant for sighting and the chronometer for time-keeping revolutionized the way-finding arts into a science. Armed with compass, sextant, clock, chart, and some tables, navigators could locate themselves anywhere on the planet with an unprecedented accuracy.

In the centuries that followed, these tools were augmented with aids of ever greater precision, from radio navigation in the 1920s to the first satellite-based systems in the 1960s. Satellites and atomic clocks converged, delivering the GPS system in the 1980s. The black art of navigation was replaced by the black box. No measuring, no calculating. Just read the location off of a screen.

GPS may seem like a radical departure from the navigation tradition, but in fact, it's the logical conclusion: the entire history of modern navigation has been one in which navigators have come to rely on ever smaller pieces of ever stronger information. And therein lies the problem with both navigation and forecasting today. We are trusting our future to ever smaller amounts of “strong” information, and we understand less and less about the context of that information—where it comes from.

Ethno-Navigation: A Different Perspective on the Future

There is another navigation tradition, one in which navigators rely on large amounts of weak information to anticipate what lies ahead. Of course, the most skilled Western navigators embodied this instinct in their work, but the highest expression of this tradition is found in the Pacific Island groups of Oceania. Here, master ethno-navigators guided their voyaging canoes thousands of miles across seemingly trackless ocean without benefit of compass or sextant, relying instead on subtler cues from the rising points of stars, the set of ocean swells, the color of water and clouds, and the types of birds and ocean life observed. It was a subtle art learned from older generations and a lifetime of sailing—so subtle, in fact, that instrument-blinded westerners failed even to recognize what the ethno-navigators were doing until after World War II when their art of way-finding was beginning to die out.

Now, as computing itself moves out of the “black box” and into the environment, the art of ethno-navigation may be revived in our 21st-century context. With information dispersed, quite literally, across the landscape, we will seek new mapping tools that tap the multitude of weak signals—both as real-world interfaces to embedded information and as a guide to forecasting. Forecasting will become less of a black-box art, and the most effective forecasters will also be the most effective navigators of weak signals in an information-rich context. They will certainly not be black-box manipulators.

—Paul Saffo

INTERVIEW: DAVID RUMSEY



David reflects on the value of old maps, inaccurate maps, and maps as metaphors

Q: | David, you probably have one of the best collections of old maps in the world today. What in the world is valuable about old maps that don't depict things as they are today? How do old, out-of-date maps help us think about the future?

Old maps certainly contain a lot of information about past places, past activities, past landforms—a kind of visual history. By looking at the old maps and comparing them to new maps of the same areas, we see how things have changed. We could read these changes in a narrative, but there's something very powerful about seeing them in a visual space. And seeing that change over time helps us think about the future.

They also help us distinguish fast processes and slow processes. For instance, for certain boundaries and cities—say, in Europe in the 200-year period from 1700 to 1900—there may be very little change. If you look at the same time period in the American West, you see enormous change in the maps. With San Francisco, there's almost nothing before 1849, and then you see an enormous period of change, of course, right around the Gold Rush. The city literally just burst into being all at once. You can just see the whole city grow over a period of 20 or 30 years and take shape. It's a very, very different kind of time scale from what happened in Paris. Obviously it has to do with human activity, discovery, mapping, and settlement. So you get a real sense from maps of how things will change at a very slow rate in some places, and at a very fast rate in other places.

Q: | We often think of maps as being accurate, but is there also value in inaccurate maps? For example, I have Halley's *New and Correct Sea Chart of the Whole World* from around 1700. It has most of the Asian shoreline and the North Atlantic very accurately represented but on the West Coast, California is still an island. It just falls off the edge. So here's all this precise stuff on the things you know, and yet, on the one space that nobody knows, it's basically unchanged since Cortez gave California its name. So what's the value of maps that have wrong information?

What I love about California as an island is that it's a metaphor. For a long time, for a hundred years, California was this incredibly enchanting, separate place. It was literally off the shore. And we still have that sense of the place here, metaphorically and culturally. We're still an island.

I think the power of maps to make the imagination run wild in lots of different directions is almost boundless. We love looking at those inaccuracies because they remind us how people had very, very different views of the physical reality of the world. We can't know just how it influenced their thinking at every level, but I know that today, we're going in the other direction. We're increasing accuracy and almost substituting "reality" for maps—with daily satellite images of the whole world, with 3D views of online globes such as keyhole.com, recently acquired by Google, with the ability to fly around an online globe and look at any level of information we want about cities, about dates, about population, about social statistics.

These are all powerful in shaping our perception of the world. I guess what I particularly love about this map revolution, as I see it happening, largely because of the Internet, is that people are really now beginning to see place as, once again, a really, really significant part of their information structure. Where things happen is of critical importance now that people can easily and enjoyably link information and location.

Q: | Let's talk about this map revolution, then—about the appearance of digital maps. How does digitization change what we can do with maps?

A hundred years from now, the "old" maps will be the USGS digital maps of today. And imagine that you'll be able to look back at 100 years of change with digital materials. We can probably presume elegant software tools that will allow us to animate the actual changes in the environment in great detail, as seen in the changing maps. We'll have much finer granularity than we have now with the older historical maps, which

David Rumsey is President of Cartography Associates and a director at Luna Imaging. He began building his collection of historical maps and other cartographic materials in 1980; now at more than 150,000 maps, it is one of the largest private collections in the United States. Parts of the collection are available to the public at www.davidrumsey.com.



were printed on a schedule of maybe twice a year in the 19th century. Now we have USGS maps changing almost weekly. Looking forward 100 years, we'll also have digital satellite imagery data that we hope is preserved. We'll actually be able to create maps of photographic images from above, showing the growth and shrinkage of towns and settlements and physical features as well.

There's a daunting amount of data being collected right now by satellite sensors all over the place, and one hopes that the current trends in cheap storage and faster processors will continue to make it possible to save all this, or to at least save a good portion of it. My fear is that political motivations may see to it that this kind of fact-based information evaporates.

Q: | You've been a wonderful agent of survival in putting your map collection online. You have all these wonderful old maps and you're providing digital tools. How do you see these tools changing the way people make maps? Who will be tomorrow's mapmakers?

There's a distinction between the modern day cartographer and a GIS specialist. The two are coming together, but there's still a friction there. The cartographers think of themselves more as artists, and the GIS people think of themselves more as data folks. What I'm trying to do is bridge the gap. Through the GIS portion of my online library, I provide GIS tools. I allow you to make maps out of the data. You're the mapmaker, but I play a role through the choice of the historic maps that I give you, the choice of the modern special data that I make available for you to combine, the choice of the software tools that I give you to overlay data for comparisons, and so on.

So I think I'm broadening the umbrella of what a mapmaker is. As Kevin Kelly has said: "Everybody's going to become a mapmaker." What excites me about this revolution is it means artists and English majors and all sorts of people with mathematical and graphical tools can go ahead and make their own maps. And that's a big, big change. Most of the mapmakers in the past were the folks going out, getting the raw data. Now we're going to have so much raw data generated by sensors that the interesting thing will be the interpretation of that data by those who are closest on the ground.

I think that the notion of maps simply showing place in the old sense of the term is going to change and give way to maps being armatures for people to put all kinds of information on top of.

So the nature of the search problem is one key organizing principle. Another is the nature of the barriers to entry. Are there areas where innovation has become stultified and you want to find ways to actively reduce barriers to entry so others can play? These are also possible candidates for open-source solutions.



IFTF's Paul Saffo asked David to reflect on the changing role of maps in providing weak signals about the past and the future.

ETHNO-NAVIGATION: TOOLS OF THE TRADE

The tools of ethno-navigation provide some provocative templates for forecasting tools. In fact, the relationship between navigation and forecasting is built into many of them. The Chinese geomancer's compass, or *lo pan*, embodies an entire cosmology of relationships between landscape and world forces; by positioning themselves in relation to the compass, Chinese geomancers would determine their location, site a new building, or assess the fortune of a newborn child. Like other early astronomical systems, such as medicine wheels, the geomancer's compass serves to guide both travel and human behavior.

While less cosmological, the tools of Micronesian navigation also provide a mental scaffolding for assessing and relating a variety of ecological features. The Marshallese stick chart is a grid for studying waves and swells as a way of understanding where one is and where one is headed. The etak compass is a way to use line-of-sight and out-of-sight reference islands to track how far and in what direction a canoe has traveled. These tools are combined with a series of highly contextualized sealife indicators, which are listed under the star toward whose rising position it extends, as Thomas Gladwin explains in *East is a Big Bird*. For example:

Altair: A whirlpool over Uranie Bank, a white-tailed tropic bird, alone; a frigate bird, alone; another white-tailed tropic bird, also alone; a large shark; a single white tern.

Orion's Belt: Two skipjack; a school of fish in the water with noddies flying and diving over them; another school of fish, mostly white terns over them; one plover (the kind which calls "cooling"); two sooty terns.

Corvus: Two sooty terns, making cries; a frigate bird, alone, flying high; two porpoises; a band of turbulence in the water with sea snails floating in it; a red-tailed tropic bird; a large porpoise.

Gladwin goes on to argue that the logic of these navigational tools combines abstraction and concreteness in a way that is usually dichotomized in Western thought, and that this dichotomy ultimately bounds Western innovation and improvisation in ways that are not seen among the master navigators of Micronesia.

1 A Chinese *Lo Pan* Used to Plot the World in Relation to the Stars

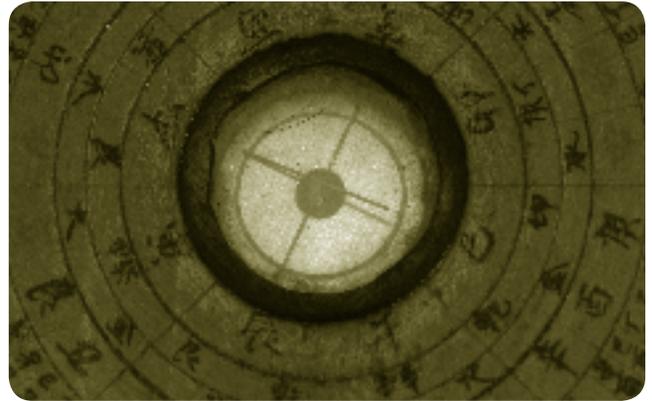


Photo by Paul Saffo

2 A Marshallese Stick Chart Used to Map the Swells of an Ocean

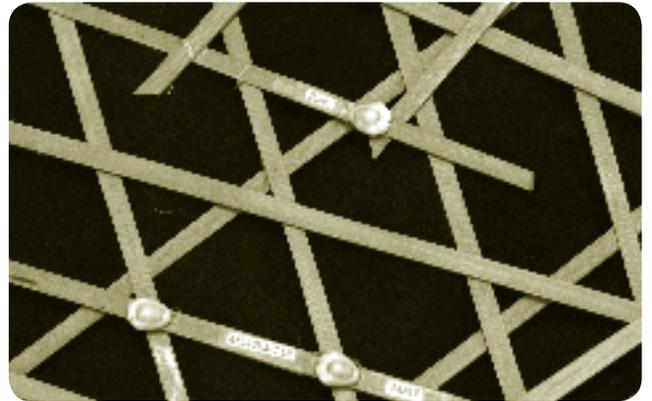
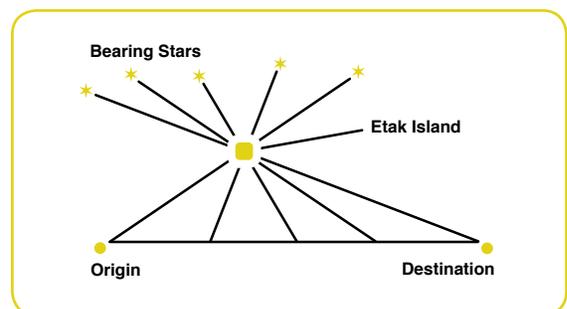


Photo by Paul Saffo

3 The Micronesian Etak System Used to Gauge Distance from Reference Islands



Source: <http://www.geocities.com/Tokyo/Temple/9845/austro.htm>

MAP PROJECTIONS FOR FORECASTING: MAPPING THE POSSIBLE, THE INACCURATE, AND THE UNKNOWN

IFTF has been using a form of mapping as a way of forecasting the future for several years now, and some of these maps bear an uncanny resemblance to some of the navigational tools of the ethno-navigators—such as the Mashallese stick chart and the Chinese geomancer’s chart. These maps don’t try to represent places literally but rather show relationships among many landmarks that are useful for navigating unknown territory. Ultimately, each map user is responsible for interpreting the significance of these relationships for the particular future domain he or she is navigating.

In developing such forecasting maps at IFTF, we have used a variety of map projections. In traditional mapping parlance, a map projection is one of many possible ways to represent the 3D surface of the Earth in a two-dimensional plane. In the realm of forecasting, we choose different projections to represent a multi-dimensional space in the most effective way. For example, we may want to give primacy to a single focal point, or we may be more concerned with the intersection of trends and domains. The kind of projection we choose will be based on the goal of the forecast.

Like projections of the Earth’s surface, the various projections of forecasting maps may include inaccuracies or distortions. Their value, in the face of these distortions, is their ability to represent a wholeness of the forecast space; the juxtaposition of many weak signals to create a stronger sense of this whole; and the ability to convey the complexity on an emerging context more than a single path through that context.

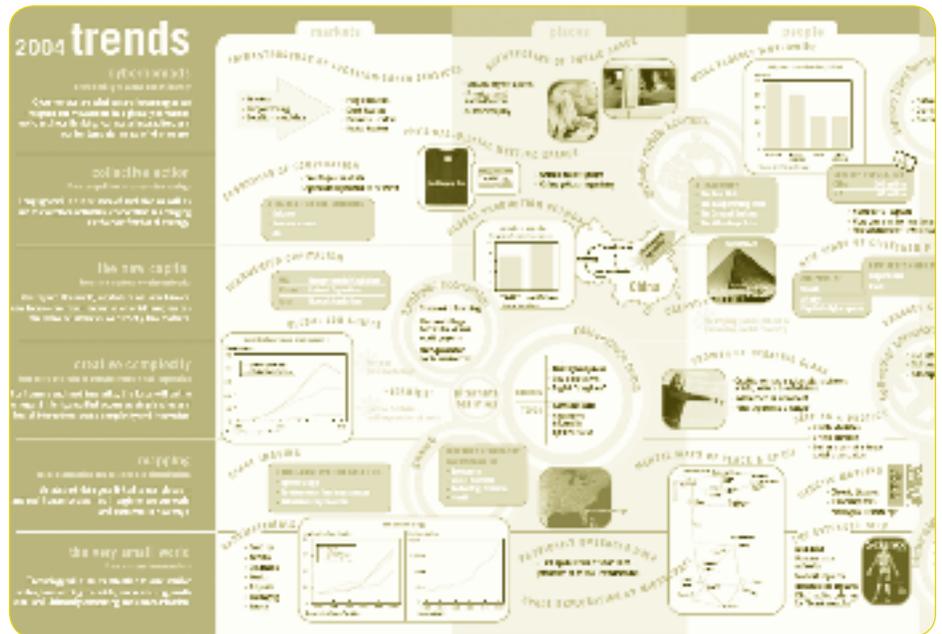
Here we explore the application and value of five key map projections that IFTF uses to forecast the future.

MATRIX: PROJECTING A GRID FROM ROWS AND COLUMNS

In the early years for futures research and forecasting, the matrix was a structured tool for forecasting cross-impacts of trends. Engineers arrayed the same set of trends along both the horizontal and vertical axes and assigned impact values to each cell, seeking a quantitative measure of how pairs of trends increased or decreased the likelihood of each other.

Today, IFTF’s matrix maps are much more about systematically describing the many ways a set of overarching trends, such as collective or the new capital will play out across multiple domains—people, places, markets, practices, and tools, for example. The goal is not to pigeon-hole impacts in cells. Rather the great value of the matrix map is that it creates a grid where we can place signals—trends, issues, data points, or examples—in relation to one another, often crossing cells to show important intersections.

4 Matrix-Style Maps Support Systematic Exploration of a Complex Context



Source: IFTF, *2004 Map of the Decade*, SR-844, 2004.

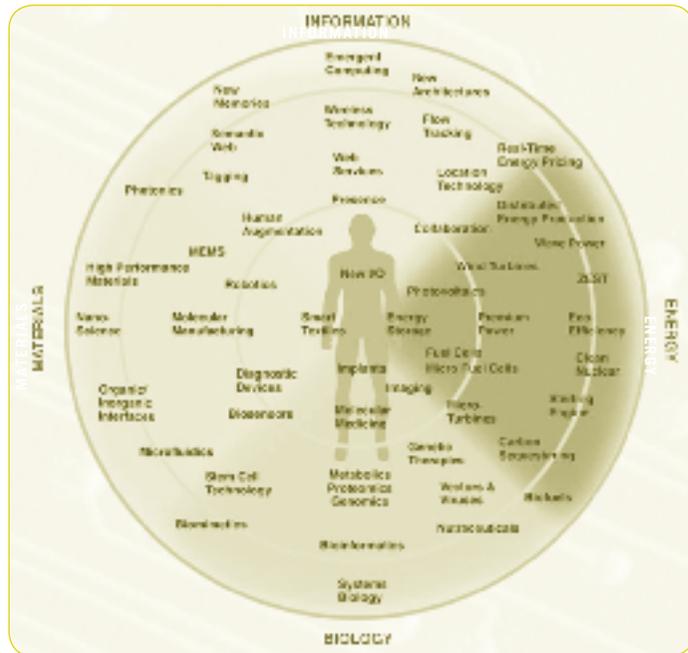
MANDALA: CREATING A FOCAL POINT

A mandala focuses the eye on a single point of impact, whether it's an issue, a domain, or a concept. Like the matrix, it offers two dimensions for analysis. Concentric rings represent one axis of information; pie-chart slices represent another.

For example, we have sometimes placed a human at the center of a technology horizon map, surrounded by layers of interaction with technology—with direct human-interface technologies in the first ring, marketplace products in the second, and abstract concepts in the third ring. We can then further plot future signals by placing them in four quadrants around the circle, such as information technology, biotechnology, materials science, and energy.

Mandala maps are thus particularly useful when several disciplines define distinctly different approaches to a common focal point—but share the same domains of impact.

5 Mandalas Organize the Context Around a Single Focal Point of Interest



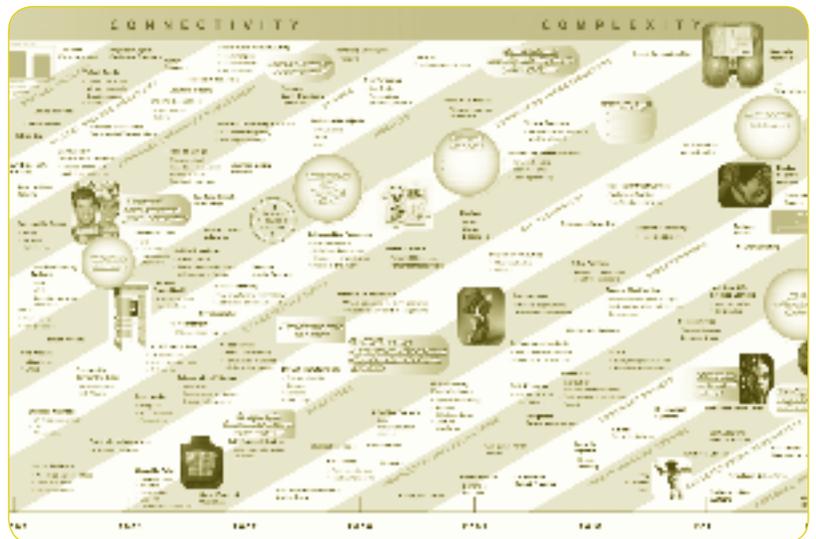
Source: IFTF, *New World Map: Technology for the Coming Decade*, SR-774, 2002.

TIMELINE: EXPLORING TIME AS A CONTEXT

Timelines, too, are a kind of map. While these run the risk of becoming “strong-information” tools and thus obscuring context, they can be constructed to show the web of weak signals and how those signals are related in time.

The standard timeline is simply a linear projection of events through time. But by adding a second dimension—for example, for trends or domains—we can begin to create a map of relationships among things in both time and application space. This approach may be particularly useful in mapping the interdependency of signals. In general, commercial markets depend on certain technological systems, which, in turn, depend on certain basic technology components which may emerge at different times. By plotting these components, systems, and markets across a timeline, we can begin to see the lags and gaps in the co-evolution of tools and human systems—and at the same time, create an overall view of changing context through time.

6 Timeline Maps Show Temporal and Logical Dependencies at the Same Time



Source: IFTF, *Technology Timeline: 2005–2015*, SR-885, 2005.

GEOGRAPHY: EXPLORING WEBS IN CONTEXT

Obviously, geographic maps can provide valuable grids for forecasting the future, and everyone from geo-demographers to weather forecasters have used this form—and refined it extensively. The essence of this kind of map is to overlay non-geographic information on the geographic grid.

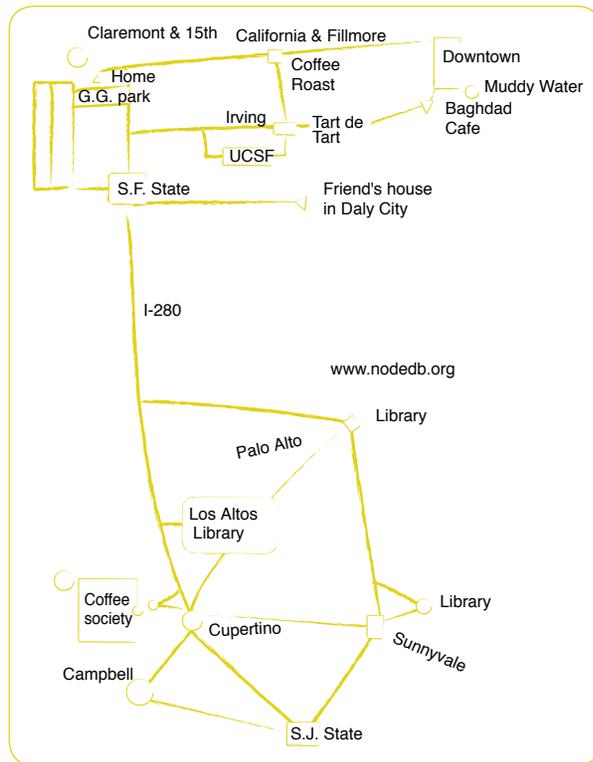
A strong-signal approach to geomapping is to pick one of two variables and compare them across geographic zones. A weak-signal approach is to plot trends, activities, and other qualitative information by place. For example, we at IFTF have plotted geoweb applications in different regions of the world, highlighting global differences in the future of the geoweb. We have also worked with information from ethnographic interviews to overlay social webs and mental maps on real places, discerning different patterns of mobility, for example. This allowed us to forecast a taxonomy of mobility strategies that included focal points, routes of travel, institutional campuses, and ad hoc opportunistic uses of mobility tools.

FREEFORM THREADED MAPS: LETTING THE TRENDS LEAD

There are any number of freeform maps in which we can abandon grids and axes and the like. However, we can also strike a balance between structure and formlessness by allowing individual trends to lead us from one place to another. The “places” may be technology domains, practices, population segments or other anchoring categories. The trends are lines that move from one place to another, bumping into other trend lines, sometimes merging into others that start in other places. Along their paths, intersections of multiple trends indicate “hotspots,” while particular signals can be placed along the trend paths as well, sometimes with dates associated.

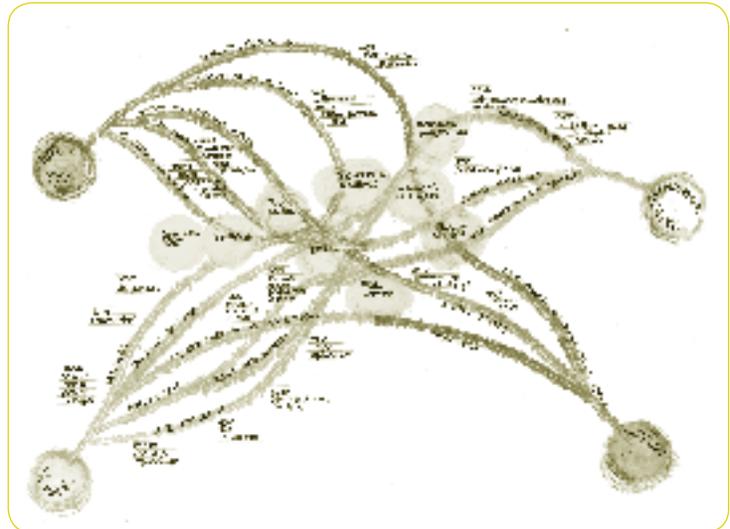
For example, IFTF has used this form to explore the relationship of trends in information technology, biotechnology, materials, and energy, representing each of these as a place and then following the path of trends as they moved toward the other places. Such pathmarking is a very iterative process as the trends begin to suggest their own most efficient fit with the space. It can also be nuanced with indicators of time and closeness of the starting points.

7 Geographic Maps Help Discern Webs of Connectedness



Source: IFTF, *The New Spatial Landscape: Artifacts from the Future*, SR-834 A, 2004.

8 Freeform, Threaded Maps Create Multiple Paths Through a Context



Source: IFTF, *Technology Horizons: The Next 20 Years*, SR-678, 1999.

In *Winged Migration*, birds navigate continents and seasons with internal instruments and lessons from their elders.



X TOOLS & TECHNOLOGY

Look for forecasting tools that draw on social webs, multiple sources

While it's tempting to look for strong information when peering into the future, such indicators are rare indeed and often precede events by only a short interval. In moments of high uncertainty, weak information guides, while strong information misleads. A web of weak information is vastly more reliable than a single strong source: with multiple weak sources, misleading indicators are compensated by their companion sources and the overall measure of agreement among sources itself becomes an indicator of the strength of particular outcomes.

A weak-information approach to forecasting does not eschew tools, but it does keep tools firmly in their place and, above all, works to ensure that users don't become bewitched by the tools they use. That said, the new generation of social-filtering software provides intriguing candidates for further evaluation and exploration—as they inherently link many weak perspectives into webs of things that matter to humans in their social guise. They thus provide a living armature—to use David Rumsey's term—for complex information about the world.

X MARKETS

Focus on the context, not the consumers

For a few years now, IFTF has been suggesting to businesses that they look beyond traditional consumer segments to understand emerging markets. Among the alternatives that we have proposed are context-focused studies. We might argue that consumer segments represent a strong, but potentially misleading signals, while context represents the web of weak signals that can better foretell where and how user needs will arise—and be met.

As computing and communications become embedded in the environment and contexts become increasingly aware of the people who occupy them, we will undoubtedly get some very strong signals about the needs of people in a particular location. However, it would be a mistake to think of context as synonymous with location—the context is ever so much richer and deeper, as layers of embedded narrative will soon show. Users may well move from context to context in a single location—or from location to location in a single context. And each may have a different mental map of the context. Finding ways to analyze these mental maps and organize products and services around them will become a strong advantage in this world of weak signals.

X COMMUNITIES/POLICY

Let the community forecast

Ultimately, forecasting may prove to be a vocation of the many rather than the few. Already, several experiments have demonstrated the value of group forecasting, such as Bernardo Huberman's work with markets as forecasting forums. Still, many of these experiments focus on strong signals. But what if communities were to take a distinctly social approach to forecasting their own futures, not only using social software to self-organize themselves into forecasting networks, but also using collaborative-filtering processes to surface a panoply of weak indicators and ratings for wiki-style forecasts of those indicators?

Services like del.icio.us already represent early steps in this direction, combining social networks and shared metatags (indicators) for online content that a web of participants deems most valuable. The next step is to create ways to map these emergent views of the world into forecast maps designed for specific decision-making purposes. IFTF is currently experimenting with such a system. For more details, contact Kathi Vian (kvian@iftf.org).

In a world rife with threats and uncertainties, health experts are increasingly concerned that the greatest threat facing humans in the near future is a biodisaster—most likely a naturally emerging pandemic, but possibly a bioterrorist attack—that could kill tens of millions. While such loss of life is familiar to poverty-stricken areas such as sub-Saharan Africa or to war zones, a truly global pandemic would put even wealthy countries at risk in a way that they haven't experienced for several generations.



The greatest threat to human populations in the coming decade is a global flu pandemic

How We Live: Five Drivers of the Threat

A wide variety of emerging or re-emerging diseases are at the center of the biodisaster threat, and chief among them is the H5N1 avian flu virus. If, as some experts fear, this virus acquires a single gene that allows it to be spread easily from one human to another, the deadly combination of high transmissibility and its demonstrated ability to kill roughly two-thirds of the people it infects would unleash a flu pandemic that would dwarf the deadliest pandemic of all time—that of 1918.

Several aspects of today's global lifestyles predispose us to such biodisasters:

- **Careless use of antibiotics** has led to the emergence of antibiotic-resistant strains of bacteria and other pathogens.
- **Human encroachment on animal habitats** and increased mixing of human and animal populations has increased the chances of genetic re-assortment leading to new mutant pathogens.
- **Increases in population density** and the ease of travel have made the “global village” smaller and more vulnerable to the rapid spread of disease.
- **Increased susceptibility** of growing populations—such as elders, diabetes sufferers, and those whose immune systems are compromised by chemotherapy or HIV—means larger portions of the population are at risk.
- **Geopolitical unrest** and escalating terrorism have raised the chance that a biological weapon of mass destruction will be deliberately unleashed.

Bioterrorism: A Mismatch of Wills

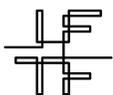
The relative ease with which humans now can modify genetic organisms makes the last of these five drivers—bioterrorism—a real and immediate threat. As Eric Noji, CDC advisor to the Pentagon, has observed:

At their worst, the New York, Oklahoma City, and Tokyo attacks may represent the crossing of a grim threshold, weakening long-standing taboos and increasing the likelihood of analogous attacks in the future. Preparing the medical community to address this threat is a formidable challenge, but the consequences of being unprepared could be devastating.

Unfortunately, the political wills of would-be terrorists and public-health defenders appear mismatched. In contrast to the will of those who would create and deliberately deploy bioweapons, the rest of the world finds it difficult to meet the demand for flu vaccine even during a “normal” season, let alone a pandemic. Witness the vaccine shortages during the 2003–2004 season and the recent shut-down of the Chiron facilities that were intended to produce half of the flu vaccines for the United States for the 2004–2005 season—with no real back-up system to take up the slack. Sadly, even the anthrax scare of 2001 didn't seem to be enough to mobilize public and political will to the degree and persistence required to build a biosurveillance and response infrastructure on a scale that could avert massive deaths and disruption.

It seems all too likely that competing priorities and public complacency or ignorance will leave both the United States and the world at large highly vulnerable to the next great pandemic.

—Bern Shen



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Eric outlines the scope and complexity of the biodisaster threat

Q: | **How real is the threat of bioterrorism?**

Having worked in the government for 13 years, I know that when any government official (including myself) speaks publicly, it represents something important, if not extraordinary. In my experience, most government officials are risk averse, resulting in a cautious approach about what they publicly write or say.

Thus, when the director of the National Institute for Allergy and Infectious Disease writes in a prestigious medical journal that a bioterrorist attack against Americans is inevitable in the 21st century, people should pay attention. Today, we in Washington view the threat of bioterrorism as serious—perhaps the most serious threat to homeland security.

Q: | **In what way do biodisasters differ from other types of disasters?**

In the past, disasters were often divided into two broad categories: those caused by natural forces such as hurricanes, earthquakes, or floods, and those caused by people, such as industrial accidents or wars and civil strife resulting in large displaced populations.

However, the boundary between natural and man-made disasters can be blurred when, for example, a natural disaster triggers secondary fires, industrial accidents, or releases of pollution—or in the case of a bioterrorist attack using either a naturally occurring or a bioengineered infectious agent. The trend now is to speak of complex disasters that combine natural and man-made elements.

Q: | **What should we be worried about in the face of a pending biodisaster?**

A major issue is that of surge capacity. If the United States was to experience a mass-casualty attack, our hospitals would have little ability to absorb the patient influx.

This incapacity results from a combination of the lack of facilities and beds, our nursing shortage, and the fact that streamlined supply-chain management has led to very

limited inventories or stockpiles of drugs and supplies. According to the World Health Organization, in high-income countries alone, there could be a demand for 130 to 230 million outpatient visits and 1.5 to 5 million hospital admissions. However, the impact of the next pandemic is likely to be even worse in low-income countries because of different population characteristics and the already strained health care resources.

For many plausible biological attacks, those on the front lines will be physicians in hospitals, clinics, and family practice rather than the police, EMS, first responders, or search and rescue teams that would be critical to coping with attacks using explosive, chemical, or radioactive materials. The rush to hospitals and medical facilities by potentially thousands of “worried well” will likely be a major patient-management disaster in and of itself. Another issue is the long lead time required to develop and deliver vaccines—assuming that a vaccine even could be developed.

Q: | **How would a biodisaster impact the everyday world of work, business organizations, and the economy?**

All you have to do is pick up any financial journal to see the effects of SARS on tourism and the hotel industry in Asia, or the impacts of foot and mouth disease on tourism in the United Kingdom. And speaking of the food chain, look at the effect of mad cow disease on the beef industry in the United Kingdom—and more recently in the United States, where just one possibly-infected cow led several countries to ban beef imports from this country.

These examples raise a couple of points. One is that bioterrorism doesn't have to be directed against human hosts to be effective—tremendous economic damage can be done by targeting our food supply through agroterrorism. Another is that we all live in an interrelated ecology—something that impacts the cattle industry automatically has ripple effects on corn futures, the trucking industry, and thus on petroleum, as well as tourism, as we've already mentioned.

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Also, terrorism isn't necessarily about killing lots of people—its goal is to sow social, cultural, and economic disruption. As Sun Tzu said in *The Art of War*, “Kill one, terrorize a million.” Look at what happened with the Postal Service and anthrax. When you think about it, we had 23 people sick and five deaths. There were more injuries and deaths on the Georgia highways this past weekend, and yet the anthrax scare basically shut down much of the Postal Service in the Northeast, with tremendous economic consequences. Even the rumor of an attack or of some sort of contamination could create disruption. In fact, even if we have a naturally occurring flu season that's heavier than usual, or if SARS or avian flu were to show up in the United States, a terrorist group could simply claim credit to increase fear.

Getting back to human diseases, even if a bioterrorist attack or a serious influenza epidemic doesn't kill millions of Americans, you can still imagine the financial impact of having, say, 30% of your workforce sick for three weeks.

Another question for business is “How clean is clean?” That is, if your facility has been contaminated by, say, anthrax, how clean do you have to get it before people can re-occupy the building and get back to work? Back in the 1950s, when the last naturally occurring case of inhalational anthrax occurred in wool sorters, they lived with hundreds of spores in their respiratory tract, but with weaponized anthrax, you have to get things much cleaner.

Q: | What can or should businesses do to prevent or mitigate the potential impacts of a biodisaster?

The bottom line is that we cannot stop terrorism. There's no way we can protect everything. We can mitigate it, but remember what the IRA said, “We only have to be successful once; you have to be successful all the time.”

That said, the greatest potential for mitigating the effects of any disaster lies in the pre-impact phase. Hazard mapping, vulnerability analysis, educating the workforce and local community, and disaster preparations and drills are all helpful, but the special case of a biodisaster also requires preparing the health care system and a ramp-up of vaccine development and production. For many hazards, the gold-standard response is evacuation—to get out of a building, to get away from a storm, flood, or fire. But where do you go if the threat is biological?

There's an emerging industry of terrorism risk analysis and management, whether biological, chemical, nuclear, blast, or radiological. Businesses are going to have to decide what their risk tolerance is with regard to all kinds of decisions, such as where to locate your company headquarters or how much you want to invest in various kinds of prevention or preparation.

The sad thing is that if you look at our typical pattern, immediately after a disaster people go into a flurry of activity, making preparations for the next big one, but as time goes on, their sense of urgency goes down, life gets back to normal, and preparations tail off. This sounds terrible, but we probably need another terrorist attack to get business interest back up again. The good news is, tools developed in response to terrorist threats serve a dual purpose. They help detect rare or unusual disease outbreaks and respond to medical emergencies, including naturally occurring outbreaks or industrial injuries that might resemble terrorist events in their unpredictability and their ability to cause mass casualties.



Bern Shen, Director of IFTF's Health Horizons Program and a former physician in emergency and disaster medicine, asked Eric about the threats posed by biological agents.

BUILDING BLOCKS OF AN EPIDEMIC

Although the nuances of epidemics can become quite complex, the key building blocks are infectious agents, vectors, hosts, and the environment. Given the myriad permutations of these variables, the kinetics of epidemics can vary widely.

Some, such as SARS, Ebola, or the 2001 Postal Service anthrax attack, are initially quite frightening, but then fizzle out relatively quickly without actually killing large numbers of people. Others, such as the flu, are relatively commonplace and recurrent (albeit with different strains from year to year), yet kill more people than their exotic cousins. Still others, such as multi-drug resistant malaria, affect large numbers of people, but because of the specifics of the disease, are still geographically confined. Yet others, such as HIV/AIDS, start from specific subpopulations and then spread to other populations and geographies over a period of several decades. Even when the basic science of an infectious agent is known, economic, political, and cultural factors play key roles in determining if and how we respond, how quickly, and how effectively.

1 Variables in the Spread of Infectious Diseases

INFECTIOUS AGENTS

Infectious agents may be bacteria, viruses, or other entities. They vary in the ease with which they're transmitted from one person to another; their susceptibility to antibiotics or physical conditions such as heat, cold, dryness, or sunlight; and the severity of the disease they produce. New or newly virulent pathogens such as H5N1 avian flu, HIV, vancomycin-resistant *Staphylococcus*, or multidrug-resistant tuberculosis can emerge through increased human contact with natural animal reservoirs of disease, genetic re-assortment (exchange of genes among pathogens that are simultaneously infecting a host), or natural selection of resistant strains through exposure to sublethal doses of antibiotics. They can also be produced deliberately as part of a bioweapons program.

VECTORS

Vectors help spread the infection. Experts distinguish vectors, which transmit disease—such as fleas in the case of bubonic plague—and intermediate hosts, which harbor and may be required for the development of pathogens on the way to the final host. Vectors can also include enabling technology, such as international airplane travel, which can help spread diseases around the world within days.

HOSTS

Hosts are the organisms targeted by the infectious agents—people, for example. Hosts can differ in their susceptibility to infection due to factors such as nutritional and immune-system status, whether or not they're taking antibiotics, and health behaviors such as hand washing or avoidance of high-risk areas or exposures. Increased numbers and density of susceptible hosts create favorable conditions for an epidemic.

THE ENVIRONMENT

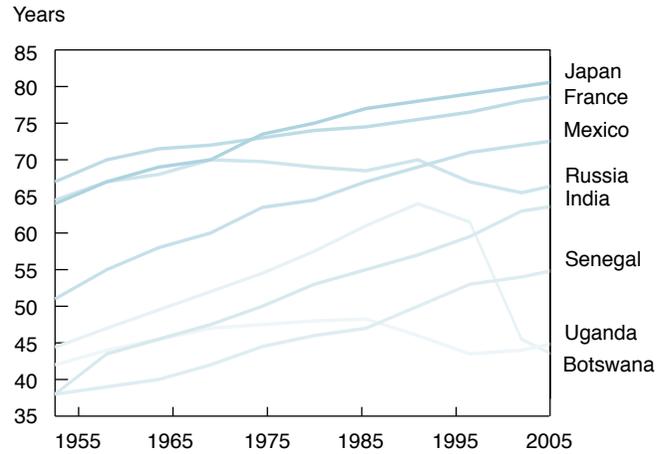
The environment includes factors that can increase or decrease the severity of an epidemic. Relevant factors can be physical (such as, temperature and moisture, which primarily affect the pathogen) as well as ambient conditions such as terrorism, war, poverty, and other forms of social dislocation that render people more vulnerable to infection.

ANTIBIOTICS RESISTANCE: THE “SHADOW EPIDEMIC”

At the beginning of the last century, when a third of all deaths in the United States were caused by pneumonia, tuberculosis, infectious diarrhea, and diphtheria, antibiotics held out the promise of controlling or even eliminating infectious diseases as a major scourge. Along with other important public-health measures, such as ensuring clean water, sanitation, and immunizations, antibiotics have contributed to the dramatic rise in life expectancy in the last century and reduction of deaths from infectious disease to less than 5%.

But the antibiotic fight against infection has been an uphill battle, as infectious agents evolve resistances to one after another of the new antibiotics and antimicrobials. As the rate of resistance grows for prominent diseases—such as pneumonia, tuberculosis, and AIDS—modern medicine may actually be creating what has been called a “shadow epidemic,” in which patterns of antibiotic use create more virulent forms of infections.

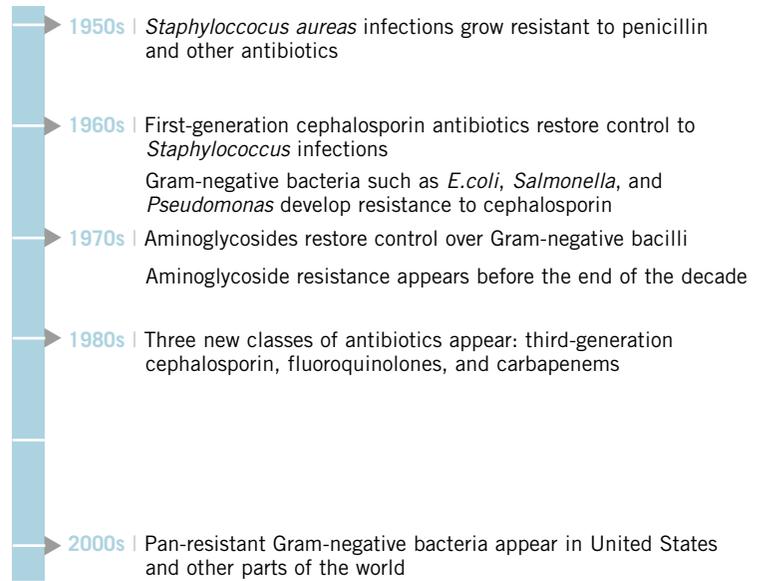
2 Life Expectancy at Birth



Source: Weiss, R.A. and A.J. McMichael, *Nature Medicine*, December 2004.

◀ The spread of HIV, falling living standards in some regions, and the breakdown of public-health infrastructure in ex-Soviet nations has resulted in regional drops in life expectancy—a pattern that is likely to spread as more regions experience increased environmental, social, and economic pressures in the next decade.

3 Timeline of Antibiotic Resistance



Source: Alliance for Prudent Use of Antibiotics, 2004.

4 Resistance to Antibiotics Varies with Geographic Location

(Percent of infections resistant to ... treatment)	Low	High
PNEUMONIA		
Macrolide	11	72
Penicillin	6	54
Fluoroquinolone	1	18
H. INFLUENZAE		
Ampicillin	6	43

◀ Resistance rates vary by geographic location. For example, 6% of pneumonia infections are resistant to penicillin in Canada compared to 54% in Hong Kong.

Source: Alliance for Prudent Use of Antibiotics, 2004.

SCALE: UNDERSTANDING THE IMPACT OF A PANDEMIC

The most notorious pandemic was probably the bubonic plague, or “Black Death,” that killed roughly one-third of the population of Europe in the mid-1300s. As grim as that epidemic was—at one point, 10,000 people were dying per day in Constantinople—the 1918 influenza pandemic was even more virulent, spreading from the first-known case in Kansas to the entire United States within a week and eventually killing roughly 40–60 million people worldwide in a single year.

Estimates for a possible H5N1 avian flu pandemic vary widely from approximately 7 million to 100 million deaths worldwide. The conservative estimates presuppose a case fatality rate of 1% or less, which is low, given that patterns of virulence of H5N1 suggest a much higher death rate than recent influenza pandemics, such as those of 1957 and 1968. Taking the demonstrated case fatality rate of 60–70% and assuming that only 10% of the population is infected, the actual number of deaths could be as high as 20 million in the United States and 400 million worldwide.

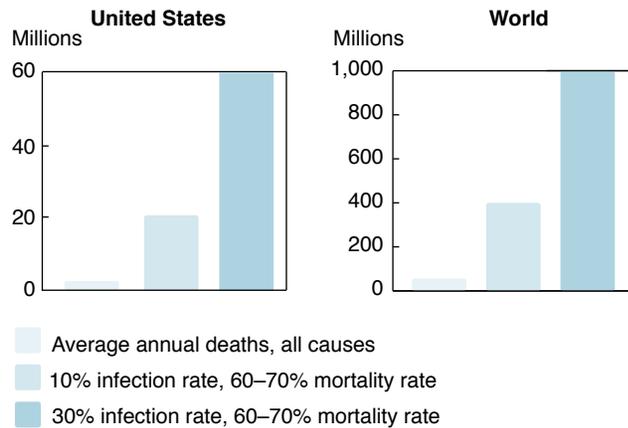
7 Conservative Projections of Impacts of an H5N1 Pandemic in the United States

(Assuming death rates to high-risk populations at less than 30%)

Deaths	207,000
Population at high risk	15%
Hospitalizations	734,000
Outpatient visits	42 million
Economic impact	\$166.5 billion

Source: Centers for Disease Control and Prevention

8 Alternate Scenario Projections for H5N1 Avian Flu Deaths



Source: Centers for Disease Control and Prevention

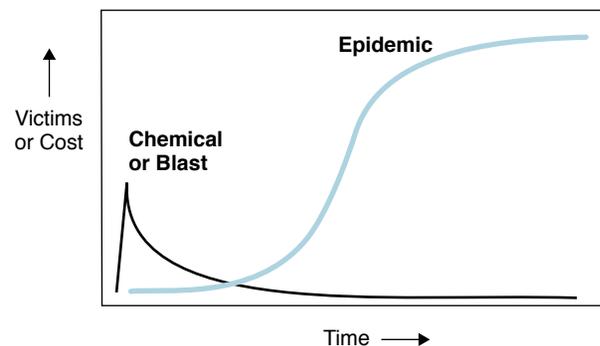
BIODISASTERS: NO QUICK RECOVERY

Biodisasters should be distinguished from other types of disasters.

Natural disasters and most man-made disasters such as industrial accidents involving chemicals, toxins, or even nuclear weapons typically involve a rapid onset of observable events and clinical symptoms.

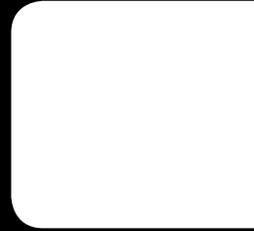
In contrast, the epidemic curve of biological agents typically displays an incubation period—during which people with the disease may be spreading it to others—followed by an exponential rise in the number of victims until either quarantine or sufficient “herd immunity” develops to level the curve. Recent simulations have demonstrated that during the steepest part of the epidemic curve, the direct and indirect costs in the United States could be as high as \$100 million an hour—fully on the same order of magnitude as a nuclear missile strike.

9 Difference Between Epidemics and Other Kinds of Disasters



Source: Institute for the Future

For now, the horrors of pandemic seem relegated to zombie films like *28 Days Later* rather than real community planning.



X EMERGENCY PREPAREDNESS

Develop broad-based global preparedness policies

In a global society, where people and food products move rapidly around the world, the best way to avert a global pandemic—without bringing the economy to a standstill—may be to have a broad-based platform of policies and practices, implemented from the bottom up. The 2004 Institute of Medicine’s Forum on Microbial Threats recommends several steps in this direction:

- Better integration of the animal and human public health communities to detect disease patterns across species
- Increased compensation for pre-emptive culling of infected animals to avoid economic disincentives for “doing the right thing”—particularly in developing countries
- More widespread use of rapid, inexpensive diagnostic tests based on the polymerase chain reaction
- Increased support for annual flu immunization and antiviral drug therapy to boost capabilities to produce vaccines and drugs before a major pandemic strikes
- International stockpiles of antiviral drugs and vaccines, including agreements that would prevent nationalization of scarce supplies in the case of a pandemic
- Better preparation for research efforts during the next pandemic in order to build our future understanding of these phenomena

X HEALTH INFRASTRUCTURE

Increase the surge capacity of the health care system

Even if the death toll were as “mild” as the official estimates, the surge capacity of hospitals and the health care system would be quickly overwhelmed. A variety of models for estimating the staffing needs and resource requirements for hospitals in case of a pandemic are currently available.

If these models were taken seriously, the overall design of health care would shift. Research and clinical training would tip toward public health and infectious disease, in general, and toward antivirals in particular. In addition, the public health surveillance and response system would finally undergo the upgrade it needs before a pandemic. Demand for certain health-related goods and services—vaccines, antivirals, respiratory therapy, mortuary supplies, and psychological counseling, among the most obvious—would skyrocket, while that for others will plummet.

X CIVIL SOCIETY

Promote civil dialog about the choices and tradeoffs to be faced

Beyond the direct human suffering and the grim task of disposing of the bodies of the dead in a pandemic are multiple concentric rings of consequences—the disruptions to families, social organizations, mental health, productivity, and markets along the entire value chain. Infection control and quarantine measures could further dampen air travel, raise the cost of shipped goods, and reduce cross-border commerce. The insurance industry would be severely impacted, possibly triggering massive reorganization. Trade and markets would be sorely tested both by the challenge of carrying on commerce in the face of a depleted workforce and by the almost certain crisis of public confidence. Civil unrest and recriminations could ignite a vicious cycle of eroding public trust and community spirit, and imposition of martial law and other curtailments of basic freedoms.

While it’s impossible to explore these potential implications in detail here, it is clear that this is a high priority topic, not only for experts in public health and infectious disease, but for stakeholders in all industries and sectors of society. We may not be able to prevent the next great pandemic, but we can certainly choose to take actions that will mitigate its human and economic costs.