

2006

TEN-YEAR FORECAST

Perspectives

economics
infrastructure
asia
culture
agriculture
health
wild card
urbanization
science
demographics
technology

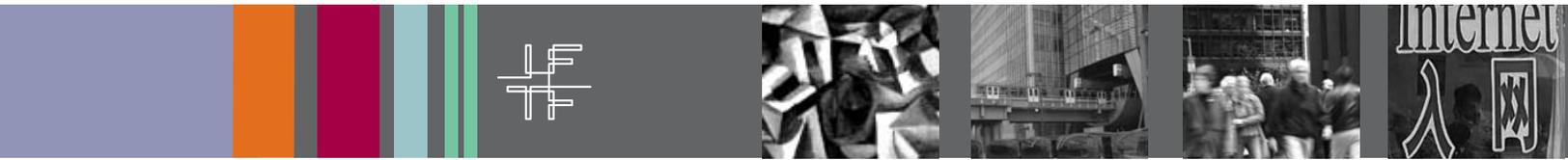
A decade of shapeshifting

The decade we face is a shapeshifter. It will certainly be a decade of unprecedented risks, serving up one surprise after another against a backdrop of turbulent uncertainty. But it may also be a time of overlooked promise. What makes it difficult to sort peril from hope is that the same trends could offer up either—or both. A new willingness to experiment with the very biology of cognition may endow people with skills and perception that stretch beyond anything we can imagine today. And yet that same experimental spirit may accelerate evolution along unconsidered, indeed life-threatening, paths. The rise of small science powers—developing nations that carve out a technological niche for themselves—will signal a new route to development but will also distribute the capacity to wreak havoc with dark-side uses of new tools.

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As we look out over the next decade, we see surprising and not-so-surprising trajectories of forces already afoot. We also see some new issues emerging from the shadows of latency. The interplay of new and old, of risk and promise in these various quarters will render a world in many shades of gray. Our choices, day by day, will give it its immediate shape.



OPEN AND CLOSED: THE SCALE OF CHANGE

In the ongoing struggle between open and closed, open continues to gain ground. For the economy, this contest translates the extension of the 1990s' open-source software development model into open-scale institutional models, with game theorists figuring out the thresholds for winning and losing in a world of increasing connectedness. In this world, the advantages of economies of scale may rapidly shift outside the boundaries of large organizations, shaking up not only business models but long-held beliefs about the best ways to manage the organizations behind them.



Economics: Open Scale

As open business models expand beyond the worlds of software and media, and economies of scale shift from large corporations to large peer production networks, how will business models and organizational strategies change? With a keen eye on the value of groups and noneconomic behavior, **Clay Shirky** joins us for this forecast that uses agent-based modeling to understand the changing economies of scale.

—Paul Hartzog

With openness also comes liveness in the form of lightweight, flexible infrastructures for everything from communications to transportation, from energy to water. But nothing new comes without a hidden curse, and the curse in the coming decade is on the struggling telco and cable incumbents. It is unlikely they will go without a fight, so look for legal challenges that may slow the shift to distributed systems.



Infrastructure: Lightweight Networks

With distributed intelligence and new materials, how will new communications, transportation, energy, and water infrastructures evolve across the landscapes of the developed and developing world? **Nicholas Negroponte** weighs in on this forecast with his vision of the role of the \$100 laptop.

—Anthony Townsend & Kathi Vian

Meanwhile, the giddy age of smart mobs will show its more sober side as dark mobs drive both innovation and crime. And last but not least, another Internet is growing behind China's Great Firewall. The current focus is on western fears that top-down enforcement will chill free expression and access. But these issues will not slow the Chinese Internet's growth, and its size may rival the western Internet within the next ten years. Look for today's concerns about freedom to be supplanted by commercial worries as global businesses realize they're being shut out of what may become the largest cyber-mall on the planet.



Asia: The Other Internet

Founded on linguistic, visual, cultural, and regulatory features that differ from today's dominant English-language Internet, how will the Chinese Internet reshape East-West interactions and business practices over the next ten years? **Isaac Mao**, Chinese blogger, venture capitalist, and co-founder of the Social Brain Foundation, reflects on the future of Chinese Internet culture.

—Lyn Jeffery



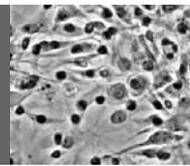
Culture: Dark Mobs

As digital information moves into the environment, how will the struggle between top-down controls and bottom-up hacking change the moral values and on-the-street behaviors of mobile mobs? **Moisés Naím**, author of *Illicit: How Smugglers, Traffickers and Copycats are Hijacking the Global Economy*, contributes to this forecast on the intersection of context-aware technology and crime.

—Kathi Vian & Jason Tester

ENVIRONMENT AND EVANGELIST: AFTER THE WAKE-UP CALL

After more than 30 years of debate, the mounting evidence of clear and present environmental instability is fracturing the environmental movement even as awareness and concern spread. But in an unexpected twist, the turbulence may shift from oil fields and coal mines to farm fields and grocery stores. Agriculture will be reinvented as an energy industry, targeted as a source of environmental woes, and implicated in all kinds of health threats from obesity to malaria. In fact, while not as dramatic as global pandemics, a slow degradation of human health may well undermine societies worldwide.



Agriculture: Groundswell

In the rush to fill the gap in global fuel supplies with biofuels, how will agriculture balance the market demands for food, fuel, and even carbon credits with the growing recognition that industrial agriculture is failing in some critical ways? With insights from **Ben Crow**, a sociologist and expert in global development, this forecast looks at the argument for a more ecological approach to agriculture.

—Jody Ranck & Kathi Vian



Health: Sick Herd

Does the rise in obesity, chronic illness, and noninfectious disease point to a reversal of the long trend toward healthier, longer lives—in short, to signs that the human population is becoming a “sick herd”? **Tom Novotny**, recently retired as a Rear Admiral from a 23-year career in the United States Public Health Service, joins us for this forecast, considering the ethics, economics, and politics of noninfectious disease.

—Jody Ranck & Mani Pande

As individuals struggle to cope with the potentially devastating effects of climate change, massive urbanization, and a growing sick herd of humanity, expect to see new religious forms rise to the occasion. Meanwhile, familiar forms will square off with one another to revive the planet, with evangelical Christian environmentalists pitted against New Age environmentalists—each using their own theology to realign the world’s believers in support of the environmental cause.



Wild Card: A New God?

Even as fundamentalists of all stripes flex their angry muscles, is there a profound surprise awaiting us on the religious horizon? For this forecast, **Sam Harris**, author of *The End of Faith: Religion, Terror, and the Future of Reason*, joins us as we consider whether perhaps the most important religion of this century is one that either doesn’t yet exist or is too small today to be noticed—and whether a new God may be lurking in our collective future.

—Paul Saffo

LOCAL INTERESTS: NEW BLUEPRINTS FOR PLACE

Ironically, in the globalized world, everything is also ultimately local, and a new appreciation of local interests will refocus strategies for everything from urban planning and science to global political alliances. In particular, pay close attention to a host of social cities, largely unnoticed today. While global megacities will serve as centers for the concentration of wealth (and poverty), many lesser metropolises with well-developed social infrastructures and decentralized governance structures will enjoy an adaptive advantage—and perhaps an unexpected political voice in the coming decades.



Urbanization: Social Cities

In the face of growing urbanization, what advantages do stability and a strong social infrastructure confer on cities—and which cities will enjoy these advantages in the coming decades? With insights from former vice-mayor of Seoul, **Hong-Bin Kang**, this forecast identifies clusters of social cities of the future.

—**Mani Pande, Kathi Vian & Anthony Townsend**

Pay attention, too, to the new role of science in revitalizing lagging neighborhoods and boosting the local economy and innovation quotient of unexpected regions worldwide. Refining the efforts of the 1990s to implement large-scale regional innovation initiatives, new alliances of urban developers, start-up companies, universities, and venture firms are now integrating science centers into urban areas. The result will be a rich cocktail of talent, resources, and markets that will brand places for particular kinds of science and technology. And such regions may be strong attractors for a new class of women immigrants—well-educated, independent, and seeking culturally rich experiences as well as entrepreneurial opportunities.



Science: Innovation in the City

As science moves out of sequestered research parks and into urban neighborhoods, how will the practice of R&D shift? Looking at science development as a partner in urban development, MIT's Senior Lecturer in the School of Architecture and Planning **Michael Joroff** contributes to this forecast on the new real estate and research strategies that are changing the shape of science.

—**Alex Soojung-Kim Pang & Anthony Townsend**



Demographics: Women on the Move

With women outnumbering men as immigrants to developed countries, how will the face of global migration change? For this forecast, **Mani Pande**, a research manager recently immigrated from India, reflects on both her own experiences and the changing profile of women migrants to understand where future immigrants will come from and what they will be seeking.

—**Mani Pande**

Finally, the relentless interfingering of cyberspace and the physical world may cause the very notion of cyberspace to be tossed in the dustbin of 20th-century history. The undifferentiated and untethered virtual world will become increasingly anchored to particular places, less a separate space and more a new dimension of the familiar physical world. It's a dimension whose impact we are only beginning to understand.



Technology: The End of Cyberspace

Over the coming decade, as the material, geographic, and social qualities of information come to the fore, will the metaphor of cyberspace cease to inspire our notions of work and play, reality and illusion? With help from **William Mitchell** of MIT's Media Arts and Sciences program, this forecast probes the past and future of this compelling concept.

—**Alex Soojung-Kim Pang**



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124 University Avenue, 2nd Floor | Palo Alto, CA 94301

t 650-854-6322 f 650-854-7850 www.iftf.org

THE TEN-YEAR FORECAST TEAM

Kathi Vian Program Director

Stephanie Schachter Program Manager

Maureen Davis Managing Editor

Lyn Jeffery Asia

Mani Pande Sociology & Statistical Analysis

Alex Soojung-Kim Pang Science & Technology

Paul Saffo Senior Forecaster & Roy Amara Fellow

Andrea Saveri Cooperative Strategy

Jason Tester Artifacts from the Future

Jean Hagan Creative Direction & Design

Robin Bogott & Karin Lubeck Design & Layout

Robin Kerns Editing

Sean Ness Business Development

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FORESIGHT TO INSIGHT TO ACTION

We look forward to working with you in the coming year to turn these foresights into insights and actions for your organization.

For more information, contact Sean Ness at sness@iftf.org.



ECONOMICS: OPEN SCALE

The scales of economy are shifting. In *The Cathedral and the Bazaar*, Eric Raymond claimed that, “the closed-source world cannot win an evolutionary arms race with open-source communities that can put orders of magnitude more skilled time into a problem.” It’s an assertion that challenges the traditional understanding of collective action—as well as traditional views of how to organize global economic production. Yet over the next few decades, this viewpoint will fundamentally change organizational strategy—and perhaps the nature of human organizations.

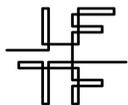


Economies of scale
that used to favor large
centralized institutions
will now favor
widely decentralized
networks—and
overturn conventional
organizational wisdom

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CHANGING THRESHOLDS: THE SHARE OF THE LABOR POOL

Mancur Olson gave us our traditional understanding of the problem of collective action: that only small groups can take advantage of the social mechanisms necessary for successful collective production. Yet the open-source software community has performed *de facto* what should not be possible *de jure*. This success suggests that some new factor has recently emerged to enable large-scale decentralized cooperation, overcoming obstacles to collective action and cooperation. That factor is arguably connective technology—but how, specifically, does it hand an advantage to open groups?

One answer to this question is that it changes the size of the labor pool—and the ability to dominate the market is directly related to the proportion of the labor pool a group or institution can capture. As the size of the labor pool goes up, the share of the labor pool within any closed institution goes down. And when the share inside the walls of the closed institution reaches a critical threshold, it can no longer compete with open processes. But how does connective technology change the size of the labor pool?

CHANGING RELATIONSHIPS: USERS AND GROUPS OF USERS

In an information economy, where the competitive value of products derives from information and ideas, the logic of *producers versus consumers* is replaced by the logic of *users*, who function as both. As Yochai Benkler explains, technology “now makes possible the attainment of decentralization and democrati-

zation by enabling small groups of constituents and individuals to become users—participants in the production of their information environment.” Thus, as the market for information-based products grows, so does the labor pool.

At the same time, connective technologies support the aggregation of self-interested groups of users who can take advantage of their small scale to meet their local needs more effectively than the larger institutions that are bound to focus on a few needs of the broadest markets. Thus the open process enjoys the advantages of both large and small scale.

CHANGING INSTITUTIONS: THE PRACTICE OF INDIRECT RECIPROCITY

If open processes represent the institutional future of humanity, what will be the key levers for fine-tuning these new organizational forms?

Certainly, many tools and practices of cooperation will be key. But perhaps these future forms will be defined, as much as anything, by a refined strategy of indirect reciprocity—the willingness to give to someone who may then give to someone else. Martin Nowak and Karl Sigmund suggest that the evolution of cooperation by indirect reciprocity leads to reputation building, morality judgment, and complex social interactions with ever-increasing cognitive demands. These may well be the critical domains of future organizational theory.

—Paul Hartzog



Q | There are probably many ways to think about what's happening in the economy as open systems and processes begin to make strong inroads. You've been talking a lot lately about the significance of groups. Why are they suddenly more important? And how does this recognition help us think about the big economic picture?

It seems like a throw-away idea, but they're more important because of the Internet. Group value can now be created outside of institutional frameworks. This is a big systemic change. Meetup Moms can now meet beyond their kaffee klatches. Howard Dean can raise gobs of money. We all know these stories.

Sector by sector, there are different ways to try to understand the impact of openness. But escaping the institutional dilemma is the common characteristic across sectors. The dilemma is this: it takes resources to manage resources in an institutional framework. Remember Yochai Benkler's paper on collaborative production? The firm uses its ability to coordinate its employees to reduce the friction of the market.

But if you only get the transactions you can justify, you keep making 80/20 substitutions all over the place. In employees. In products. The question around 80/20 substitutions, though, is: why are you giving up a fifth of the value? If the design of the system makes it so expensive to reach those people, then you should redesign the system.

In most systems of distributed production, you have the power law distribution: a handful of people do an enormous amount of work, and most do only a little bit. Microsoft's Steve Balmer uses this fact to critique Linux. He says most of the work was done by a handful of programmers. Most participants have added only one patch each. From the perspective of a big institution like Microsoft that is paying salaries and benefits for hundreds of programmers, that's a terrible model. But Linux folks don't care. The delta between what institutions care about and what open-source groups are capable of is to take contributions from everybody without regard to 80/20 considerations.

Q | Are big institutions at risk in this environment? Are entire sectors at risk?

Institutions have overhead not only in things like salaries and benefits, but in their processes and even their identities. If a single person has an informative photo that you want to use, you don't have to worry about whether they're a quali-

fied photographer or have a professional publishing outlet to make the decision to use that photo. But an institution has the overhead of maintaining the professional identity. They suffer doubly: their open competitors aren't forced to use conventional economics *and* they don't have to refuse contributions at the margin.

Everyone who is in a profession immediately inherits from that environment the story of why that profession is part of life itself. "The world won't function without librarians." Institutions are quick to recognize threats from other institutions. Newspapers all spilled their coffee the day that *USA Today* launched. They were galvanized. When weblogs came along, though, they couldn't even see them for years; they literally couldn't recognize them as a threat.

Seeing that threat requires you to see that your institution is an accident. Journalism is not a first-order aspect of society. Journalists can't even ask the question: are bloggers journalists? It isn't a valid question at all.

The current threat is not that old institutions are lined up against new ones. It's that the old ones are lined up against a new ecosystem. Each weblog is a teeny tiny competitor to the media. Even the largest are puny, but it is the ecosystem that threatens. The same is true for Microsoft. The presence of an ecosystem that produces code is a threat.

Institutions are victims of their own monopolies, whether a corporate monopoly or the monopoly of a profession. Monopolies are insects; they're exoskeletal. When AT&T said they were becoming competitive, they just vanished. Anyone who has a circumstantial monopoly is screwed because today's engineering is breaching the exoskeleton, and there's no alternate source of value. Scarcity is the only thing keeping those big monopolies going.

I was talking recently with Charlie Leadbetter in the United Kingdom about Benkler's paper "Sharing Nicely." I asked, "Are you predicting that these new modes of production take over everything?" He said, no, you can see how you might want qualified engineers to design your nuclear containment environments. Then he stopped himself and said he thought there were even pieces of that you could strip out and do differently.

Q | A lot of discussion has focused on how far open systems can extend beyond the software world and what other sectors might be especially vulnerable. How would you describe who's most vulnerable?

We're not really talking about who this affects or doesn't. We're playing for all the marbles. Everything is on the table, especially if it has an information component and involves a group.

Take Meetup's most active group—the stay-at-home moms. In the center of the United States, where work has become the new center of activity, stay-at-home moms are more isolated than ever before. They turn to this software because it solves a coordination problem.

The noneconomic nature of production of previously economic items is starting to get attention now. The production of noneconomic goods, like social capital, is important, too. The open-source story has been told through a business lens. The frame is: Linus, an upstart, challenges Microsoft. But the big story here is that stay-at-home moms create missing social capital using these tools. It's not a business story, but the effects may be larger in economic terms—like the suburbanization of America.

There may be a major economic shift here without economic products. There may be important new goods not created by a market economy. These lack the normal framing.

Q | So what should we be looking for if we want to understand the economic impacts of openness?

Look at what Christopher Alexander proposed—the pattern languages. Look for new pattern languages for peer production. For example, graduate students are looking for credit, so the non-anointed nature of the peer-to-peer effort is a provocation, and openness will sort in favor of those who have the most radical acceptance of the basic proposition. This is the underlying pattern.

Ultimately, if you want to understand this, you need to frame it as a social issue with economic ramifications. Keep your eye on the social changes that have economic effects even though they aren't themselves economic.



Jerry Michalski, IFTF Research Affiliate, asked Clay to consider the macroeconomic effects of openness.

COMPARING OPEN AND CLOSED STRATEGIES: AN AGENT-BASED MODEL

Agent-based models are increasingly used as tools for investigating phenomena that are not well understood. Paul B. Hartzog¹ has created such a model to explore the dynamics of open versus closed systems, specifically in the realm of software development.

The model is organized around a cycle of software production in which development leads to quality, quality leads to use, and use leads to further development. At each step in the model, agents (which you can think of as users) can learn about available software from their neighbors or discover it on their own. They can compare open and closed versions of the software for a given software slot (which you can think of as a type of software); they then make an adoption decision based on an adoption threshold.

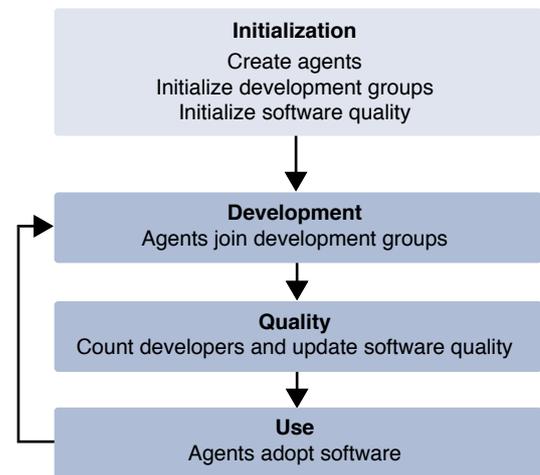
Agents each have an assigned adoption threshold at which they will adopt an open version of a software type. The threshold is compared to a quality difference between the closed and open versions of the software, which acts as a proxy for the “costs of switching” and varies from agent to agent. Because the threshold can be either negative or positive, it can simulate both early adopters who will switch even if the open software is not yet as good as the closed version, as well as loyalists who will not switch until it is markedly better. Agents also have different development thresholds that affect how likely they are to join the open software development group.

Software use in the population increases the number of developers available to that particular software group. Because centralized development incurs both material and contractual property costs per developer while decentralized development does not—open-source developers use their own equipment and their own donated time—a parameter is used to regulate the number of developers each closed development group can support, and the mechanism serves to constrain the total size of closed development groups.

Four key parameters were varied during the run of the model:

- Connectivity of the population varied from 0 to 100%
- Number of agents (a function of connectivity) varied from 0 to 441
- Closed developer share varied from 1% to 9%
- Initial advantage for closed software quality

1 How the Model Represents the Cycle of Development and Use



Source: Paul B. Hartzog, 2005.

¹ Paul B. Hartzog is an IGERT Fellow at the Center for the Study of Complex Systems, University of Michigan. He is a member of IFTF's Future Commons and has been an active participant in our research on cooperation during the last two years.

DETAILS

MORE CONNECTIVITY MEANS MORE OPENNESS

The model results suggest that as the connectivity increases, the likelihood of all the agents converging on open development for all the software increases.

Specifically, as connectivity increases from 33% to 100%, the percentage of runs that converge on open solutions increases from 20% to 60%. In addition, with greater connectivity, the models converge more rapidly on the open solution—taking an average of 808 steps to converge at 33% but drop to an average of 301 steps at 50% and 151 steps at 100%.

THE PATH OF CONVERGENCE: OPEN WINS

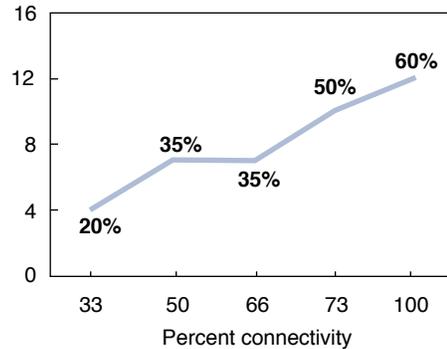
When the model runs converge on an open solution, the path toward convergence follows a typical pattern. Due to the initial advantages enjoyed by closed software—higher quality and more developers—adoption of closed software almost totally converges in the population during the first step. However, when the closed software groups are not able to maintain enough developers to outpace the spread of open development in subsequent runs, the closed software eventually falls behind while its open counterparts rise to success.

THE PATH OF DIVERGENCE: A MIXED WORLD

If the closed systems can capture enough developers early on, the model converges on either a closed solution or a mix of open and closed. In the latter case, adoption of closed software almost totally converges during the first step. As the runs progress, only some of the open development groups are able to acquire enough developers to produce software of high enough quality to compete with the closed counterpart.

2 Increase in Convergence to Openness as Connectivity Increases

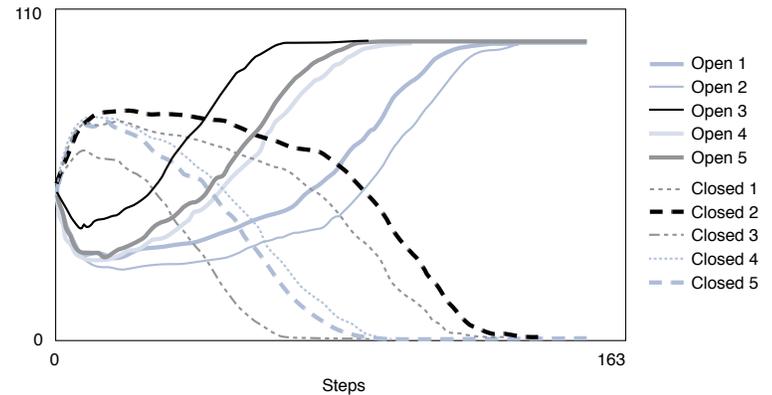
Number of runs in which open source won



As connectivity increases, the percent of runs that converge on open-source solutions increases.

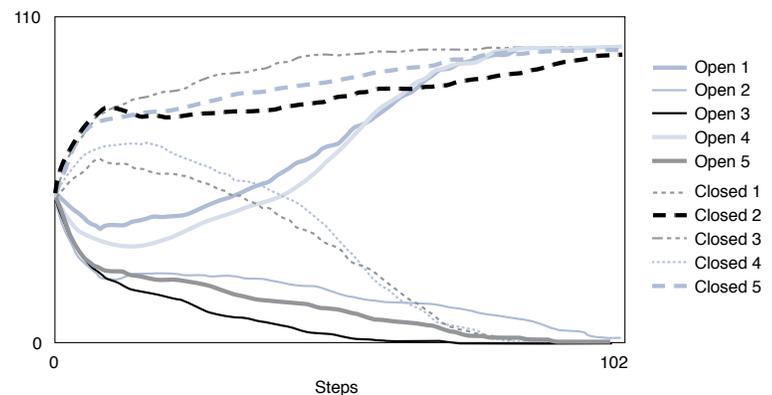
Source: Paul B. Harzog, 2005.

3 A Typical Run That Ends in Convergence on Open Software



Source: Paul B. Harzog, 2005.

4 A Typical Run That Ends in Divergence



Source: Paul B. Harzog, 2005.



FEWER CLOSED DEVELOPERS MEAN FASTER WINS FOR OPENNESS

In the real world, closed software projects can't capture large numbers of developers due to material costs, costs of coordination, and other barriers that centralized production faces. The model uses a variable closed developer share as a proxy for these barriers. Because the costs are variable, exploring this parameter exposes a sweet spot at which competition between open and closed software is possible. Outside that sweet spot, either open or closed software will dominate the entire space.

In the model runs, when closed groups are able to capture only 5% or less of the developers, the model always converges on an open software world. When closed groups are able to capture 8% or more, closed worlds result. At 6% or 7%, the software environment is a mix of open and closed.

THE QUALITY BAR FOR OPENNESS

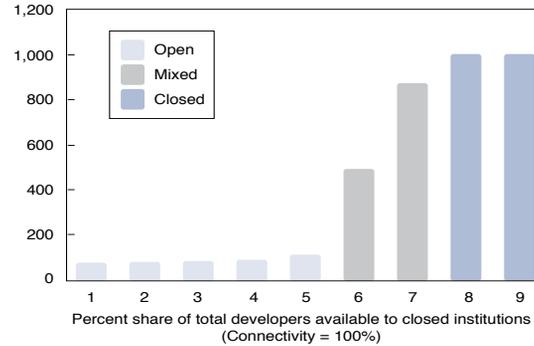
In the course of any model run, the quality difference between closed and open software changes as closed or open groups capture more of the developers. The model shows that the quality bar for open software is much higher than the quality bar for closed software. Even though individual agents can choose to switch from closed to open at any time—as long as the open version is within their adoption threshold—the open quality has to be much higher than the closed quality before all agents switch to using the open version in all five software slots.

WHEN OPEN QUALITY WINS

In model runs where all the agents converge on open software, there is a marked divergence between open and closed quality. Closed quality is initially higher, but once it is surpassed by the quality of the open software, the closed development community is unable to support its developers. The loss of development becomes a positive feedback loop that causes further loss of developers and a rapid leveling off of the quality of each closed software offering.

5 The Impact of Closed Developer Share on Speed of Convergence

Number of steps required to converge on a solution

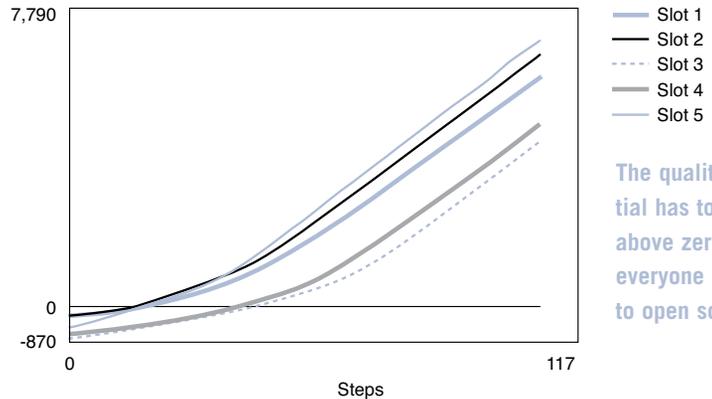


When the maximum closed developer share is 6%–7%, open and closed software compete for a longer period of time before converging on one or the other.

Source: Paul B. Harzog, 2005.

6 The Difference in Software Quality Over the Course of the Model Run

Difference

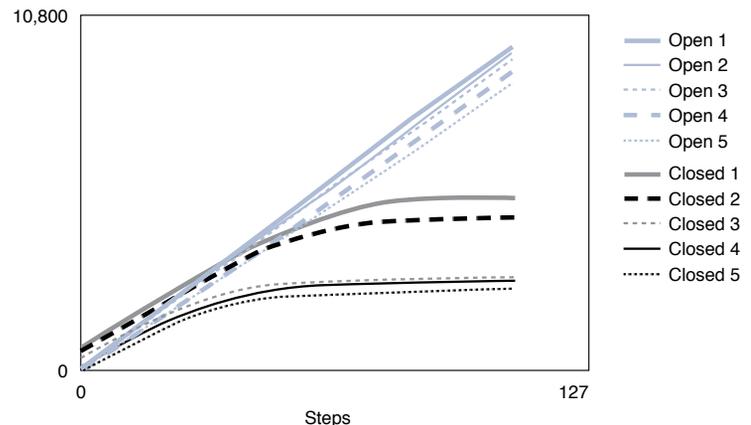


The quality differential has to rise well above zero before everyone switches to open software.

Source: Paul B. Harzog, 2005.

7 The Quality Curves for Open and Closed Software

Quality



Source: Paul B. Harzog, 2005.

STRATEGIC CHOICES

This model suggests that centralized hierarchies should not be too rudely rejected, but should be seen as effective methods of production during specific periods when connectivity is low. Only as technology makes cooperation among large numbers of people possible does decentralization become a feasible alternative.

Robert Axelrod and Michael Cohen suggest in *Harnessing Complexity* that because complexity is “rooted in patterns of interaction among agents, then we might expect systems to exhibit increasingly complex dynamics when changes occur that intensify interaction among their elements ... reducing the barriers to interaction among processes that were previously isolated from each other in time or space.”

In short, because closed groups have to support their developers and open groups do not, open groups can diffuse to very large numbers. As a result, the closed groups cannot leverage the value of large-scale cooperation in the way that open groups can.

Closed groups can make two key strategic choices to improve their competitiveness vis-à-vis open groups.

Make Closed Groups More Like Open Groups

A clear implication of the model, perhaps the clearest, is that closed development groups should take advantage of the things that make open development successful. This means becoming more like the open groups. However, if closed groups become more like open groups, then would they really be closed groups anymore?

The answer is: it depends. In an attempt to leverage the benefits of volunteer labor, Google engineers can take up to 20% of their time to work on any project they want, achieving a kind of internal openness without losing their closed-firm boundary. However, regardless of whether closed development processes change into or are replaced by more open development processes, the production environment as a whole trends toward more open cooperation. This is achieved via selection against development groups themselves as well as selection against the strategies enacted by those groups.

Capture an Initial Advantage

Another possibility is for closed development groups to continually capture an initial advantage on a round-by-round or software-by-software basis. They can do so by letting go at the top, the point where the open version is beginning to become competitive, and release the closed version into the open. This was Kevin Kelley’s advice when he advocated “abandoning the highly successful in order to escape from its eventual obsolescence.” This suggestion has been employed in the economy. Netscape, concerned over the loss of adoption of its browser, opened its code to the community. IBM followed with some of its products. The lesson is that by becoming more open, a development group can gain a community of interest that will participate in the creation of new value.

To Run

- 1) if all agents are using open software in all five slots
 - a) **stop**
- 2) if the run reaches 1000 steps
 - a) **stop**
- 3) agents **do**
 - a) adopt software
 - i) agent randomly **selects** one of the five software slots
 - (1) if any neighbors have a version of the software different than the agent’s own, e.g. open or closed version **then**
 - (a) if the quality difference between the two software versions is within the agent’s open adoption threshold **then** adopt the open software, assigning the a 1 to that software slot
 - (2) if a random number between 1 and 100 is less than the software discovery rate parameter 5% **then**
 - (1) if the quality difference between the software versions is within the agent’s open adoption threshold **then** adopt the open software, assigning the a 1 to that software slot
 - b) join closed development
 - i) agent randomly **selects** one of the five software slots
 - (1) if the agent is not already developing that group **then**
 - (a) if the percentage of developers in the group for that software is less than the closed adoption development rate
 - (i) if a random number between 1 and 100 is less than the job change rate of 1% **then** join the development group
 - c) join open development
 - i) agent randomly **selects** one of the five software slots
 - (1) if the agent is not already developing that group **then**
 - (a) if any neighbors are in that development group **then**



OPEN SCALE: MONDAY MORNING

Orange is an open movie project that uses open-source Blender 3D graphics tools with a community of over a million users.



STRATEGIC PLANNING: Identify key thresholds for open systems

In *Toward a New Literacy of Cooperative Strategy in Business* (SR-851A), IFTF identified seven key “tuning levers” for improving cooperation within large systems. One of these was thresholds. The agent-based model of open systems presented here has identified two crude thresholds for the success of open versus closed systems: connectivity (with a critical threshold between 50% and 75% connectivity) and share of the developer population that an institution can capture (with a critical threshold at a 6–7% share).

A next step would be to refine these thresholds using more complex representations of both connectivity and closed developer share. But it would also be strategically useful to identify other potential thresholds that drive the success or failure of open systems. For example, taking a cue from Nowak and Sigmund on indirect reciprocity, we might test thresholds of reputation building, morality judgment, complexity of social interactions, and level of cognitive demand. These thresholds could translate into critical strategic initiatives for both closed and open systems.



TECHNOLOGY & DESIGN: Cultivate design to shape organizational practice

One of the key lessons of openness is the role that technology has to play at both the macro level—overall connectivity—and the micro level, where specific tool designs influence the social behavior of users. In fact, in widely distributed open systems, technology may well take the place of the manager, setting in place the structural environment in which individuals, groups, institutions, and even states may succeed or fail.

For technology designers, this new social–managerial role of our tools demands a much more sophisticated understanding of interaction design. Technologies of cooperation are those that focus on solving some of the key problems of collective action, including things like reputation building. In this sense, tool design moves from a focus on individual productivity and ease of use to a much more strategic role in understanding how to support cooperative group behaviors. This is undoubtedly the frontier of technological design.



COMMUNITY/POLICY: Model a larger “sharing economy”

It would be well worth the effort to extend the basic concepts of the model presented here to something other than producing software—or any single type of product. While pharmaceuticals, media, telecommunications, and perhaps even basic infrastructure goods such as power and transportation might converge on open practices in the future, there is a larger macroeconomic framework for openness.

Scholars like Eric Raymond argue that the openness community is a “gift culture” that threatens the capitalist world economy. Howard Rheingold suggests that open source refers not just to the software but also to a method for developing it and perhaps more importantly, a method for maintaining a “public good.” Yochai Benkler defines a class of shareable goods that are analogous to labor and information sharing in commons-based peer production. We should certainly attempt to understand such challenges before the economy as a whole is beset by the transformations it has thus far ignored.



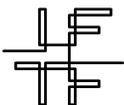
INFRASTRUCTURE: LIGHTWEIGHT NETWORKS

From the molecular level to the macroeconomic level, our global infrastructure is rapidly shifting to networks of smaller, smarter, more independent components. Such systems can be organized in more efficient, more flexible, and more secure ways than the capital-intensive, centrally planned and managed networks of the last century. As these lightweight infrastructures come online, they may be able to boost emerging economies, mitigate the environmental impacts of rapid global urbanization, and offer alternate paths to economies of scale.



Distributed intelligence and new materials will create a new kind of infrastructure—with new ways to organize people, services, and wealth

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SHIFTING SCALES: THE NEW GEOGRAPHY OF NETWORKS

During the 20th century, large public infrastructure networks drove global economic growth. With huge capital investments, long construction cycles, and centrally managed plants, these networks were a force for stability as well as for the creation of wealth. Over the next ten years, however, infrastructure design will emphasize innovation and expansion of smart, small plants based on new materials. Advances in sensing and nanomaterials, plus intelligent distribution networks, will drive down the minimum size requirements for safe and efficient components across the entire range of modern infrastructures. These lightweight networks will process materials and services closer to their point of production or distribution, reducing the inefficiencies of transmitting resources over large distances to their end users.

They will also reshape both the developed and developing world. In industrialized regions, lightweight systems will provide a solution to NIMBYism (not in my backyard), offering more benign methods to expand capacity. In developing regions, they will help maintain economic growth while leapfrogging a century's worth of dirty, heavy industrial development. For developing countries already debt-saddled from mismanaged infrastructural megaprojects of the late 20th century, incremental deployment of lightweight systems may be the only way forward.

SHIFTING STRATEGIES: CANNIBALIZATION OF LEGACY NETWORKS

The next decade will repeatedly witness the cannibalization of existing “heavy” infrastructures by their distributed offspring. The Internet was initially deployed as a service running over the landlines of the telephone network. Yet, in less than a decade, it commandeered most of the resources of that system, restructured them according to distributed principles, and now provides the same services more efficiently and flexibly. Today, lightweight technologies threaten to reshape the topology of other legacy infrastructures in transportation, telecommunications, power, and water.

SHIFTING SUPPLY AND DEMAND: THE GLOBAL MARKET FOR MOVEMENT

Over the next decade, many of the routine transactions that drive the movement of money and material in the global economy will be negotiated and executed by artificially intelligent agents. At the same time, logistics systems will become increasingly context-aware, enabling more rapid and efficient reactions to shifts in supply, consumption, and disruption. As these two global economic infrastructures—transactions and logistics—are woven together, they will merge to create a single global market for movement, in which competing fleets of artificially intelligent agents optimize the allocation of material resources across the globe based on who is willing to pay for what, where, and when. The result is likely to be a lightweight system of commerce that can redirect flows of resources instantly, with minimal waste.

—Anthony Townsend & Kathi Vian



INTERVIEW: NICHOLAS NEGROPONTE

Nicholas sees lightweight computing—the \$100 laptop—as the path to a world with “one laptop per child.”

Q | Back in the 1990s, Newt Gingrich proposed a tax credit for America’s poor to buy laptops. Many critics saw it as a “quick fix” policy that ignored all the other investments needed to realize the benefits of information technology. A similar proposal at the 2000 G8 Summit provoked one leading third-world advocate to say “the poorest people in the world cannot eat laptops.” What’s different about your proposed \$100 laptop?

There are many things you cannot eat, including schools, Band Aids, and shoes. But no matter what large global problem you pose—peace, poverty, hunger, environment—the solution includes education. In fact, any solution without it is not a solution at all. This is not a laptop project. It is an education project.

So what is wrong with education? While ours can do with improvement, it is one of the best in the world, perhaps the best (but that is a longer story about innovation versus rote learning). In poor countries, especially in rural areas, the teachers are not very good; in some cases, they only have a sixth-grade education themselves. At best, they may sing songs and do recitations. By contrast, the children are just as curious and intelligent (with the possible exception of those that are malnourished) as kids the same age in rich countries. So the key is to leverage the children, by having more self-learning, more peer-to-peer teaching, and more opportunity for exploration.

Newt was right.

Q | What impact do you think the \$100 laptop might have in developing countries over the next ten years? Are there specific social or economic goals that you hope to achieve with increased access to computation?

This is not about access to computation. It’s about access to “pencils.”

I am most fond of Seymour Papert’s story of a fictitious culture that existed in oral form only. All of a sudden one day, somebody invents writing. One intrepid leader steps forward and says, “let’s put a pencil in each class.” Another says, “let’s put 20 pencils in one special room and call it a Pencil Lab.” The moral of this story is that the computer provides a new window and a tool for children to learn how to learn. Sadly, most educational systems that recognize the important need for computers meet that need with a roomful of desktops, to which a child might go for a few hours per week.

Computing should be like a pencil, where you have your own (versus community pencils) and use it for all kinds of purposes related to school, home, work, and play. This model of computing calls for a lightweight, full-screen, full-color, fully connected laptop. We want to have every child own one.

Solving problems of poverty, peace, or the environment will require developments in primary and secondary education on a scale inconceivable without the use of powerful knowledge technologies like those that have transformed all other sectors of our society. To date, however, cost has been a barrier. At first, the problem was connectivity; now it is computers.

Q | How will the \$100 laptop change education in places like Cambodia and Brazil?

There will be a great deal more learning by doing. We all learn how to walk and talk by interacting with the world and people around us, motivated by what it gets us. Suddenly, at about the age of six, we are told to stop learning that way, and to do most of our learning for the next 12 years by being told (by books or teachers). The most general change occurring because of computers is that those two forms of learning will become more seamless, and more of what we do in the first six years will happen in the next 12. We sometimes call this “learning learning.”

This will be true in Cambodia and Connecticut, Brazil, and Belgium.

Q | What is the “killer app” for the \$100 laptop?

The software package we’ve provided is a tiny Linux core, a Web browser, and a cartload of constructionist tools. But remember that this laptop is a sunlight-readable eBook as well, which turns it into something of a Trojan horse. The economics of textbooks is such that we can justify the whole cost in many countries, amortized over five years. This is reminiscent of how Minitel in France was largely paid for just through the cost savings of replacing printed telephone books with electronic directories.

But it’s hard to tell what these devices will be used for. In some of our past experiments in Cambodia, at night children took the laptops home, where they and their families exploited the machines for every imaginable use—from tracking a favorite soccer team’s fortunes to researching the rice market and providing the brightest light source in the house. These kids’ first English word was “Google.”

NICHOLAS NEGROPONTE is the co-founder of the MIT Media Lab. His most recent effort, the One Laptop per Child Project, seeks to develop a sub-\$100 laptop for children in the developing world.

Q | What about Internet access?

The laptops are designed to form ad hoc mesh networks, so they will all be connecting to each other all the time and sharing network connections. All of the communities will also connect to the Internet backbone and are working with carriers, satellite providers, and others to make sure this is true everywhere—even if 200 kids have to share 2 megabits. But there will also be a LAN aspect: many schools will have servers, and the kids will no doubt be swapping all kinds of messages and files among themselves.

Q | Where will people turn for technical support or repairs in poor, remote areas?

The most important form of technical support and maintenance is ownership. The kids must own these computers and not be expected to give them back any more than they do shoes, uniforms, books, or for that matter, lunch.

Why is ownership important? Have you ever washed a rented car? Need I say more?

As for technical support beyond “tender love and care,” the kids will handle it just fine.

Q | What’s your greatest hope for this project?

To realize it. There are more than 1 billion poor children out there with no access to essential tools for learning.



The proposed \$100 laptop from MIT's Media Lab.



Anthony Townsend, Research Director at IFTF, asked Nicholas how lightweight computing tools might change the prospects for developing countries.

THE TELEPHONE NETWORK GETS CANNIBALIZED

In the late 1990s, two new technologies transformed the global telephone network by cannibalizing its core functions.

First, mobile telephones provided a vastly superior end-user interface to fixed terminals and wired last-mile connections. By 2003, the number of fixed telephone lines in industrialized world peaked and began to decline.

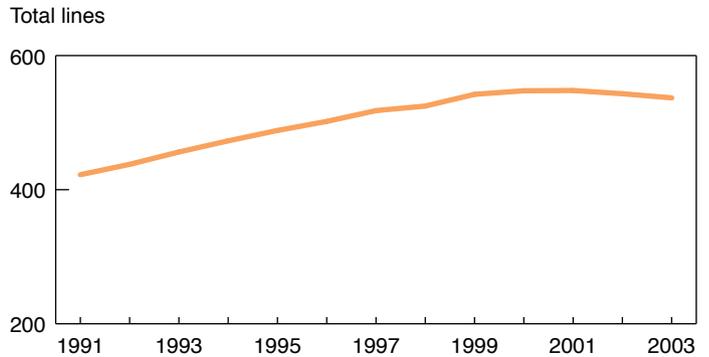
At the same time, the Internet consumed the long-haul trunk lines of the telephone system from within. The Internet began in the early 1990s as a data-communications application running over leased phone lines, consuming a negligible portion of that system's capacity. By 2000, the Internet's popularity had driven the investment of tens of billions of dollars in optical upgrades to regional, national, and intercontinental backbone networks. By 2003, data traffic on public networks exceeded voice traffic by a factor of ten.

This network cannibalism is likely to repeat itself in the future, continuously disrupting existing infrastructures through the rapid diffusion of lightweight infrastructures within them.

VOIP DISRUPTS TELEPHONY

Voice communication over the Internet (VoIP) illustrates the way that lightweight infrastructures can disrupt the well-established players and business models in a major industry sector. Long-distance telephone service has evolved a complex set of tariff conventions and service relationships among national and regional carriers and service providers. But with VoIP, distance, length of call, and even number of callers become irrelevant. So service models and revenue streams based on these criteria can be expected to shift significantly. In addition, service is decoupled from network access, opening the field to many new kinds of service providers.

1 The Telephone System Has Peaked



Source: Organization for Economic Co-operation Development, *Communications Outlook 2003*.

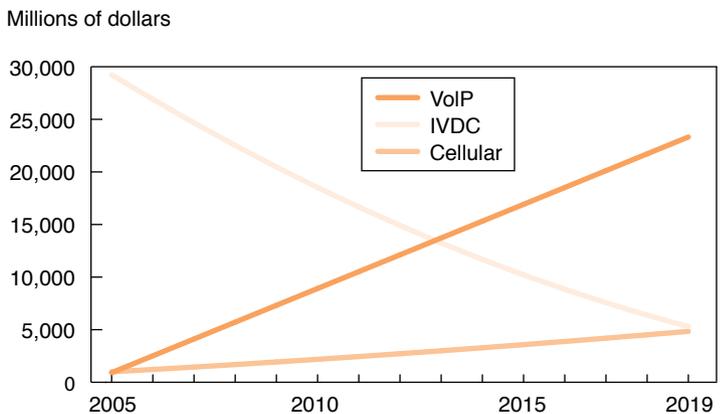
2 Cannibalizing Lightweight Network Node



The StarSight streetlamp, developed for initial deployment in Cameroon, combines a streetlight with solar panel, wireless network (Wi-Fi or Wi-Max), remote management, local network access, and hookups for charging small devices.

Source: Worldchanging, 2005; www.worldchanging.com/archives/003779.html.

3 Revenues for Voice Services in the United States



Source: Martha Garcia-Murillo and Lee W. McKnight, *Internet Telephony: Effects on the Universal Service Program in the United States*, 2005.

DETAILS

THE NEW MASS TRANSIT: ON DEMAND AND INTELLIGENT

Early on, automobiles were tools of distributed mobility, fundamentally reshaping the geography of human settlements. Today, they are a source of congestion in densely populated areas and growth of megacities. Thus, in recent decades, transportation planners have returned to advocating increased reliance on highly centralized, capital-intensive mass-transit technologies like rail and bus to alleviate urban roadway congestion.

However, new technologies will offer opportunities to combine the advantages of automobile travel—on-demand, door-to-door mobility—with the economies and congestion-reducing capabilities of mass transit. One highly compelling vision for a distributed transportation system recently emerged from the Mobilicity project based at the Royal College of Art in London. Mobilicity (www.mobilicity.com) calls for the development of automated, driverless 16–24 seat coaches that can be summoned on demand by passengers; they then link up to maximize roadway capacity on longer legs of the journey.

ON-DEMAND AIR TRAVEL, TOO

In 2006, DayJet Corporation will introduce a novel on-demand small-jet service for regional day trips. Priced competitively with commercial flights, it is novel because it replaces the traditional hub-and-spoke strategy of commercial airlines with agent-based software scheduling that finds the fastest service between two points, assuming small fleets of available jets in its service cities, modeled after rental car operations.

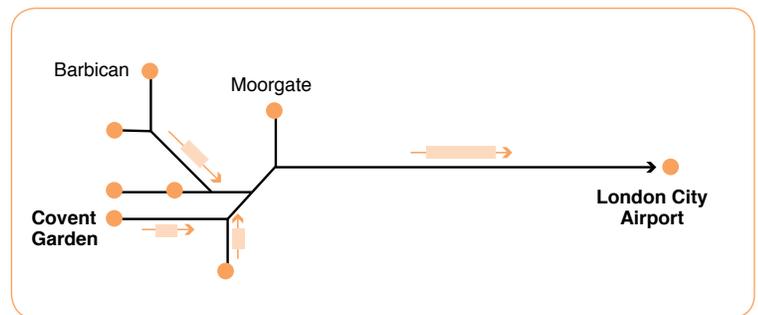
The key to the innovation is the software, which runs on a 40-processor supercomputer. Its goal is to move the jets from city to city in the most efficient pattern based on the current status of customer requests—and to adjust costs in real time to provide the best service for the lowest cost. The target time to solve this problem is five seconds.

Indeed, intelligence will be a critical factor in many of the lightweight solutions to infrastructure problems over the next couple decades.

4 Future Concept: On-Demand Transit in London



Small, lightweight, driverless coaches respond to on-demand calls and then link up locally to form a train for efficient cross-city travel in this 2025 scenario.



Source: *Mobilicity Project Report*, Royal College of London, 2004, www.mobilicity.org/downloads/The-mobilicity-Report.pdf.

5 DayJet to Offer Competitively Priced On-Demand Jet Service



Source: DayJet Corporation, www.dayjet.com, 2005.



THE MARKET FOR DISTRIBUTED POWER GENERATION

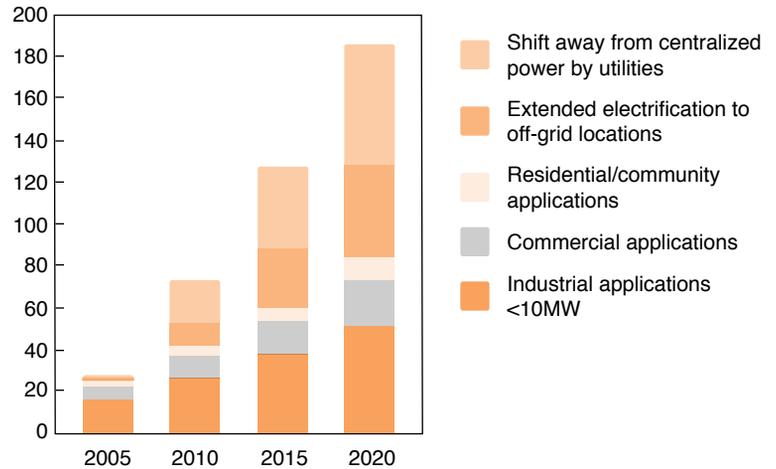
Electrical power production remained the most centralized of the major networked systems in the 20th century, as convenient power storage remains a major obstacle to distributed power. However, over the next 15 years, several major technology trends indicate that distributed power generation will reshape the power grid from the inside out. Beginning in industrial plants and later appearing in commercial and residential venues, global demand for distributed generation is projected to exceed 180 gigawatts. While this represents a tiny fraction of the world's total power consumption (some 803 terawatt hours in June 2005 alone), it will begin the transformation of the power grid from a unidirectional flow to a bidirectional flow, where consumers play an increasingly important role in stabilizing and supplying power to the grid.

LIGHTWEIGHT URBAN RENEWAL

The kind of off-the-grid “appropriate” technologies that latter-day homesteaders were experimenting with in the 1970s are finally beginning to appear feasible for large-scale urban neighborhoods. For example, Portland, Oregon, is undertaking the redevelopment of an old 35-block freeway neighborhood to create 8 million square feet of office and residential space using a variety of so-called green technologies to expand capacity while reducing the ecological footprint. Among the technologies are bioswales to collect rainwater and recharge the groundwater; graywater systems alongside potable water systems; photovoltaics and wind turbines to supplement power; and an underground thermal loop for heating requirements. The plan is part of a larger Portland plan to provide off-the-grid independence for disaster preparedness. Promoters say it will reduce energy and water consumption to the equivalent of a patch of native Northwest forest.

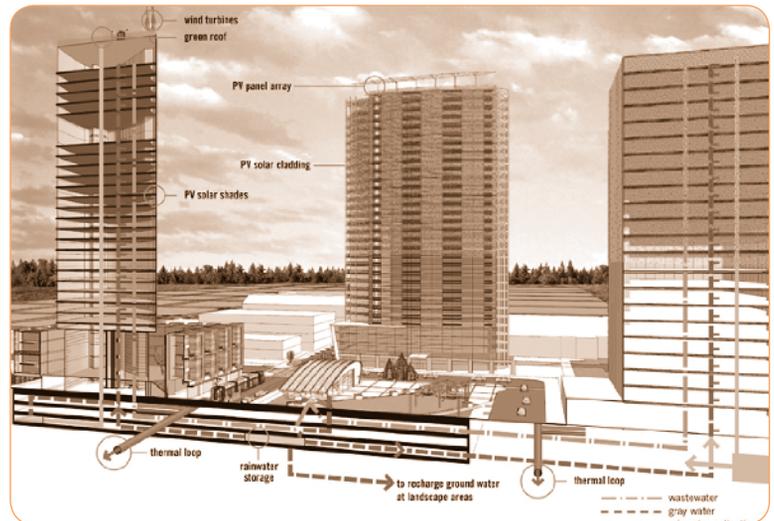
6 The Global Market for Distributed Power Generation

Capacity (GW)



Source: Aurilio Bauen, Imperial College, www.iea.org/dbtw-wpd/Textbase/work/2004/distgen/Bauen.pdf.

7 Plans for Portland's Lloyd Crossing Development



Source: Mithun, Inc., 2005.

CLEAN WATER FOR THE REST OF HUMANITY

According to the United Nations, over 1 billion people in the world’s poorest nations lack access to clean drinking water. However, the resources required for large, capital-intensive water infrastructure systems are usually beyond the reach of these impoverished communities. Several organizations are now trying to solve this problem with inexpensive, portable filtration systems that use nanomaterials to quickly produce large amounts of clean water.

In Africa, an Australian organization known as Africa Now has begun field trials of a revolutionary “water stick.” The water stick, developed originally by Seldon Technologies for military applications, uses a carbon nanotube filter that requires no power, heat, or chemicals to remove bacteria, viruses, lead, and arsenic from water. It can filter a liter of water in 90 seconds. The same technology also offers possibilities for significant cost and plant size reductions in desalinization.

LIGHTWEIGHT INFRASTRUCTURES WILL DRIVE GROWTH IN DEVELOPING MARKETS

For many of the world’s rural poor, access to information and distribution channels is a necessary precondition to improved buying power in the global economy.

C.K. Prahalad and Allen Hammond, in their work with emerging markets in the developing world, argue that ownership is not as important as access and that pay-per-use models can be applied to everything from cell phones to refrigeration centers. They also point out that business models tailored to providing these services represent very large market opportunities—and it turns out that lightweight infrastructures adapt well to these business models.

8 The Water Stick



Source: Seldon Technologies

Not much larger than a pencil, the water stick may prove to be a low-cost, high-technology “straw.”

9 Cost of Current Infrastructure Services for Poor vs. Middle Class in Urban India

	Dharavi (poor)	Warden Road (middle class)	Cost Multiplier for Poor
Municipal grade water	\$1.12	\$0.03	37x
Phone call (per minute)	\$0.04–0.05	\$0.025	2x
Cost of credit (annual interest)	600–1,000%	12–18%	60–75%

Source: C.K. Prahalad and Allen Hammond, *What Works: Serving the Poor, Profitably*, 2004.

10 How Infrastructure Shapes the Business Model

Heavy Infrastructure	Lightweight Infrastructure
High margins	Low margins
High volume	Very-high volume
High capital investment	Very-low capital investment
Centralized distribution	Peer-to-peer distribution
High ROI = gross margins	High ROI = high capital efficiency

Source: Adapted from C.K. Prahalad and Allen Hammond, *What Works: Serving the Poor, Profitably*, 2004.



LIGHTWEIGHT NETWORKS: MONDAY MORNING

Skype promotes peer-to-peer sharing of computer resources to build out a free VoIP service.



SHARING GOOD.
NOT SHARING BAD.



COMMUNITY/POLICY:

Use lightweight designs to balance infrastructure needs and local concerns

A perennial challenge for both communities and companies is balancing the need for growth with local concerns about the economic and ecological impacts of new infrastructure projects. While consumers demand ever greater access and quality of service, environmental regulations limit the ability to expand capacity at centralized plants. Furthermore, suburban sprawl is creating a greater awareness of the need to protect undeveloped land from industrial activity. Homeland security concerns abound, too.

Expect new opportunities to balance these objectives using distributed infrastructures built with lightweight components. In the short term, the focus will be on low-hanging fruit: the power and water systems. These both have major environmental impacts and currently lack the excess capacity to ensure stable and secure flows of resources. In the longer term, lightweight design philosophies will permeate manufacturing and servicing operations with small-scale, locally integrated fabrication plants perhaps signaling a return to the shop-based production of the preindustrial age.



SECURITY & SAFETY:

Leverage lightweight systems to diversify networks and ensure business continuity

The combination of climate change, urbanization, and globalization all increase the risk of infrastructure and industrial disasters. Terrorist concerns also threaten as many as 15,000 industrial plants in the United States. These increased risks have driven a new emphasis on business continuity planning in companies of all sizes, as well as a growing interest in lightweight infrastructures.

Particularly important here will be tools that diversify corporate networks to improve business continuity. For both everyday crises and major disasters, lightweight systems improve the resiliency of organizations by providing multiple redundant path-

ways for moving people, goods, and information. Many of these redundant pathways may actually lie outside the formal corporate system. The success of emergent collective disaster response has signaled the important role that ad hoc bottom-up systems can play in a highly connected society. Companies and communities alike should analyze these emergent responses for best practices and then develop strategies to leverage these practices both formally and informally within their organizations.



BUSINESS MODELS:

Update business models to create value from lightweight services and cooperative strategies

As lightweight infrastructures cannibalize existing heavyweight operations, they provide the opportunity for growth in two ways. First, they expand the potential base of customers by making basic services available to a portion of the population previously excluded. Second, they decouple access to basic resources from the range of services that can be built on those basic resources, allowing for many more service providers to build innovative offerings.

Taking advantage of this growth potential, however, will require very different approaches to business models, market channels, and ultimately, organizational structures. Interestingly, the guidelines for success in reaching the world's poorest people turn out to be good guidelines for many of these lightweight initiatives: low profit margins and capital efficiency. The other key component of success in a world of lightweight infrastructures is cooperation: these models will rely increasingly on understanding the principles of "the commons," open-source production, and peer-to-peer organization.



ASIA:

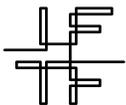
THE OTHER INTERNET

In China, Internet use has grown by over 300% in the last five years, with more than 100 million Chinese now creating their own virtual China. This “other Internet” is founded on linguistic, visual, cultural, and regulatory features that differ from today’s dominant English-language Internet. And as it grows over the next decade, its social and economic impact will rival what most people in the West think of monolithically as the Internet. With the increasing importance of China as a manufacturing base, consumer market, and political superpower, non-Chinese-speaking businesses, organizations, and political institutions ignore this other Internet at their own peril.



In the next decade,
the Chinese-language
Internet will grow to rival
the English-language
Internet—reshaping
East–West interactions

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VIRTUAL CHINA + VIRTUAL WEST = VIRTUAL ADVANTAGE

Chinese netizens are primarily interested in Chinese-language content and will continue to be during the next decade. Yet many are also able to use the English-language Internet—giving them an advantage over Western users. With English-language education starting in elementary school and English required for graduate school, educated Chinese Internet users make their way around the English-language Internet with ease.

The opposite is not true for Westerners who wish to access virtual China. Whether a business is trying to get its Web site indexed by Chinese search engines or a teen is seeking a Chinese author’s writings, there’s no way around the Chinese language. The result? A growing information imbalance that disadvantages non-Chinese speakers. Without a broad proliferation of grassroots language translation, the Chinese- and English-language Internets will likely continue to run in parallel, with Chinese users increasingly able to exploit both.

FOCUS ON VIRTUAL ENTERTAINMENT

In the West, cherished assumptions about the power of technology and free speech have shaped English-language content on the Internet. Blogs have challenged mainstream media, and online collectives such as Wikipedia are challenging the hegemony of traditional profit models. So it’s not surprising that so much Western reporting on the Chinese Internet focuses on the jailing of Chinese cyber-dissidents, the filtering of politically sensitive content, or the power of online communities to focus attention on official corruption.

However, the real story of the Chinese Internet in the next decade will be the explosion of entertainment content and its power to shape the Chinese worldview. Looking for fun and expressive human connection, the Chinese population is driven to the Internet by three key factors: the sparseness of China’s mainstream media and entertainment landscape; easy online access to copyrighted music, games, and films; and ongoing economic and social disruption of traditional communities.

Scholar Guo Liang calls it “China’s entertainment highway.” Online gaming, dating, and blogging will shape the Chinese culture to an even greater extent than in the West.

THE GOVERNMENT’S ROLE: PROTECTION FOR THE PEOPLE

While Chinese youth will grow up on the Internet, their experience is likely to be different from the Western or even Japanese experience—thanks to the much more active role that government will play in virtual China.

Most of Chinese Internet users believe the Internet should be managed to protect China’s youth, in particular, from pornography, violence, and too much online gaming. As this other Internet grows in scale and scope, the consequences of such attitudes will shape the kinds of content global businesses and media create for the Chinese market—and possibly create unexpected alliances with the more conservative voices of the West.

—Lyn Jeffery



INTERVIEW: ISAAC MAO

Isaac talks about the top three issues in Chinese cyberspace—free access, free speech, and language barriers.

Q | Isaac, you've created a role for yourself as someone who bridges the two worlds of the Chinese Internet and English-language Internet through your work as an engineer, a blog hoster, blogger, and social software pioneer. You are not an average Chinese Internet user by any means—but what are your impressions of the kinds of activities the average Chinese user engages in when they go online?

We cannot use one sentence to describe Internet users in China, but if we had to sum it up in one sentence, I think 90% of them are just one-way information users, not two-directional users. In my observations, many people—for example my colleagues in the office, students on campus, or even my parents at home—are just information seekers. They just want to get information from the Internet. Some of them, because of their work requirements, have to use communication tools like e-mail or IM, but they are not editors and contributors to the Internet.

Most people don't know how to share their content online, or they may have a very fixed sense that, "if I publish some information online, it's very dangerous to me." Even in open-source arenas, few Chinese programmers would like to share their code and content or collaborate with others. This observation has inspired me to think about why, in Chinese culture, they don't like to share—and is this changeable or unchangeable?

Q | What is the nature of the danger in sharing information online in China?

There are two kinds of dangers. One is that, "maybe my privacy will be lost." Even many of my previous Intel colleagues, when I invite them to try some new software online, they'll decline it. They never want to try new stuff. They're worried about their credit card information, their real names, their contact information, their addresses. If you are living in an open society, in an ideal case, you are not afraid of opening up your content to others because you can control it in some way. If someone calls you on the phone, you can politely ask them, "who are you?" But in China, the community lacks trust. If people don't trust the outside world, they won't trust the Internet. For example, if they register online at some Web sites, the Web sites may sell the content to others. There are many, many such cases in China, and there are no laws or policies to forbid such things.

The second danger is political danger. If you want to express yourself, you have to take some risks, maybe, on sensitive topics. Otherwise, you can only talk about entertainment, but even that may be sensitive! For example, organizing anti-Japanese protests online—even if you talk about them in a humorous way during a sensitive period—you may be monitored or warned by the authorities: "Take care!"

Q | In the West, we assume that we have access to all public Web sites—if we use search tools well. How aware are average users of the Chinese state of filtering Web searches?

The free access problem is serious in China. I think more than 99% of people don't know what's going on with Web sites that they can't access. Even I don't know when I visit a Web site for the first time—"Oh! It returned a blank page," or it tells me there's no data. So I have to try a proxy server [another computer that acts as an intermediary between surfers and Web sites, helping to hide their Web footprints and evade the filters] to test whether the Web site is blocked or just not working. After multiple attempts, I get so frustrated to find that many Web sites are blocked by the Great Firewall, the Golden Shield. The majority of Chinese don't know what they don't know.

Q | You're working with others to support cultural and technological change in China. How are you going about that?

We are trying to find new tools and technologies, like blogs and wikis, to change social norms and encourage more collaboration and collective intelligence. That's most important for China—that we can become more intelligent and make better decisions for the future.

We cofounded an organization called Social Brain Foundation in 2004. There we do things like sponsor collaborative translation of English books; in one month a group of people translated Larry Lessig's book, *Free Culture*. The translation is always evolving, becoming more perfect with links to Internet resources, so it's actually better than a traditional translation done by one person.

We also want to change China's "lecture culture," where the teacher lectures in front of the class and students just receive input but don't produce output. We're working with "offline blogs" where students write down recent insights on themselves, their families, their campuses, reading, or activities, and then share it with their classmates and let them comment

ISAAC MAO works in Shanghai as a partner in the venture firm UCI, and is a co-founder of the Social Brain Foundation. He blogs in both Chinese and English.

on it. We encourage them to put tags on their writing, to read aloud their keywords, and find others with the same keywords. Only after this offline practice do we teach them how to blog online, how to collaborate, how to find peers with similar interests and close friends in a larger group. Maybe it's not so exciting in other countries. But in China it's a big change from the normal classroom culture. Students will be very active in this kind of setting, this kind of game.

In our future vision we'd like to see many Chinese people connect to the Internet in a bidirectional way, contribute to the knowledge pool and access it with ease.

Q | At the moment, Chinese-language cyberspace is huge and expanding, but it seems to be pretty separate from English-language cyberspace. What are your thoughts on how we can bring these two worlds together?

Even today, few people really understand Chinese cyberspace, so we want to create more channels and bidirectional ways for Chinese cyberspace and the outside world to connect, even to melt into one eventually. For language problems, we have to rely on humans. For example, we are trying to encourage more people to become bilingual writers online—we call them “bridge bloggers” or “bridge authors”—to try to help the outside world better understand China. China's government-supported media and media from the outside world can only present partial views of what the Chinese people are thinking, what their real offline worlds are like. That's why I'm so interested in blogging and trying to encourage Chinese people to become bloggers, to help them understand the outside world and to help the outside world understand China.

Q | Last year's biggest Internet phenomenon was the very silly bulletin board service (BBS) star, Sister Furong, who was quickly picked up everywhere in the newspapers and television. It's hard to imagine an Internet personality in the United States hitting mainstream pop culture with that kind of force. What does that say about the relationship between the Chinese Internet and mainstream media?

There's a very interesting Chinese term: the boredom economy (*wuliao jingji*). People don't have many choices in their lives, so they have to chase boring things instead. Even some of today's college students don't have enough interests to focus their attention on campus, so they turn to the virtual world. Initially, Sister Furong was created in one of these campus environments on a BBS forum. Then the mainstream media found she was a new way to capture eyeballs, and she went directly from BBS to mainstream media. In China, the mainstream media has two kinds of things to say—one is political commentary by the government, the other is boring things. In China, you can talk about strange or weird social phenomena even more than in the Western media, which often has strict editorial control about these things.

But you can't talk about social problems. For instance, farmers were attacked in Henan province [in an incident in 2005], and many bloggers reported on it. However, the mainstream media kept quiet, and no further reports were allowed. So the majority of the people didn't know about it. It's not good, but I don't know when it will change or what kind of things can change it.



Lyn Jeffery, Director of IFTF's new Asia Focus Program, asked Isaac about the ways he and others in China are trying to change Chinese Internet culture.

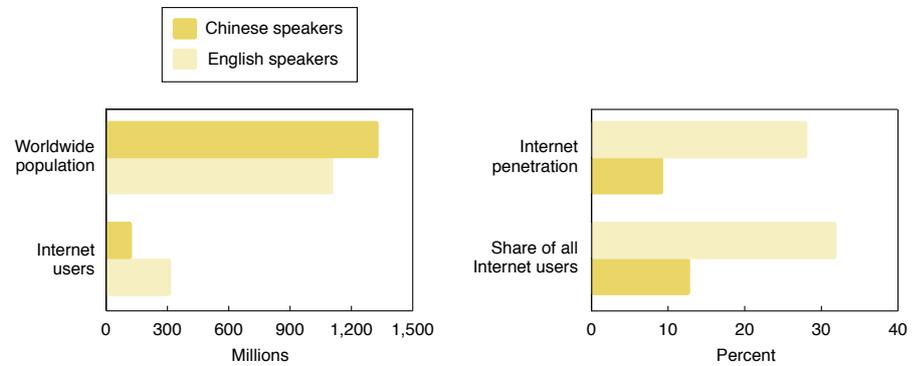
**VIRTUAL CHINA:
BIG AND GETTING BIGGER**

With the fabled Chinese consumer market finally coming into its own, three factors presage the emergence of a virtual China that will transform Chinese life and the shape of the World Wide Web: growth of Internet use, broadband access, and mobile phone penetration.

Consider the growth potential. Of the estimated 1.3 billion Chinese speakers in the world, only 9% are currently Internet users. Yet this 9% makes up nearly 13% of all Internet users worldwide. If, as conservatively estimated, Chinese users double over the next five years, they will roughly equal today's English-language users and perhaps constitute a quarter of all users worldwide.

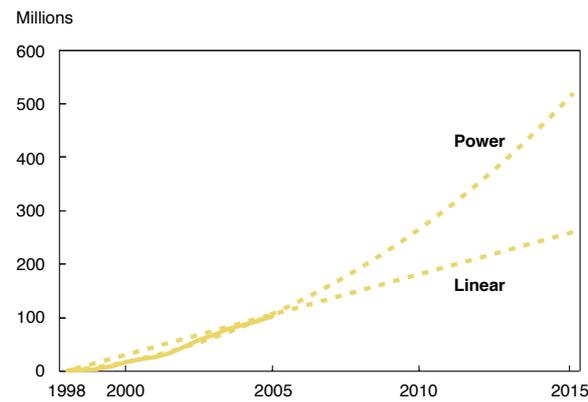
In addition, China's broadband market is now second only to the United States. Its cable television and cell phone markets are already the world's largest. It has the largest number of concurrent online gamers. Furthermore, China is aggressively building what will be the largest next-generation Internet network in the world—the IPv6-based ChinaNet Next Carrying Network (CN2). CN2 will provide the billions of IP addresses needed to enable sensor-laden networked objects for context-aware computing in coming decades. This is the scale of the emerging virtual China.

1 Chinese- and English-Language Internet Users, 2005



Source: Internet World Stats, November, 2005; www.Internetworldstats.com/stats7.htm.

2 Growth Potential of Chinese Internet



While historical data suggest a power-curve growth, lack of education and access to Internet devices may produce a more conservative straight-line growth.

Source: China Internet Network Information Center.

3 Global Web Sites with the Most Traffic, Q4 2005

1	Yahoo!	U.S.	7	eBay	U.S.
2	Microsoft Network	U.S.	8	Sohu	China
3	Google	U.S.	9	Passport.net	U.S.
4	Baidu	China	10	163.com (NetEase.com)	China
5	Yahoo! Japan	Japan	11	QQ	China
6	Sina	China			

Note: Data may be somewhat skewed by the rate of adoption of Alexa software in different parts of the world. Source: Alexa.com, 2005.

DETAILS

CHINESE NETIZENS: EDUCATED AND CONCENTRATED ON THE COAST

China has the second largest population of Internet users. About 60% of these users are male, and more than 70 million are under the age of 30—the largest under-30 user population in the world. Almost half of all Chinese Internet users live in the three cities of Shanghai, Beijing, and Guangzhou, where Internet penetration reaches as high as 40%. The most common profile today is a young urban male who is relatively highly educated and relatively wealthy.

But the next decade will see significant user growth in China's second- and third-tier cities, as well as in rural areas. Less urbanized or modernized areas may well drive growth in online entertainment, given the relative lack of entertainment options in many Chinese inland cities.

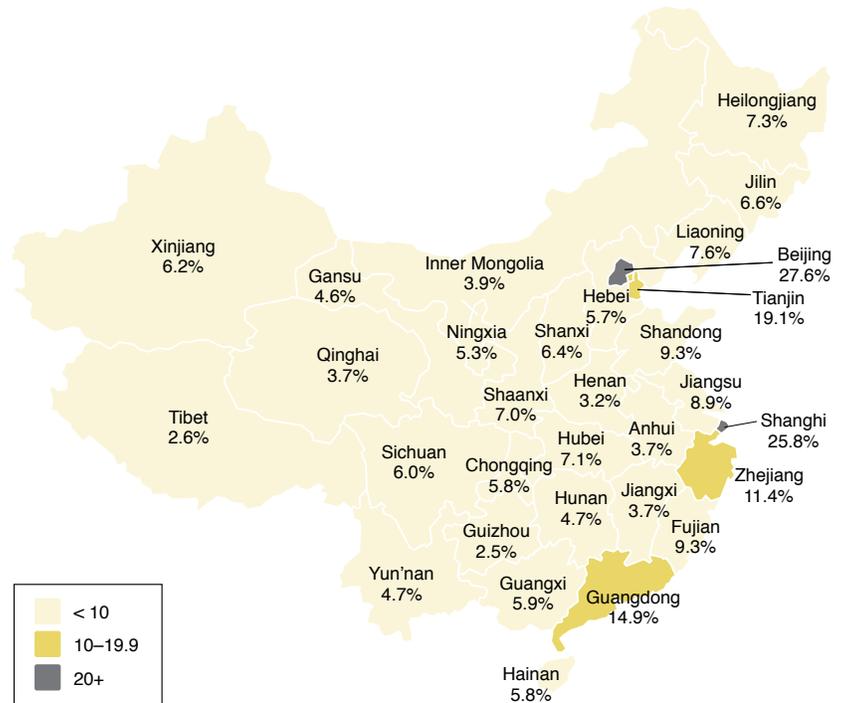
CHINESE INTERNET CAFÉS: HOTSPOTS FOR SOCIAL CONFLICT AND CONSUMER INSIGHT

Most Chinese access the Internet from home, but a significant 15–20% are going online in public Internet cafés. Café users of the Internet tend to be:

- Migrant workers and others without the means to buy their own computers or the space to house them.
- Older Chinese who want to go online but don't want the expense of maintaining a computer at home.
- China's most avid users: students who want to escape their parents' regulation of Internet use at home.

Chinese gamers also often prefer the Internet café milieu, where they can use higher-end graphics and games in the company of friends. As one of the few spaces where youth can operate beyond the watchful eyes of their parents, the smoky, crowded Internet cafés are the subject of widespread social concern and frequent regulation. Yet these public places—often locally owned small businesses—are also the primary driver of Internet diffusion in small towns, suburbs, and the urbanizing Chinese countryside. Like South Korea's PC bangs, China's Internet cafés are central meeting places for networks of youth and gamers.

4 Geographic Distribution of Chinese Internet Users by Province





THE CHINESE PORTAL

Over 40% of Chinese Internet users eschew search engines and access the Web through portals such as www.sina.com.cn, www.sohu.com, and www.yahoo.com.cn. The government doesn't allow these portals to write their own news stories, but they can aggregate from the array of Chinese domestic media, giving readers an unprecedented view of news from across the country. As German scholar Hans-Juergen Bucher notes, portals are dominated by links to games, chat rooms, information about stars, show business, leisure, or travel services. Even "news," which Chinese Internet users cite as their main online activity after e-mail, is skewed toward news about entertainment.

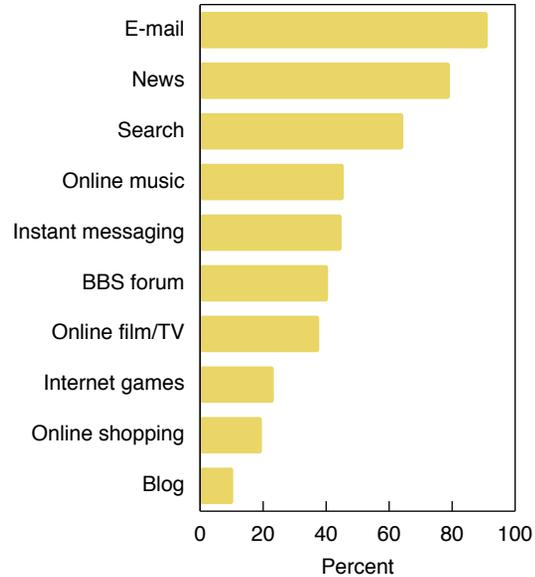
Nevertheless, Chinese search engines will grow in the next decade. The top Chinese search engine, Baidu, is overwhelmingly favored by those under age 25. It is unlikely that a generation of youth accustomed to downloading their music and movies for free will migrate to platforms that don't support these functions. But note: the future of Chinese search is likely to be found in better, faster ways to find and download entertainment content.

DIFFERENT DATABASES AND DIFFERENT RESULTS = DIFFERENT VIEWS OF REALITY

Online information trumps offline information in today's world, and search engine indexing is critical in shaping the information that guides decisions. As Rebecca Mackinnon, an American blogger and Chinese media scholar, writes, "The Chinese government has been pretty successful at molding Chinese people's view of the world and of their own government."

English-language content providers and creators—from businesses to scholars—should make no assumptions about what happens to English-language content on the Chinese Internet. If it's indexed at all, you may or may not be able to get to it, due to China's infamous filtering technologies. For instance, Google's search engine was blocked in 2002 prior to a national political convention; Google News was blocked in 2004; and the Google cache is filtered by keywords, as are all searches in virtual China.

6 Services Most Frequently Used by Chinese Internet Users



Source: China Internet Network Information Center (CNNIC), 16th Statistical Survey Report on the Internet Development in China, July 2005.

7 Chinese Internet Portal Sohu.com



One of China's most popular Web sites, Sohu.com, contains breaking news and allows users to post comments on its BBS, search for MP3s and photos, and play games.

Source: www.sohu.com.

A LONG WAIT FOR GOOD TRANSLATION

Machine translation is notoriously tone-deaf when it comes to interpreting China's tone-based language in context. Trying to keep tabs on virtual China using current translation tools is like watching television through a fishbowl. Humans—or a combination of human and machine translators—are still a better bet for at least the next decade.

But even the best of the multilingual Chinese Internet whizzes admit the difficulty of navigating two parallel universes. Michael Zhao, a world expert in China's Internet infrastructure and systems integration, says, "Better translation would make a big difference to people like me since it would expand the information base by many-fold. For example, now if I search, I have to search both in English and Chinese. Even though I get to see content in both languages, there is no coherent relationship between the content, so lots of work needs to be done to sort them out."

However, Michael Zhao and the rest of us may be able to access something better than today's crop of tools in the next ten years. Current translation applications use a rules-based approach, which rely on a dictionary and a set of linguistic rules. But companies like Language Weaver (with roots in DARPA) are pioneering the next wave of translation tools, called statistical machine translation (SMT). Using brute computing force, SMT analyzes the relationships and patterns between source and target texts without the use of dictionaries or set rules. "By analyzing millions and millions of words," notes a recent report by Byte Level Research, "the software gets pretty good at 'guessing' how to translate a given text string."

8 English Translations of a Chinese Blog Post Are Lacking

专为卡拉OK迷准备的播客网站 : myvideokaraoke

In 精彩生活



卡拉OK迷们, 准备好了吗?把你们的迷人风采传上去, 与人分享吧!链接。

Tags: [卡拉OK](#), [播客](#)

这条新闻挺有意思的, [我也想来两包](#)。

Posted on: Sun, Dec 18 2005 9:22 PM | [Email This](#) | [Clip/Blog Th](#)

Source: www.postshow.net/.

Translation by [Babelfish.com](#)

Specially confuses for Kara OK the preparation to broadcast the guest Web site: Myvideokaraoke.

Translation by [Google Translate](#)

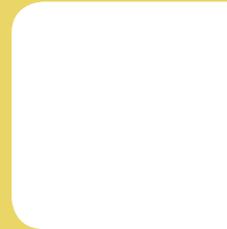
Kara OK confuse, prepare? Passes on yours enchanting elegant demeanour, shares with the person!

Babelfish and Google's translators have trouble interpreting a post on a leading Chinese blog, Postshow (www.postshow.net). The post describes a Web site where karaoke singers can upload video of their most recent performances and share them with others.



THE OTHER INTERNET: MONDAY MORNING

Online roleplaying games like *World of Warcraft* are big business in China, partnering with Coca-Cola and other major advertisers.



✓ DESIGN: Expect aesthetic differences to drive technological evolution

As the Chinese build their Internet presence, and as Western businesses adapt to Chinese preferences, aesthetic differences in the Chinese Internet will influence function as well as form. Compare top Chinese sites to their cousins in English or even to Chinese-language sites in Taiwan, Hong Kong, or the United States: the mainland sites bristle with categories, functional elements, links, color, flash animation, and multiple search boxes. A recent study found that Chinese sites have a flatter hierarchy than their English-language counterparts, with as many elements on each level as possible—what one researcher has termed “an aesthetic of abundance.”

These differences may become more striking as China uses IPv6 to build the Internet of things. (For more information, see “Technology: The Addressable World” in *2004 Ten-Year Forecast: Perspectives*.) With information and communication design entering the world of material products, these early differences may well shape the way designers and users think of smart objects—and how they expect to use them.

✓ KNOWLEDGE WORKERS: Cultivate new roles and practices for navigating parallel Internets

Even as machine translation improves, global workers will need guides to help them navigate the parallel worlds of Chinese-language and Western Internet sites. There are clear needs and opportunities for both in-house and outside IT services that help knowledge workers integrate relevant resources into their work. Expect to see the growth of new social tools—such as tagging and bookmarking systems—that are designed precisely for people who work across this East–West divide. A particularly valuable analysis would be a comparison of the way Chinese and Westerners use these kinds of collective-intelligence tools.

At the same time, don’t overlook the important role that human information aggregators will play in bridging these very different Internet environments. Be sure to identify and tap into the new knowledge brokers in informal publishing spaces—people like Xiao Qiang, at UC Berkeley, who not only aggregates English-language news for China, but also helps to get key Chinese media translated and published in the English-language blogosphere. Also consider creating formal internal roles for such people. For example, cultivating a cadre of internal Internet “diplomats” could help define processes and protocols for assuring effective access to information and to users in both cultures.

✓ MARKETS: Look past the political content for insights about emerging markets

Western focus on the political impacts of the Internet often overlooks the role of the Chinese Internet in defining a next generation of commercial markets and cultural innovations in China beyond the educated and young, urban user. Observed in the blog EastSouthNorthWest (www.zonaeuropa.com/weblog.htm):

If you read the English-language mainstream media and blogosphere, you get the impression that things are going haywire in China ... The most frequently reported subjects are: murders, suicides, wealth inequalities, mass riots, arrests of dissidents, unaffordable education, worker exploitation, Internet censorship. The question is: Why hasn’t this society imploded yet?

The truth is that the Chinese experience of the Internet may be better expressed in the kind of buoyant optimism we reported in last year’s forecast on Chinese futures thinking than in the Western filters of disruption and dissidence. A key strategy for any Western organization with interests in China is to expand the sources of information they track on the Chinese Internet—and to map a diversity path through the emerging virtual China.



CULTURE: DARK MOBS

In 2002, Howard Rheingold introduced the idea of *smart mobs*—large groups of ordinary people who could use mobile technology, the Internet, and distributed information to quickly band together in collective action, liberating themselves from unjust leaders and redrawing the map of democracy. Yet over the next decade, we may see a very different scenario emerge as top-down forces face off with some bottom-up segments of society in an escalating battle of *dark mobs*.

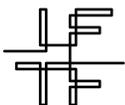


As digital information moves into the environment, top-down control will co-evolve with bottom-up innovation—creating a gray scale of moral choices and criminal behavior

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TOP DOWN AND BOTTOM UP: THE DYNAMICS OF TECHNOLOGICAL INNOVATION

The coming decade will see Rheingold’s technologies of collective action diffuse into the environment as places, objects, and software become “context aware.” Tools for communication, sensing, and sensemaking will play out in a range of applications from top-down systems that emphasize security, predictability, productivity, and convenience to bottom-up applications that emphasize connectivity, creativity, disruption, and desire.

Smart environments will coevolve with these two ends of the spectrum, each pursuing often incompatible ends. As cities embed security surveillance systems on their streets, people who don’t want to be monitored will develop bottom-up tools to “sense the sensors” and move about the city unseen.

This ongoing clash of objectives will be a primary source of innovation in technology, society, and the marketplace over the next several decades. And while corporate R&D and venture-funded startups will continue to offer new products, the development path may be paved not so much by consumer demand as by the interplay between these two forces.

HACKERS AND ENFORCERS: THE DIMENSIONS OF SOCIAL DISCORD

The clash between control and innovation will also shape the nature of our social discord. It will define what is criminal, what is abusive, what is dark in society—as well as what constitutes freedom and healthy competition.

In an attempt to control the uncertainties and disruptions of bottom-up innovation, top-down advocates will seek to restrict access and criminalize openness. For example, in the name of security and consumer protection, proposed legislation in Westchester County, New York, makes it illegal to operate a wireless access point without password protection, perhaps undermining the ability to set up a mesh wireless network. Ironically, these sanctions will be applied to groups who self-identify using emerging context-aware tools, by enforcers who themselves adapt the technologies to their own use. In the recent French riots, police monitored and used cell phones and the Internet to arrest and convict more than 600 smart mob participants.

For their part, innovators will continue to look for workarounds. Silicon Valley’s innovative economy is built on the workaround, and to the extent that entrepreneurs can continue to find technical ways to cheat the top-down controls, innovation will continue. However, as more and more hacks are considered criminal, hackers may be increasingly forced into the dark spaces of the Internet. Their innovations will become contraband, and users will have to weigh greater risks of dark market transactions. In the end, criminalization could lead to a new kind of organized crime not unlike that associated with liquor in the Prohibition era or drugs in the latter half of the 20th century.

—Kathi Vian & Jason Tester



INTERVIEW: MOISÉS NAÍM

Moisés describes a world in which globalization and individualization combine to create illicit networks beyond the reach of traditional institutions.

Q | Let's start with a definition of globalization. One way to think of it is that it's the diffusion of power down to individuals and groups worldwide, putting them in an advantaged position over traditional, governmental units. How much of that do you think is being caused by information technology?

We have witnessed a debate that essentially centers on technology as the driver of globalization, and rightly so. But that often ignores the fact that there was also a wave of political revolutions and political changes, as profound as the technological changes, that enabled countries, communities, and individuals to connect across oceans and mountains and political borders. Think about China, India, Latin America. Think about countries where anybody would have had a very difficult time traveling and now the borders are open and more porous. Did the technology enable the political revolutions? I think technology greatly helped and accelerated political changes. But it is also true that political changes are at the core of a lot of the global integration that we now call globalization. So they're both. And just looking at one of them is never enough.

Q | In the 1990s, everybody was completely entranced by information technology, and it was a very idealistic time. I think that today people are taking a much more realistic view that technology comes with down sides and dark sides. How big a role does technology play in the world you describe in *Illici!*?

Huge. And it is as important for these illicit networks, what you aptly call "dark mobs," as it has been for multinational corporations. Trade boomed in the '90s; investment and investment flows and communication flows also boomed in the '90s. And so illicit trade of all kinds has expanded at an unprecedented clip, and technology is behind that. Think about the managerial complexity it takes to put a fake Prada handbag in all of the major cities of the world at the same time. That is an achievement that would be impossible without the technologies we now have—the Internet especially, but also prepaid calling cards, which are as transformational a technology as the Internet in many poor countries. In fact, the prepaid telephone calling card touches more people today than the Internet. The ATM cards that allow international transfers of money, prepaid cellular telephones, the international flow of electronic money—all of those technologies have greatly empowered criminals and greatly weakened the agencies that try to contain them.

Q | From the Silicon Valley perspective, we see little companies become successful, they become big companies, and they're Titans astride the marketplace. Is there a point at which this activity stops being bottom-up and we actually have some top-down control by a few powerful gangs? Or does it continue to be unstable?

It's unstable. The moment you become very significant and influential, you become visible. And the moment you become visible, you are under attack by predator rivals and law enforcement and governments. So there is a great incentive to stay decentralized. That doesn't mean that some of these networks aren't huge, but they do have a very decentralized structure. We are no longer in the land of Don Corleone and the Bonanno family. When you had the Mafia-like structures with a Don, a boss of all bosses sitting at the top of a pyramid, taking out the top of the hierarchy was usually very damaging to the whole organization. Here, we are dealing with highly decentralized recombinant networks and cells that organize and join and then disperse. They get into opportunistic agreements, depending on market opportunities.

These networks are more stable and better organized than the Mob. They are self-organizing, they are decentralized, and are often non-hierarchical. They also are more driven and more purposeful. The goals of the Mob are more transient, whereas these are more stable kinds of organizations that are deliberate and permanent in their money-making activities, arbitraging products and people where they're very inexpensive to countries where they're very expensive.

Q | Is the level of illegal, antisocial, undesirable activity that this technology allows at an unprecedented level? Is this something fundamentally different than we've seen in the past?

Yes. It's different because it's global and it's individual at the same time. All the innovation in the past mostly enabled large organizations, and therefore it had a more institutional impact. Institutions were the mediators. Now, you have U.S. teenagers who, in the middle of the day, can connect with God-knows-whom in Australia. So think about the law-enforcement dimensions of that—a pedophile in Australia or in Belgium or in South America talking to a little girl in middle-America. Who is mediating that? What is the regulatory authority there? How do you contain it if you try?

And then you get an economy like Afghanistan, where 50–60% of GNP depends on trade of a good that is considered illegal by the rest of the world. It is very likely that the production of cocaine in Bolivia next year will double.

MOISÉS NAÍM is editor-in-chief of *Foreign Policy* and author of *Illicit: How Smugglers, Traffickers, and Copycats are Hijacking the Global Economy*. He holds a Ph.D. from MIT.

The border between the United States and Mexico now has become what I call a geopolitical black hole—a place where traditional laws of politics, law, civility, and governance do not apply. It's a completely different reality.

The U.S. Congress is seriously debating building a multi-billion dollar wall to try to stop people from crossing the U.S.–Mexico border. But all they have to do is to think about Spain. Spain has an ocean between it and North Africa, and yet it cannot stop the traffic. So the idea that walls and moats and oceans and mountains and borders and police forces and the military is what you need to protect your country from this kind of trend, it's just a very dangerous illusion.

Q | Historically you could sense who controlled society by looking for the biggest building in the center of town. It went from castle to church to city hall to multinational high-rise. What's next? What is the next Colossus that stands astride the world order?

The termite. The great paradox of our time is this illusion that the world's powers are concentrating, that power is concentrating in the United States, or in mega-corporations, or in mega-universities, or in the bigger brands. That is the popular perception. But the reality is that we are living in what I call the Era of Diffusion: diffusion of power. And what we're seeing is a proliferation of centers with the ability to veto and constrain the range of options available to big powers—corporations, countries, nations, international alliances.

Think about who is creating problems for the biggest, most powerful army in the history of humankind. Well, these are a bunch of termite insurrections in Iraq. Think about the effect that NGOs are having on governments and corporations. Or the consequences of bloggers for the immensely huge media companies. Or the kind of criminals and traders that I discuss in *Illicit*. Termites are now as important as the biggest centers that mankind has ever known.

Q | Is there a religious dimension to this illicit world as well?

The big paradox is that whenever markets get very constrained, they go underground and feed the kind of networks I discussed. So if you think about Iran's very religious society, you also have to know that Iran has black-marketeers, smugglers, drug traffickers, people traffickers, and all kinds of crime. So yes, there is a religious dimension here: religions that tend to repress market activities and criminalize some sort of market interaction inevitably drive those markets underground.

Q | So in this world of dark mobs, are there any heroes? Who are the Robin Hoods?

Think about the Coyotes whose existence allows a Guatemalan woman to move to the United States. Thanks to them, two things happen: she can put food on the table for her children and provide them with education and a future; and she provides services to take care of a senior citizen who otherwise could not afford the normal market salaries in this country. Who is the hero there?



Paul Saffo, Roy Amara Fellow at IFTF, asked Moisés about dark mobs as the leading edge of a new world order.

**AT THE LEADING EDGE OF TECHNOLOGY:
TOP-DOWN VS. BOTTOM-UP STRATEGIES**

The leading edge of information technology is arguably context awareness—the ability of objects, environments, and tools to interpret the context of the user and respond accordingly. Context awareness depends on a combination of communication, sensing, and sensemaking technologies, and the approaches to this problem vary along a spectrum from top down to bottom up.

The applications at the top-down end of the spectrum tend to be closed, simple, and formal—for example, monitoring systems for infrastructure or electronic toll passes. At the other end of the spectrum are bottom-up systems, which tend to be open, with smart sensing devices and informal sensemaking technologies such as tags and tag clouds. The bottom-up solutions assume a high degree of human participation.

These technologies will play out in a variety of top-down and bottom-up applications in which the top-down solutions are designed for applications such as crowd management, public safety, and even smart consumer displays, while the bottom-up applications may create, among other things, “contested aware cities”—places where context-aware technology is at the center of a cat-and-mouse game of detection and counter-detection, action and avoidance. For example, a group of artists in New York City calls itself the Institute for Applied Autonomy and has mapped the location of surveillance cameras throughout Manhattan. The group has created a Web site where anyone can plot “a path of least surveillance” between two points.

The battles between top down and bottom up will be about how to balance convenience with privacy, security with anonymity, and predictability with serendipity—and they will tend to drive an ever steeper curve of innovation in context-aware technology and disruption in the marketplace.

1 A Spectrum of Context-Aware Tools and Tasks

Top-Down	Bottom-Up
Characteristics of the Tools	
Close	Open
Simple	Smart
Formal	Informal
Critical Tasks	
Delegating responsibility	Expanding awareness
Replacing human	Extending human capacity
Automating tasks	Decorating the world
Maintaining boundaries	Discovering new groups
Instrumenting processes	Dynamic context creation
Alerting	Responding collectively
Predicting	Creating
Cultural Goals & Drivers	
Productivity	Creativity
Precision	Connectivity
Security	Disruption
Convenience	Desire

Source: Institute for the Future.

DETAILS

INTERNET CRIME: TAXONOMIES AND TRENDS

Internet crime springs from two main sources:

- The adaptation of familiar kinds of crime such as fraud, counterfeiting, prostitution, and trafficking to the particular vulnerabilities of the Internet
- The criminalization of innovations that threaten the advantage of existing institutions or the morals of empowered segments of society

Especially in the second case, the battle against crime has become an increasingly sophisticated war of words and categories—an effort to create a legal environment and public discourse that favors some and disadvantages others. In both cases, the underlying dynamics are often ignored, creating impossible enforcement demands and an increasingly robust underworld. Previous experience with this kind of targeted criminalization—during Prohibition of the 1920s and the war on drugs of the 1980s—suggests a tendency for escalation of the conflict. (In fact, some of the literature on computer crime bears a striking resemblance to the literature on drug use, detailing three stages of cybervandalism progressing from idiosyncratic kid hackers to college students who become more skilled at writing viruses and gradually emerge as professional virus writers.)

Lacking interventions other than criminalization and enforcement, society will likely see more electronic crime, with lists like the U.S. Department of Justice's taxonomy of computer and intellectual crimes providing a map to this escalating conflict.

2 The Taxonomy of Computer and Intellectual Property Crimes

Computer intrusion	Currency counterfeiting
Password trafficking	Child pornography or exploitation
Copyright piracy (software, movie, sound recordings)	Internet fraud and spam
Theft of trade secrets	Internet harassment
Trademark counterfeiting	Internet bomb threats
	Internet trafficking in explosives and firearms

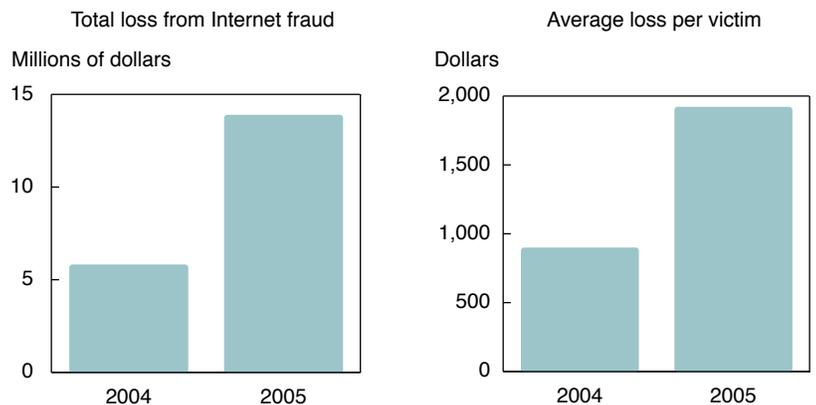
Source: U.S. Department of Justice.

3 Share of Internet Fraud, 2004

	Percent		Percent
Auction fraud	71.2	Confidence fraud	0.4
Nondelivery	15.8	Identity theft	0.3
Credit/debit card fraud	5.4	Computer fraud	0.2
Check fraud	1.3	Nigerian letter scam	0.2
Investment fraud	0.6	Financial institution fraud	0.1

Source: National White Collar Crime Center, *IC3 2004 Internet Fraud Crime Report*, 2005.

4 The Growth of Internet Fraud



Source: National Fraud Information Center, *2005 Internet Fraud Report*.



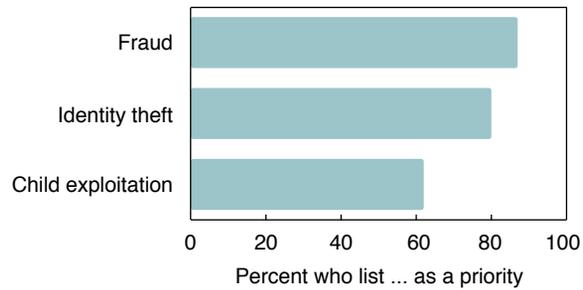
INTERNET CRIME: THE CORPORATE EXPERIENCE

In a 2005 survey, *CSO* magazine and the U.S. Secret Service probed the extent and trajectory of corporate electronic crime with 819 private- and public-sector organizations, ranging from very small to very large. About a quarter of these organizations spend over \$1 million a year on IT security, while about half spend less than \$50,000, using a minimal enforcement staff (0–1 employees).

- While 43% reported a decrease or no change in electronic crimes between 2003 and 2004, compared to 35% who experienced increases (the remaining respondents were uncertain), 88% expected it to increase in 2005. Also, the median number of crimes in an organization in 2004 was three, committed primarily by outsiders to the organization. So in spite of growing fears about electronic crime, actual experience doesn't necessarily match the perceived threat.
- While most of the security effort is spent on dramatic crimes such as fraud, identity theft, and child exploitation, the most common crimes tend to be things like viruses and malicious code, spyware, phishing, illegal spam, and unauthorized access to information. The majority of losses are noncritical operational losses, with only 2% of all electronic crimes resulting in critical financial losses.

One way to interpret these contradictions is that the corporate experience of electronic crime is rather mild, but that the increasing resources allotted to it will drive more concerted enforcement efforts, trapping more hackers and spammers in irritating rather than critical crimes.

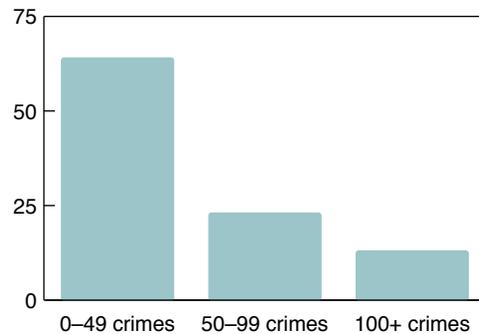
5 Top Three Priorities for IT Security Staff, 2004



Source: *CSO* magazine in cooperation with U.S. Secret Service and CERT Coordination Center, 2005 E-Crime Watch Survey.

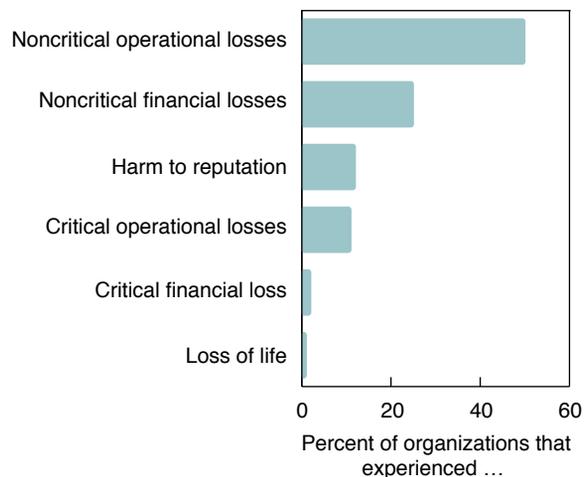
6 Electronic Crime Levels in Organizations, 2004

Percent who reported ... electronic crimes against their organization



Source: *CSO* magazine in cooperation with U.S. Secret Service and CERT Coordination Center, 2005 E-Crime Watch Survey.

7 Corporate Loss as a Result of Electronic Crime, 2004



Source: *CSO* magazine in cooperation with U.S. Secret Service and CERT Coordination Center, 2005 E-Crime Watch Survey.

INNOVATION AND DARK-SIDE USES

Over the last few years, several researchers have pointed out the critical role that pornography and adult content have played in capitalizing all kinds of technological innovation, from VCRs to the Internet, and more recently, mobile online services. So-called “dark net” activities involving music swapping and filesharing have driven the technology for peer-to-peer networks and a host of cooperative technologies. In a real sense, fraud has also subsidized the high-value growth of auction services like eBay and classified services like Craigslist. And there’s every indication that socially marginal behaviors will continue to build capacity in alternate reality worlds, such as *Second Life*.

This connection between dark-side uses and innovation is not limited to technological innovation. In gray and black markets, individuals develop new personal skills using the emergent toolset as well as social practices that define new kinds of organizational strategies that can be applied in both legal and illicit activities.

As Moisés Naím pointed out in our interview with him, the combination of globalization and decentralization fundamentally changes the nature of both dark-market activities (making them potentially more dangerous) and our ability to mediate conflicts in these activities. Geographic and institutional boundaries become barriers for enforcement but not for illicit activity. In fact, one of the pressing needs for innovation is for new forms of mediation—whether they involve markets, technologies, or social innovations—between those who are at risk from dark-market activities and those who benefit from it.

In a 2002 study on the so-called “darknet,” Peter Biddle et al., from Microsoft Corporation, concluded that darknets “will continue to exist and provide low-cost, high-quality service to a large group of consumers.” Darknets will compete aggressively with legal commerce, and businesses will need to engage them on the same terms as they compete with legal organizations. The result? A host of new business strategies will emerge once today’s organizations abandon an over-reliance on legal sanctions. As Naím said, “I am surprised either at the hypocrisy or at the tardiness, the lag, with which high-tech companies are dealing with the notion that governments cannot really protect them. By that I mean that there is plenty of evidence that patents are no longer the best or the most reliable tool to protect your intellectual property.”

Unintended Consequences of the Digital Millennium Copyright Act (DMCA)

Copyright and patent protections have become too blunt as tools for mediating the positive and negative innovations of the digital world. For example, the Electronic Freedom Foundation reports the following dysfunctional impacts of the 1998 DMCA:

- **Stifling innovation in user interfaces**

Rules regarding access controls (such as the ability to fast-forward through the commercials that precede the feature presentation in a DVD you rent or buy) discourage innovation in digital interfaces for all kinds of consumer products.

- **Limiting collaborative scientific and technological inquiry**

Liability concerns lead online services to censor discussions of any technologies having to do with digital security and practitioners to stop publishing the results of their work. Foreign scientists fear travel to the United States, and scientific conferences are being relocated abroad.

- **Undermining existing and future cybersecurity**

Legitimate research and information sharing about the vulnerabilities of technologies in the public domain are being thwarted by overzealous legal action against anyone attempting to identify and publish specific security flaws in those technologies.

- **Facilitating unrestricted censorship**

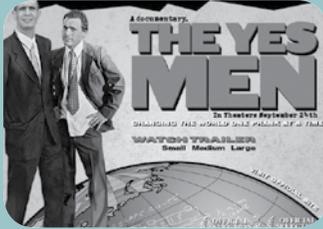
Even as the media decries Chinese censorship of the Internet, the DMCA is being used to block attempts to determine whether censorware—mandatory Web filtering software for federally funded U.S. libraries—is inappropriately blocking Web sites.

Source: Adapted from Electronic Freedom Foundation, “Unintended Consequences: Five Years under the DMCA,” Version 3.



DARK MOBS: MONDAY MORNING

Posing as WTO officials, *The Yes Men* highlight the struggle between traditional institutions and hackers.



COMMUNITY/POLICY:

Avoid marginalizing the masses

While many of the gray markets for digital goods are cast as marginal and potentially menacing, they actually represent the activities of substantial portions of the population—about half of all college students swap music online, for example. They are also influential; the blog Endgadget, which routinely posts work-arounds and hacks, is well read by a large technical community and is the source of much innovative thinking.

Any legislation that seeks to control, restrict, or criminalize activities that are common across a large population faces the problems of enforcement and marginalization of valuable and productive members of society. The social and economic cost of turning gray markets into black markets is thus high, and legal remedies are perhaps best reserved primarily for human health and safety issues in an increasingly decentralized and globalized world.



MARKETS:

Evaluate hacks as expressions of popular needs and desires

Behind every hack is an unmet need or desire, even if that desire appears to cross the line of social or legal acceptability. Think about the hacks that allow Sony PSP users to play homebrew or illegally copied games; or Bluetooth-capable phones to download photos directly to computers, bypassing the carriers and their fees.

On the surface, the desires and needs behind these hacks may seem unprofitable and even unacceptable. However, assigning such hacks to categories like cybervandalism and theft overlooks the fact that consumer markets have steadily grown with a broadening of consumer rights. Ultimately, what may be most interesting about dark markets is that they are dark. Like dark matter in the universe, they give the Web its mass. Rather than creating values that drive consumption, marketing organizations will increasingly need to tap into this dark mass, understand it, and bring parts of it to light with acceptable ways of meeting the needs it expresses.



PRODUCTS & SERVICES:

Focus on natural costs and natural talent

Black and gray markets are often created when the value of goods is artificially inflated by controls or the add-on costs of marketing and distribution in one domain (a country, for example) and not another. One of the impacts of openness—whether in technology, production, or international trade—is that the costs of goods tend to drift toward their natural cost, often undermining the value of existing companies or even entire sectors.

Much has been made of a service strategy that provides market value on top of this natural cost. Service models are often difficult to discern, however, in a world that has been organized around brand transactions with passive consumers. But as consumers increasingly participate in the production and distribution of goods, service models might shift to focusing on the production-side of the equation, tapping the natural talent of a broad population. As Jerry Michalski has asked: What happens when you strip away the artifices of market-making and serve ecologies of behavior, need, and passion?



GLOBAL GOVERNANCE:

Understand cooperative bottom-up strategies for global governance

For the last few years, IFTF has been working with Howard Rheingold to develop insights and understanding of cooperative strategies. In a world of smart mobs and dark mobs alike, it is clear that this is not an altruistic, “wouldn’t-it-be-nice-if” undertaking. Rather it is a critical piece of our understanding of how to reorganize global society and create the kinds of structures, rules, resources, and feedback systems that will diffuse the battle between legitimate and illicit actors, allowing a self-organizing, global society to self-monitor and self-adjust. As smart mobs and dark mobs undermine traditional institutions—both private and public—cooperative strategy is perhaps the critical intelligence the world needs to both police and protect its citizens.



AGRICULTURE: GROUNDWELL

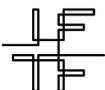
In the last 50 years, the world's agricultural sector has changed the face of global food production, concentrating more production in fewer crops and ever larger industrial farms. Over the next decades, however, competing demands on the agricultural sector, as well as the unexpected consequences of agricultural industrialization, may set the stage for a fundamental reorganization of this enterprise—one that requires an agro-ecological perspective to achieve sustainability.



Agriculture will be
ground zero for
global turbulence
as demands for food
compete with those for
fuel, carbon management,
development, and
human health

TEN-YEAR FORECAST
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NEW CROPS: NOT JUST FOR THE DINNER TABLE

As agriculture has become more industrialized, its original mission of putting food on our tables has shifted. Farms are increasingly organized as production plants with global distribution systems. Labor, seeds, chemicals, and equipment are all rationalized to generate the highest return on investment (ROI).

This rationalization makes it easy—even financially imperative—for agricultural firms to look for crop substitutions or agricultural practices that improve the bottom line. At the same time, a more complex global marketplace is offering up more choices for crops:

- As traditional energy sources decline, fuel markets will compete with food markets for key crops such as corn, beets, and soybeans.
- With carbon credit trading, carbon sequestration crops may offer a profitable alternative—or enhancement—to traditional food crops.
- “Virtuous consumption” foods, such as organic or fair-trade foods, require expensive certification processes and create challenges for those who want to assist poor farmers.
- The growing fresh flower markets worldwide bring much higher ROI than basic food crops.

NEW RISKS: THE DISEASE CONNECTION

Aside from creating potential disincentives for basic food production in the global marketplace, the industrialization of agriculture

has introduced a host of unforeseen health consequences. High production of a few basic crops—corn, wheat, poultry, beef, cane sugar, and sugar beets—has supported the rise of fast-food markets, ever-larger portions, and less variety in the average diet, contributing to health problems such as obesity and diabetes.

These large-scale monoculture practices may also be setting the stage for life-threatening epidemics. The conditions under which livestock are raised and slaughtered—relying on antibiotics to compensate for the risk of disease in overcrowded and unnatural conditions—have led to antibiotic-resistant strains of bacteria. Monocultures of hybrid crops may also be linked to health-threatening ecological imbalances: hybrid maize has been implicated in the spread of malaria in Africa.

NEW STRATEGIES: AGRO-ECOLOGICAL DEVELOPMENT

Over the next decade, expect the agricultural sector to become progressively more politicized as competing demands and unintended consequences play out in the global marketplace. The results? Agro-ecological strategies will emphasize multiple, locally tailored crops, managed at the ecological level rather than the crop level. Trade disputes over agricultural commodities will intensify. Political debates over sustainability and globalization will be reframed. And environmental health will become increasingly entwined with agricultural policy.

—Jody Ranck & Kathi Vian



INTERVIEW: BEN CROW

Ben talks about the differing impact of globalization and new technology on rich and poor farmers in the developing world.

Q | What are the key challenges facing farmers and the agriculture sector in developing nations today?

The challenges are different for rich and poor and somewhat different in Africa and Asia. Poor farmers need ways of weathering the crises of illness, unexpected expenditures, poor harvests, and unpredictable work availability. These farmers—and they are the largest group of farmers in the global south—depend only partly on farming for their livelihood and may have multiple occupations, with wage labor for others as a mainstay. In the absence of reserves and insurance, quite small perturbations in the market, in social and state obligations, and the weather may result in such farmers auctioning their land and tools just to survive. Dani Rodrik's (Harvard University) suggestion of the liberalization of global labor migration through temporary contracts could be a significant source of remittances, which are usually effectively used.

For these farming households, employment generation and the generation of reserves may be more important than crop productivity. In the right conditions, nevertheless, they can mobilize a significant labor force to grow crops for consumption and sale.

The challenges for rich farmers vary by region and country. In Kenya and some other African countries, rich farmers are making a lot of money with flowers and other horticultural products exported to Europe. Rapid access to international airports with cheap freight space on passenger planes is a prerequisite for this enterprise. Water supplies may also be an increasing constraint on this form of production because it seems to be water intensive. In some parts of Asia, particularly Indonesia and Thailand, export markets for cereals are important. In this case, the reduction of agricultural subsidies by United States and Europe could help improve the prices of exports.

The challenges facing the agricultural sector can also be understood through disaggregating the different actors. Governments want revenue (among other things), and many governments have often been unwilling or unable to tax farmers. Increasing returns to agriculture might be part of a process enabling taxation of agriculture. I guess the challenges that you're interested in are those that would enable growth of agricultural output. I am not sure that I have a good or simple answer to that question. Horticulture in Africa and shrimp farming in Asia are the two contemporary examples of rapid agricultural growth of which I am most aware.

Q | Many developing countries are facing rapid growth of urban populations in the coming decade. What do you see as the key challenges to organizing agriculture—locally and globally—to feed these growing populations, both in megacities and in rapidly growing smaller cities?

If people in cities have adequate incomes, I think agricultural production will respond. Local production of vegetables, milk, and poultry in the area around Asian cities has been growing quickly. Similarly, if cities have demand backed by purchasing power, global trade can deliver food cheaply and, barring unforeseen circumstances, reasonably reliably. Building local production needs roads, trucking firms, and good communication. Again, reducing industrialized-country agricultural subsidies would probably increase the availability and reliability of global food.

Q | Can high technology be appropriate in the global south?

Again it helps to disaggregate the farmers. Poor farmers have been able to adopt technologies that are scale neutral or not “lumpy” and for which the risks are not high. In general, biochemical technologies have been relatively scale neutral. That is, you can buy a large or a small bag of fertilizer and a large or small number of seeds without paying a huge difference in price. Mechanical technologies—pumps, tillers, tractors, and the like—have tended to be more lumpy.

Rich farmers who have adequate reserves against risk and are cultivating on a larger scale tend to be first to adopt new technologies, particularly those that are mechanical or particularly risky. There are exceptions, though: tillers can be made more widely available through rental markets, and water markets can spread the water from lumpy pumps.

With the caveat that the growth of employment matters more than the growth of productivity for small and poor farmers, new seeds have been adopted across the range of rich and poor. Precision agricultural techniques could also potentially be important for farmers with small and often scattered plots. Whether the skills, knowledge, and investment required for the deployment of precision techniques would make them too lumpy or too risky is a question that requires investigation.

BEN CROW is assistant professor of sociology at University of California, Santa Cruz, where he has developed a Global Inequality Index to inform development strategy.

Q | One of the promises of genetically engineered crops is that they could provide better yields for marginal growing conditions in many developing countries—but they also make farmers dependent on large seed companies. Australian researchers have announced that they've created techniques for generating “open-source” crop biotechnology, offering some of the same gains as traditional GMOs but without the legal and economic restrictions. What would these crops mean to farmers in developing nations?

It is possible that cheap GMO crops could be widely adopted. In the parts of Asia I know (largely the irrigated areas of South Asia), most farmers are dependent on purchased seeds. For them, the price matters. But whether it comes from the government or a global seed company probably does not. I think the commercialization of seed supplies is probably less in Africa. And certainly in some parts of Southern Africa, popular resistance to GMOs would seem likely to bar open source as well as patented GMOs.

Q | Another challenge facing agriculture worldwide is the development of sustainable farming practices. Are there technologies that could improve sustainability of agriculture in developing countries? Are existing sustainable practices likely to be displaced by technologies?

I think there are technologies that could improve the sustainability of agriculture in the south. Alternatives to pesticides, more efficient composting of agricultural wastes, more efficient use of water could all be important. The more efficient use of water would be the one I would expect to have the greatest impact. Small, private tubewells for irrigation are lowering groundwater levels dramatically in parts of South Asia. If there were costs perceived by individual owners, then drip irrigation could easily be implemented for high-value crops.

Q | In the West, sensors and sensor networks are being tested on high-value crops—such as in wine-grape vineyards—with the aim of providing more precise control over characteristics of the crop that people are willing to pay more for. Do these technologies have any place in agriculture in developing nations?

I think sensors do have a place in developing country agriculture. As with the Grameen phone, it may not be immediately obvious how sensors can best be used, where, and with what crops. As sensors become more available and cheaper, I think uses will emerge.

Q | Are there other technologies—beyond precision farming and genetic crop engineering—that are likely to play an important role in the future of agriculture in developing countries?

I am interested in bucket irrigation for small farms and household plots. This is a system where water is delivered to a small storage tank—by bucket if no other source is available—and then delivered to crop plants through plastic pipes and drippers. The system seems to have potential for small farmers (particularly women) with limited access to water. Small treadle pumps have been selling well in Kenya to lift water into nurseries and plots from rainwater harvesting tanks. Technologies of rainwater harvesting, small dams, and local storage from rooftops have all been important in India.

Social innovations may also play a role: community organization around water can have important benefits for small irrigation and household agriculture and livestock production.



Alex Soojung-Kim Pang, Research Director at IFTF, asked Ben about the shape of agriculture in the developing world over the next decade.

BIOFUELS COMPETE WITH FOOD, REDUCE BIODIVERSITY

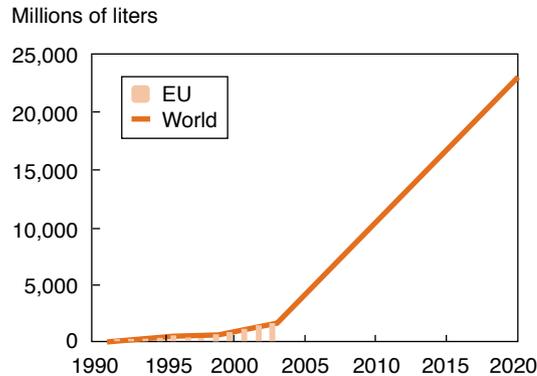
As the world looks for substitutes for fossil fuel, two types of biofuels will grow, quite literally, over the next two decades.

Production of biodiesel fuel—which substitutes agricultural oil such as soybean oil for petroleum—will grow by a factor of six by 2020. Currently, the EU is the leading producer worldwide of biodiesel fuel.

Ethanol, a fuel alcohol made from fermented sugars, will be mixed with gasoline or used as pure fuel for an increasing percentage of automobiles. Already in Brazil, more than a quarter of all automobiles manufactured include a fuel-sensing engine that can automatically switch between 100% ethanol and 25% ethanol fuel, and every filling station offers both. Sugar cane, beets, and corn are all crops used to produce ethanol. The share of corn used for ethanol production has increased dramatically since 1980 and will continue to grow through 2014.

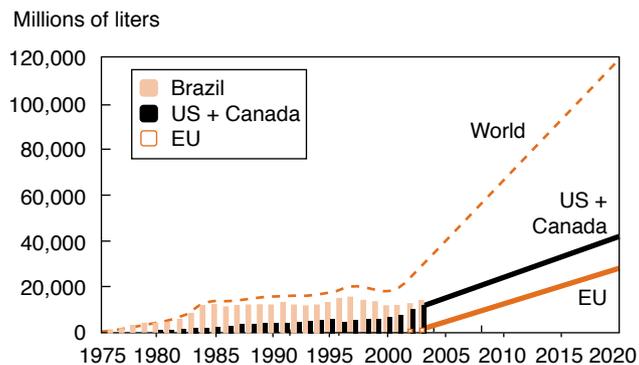
Both biodiesel and ethanol markets will continue the trend toward the industrialization of agriculture with significant potential for reducing biodiversity. Large monocultures of crops that can be sold in either food or fuel markets, depending on current market price, will displace mixed-crop farming in the developing world, while clear-cutting of diversity-rich zones like the Amazon will continue to reward the largest producers.

1 Growth of Biodiesel Production



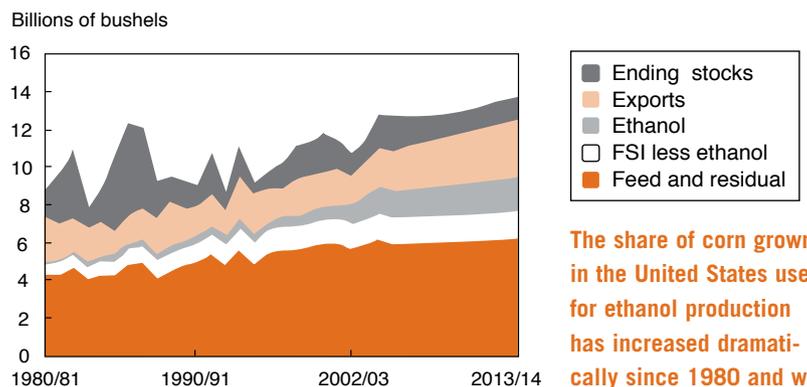
Source: International Energy Agency, Organisation for Economic Co-Operation and Development, *Biofuels for Transport: An International Perspective*, 2004.

2 Growth of Ethanol Production



Source: International Energy Agency, Organisation for Economic Co-Operation and Development, *Biofuels for Transport: An International Perspective*, 2004.

3 Uses of U.S. Corn Crop



Source: Economic Research Services, U.S. Department of Agriculture, USDA Agricultural Baseline Projections to 2014, February 2005.

The share of corn grown in the United States used for ethanol production has increased dramatically since 1980 and will continue to grow through 2014.

DETAILS

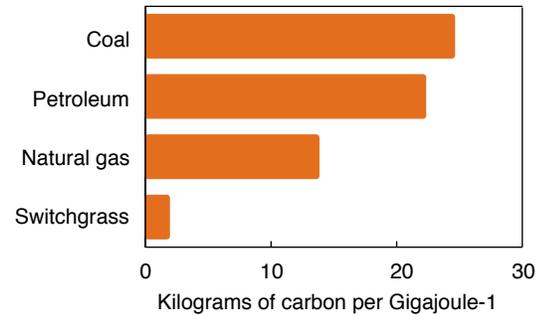
CARBON MARKETS DRIVE BIOENERGY CROPS AND CARBON SEQUESTRATION

The emergence of markets for trading carbon emissions—that is, the right to exchange positive carbon emissions for negative emissions for a price—has led to a lot of experimentation with “bioenergy” crops and carbon sequestration, which can go hand-in-hand.

Bioenergy crops can be burned in place of fossil fuels such as gas, coal, and oil. While not as energy-efficient as fossil fuels, bioenergy crops such as switchgrass, elephant grass, tall fescue, poplar, and mesquite produce less carbon when burned and also sequester carbon: for example, it’s estimated that bioenergy crops could sequester 318 teragrams of carbon per year in the United States and 1,631 teragrams worldwide. In addition, they could be planted in marginal soils.

Overall, the capacity to sequester carbon has declined in the United States over the last decade, even as carbon markets have become available.

4 Carbon Emissions from Combustion of Fuels



Source: R. Lemus and R. Lal, “Bioenergy Crops and Carbon Sequestration,” *Critical Reviews in Plant Sciences*, Jan–Feb, 2005.

5 Net Carbon Sequestration in the United States in Teragrams of Carbon

	1999	2001
Forests	268	207
Urban trees	16	16
Agricultural soils	4	4
Landfill yard trimmings	5	1
Total	293	228

Source: U.S. Environmental Protection Agency, U.S. Emissions Inventory, 2003.



THE AGRO-ECOLOGICAL PERSPECTIVE: THE CASE OF MALARIA AND MAIZE

Various industrial agricultural practices—from large-scale hybrid monoculture to “industrialized organisms”—may be setting the stage for an avalanche of unanticipated problems in the environment, in social systems, and in human health. The agro-ecological perspective offers an alternative.

To understand this perspective, consider the case of maize and malaria. Environmental historian James McCann and his Ethiopian and Harvard colleagues make a strong argument for the link between industrialized maize production in Ethiopia and an unprecedented outbreak of malaria. Once a patchwork of mixed crops, the highlands of Ethiopia were gradually converted to unbroken fields of hybrid maize due to government initiatives to adopt “industrialized scientific agriculture.” In particular, a tall, late-ripening hybrid maize replaced not only the traditional grains of teff and eleusine, but also the low-growing varieties of maize that ripened earlier.

Unfortunately, pollen from the tall maize was released precisely when mosquito larvae were breeding in an increased number of soggy sites, many close to homes of residents. Availability of this pollen for food appears to have led to a much larger, more robust mosquito population in 1998. The result was a malarial outbreak in which nearly half of the population of the single district of Burie contracted the disease and 740 died—all in a region in which malaria has historically been rare. In the summer and fall of 2005, the Ethiopian Ministry of Health reported malaria rates as much as ten times higher than average. Drought-intolerant maize has also become a central concern in Southern Africa, where more frequent droughts have decreased food production, leading indirectly to higher HIV rates and chronic hunger for nearly 50% of the population.

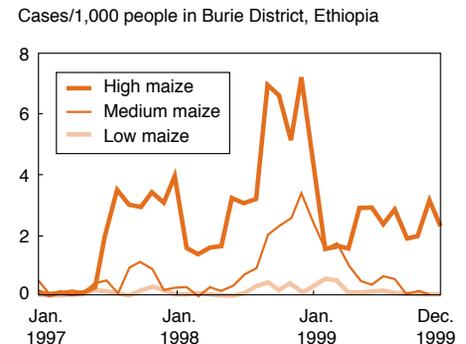
These cases stand as examples of the interconnections of habitat, health, and agricultural policy, and this perspective will be at the core of reform efforts in the coming decade.

MEGACITIES: NEW HOME FOR SMALL FARMS

More than 90% of the world’s population growth will occur in the cities of the developing world over the next few decades. As these cities grow, an increasing share of the food economy will depend on urban agriculture—from small, private gardens to commercial farming within city limits and surrounding the city. By 2015, approximately 1.7 billion people worldwide could be engaged in urban farming, with about one-quarter of those considered market producers. Urban agriculture provides about 15% of all food consumed in urban areas today, and its share could double over the next couple decades.

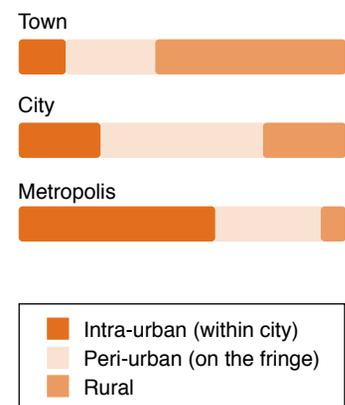
Small urban plots of mixed traditional crops offer an antidote to large-scale monoculture in rural areas, but they also create new problems for urban planners and public health officials. Water management is the biggest of these: crops and livestock can be contaminated by unsanitary water and can also contaminate the water supply. Unfortunately, very little research and technology development focuses on urban agriculture, maintaining a bias toward large rural farms.

6 Rates of Malaria Infection in Burie District, Ethiopia



Source: James McCann, *Maize and Grace*, Harvard University Press, 2005.

7 Estimated Contribution of Agriculture from ... Areas by Size of City



According to Mougeot’s research, the sources for agricultural products as well as their consumption become increasingly urban as cities increase in size.

Source: Adapted from Luc J.A. Mougeot, “Urban Agriculture: Definition, Presence, Potentials and Risks,” Bakker et al., *Growing Cities Growing Food: Urban Agriculture on the Policy Agenda*, 2000.

WOMEN, HEALTH, AND FAMINE: UNRAVELING THE SOCIAL FABRIC

Women in the developing world are playing an increasing role in farming. Overall, women produce approximately 50–70% of Africa’s food. This shift has occurred as men are lost to war, sickness, and urban migration. Approximately one-third of all rural households in sub-Saharan Africa are now headed by women who bear the burden not only of caretaking but also of tilling the land.

Statistically, women farmers are less educated and younger than their male counterparts, and have less land and fewer resources. Lacking resources, they are increasingly altering their crop plantings, resulting in decreased production, which in turn results in malnutrition. Malnourished, they are less able to plant and harvest, creating a downward spiral in farm productivity.

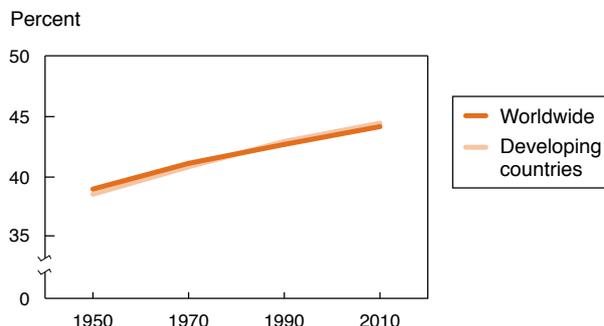
In addition, HIV has taken a large toll on young adults in many developing nations—the men and especially women who are the food producers and caretakers. As these women sicken and die—or spend more of their time caring for their ill—the community as a whole cannot support the burden of care, and the larger social structure begins to break down to where it cannot recover. Again, agricultural productivity spirals downward. While this pattern is most pronounced in Africa, China may also face a growing agricultural and political crisis as HIV sets up a similar dynamic there.

SUBSIDIES AND PROTECTIONS: CONTINUING BATTLES IN GLOBAL FOOD MARKETS

One of the most contentious agricultural policies has been the food subsidies and protections that keep the price of agricultural goods artificially low—or high—in the global marketplace. These indirect price controls favor large producers from developed nations who, with the financial support of their wealthier governments, can offer goods at lower prices than local farmers in developing nations.

The International Food and Policy Research Institute has modeled the impact of current agricultural policies in developed nations at a minimum cost of \$24 billion annually to the developing world. By comparison, total subsidy support to agriculture in OECD countries was approximately \$311 billion in 2001. And while the subsidies support international assistance programs, the cost of lost agricultural income far outweighs the amount of international assistance and undermines the economic growth of poor nations.

8 Share of Women In Agricultural Labor Force



Source: U.N. Food and Agricultural Organization, Gender and Food Security Program.

9 Relative Impact of HIV/AIDS on Economic Sectors in Southern Africa, 1990–2000

	Skilled Labor	Female Labor	Capital	Market	Burden
Manufacturing	High	Very low	Low	Low	Low
Mining	Low	Very low	Very low	Very low	Very low
Agriculture	High	High	High	Very low	Very high

Source: A. de Waal and J. Tumushabe, “New variant famine: AIDS and food crisis in southern Africa,” Southern African Regional Poverty Network, 2003.

10 Simulated Result of Liberalizing Agricultural Trade Policy

	Percent increase in value of trade to region
Sub-Saharan Africa	45
Asia	85
Latin America & Caribbean	47
Other developing countries	38
All developing countries	198

Source: Xinshen Diao, Eugenio Diaz-Bonilla, and Sherman Robinson, “How Much Does It Hurt? The Impact of Agricultural Trade Policies on Developing Countries,” International Food and Policy Research Institute, 2004.



GROUNDWELL: MONDAY MORNING

The Real Dirt on Farmer John documents the unexpected intersection of urban culture and peri-urban agriculture.



✓ EDUCATION: Refocus extension services on women and health

Although one-third to one-half of primary food producers worldwide are women, agricultural extension services have primarily targeted men. In addition, they have overlooked the interdependent issues of human and even animal health. Often poor families go hungry when pests and disease kill their livestock. The HIV epidemic has disproportionately impacted younger generations so that parents in hard-hit areas are beginning to back away from education, undermining one of the most successful social interventions in alleviating poverty.

To ameliorate this situation, agricultural extension services worldwide might best be reorganized to integrate public health and agricultural outreach, and should be redesigned to leverage resources for supporting young women engaged in farming and caretaking.

✓ NEW BUSINESS DEVELOPMENT: Develop new tools and services for urban agriculture

As megacities dominate the landscape of developing nations, a key food strategy will be to support a healthy urban agricultural economy. Clean water will be essential to this goal, but most current strategies for low-cost water purification focus on personal drinking water, not irrigation or wastewater management. Solutions to these problems could dramatically impact the viability of urban agriculture.

Perhaps even more important will be social services and tools that help people organize their small-scale endeavors into a citywide food economy. The same kind of bottom-up tools and services that have helped turn eBay into a colossal marketplace might be adapted to the needs of urban farmers in the developing world. Adding to the list of reforms for agricultural extension services, a new focus on urban agriculture might well address the food needs of megacities, with fewer environmental and health consequences than current rural industrial strategies.

✓ INTELLECTUAL PROPERTY: Develop new models of wealth creation based on open-source biology

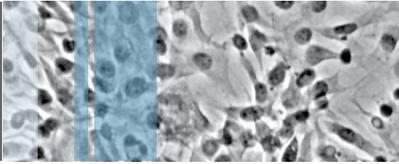
Agro-ecological ways of thinking about new biotechnologies may reconfigure some of the “food fights” of the 1990s that focused on Bt (insect-resistant) maize and cotton. Together with new open-source approaches to hybrid development, they may create tools, practices, and hybrids that are not only safer, but also are more accessible to small farmers with limited resources.

BIOS, for example, is an open-source protected commons for biological research that could lead to new varieties of cassava or protein-enriched and drought-resistant maize. Similarly, a Creative Commons-like approach to protecting native plants may ensure that traditional farmers can continue to exchange their traditional seeds without fear of losing them to patent wars. Expect to see new regimes of benefit-sharing when life-as-information becomes the commodity rather than the actual agricultural good. And expect policy debates over the trade in bio-information as plant materials from developing countries are substituted by products produced using technology.

✓ GLOBAL MARKETS: Reform trade subsidies

At the heart of agro-ecological reforms will be the liberalization of agricultural subsidies and protectionist policies. Without access to even their own local markets, rural and urban farmers alike will not be able to rise above subsistence farming.

Even in highly subsidized countries like the United States, the majority of citizens oppose annual subsidies. However, reformers face not only the beneficiaries of subsidies—mostly large industrial farms—but also some development agencies whose mission is to feed the poor and who depend on the subsidies for their activities. Over the next decade, this conflict is likely to be ignited as the connections between industrial farming practices and health, famine, and poverty become clearer.



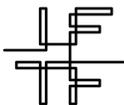
HEALTH: SICK HERD

Despite a century of dramatic medical and public-health breakthroughs that have extended human life expectancies by as much as 20 to 30 years, there are indications today that the human species is becoming a sick herd. From rapid increases in immuno-compromised populations to urban overcrowding and the effects of chronic diseases in aging populations, the stresses on human health from noninfectious as well as infectious diseases are growing. And while the effects will be felt throughout the global economy, local populations will exhibit highly differentiated patterns of disease, requiring new and targeted interventions.



Lifestyle, environment, and economic disparity may pose a greater threat to human health than a global pandemic

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SIGNS OF STRESS: BEYOND INFECTIOUS DISEASE

In the wild, ecologists recognize a struggling animal population by several signs: the rapid spread of disease, the failure to reproduce, diet changes, mutations, or migration beyond normal feeding grounds. Seen from this ecological viewpoint, humans show growing signs that their environment is not sustaining them. While lower fertility rates, higher farm productivity, global migration, and the ability to reprogram human genes all look like signals of social, economic, and technological prowess, they also match the ecologist's template of a sick herd.

Accompanied by global flows of capital, trade, people, and media, new epidemiological patterns do not conform to the narrative of progress in health outcomes globally. The number of immuno-compromised people has been steadily increasing, with more prevalent asthma, allergies, depression, and violence as indicators. Among the possible causes of immuno-weakness:

- Increasing UV-B radiation
- Air pollution, pesticides, and chemicals such as PCB, mercury, and biphenyl B
- Perhaps ironically, ultra-clean environments
- Less nutritious or more toxic diets

In this overall ecology of malaise, individual populations exhibit unique patterns of vulnerability. For example, in Bangalore, India, children from high-traffic, low socioeconomic areas are about 60% more likely to suffer

from asthma than those in high-traffic areas in general—who in turn, are almost twice as likely to have asthma as those from low-traffic areas in general. With occupation, age, genetics, socioeconomic status, geography, and local environment contributing to the prevalence of asthma, the most effective intervention for a particular population will certainly not be a cookie-cutter solution.

PUBLIC HEALTH: THE CAPACITY TO RESPOND

Even as the immuno-compromised, chronically ill, and aging segments have increased, the capacity of society to respond to health challenges has declined. Since the 1980s, public health agencies worldwide have been eviscerated. Medicine relies increasingly on prescription drugs, the cost of which is expected to more than double by 2011 in the United States alone. New diagnostic and therapeutic regimes have arguably increased demands on the health system for previously nonmedical conditions.

All of this points to the possibility of a fundamental reinvention of public health, both globally and locally. Just as other sectors are increasingly learning the basics of cross-institutional and even cross-sector cooperation, public health functions may be integrated—or serve as the focal points for integration—with a range of other resources and perspectives, including urban planning, agricultural extension programs, environmental interventions, and technology development.

—Jody Ranck & Mani Pande



INTERVIEW: TOM NOVOTNY

Tom reflects on the consequences of globalization on noncommunicable diseases—from tobacco addiction to asthma and obesity.

Q | Tobacco use has been an iconic example of noncommunicable disease around the world. How have policies surrounding the use of tobacco changed over the last several years?

Well, they have indeed changed. Health organizations in the past focused mostly on child health and development, maternal child health, and infectious diseases. But several years ago, the World Health Organization took a very strong, major step toward addressing tobacco and other noncommunicable diseases. Derek Yach, as assistant director general, started the Tobacco-Free Initiative and also the noncommunicable disease cluster. And then he was joined by people from other organizations, like Mike Erickson from the Office on Smoking and Health in the CDC, as well as Prabhat Jha from the World Bank.

Around 1997, the World Bank undertook a major effort to identify the tobacco control issues for developing countries and the economic consequences of tobacco globally. That work helped us get a handle on both the evidence and the economic implications—and to translate it into the development context for the Bank and into a multinational cooperation context for the World Health Organization. So those were two major changes. And then as a result of this interest, the first World Health Organization treaty on tobacco and health was implemented and ratified by a majority of countries.

The pharmaceutical companies—Pfizer and others—have put forward therapeutics for smoking cessation, mainly nicotine replacement and antidepressants. So they've played a role by simply getting the message out that you can get help to quit. But corporate-wise, those are probably the only real significant players that have done anything. And that's too bad because, as a work-site issue, this is a big deal. If employers fully recognized the benefits of supporting a nonsmoking environment and providing smoking cessation programs, they would embrace tobacco control. Certainly some have—those that have good health promotion divisions (like some of the automobile manufacturers) and those with good health promotion plans. There have also been lessons, even from abroad, where corporations have benefited from being smoke free. But there hasn't been a wholesale interest from the corporate world, in terms of employee health and productivity, reduced absenteeism, and reduced payout for health benefits.

Q | You've looked at the impacts of globalization on noncommunicable disease. How does globalization drive tobacco use?

There's still a mystique about the benefits of Western society and culture that gets marketed along with tobacco. I think that U.S. movies also have a significant role to play in modeling tobacco use. I think the tobacco industry has a direct effect, either through marketing or any kind of policy work they promote, so that they're a driving force and should be looked at as a vector that needs to be controlled. I think that open markets drive tobacco use in developing countries or in countries such as China, where markets have been less penetrated by global brands.

But changes in social structure, such as urbanization, also increase tobacco use because people get exposed to more advertising and more use of tobacco. Changing gender roles also encourage more women to smoke as a mark of their independence. And there's a persistent sense of normalization, that somehow tobacco smoking is normal. So despite the fact that the mortality burdens seem to be growing for tobacco-related diseases even in developing countries, people don't see it as nearly the same sort of threat as other global health issues like SARS or pandemic influenza.

Q | Asthma is another important disease on the horizon. How would you characterize its threat today?

It is something that has increased, especially in children. It's closely related to tobacco smoking, as a result of primary and secondhand smoke exposure. But it also has other possible causal agents. It's a major threat, though not nearly as bad as tobacco, with a substantial health burden. Some of the issues are environmental: as we insulate our buildings and tighten them up, indoor air becomes more problematic. Global atmospheric emissions have changed a lot, too. They continue to grow as industrialization occurs.

And while a pharmaceutical solution is critical, and pharmaceutical management is absolutely essential, even on a public health basis, drugs are not going to solve the problem. There are still the environmental allergens, and people are not going to stop living with their cats and dogs. A broader population-based health intervention, whether it's at the home or in the global environment, is also essential.

TOM NOVOTNY is the Director of International Programs at the UCSF School of Medicine, maintains an office at the Institute for Global Health, and serves as the CDC liaison for the UC Berkeley School of Public Health. He has also served as a consultant to the WHO.

Q | Obviously everybody's talking about the rising burden of obesity and diabetes these days. Who's addressing this problem and how are they going about it?

To make their employee base healthier, firms have addressed these issues through exercise programs, better food and food information in cafeterias, incentives for weight loss, group weight-loss contests, and better health education messages. In the schools, parents and teachers have tried reducing access to sweetened drinks. So there are a lot of things that can be done, and have been done, from that end. There's little evidence, though, about whether these efforts do any good because there hasn't been a strong set of evaluation programs. But certainly these practices are getting a lot of attention, which can help raise the level of discussion and policy work. Also, I think the marketing of high-caloric food in this country is something that has to be taken on as an issue of corporate responsibility.

One particular group that has a chance of bringing the corporate, government, and academic sectors together around this issue is the Oxford Health Alliance. This consortium was supported initially with funds from a pharmaceutical company, Novo Nordisk, which makes diabetes medicines. It put a million dollars into this consortium, which is an effort to raise the level of awareness of noncommunicable diseases with a focus on diabetes, obesity, and the consequences that are related to diabetes.

Q | You've also done a lot of work on globalization and bioethical issues. What do you see as the most pressing bioethical issues associated with globalization?

Corporate social responsibility is a big one, and I think that has to be driven much more by states or by multinational organizations like WHO and the World Bank. We can't just sit by and let open markets take care of these issues because markets often fail when it comes to health risks. And when there are market failures, there have to be interventions to get companies to act responsibly.

The second issue is global governance. This is where equity for those countries that don't have the resources to take care of their own sovereign needs can be supported. For example, you might have an international agreement by multiple countries to both address the health issues and provide the funding necessary to help those with the fewest resources succeed as well as those with abundant resources.

The third issue is recognition on the part of individuals of their shared responsibility, especially in developing countries. It's not just a matter of how much we can do for ourselves, but how we can make it our personal responsibility to contribute to global health.

I think these are the broad ethical concerns, and they should certainly be articulated by government leaders. Unfortunately, it's not something that our government is pushing; health professionals should advocate for more ethical commitment to global health. We've got the resources to do it and the responsibility as the richest nation on earth.

Q | Do you think there's a way to move this bioethics discourse beyond several big principles that are really rather blunt instruments to more mobile, context-specific concepts?

I think so. I think there should be research funds put into global bioethics. Think tanks should be supported to address these issues more directly. Academic institutions have a responsibility for this, and I think the issue should be raised in the policy literature as well as in the general media. And I think it can be done. Some companies like Novo Nordisk have done a great service in supporting noncommunicable disease discourse, but I think that corporate social responsibility can be further encouraged. Incentives can be created, and when it seems to be lacking, it can and should be criticized.



Mani Pande, Research Manager at IFTF, asked Tom about the bioethics of noncommunicable diseases in a world of increasing globalization.

THE GROWING GLOBAL BURDEN OF DISEASE

One of the measures of the global burden of disease is the disability-adjusted life years (DALYs), which combine years of life lost due to premature mortality and years lost due to disability. According to the World Health Organization, global DALYs are projected to increase from 1.48 billion in 2002 to 1.65 billion in 2030—an increase of about 11%.

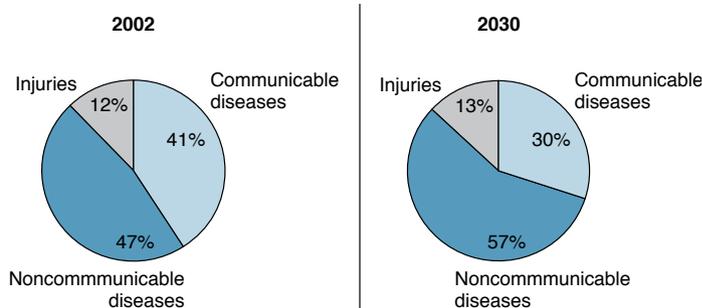
As this global burden of disease increases, the share of noncommunicable diseases will grow as communicable disease declines. The shift in burden will be particularly striking in low-income countries; even taking into account the doubling of HIV/AIDS, communicable disease will fall from 41% in 2002 to 30% in 2030. Noncommunicable disease is expected to increase to 57% of DALYs worldwide in the same period. Of these, depression will be the leading cause.

THE AIR WE BREATHE: FROM LOCAL AIR QUALITY TO GLOBAL ATMOSPHERIC CHANGE

Changes in atmospheric gases—carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons, among others—have direct and indirect impacts on human health. In the preindustrial world, the levels of these gases were either much lower or nonexistent. Chlorofluorocarbons that deplete the ozone layer didn't even exist in preindustrial times, but are abundant now. With the depletion of the ozone layer, the average global temperature will rise by several degrees Celsius during this century, leading to changes in the world climate.

The first detectable impacts of climate change on humans will be higher incidence and change in seasonality of infectious diseases, including malaria, dengue fever, and food-borne diseases like salmonellosis. By midcentury, there will be a higher incidence of temperature-related mortality, as deaths attributable to heat waves increase several-fold—500 to 1,000 deaths per incident for New York and 100 to 250 for Detroit. More natural disasters will also lead to increases in both deaths and disease.

1 Growth of Noncommunicable Disease Worldwide Share of DALYs Caused by ...



Source: World Health Organization, 2005.

2 Change in Top-Five Leading Causes of DALYs Worldwide

2002		2030	
Perinatal conditions	6.6	HIV/AIDS	10.3
Lower respiratory infections	6.3	Unipolar depression	5.3
HIV/AIDS	5.7	Ischemic heart disease	4.4
Unipolar depressive disorder	4.5	Pulmonary disease	3.8
Diarrheal diseases	4.3	Perinatal conditions	3.8

Source: World Health Organization, 2005.

3 Greenhouse Gases Affected by Human Activities

	Preindustrial	1998	Atmospheric lifetime*
Carbon dioxide	280 ppm	3,565 ppm	5–200 years
Methane	700 ppb	1,745 ppb	12 years
Nitrous oxide	270 ppb	314 ppb	14 years
Chlorofluorocarbon 11	0	268 ppb	114 years
Hydrofluorocarbon	0	14 ppt	45 years
Perfluoromethane	0	80 ppt	260 years

* This lifetime is adjusted to take into account the indirect effect of the gas on its own residence time.

Source: World Health Organization, 2005.

DETAILS

THE FOOD WE EAT: FROM UNDERFED TO OVERWEIGHT

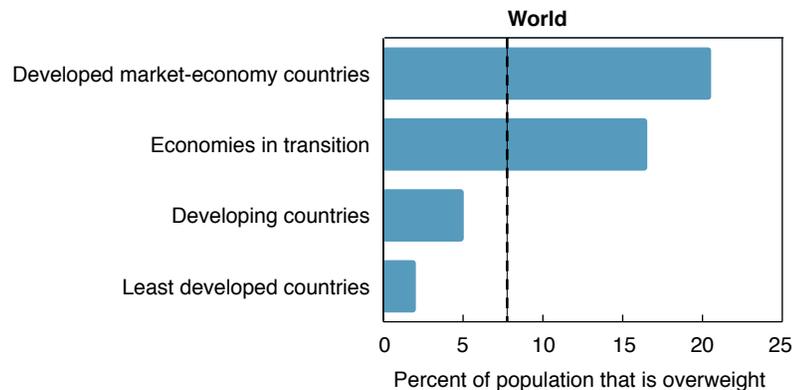
The globalization of the food chain, urbanization, and their impacts on lifestyles are resulting in a nutritional transition with important health implications. Obesity, diabetes, and heart disease are all health conditions associated with this shift, and they impact both industrialized and developing countries.

The number of overweight people worldwide now equals the number of underfed, at 1.1 billion each. The number of obese adults grew from 200 million in 1995 to 300 million in 2000. In 1995, 18 million children under five were obese.

Obesity is a global problem. While 30% of U.S. adults (60 million) are obese, 115 million people from developing countries suffer from obesity-related problems. A 1999 study found that the number of overweight Chinese had jumped from 10% to 15% in just three years. In Brazil and Colombia, obesity rates are comparable to those in Europe at around 40%. Even in sub-Saharan Africa, one of the poorest regions in the world, the urban population is becoming increasingly obese. And in India and China, both obese and underfed individuals are living in the same household.

According to a 1998 National Health Interview Survey, the medical expenditure attributable to obesity and overweight was \$78.5 billion in the United States. Diabetes is one of the major medical consequences of obesity; the number of diabetics worldwide is expected to nearly double in this decade. Again, the problem is not limited to industrialized nations. India is known as the diabetes capital of the world, and in the Middle East, high diabetes rates (17% to 20%) combine with very high rates of high blood pressure and heart disease.

4 Global Obesity Patterns, 2000



Source: World Health Organization, *Obesity: Preventing and Managing the Global Epidemic*, 2000.

5 The Incidence and Cost of Diabetes Worldwide

Worldwide incidence of diabetes in 1997	124 million
Projected incidence by 2010	221 million
Incidence of diabetes in India today	35.5 million
Projected incidence in India by 2025	73.5 million
U.S. medical costs associated with diabetes in 2001	123 billion
Cases attributable to obesity	61%

Source: A.F. Amos, D.J. McCarty, and P. Zimmet, *Diabetic Medicine* 1997; 14 Suppl 5:S1-85; *Diabetes Voice*, May 2003, Vol. 48.



THE WAY WE FEEL: FROM A BAD DAY TO LONG-TERM DYSFUNCTION

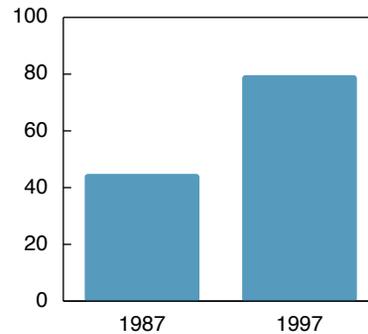
Mental and emotional disorders—as well as new kinds of addictions—contribute to the growing global burden of disease. According to the World Health Organization, unipolar major depression will become the second leading cause of disability by 2020. In the United States, treatment of depression has changed dramatically as pharmacological options multiply. In 1997, patients were 78% more likely to receive a psychotropic medication than in 1987, and they were slightly less likely to receive psychotherapy.

Autism and autistic spectrum disorders are also increasing in both the United States and the United Kingdom. Along with attention deficit hyperactivity disorder (ADHD), autism is a primary contributor to sensory integration disorder, which results from the brain's inability to integrate information received from the body's five basic sensory systems. This disorder is usually diagnosed in children and can manifest in different forms: children might be oversensitive or undersensitive to touch; they may also be easily distracted, suffer from social and emotional problems, or lack self-control.

Finally, a growing number of compulsive activities are being classified as addictions, with psychological and pharmaceutical treatments. These include Internet surfing, shopping, sex, and gambling. Psychologists disagree strongly over whether these excess behaviors should be labeled addictions, but the American Psychological Association recently recognized “pathological gambling” after amassing evidence that gambling produces the same responses in the brain as cocaine and that withdrawal and relapse follow the same patterns as drug and alcohol abuse. According to the *New York Times*, psychiatrists estimate that 6% to 10% of the 189 million Internet users in the United States have a dependency that can be as destructive as alcoholism and drug addiction. Mental health experts also talk about technology addiction, citing especially the BlackBerry (often referred to as “CrackBerry”) and obsessive online gaming.

6 Changing Treatment for Depression

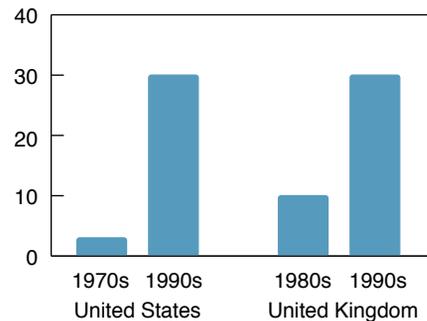
Percent receiving medication



Source: Olsson, et al. “National Trends in the Outpatient Treatment of Depression.” *JAMA* 287: 203–209, 2002.

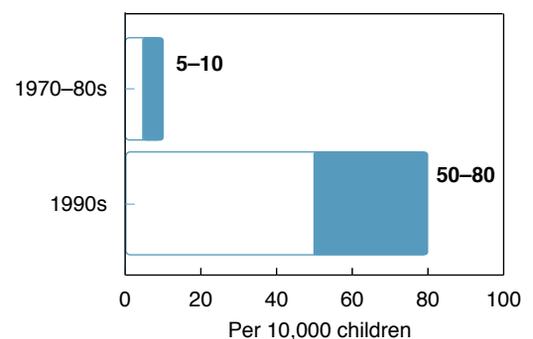
7 Changing Incidence of Autism

Per 10,000 children



Source: Blaxill, Mark, “What’s Going On? The Question of Time Trends in Autism,” *Public Health Reports*, Nov–Dec 2004, Vol. 119.

8 Changing Incidence of Full-Spectrum Autistic Disorders in the United States and the United Kingdom



Source: Blaxill, Mark, “What’s going on? The question of time trends in autism,” *Public Health Reports*, Nov–Dec 2004, Vol. 119.

THE DRUGS WE TAKE: FROM WARINESS TO EAGER EXPERIMENTATION

Over the last decade or so, there has been a dramatic cultural shift from a general wariness of drugs to a growing willingness to experiment with them—or even to be experimented on (though concerns about drug interactions have led to testing in so-called naïve populations in developing countries who are assumed to take fewer drugs). As a result of increasing focus on pharmaceutical solutions, prescription spending more than doubled in the last decade.

The shift is in part a consequence of pharmaceutical marketing: while the U.S. R&D labor force in the drug industry remained steady at about 49,000 workers between 1995 and 2000, marketing personnel rose from 30,000 to over 87,000 (according to PhRMA). The industry has also developed successful marketing campaigns to offer medical cures for disorders previously unknown or “unmedicalized,” including shyness, sexual dysfunction, and the consequences of aging such as irritable bowel syndrome and incontinence.

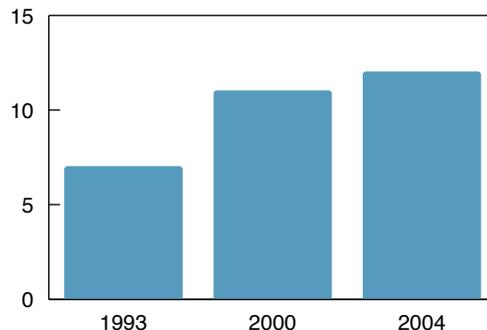
These very large markets clearly promise easy growth paths for pharmaceutical companies, but they exacerbate the looming crisis in health care spending, while often providing little real benefit over pre-existing, less expensive remedies. Furthermore, the risk of iatrogenic illnesses from drug–drug or drug–food interactions has grown substantially. Meanwhile, on a global scale, diseases that affect the majority of the world’s population—HIV, malaria, TB, acute respiratory infections, and diarrheal diseases—comprise only 1% of the world’s collective pharmaceutical research budget.

WHAT WE CALL HEALTHY: FROM LACK OF DISEASE TO TRANSHUMANISM

Health is not a static or objective state. New diagnostics and therapeutic regimes are constantly restructuring the ways in which we come to know and understand our bodies, our environment, and what we call healthy. One thing is clear: our standards for a healthy life have shifted significantly over the last century as we have found ways to eliminate pain, extend human physical and cognitive functioning, and increase longevity. This quest for health that goes beyond the lack of disease has spawned philosophical viewpoints and life practices that are expressed, perhaps in the extreme, by transhumanism: the belief that science and technology can help humans transcend the natural limits of their bodies, including indefinite lifespans. Ironically, it is perhaps another indicator of the threat to the human species that people are now turning to technology to redefine humans as man-machines in order to overcome the vulnerabilities of our familiar biological bodies.

9 Growth of Prescription Drug Use

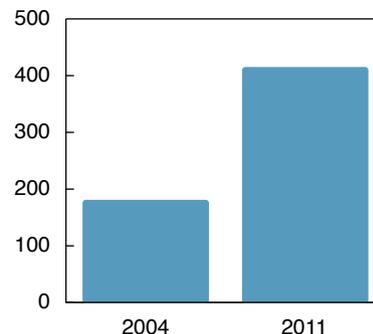
Prescriptions per person



Source: Greg Critser: *Generation RX: How Prescription Drugs Are Altering American Lives, Minds, and Bodies*, 2005.

10 Annual Spending on Prescriptions in the United States

Billions of dollars

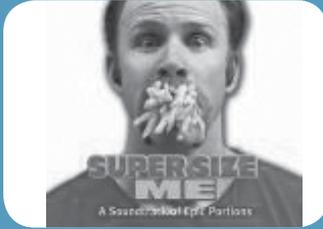


Source: Greg Critser: *Generation RX: How Prescription Drugs Are Altering American Lives, Minds, and Bodies*, 2005.



SICK HERD: MONDAY MORNING

SuperSize Me exposes the links between fast food, class, and obesity.



COMMUNITY/POLICY:

Invest in a truly ecological approach to public health

In the last few years, there has been a move to define a practice of ecological medicine to reconcile the care and health of ecosystems, populations, communities, and individuals. Recognizing that public health, individual health, and ecosystem health practices have often been at odds in their priorities and methods, a number of groups have begun to try to define the key principles and practices of a more ecological public health policy.

Among the tenets of ecological medicine are a commitment to understanding the interdependence of populations and their ecosystems, a strategy of working with the innate ability of natural systems to restore and heal themselves, an emphasis on the use of appropriate tools and interventions for specific populations in specific locations, and a focus on cooperative structures and strategies that spring from local communities. These approaches may be far more productive in addressing HIV in Africa, for example. They provide a more sophisticated understanding of the ecologies of poverty that forge connections across agriculture, health, and local economics where global policies often miss the mark.



TECHNOLOGY:

Develop early-warning tools for sick populations

Over the last few years, a growing number of technology companies have turned their attention to personal health markets, providing relatively low-cost monitors and diagnostic tools for daily use by individuals. These kinds of tools are expected to proliferate in the future.

Yet personal uses of such monitors may miss early signals that a population is distressed and therefore opportunities to intervene before large numbers of the population are affected are lost. Given the advances in technologies that help groups self-identify and self-organize, it might make good strategic sense to look for opportunities to develop products and services that build these social applications into personal monitoring tools—and also

link these monitors to a variety of geocoded environmental and cultural data in order to uncover important links. Such practices may overcome the gap between the goals of clinicians in using diagnostics and the needs of public health professionals who may require more data to address population-based problems beyond the individual.

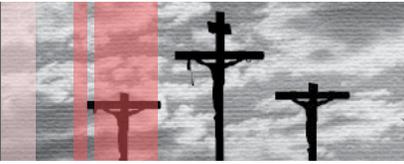


WORKERS:

Provide aggressive remedies for lifestyle and personality disorders

With industrialization, the workplace has increasingly become a complex health ecology in which workers represent significant health populations, often shaped by commonalities in occupational exposure, work practices, geographic collocation, lifestyle, and values. These commonalities can both produce distinctive epidemiological patterns—including lifestyle and personality disorders—and provide a basis for responding to them in nonpharmaceutical ways.

It's obvious that organizations should remedy workplace conditions that contribute to physical disability. It's less obvious that they can and should intervene in the lifestyle and personality disorders that are typically left to individuals to resolve privately. However, given the increasing costs and potential iatrogenic effects of prescription-based solutions to lifestyle and personality disorders, organizations may want to look carefully at workplace sources of these problems and develop targeted social and technological remedies for them. Some of these solutions may require innovative cooperative partnerships among health payers, providers, consumers, and firms where today's fragmented health system makes constructive approaches to these problems difficult.



WILD CARD: A NEW GOD?

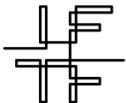
Nietzsche put it nicely when he observed, “Almost 2000 years and no new god.”

And indeed, it is surprising that though hundreds of new religions appear and disappear every year, it has been centuries since a truly new great religion has appeared on this planet. We are overdue for a new god—or at least a new prophet.



New levels of social integration—via telecommunications, travel, and global trade—may set the stage for the emergence of a powerful new religion

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THE AXIAL AGE: DISRUPTION AND SYNCRETISM

The current religious order was formed in the Axial Age—that extraordinary period between 800 and 200 B.C.E. that witnessed the mainstream acceptance of monotheism in the form of Zoroastrianism, the appearance of Buddhism, the establishment of Confucianism, and the efflorescence of Greek humanistic philosophy. All these contributed to the rise of Christianity, itself a syncretistic amalgam of monotheistic beliefs built around a core heretic offshoot of Judaism.

The Axial Age shares interesting parallels with today. It was a time of innovations in transportation and communications. Stretches of sea that once were barriers became highways, and ideas traveled with goods to new lands. These changes led to growth in populations, with new organizational challenges demanding political innovations. The consequent intellectual ferment yielded new worldviews and new religions. It was an age of anxiety: everyone wondered about his place in a changing world.

ROOTS OF THE FUTURE: THE RESTLESS FUNDAMENTALISTS

Global forces today parallel those underlying the Axial Age. The electronics revolution, ubiquitous air travel, and a global system of containerized freight have delivered a cornucopia of ideas, products, and services, with an array of benefits and unintended consequences. Populations around the world are struggling to find security and identity in this future-shock world. Meanwhile, the rise of fundamentalism in all religions is a sure-fire indicator that doubt and questioning are afoot. Unhappy

believers first look back to their roots for comfort, but old orthodoxies rarely comfort for long, and the disaffected inevitably search for something new.

Consider Christian fundamentalism. Outwardly, it looks like a simple turn backwards, but it really is a radical step into a new space—a Christian marketplace populated by restless shoppers joining small congregations and moving on when they become bored, dissatisfied, or unhappy. Gone are days when a person stayed in one church for life; Today’s believers change churches with the casualness once reserved for changing TV channels.

GOD’S NEW FACE: IN THE MIRROR OF DISASTER

The result is a vast population of the global religious restless. They are adrift and unsure of their place—and without necessarily knowing it, awaiting the arrival of a messiah. Throw in the usual round of human misery served up by war and natural disasters, and the result is a potent cultural petri dish from which a great new religion could spring.

The emergence of a new great religion may, in fact, not be a wild card, but a near-certainty. It is not a matter of whether, but merely when and how. The wild card is what will trigger its emergence. Disasters like the Sumatran quake are good catalysts—witness how Krakatoa boosted Islam in the Indonesian archipelago. Or Science may spawn a prophet. Perhaps unnoticed, a new religion is appearing even as these words are written.

—Paul Saffo



INTERVIEW: SAM HARRIS

Sam looks at the role of reason and evidence in new religious and spiritual practices, as well as fundamentalist versions of existing religions.

Q | Is this a moment in time—the next 10 to 20 years—when we could see the emergence of some entirely new religion or belief system?

It's hard to see a truly new religion emerging, one that repudiates existing religions and wins converts to a radically new theology. What I don't find hard to imagine is the emergence of a quasi-religious movement based on some strand of empiricism that is not well accounted for by existing religions—some future psychedelic church, perhaps, or a movement that was fixated on the existence of extraterrestrial life.

The problem for a new religion is that all people, including religious fundamentalists, are slowly raising their standards for evidence. A fundamentalist, while he may be committed to religious propositions for which he has very little evidence, is much like an atheist or a scientific secularist in every other sphere. Reason—the demand that our beliefs conform to evidence and logical argument—is now a pervasive feature of our worldview. And reason is contagious. You find that people, no matter how they try to immunize themselves against the demands of reason, can't succeed indefinitely. And so religion continually has to relinquish ground to scientific thinking, even when it's disinclined to.

That's not to say that religious fundamentalists are not capable of fighting a doomed and (for brief periods) politically ascendant battle against the forces of reason. In our country, we are currently witnessing a terrifying empowerment of religious fundamentalism—and the same sort of thinking is regnant in the Muslim world. But when you look at the way most people live their lives, you find that we're not merely in the presence of Medievalists across the board. People who accept the *Bible* or the *Quran* as the basis for their worldview are demanding a significant degree of good evidence and argument when it comes time to invest their money or to accept a public policy that is going to affect their lives and the lives of their children. So insofar as the modern, scientific worldview continues to encroach on terrain previously claimed by religion, religion will continue to lose ground, and any new religion emerging in this context will have to be more scientific than the old religions have needed to be. It will have to be more grounded in evidence and in a coherent, logical framework, or it is hard to see how it will successfully compete. The old religions, after all, win many points for being old.

Q | So could science spin off new, faith-based belief systems?

It depends on what you mean by faith based. Recent ideas about multiple universes and quantum strangeness—while truly bizarre—are not faith based in the ordinary religious sense. There are good reasons that can be adduced for believing in multiple universes or that consciousness has a direct effect upon the material world. But, being scientific, all such claims are revisable by the next scientific insight. So for instance, people who pin their spiritual hopes on the deliverances of quantum mechanics are now beholden to the evolving conversation of physics. When someone comes forward, as many physicists have, and gives an alternate description of the quantum mechanical data, the Copenhagen theory that gives such pride of place to consciousness may fall out of favor. This process can easily undermine the quasi-religious adoption of physics that New Agers fancy.

Q | What, in your opinion, is New Age religion, and is it still alive?

There are two faces of the New Age that are quite distinct. The positive face is that many New Age ideas have resulted from a fundamental erosion of traditional religious boundaries. People woke up in the 1960s and realized that they didn't have a right to their religious provincialism—that human cultures were no longer isolated from one another geographically or linguistically, and that all religious claims and spiritual claims were on the same footing to be analyzed. And so people took this realization in many different directions. They found what they thought was the best religious discourse, be it Buddhism or Hinduism or some personal collage they created out of all the visions offered, and this eclectic mix became their New Age system of spirituality. So the good news is that there really is competition among these different worldviews and among competing spiritual claims. Some claims are more reasonable than others; some paths are more accessible than others. So, on that front, the New Age has represented a very healthy shedding of provincialism.

The rather depressing side of the New Age is that even the most preposterous claims to knowledge are now regularly accepted as valid, especially if they are the product of some ancient culture. Many New Age medical claims are dangerous, or at the very least unsupportable, and yet New Agers are highly disinclined to look at them critically.

SAM HARRIS, the author of *The End of Faith: Religion, Terror, and the Future of Reason*, is a Stanford philosophy graduate currently completing a doctorate in the neural basis of belief, disbelief, and uncertainty.

Q | How does mysticism fit in this crucible of science and New Age religions?

There's clearly a range of human experience that is extraordinarily positive (and therefore normative) but also very hard to access (and therefore rarely accessed). We can call these experiences "mystical" or "spiritual." Another word we could use is "contemplative," because this range of experience tends to be accessed by people who, for one reason or another, spend an extraordinary amount of time practicing techniques of introspection. Unhappily, these techniques have always been elucidated and applied in a religious context. So all the contemplative literature is riddled with religious dogmatism. The burden is upon sensible people in the 21st century to separate the wheat from the chaff.

There's no reason, however, to deny that this range of experience exists and is worth exploring. Once we understand the psychophysical basis for mystical experience and perhaps can manipulate the brain far more precisely than we can at present, then science will have a lot to say about the nature of these states. We will then have a contemplative science and will not need to use terms like mystical and spiritual, because it will all just be part of our scientific understanding of ourselves at that point. Our goal should be to understand human well-being on every relevant level—biochemical, psychological, economic, political, contemplative, and so on.

One very simple way to describe contemplative life is that it is the search for a form of happiness that is not contingent upon changes in the quality of experience. The central claim from our contemplative traditions is that there's something about human consciousness that transcends the ordinary differences between pleasure and pain, happiness and suffering. A very simple way to think about this is with respect to consciousness: the part of you that is aware of joy and the part of you that is aware of sadness is the same part of you, and it is not actually improved by joy or harmed by sadness. One can actually learn to fall back into the mere awareness of the flow of experience in such a way as to discover some very startling things about the nature of subjectivity. One of those startling things is that there's a kind of mystical well-being—a direct, unmediated well-being—to be found in simply being consciousness itself. For many people, recognizing this property of consciousness is very difficult; it can take a lot of training. But most things worth doing take a little effort.



Paul Saffo, who is the Roy Amara Fellow at IFTF, asked Sam about the potential for a new religion, perhaps science based, to reshape the horizon of belief.

PEOPLE SEEK SPIRITUAL EXPERIENCES, NOT RELIGIOUS AFFILIATION

Although overall religious affiliation has declined in the United States by about 10% since 1990, 81% of the population reports some sort of religious affiliation. Numerous researchers point out, however, that the kind of religious affiliation is shifting, as people increasingly make a distinction between religion and spirituality. The result: a move away from large, institutionalized churches and denominations in search of more community-based or experiential spirituality. In fact, while seven out of ten Americans report that spirituality is important in their lives, about half of all Americans never attend religious services or attend them less than once a month.

RELIGIOUS MOBILITY INCREASES

In the 1990s, more than 33 million American adults shifted their religious identity or preference. Commentators have suggested that this turbulence is the result of everything from a bigger, more aggressive religious marketplace, with about \$80 billion in annual giving to American religious organizations, to new methods to mobilize people around their interests—both worldly and otherworldly.

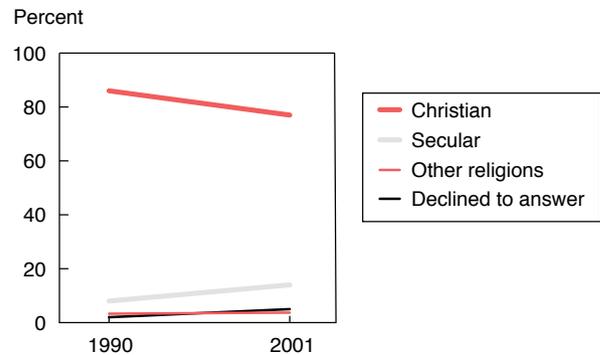
Among the demonstrated determinants of religious mobility are education and family ties. Sociologist Darren Sherkat has shown that educational attainment of peers in a denomination decreases the odds of switching to a conservative religion and increases the odds of apostasy—while education in a religious setting tends to increase loyalty to one’s denomination of origin. Having kids reduces the likelihood of apostasy—while close relationships with parents increases the chances of switching to a more liberal group and decreases the chances of switching to a conservative group.

FASTEST GROWING RELIGIONS ARE A MIXED BAG

Islam is often cited as the fastest growing religion, but differences in the way adherents are counted and problems with the quality of the data make it difficult to compare religions worldwide. Overall, Christianity remains the largest religion, with about 33% of the world’s population. Islam is second with 22%, followed by those with no religion (16%). The Barna Group, which tracks religious behavior in America, disputes any revival in America and claims that evangelicals remain just 7% of the adult population, a number that has not changed since the group began tracking them in 1994.

Without making any formal comparisons, Adherents.com, suggests an eclectic list of rapidly growing religions that might be pointers to a new religious horizon.

1 Shifts in Religious Affiliation in the United States



Source: The Graduate Center, The City University of New York, American Religious Identification Survey, 2001.

2 Measures of Religious Mobility

Percent of adult U.S. population that changed their religious preference in the last ten years:	16
Percent who had, in their lifetime, left their religion of origin in 1958:	4
Percent who had, in their lifetime, left their religion of origin in 1999:	33

Source: The Graduate Center, The City University of New York, American Religious Identification Survey, 2001; Richard Cimino, “Choosing My Religion,” *American Demographics*, April 1999.

3 Rapidly Growing Religious and Quasi-Religious Groups

Animal rights activists	Pentecostalism
Assemblies of God	Primal-indigenous religion/revitalized tribal and “first peoples” organizations
Church of Jesus Christ of Latter-Day Saints	Seventh-day Adventists
Environmentalists	Soka Gakkai
Evangelicals	Sufism
Hinduism	Unitarians and Unitarian Universalists
International Church of Christ	Universal Fellowship of Metropolitan Community Churches
Islam	Wicca
Jehovah’s Witnesses	Zen Buddhism
Lubavitcher Hasidic Jews	
Non-denominational community churches	

Source: Adherents.com, www.adherents.com/adh_faqs.html#fastest.

NEW AGE: THE ROOTS OF NEW RELIGIOUS EXPRESSION

The so-called New Age religions are often linked to the counterculture of the 1960s and 1970s—and by association—to the boomers. However, their viewpoints and practices have much deeper roots and are part of a larger evolution in human society with ties to globalization (beginning with the exposure to Asian religions in the 1800s), democratization (driving a more independent approach to religion as well as social life), and industrialization (spurring a redefinition of humanity's relationship to the environment). Scientific thinking, too, has shaped its path.

This particular stream of religious innovation has passed through several movements, starting with the Transcendentalists in the 1800s, the Theosophists and New Thought movements of the 1900s, and the psychedelic counterculture and Human Potential movements of the 1960s and 1970s. Each has given shape to the current New Age religions. Key elements that bind these movements together include:

- A keen interest in a perceived nonmaterial world
- A conviction that spiritual truth comes from within
- A commitment to self-improvement as part of one's "religious work"
- A focus on health and healing as an expression of spirituality
- A belief in a larger collective intelligence, a "oneness" that is not separate from the world

In *Darwin's Cathedral*, David Sloan-Wilson argues that religion is a means of organizing societies into complex cooperative structures that improve survival. In this light, New Age beliefs can be seen as support for a human society that is reorganizing itself in a decentralized manner at a global level and drawing upon a distributed (and therefore invisible) collective intelligence to improve its chances of survival in the face of extreme environmental pressures.

This convergence of religious belief and economic–environmental imperative suggests at least three possible scenarios for the development of a compelling new religious movement over the next couple decades: a fundamentalist Christian environmentalism as an alternative to the pantheism of New Age believers; a religion of quantum reality that seeks to master the potential of alternate realities; and a sanctification of the cyborg as the ultimate experience of human potential.

—Kathi Vian

Christian Environmentalism



Christians are awakening to the need to frame environmental issues in their own terms. While some evangelical Christians continue to espouse environmental abuse as a means of hastening the Second Coming, a growing Christian dialog among both moderates and evangelicals is reframing the Christian responsibility for "stewardship" of the environment to fit Christian doctrine.

Unlike New Age believers who see Nature as a kind of pantheistic force—perhaps expressed by the Gaia Principle—the new Christian environmentalists see Nature as God's creation, and humans as those charged with protecting it. They don't worship nature, they worship God. But they see environmental degradation as a sign that they've failed to keep their covenant with God. And viewing the environmental movement as co-opted by the New Age movement, they urge a counterattack: "We cannot allow the enemy to take over leadership in an area that is rightfully ours. As the redeemed of the earth, our motivation to care for the land is even higher than that of the New Ager."

One scenario is that Christian environmentalists develop a public agenda for environmental protection, drawing their allies not from secular and New Age environmentalists but from established institutions. In this scenario, these institutions, including the military and some large financial and philanthropic institutions, seek not only to mitigate the effects of environmental degradation but also to counter the liberal globalization and decentralization trends that go hand-in-hand with New Age beliefs. Exercising "dominion over every creeping thing," they establish their moral right to direct and manage environmental interventions, disaster response, global human migrations, and the adoption of new technologies.



Quantum Religious Reality



Primed by quantum physics, *Star Trek*, and perhaps Carlos Castaneda, a growing number of authors and New Age leaders are looking to the mathematics and metaphors of quantum science to understand what might be called “separate realities.”

As many have suggested, quantum science is as great a challenge to both modern religious and secular views of reality as the Copernican universe was to the established church in 1530. And today—a hundred years after Max Planck and Albert Einstein made the first forays into quantum mechanics—technology, commerce, and religious beliefs are all about to be shaped—correctly or incorrectly—by what Jason Scott (of rotten.com) calls “a miasma of multiple possibilities, solidified probabilities, and verifiable impossibilities.”

Quantum physics is difficult to grasp because it describes the behavior of the universe at the smallest scale, not the scale at which humans normally view it. Yet as engineers begin to manipulate the world at this scale, it seems inevitable that the metaphors, if not the material realities, of quantum physics will drive a revisionist view of religion. Already, New Age bookstores have dedicated shelves to quantum physics, quantum healing, and quantum reality.

While philosophers argue about whether quantum physics truly represents a convergence of science and religion, it’s probably unarguable that the concepts and applications of quantum physics—from quantum computing to teleportation—will fundamentally alter how humans view themselves in a material universe. And the next century will almost certainly see the first efforts to define this new relationship, to recast human potential in terms of “clouds of probability,” and to articulate a morality that fits this strange new world.

Varieties of Cyborg Experience



Over the next 50 years, a wide variety of technological interventions will extend the human mind, body, and social capacity, perhaps beyond recognition. Already, cosmetic surgery, body modification, cognitive-enhancing drugs, body-building drugs, digital life recording, immersive online experiences, life-extension practices, and electrobiological implants are creating a variety of what might be called cyborg experiences—and spurring new types of human expression, from reality hackers to extreme athletes and extropians who intend to live forever. There is already a World Transhumanist Society that seeks to:

...lay 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.

These innovations in human being may be the natural extension of core New Age tenets that combine radical self-improvement, radical health, and a belief in the ability to transcend the human body. Like James’ *Varieties of Religious Experience* (1902) and Masters and Houston’s *Varieties of Psychedelic Experience* (1966), the varieties of cyborg experience may be the next expression of the human search for meaning, challenging basic ideas of the natural, God-given life. In fact, they may be the ritual practices of a species consciously participating in its own evolution in the face of severe environmental pressures. And there’s every reason to suspect that these rituals will take on religious significance as they help humans organize for a new level of social, cultural, and technological integration.

NEW AGE CONSUMERS: NOT THE STEREOTYPE

In spite of their association with the 1960s counterculture and therefore with the boomer generation, New Age practitioners define a broad marketplace: in a 1998 Texas survey, 22% reported purchasing New Age products and services. If we were to use that number as a proxy for people who subscribe to New Age beliefs, they would constitute the second largest religion in America. (Note, however, that many of those people claim other religious identities from Baptist to Buddhist.)

Furthermore, the study suggests that many New Age stereotypes are in error:

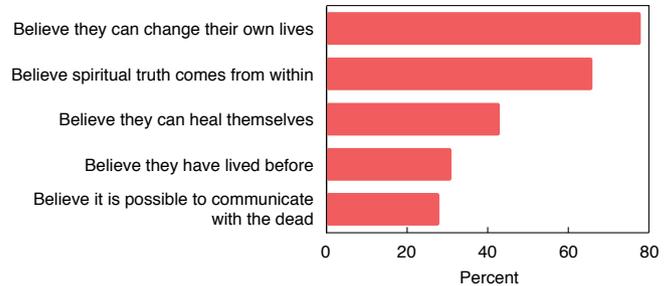
- Wealthier, well-educated people are no more likely to buy New Age products than the poor and less educated.
- Women are no more likely than men to buy New Age products.
- People in their 20s are more likely to buy New Age products than boomers.
- Hispanics and African Americans are more likely than non-Hispanic whites to buy New Age products.
- Rural and suburban residents are just as likely to buy New Age products as urban residents.

In fact, it appears that the strongest predictor of New Age buying is one's social network: survey respondents were 12.5 times more likely to buy New Age products if their friends or family also did.

A key indicator of the growth of New Age sensibilities comes from the publishing world. For example, there are 400 to 500 New Age periodicals in the United States and Canada. New Age books and bookstores continue to thrive. With more than 7,000 New Age bookstores in the United States, over 1,000 book publishers and 200 distributors trade in New Age materials.

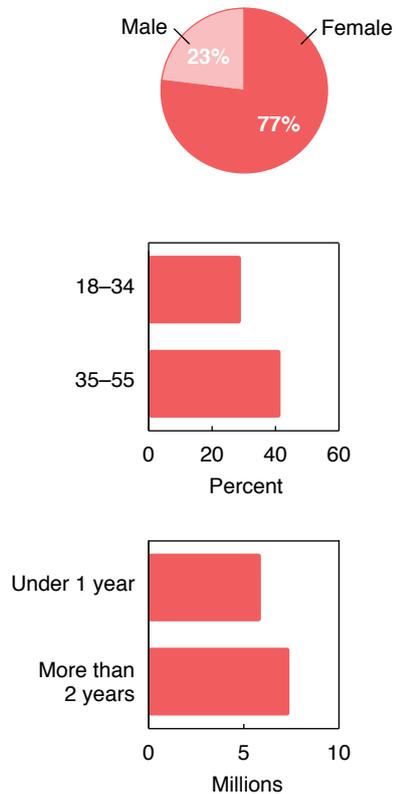
Another indicator is the steady growth of interest in yoga, which embodies many of the movement's values. For example, the circulation of *Yoga Journal* has tripled in the last seven years, and its 2005 survey estimates 16.5 million yoga practitioners in the United States, up 43% from 2002. The fastest growing segment is the 18–24 age group, which increased 46% in one year. Wal-Mart's Web site boasts 990 yoga products such as videos, books, and mats; Target's has 4,235. Yoga is taught in senior centers and Girl Scout camps, and movie and rock stars chat in the media about their yoga practices.

4 A Profile of New Age Consumers



Source: D. Mears and C. Ellison, "Who Buys New Age Materials? Exploring Sociodemographic, Religious, Network, and Contextual Correlates of New Age Consumption," *Sociology of Religion*, Fall 2000.

5 Profile of Yoga Practitioners in the United States

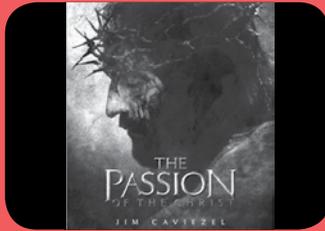


Source: "Yoga in America," *Yoga Journal*, 2005.



A NEW GOD? MONDAY MORNING

The *Passion's* use of cinematic realism captures the dynamics of faith in the global age.



HEALTH:

Track links between religious and commercial innovation

In the early 1900s, the New Thought Movement coincided with a commercial boom on the scale of the 1990s dotcom boom. The driver of commercial innovation was processed foods—especially cereals—first introduced as “health food.” The New Age movement, with its roots in the 1960s, drove another round of commercial innovation, with its emphasis on alternative health and so-called natural products, laying the foundation for what IFTF calls the Health Economy.

As this underlying movement goes through yet another incarnation in the coming decades, expect to see a further redefinition of human health and a new marketplace to support it. In fact, tracking the leading edges of popular religious belief may provide early indicators of what kinds of health care, health products, and health practices are likely to drive economic growth. Some things to watch for: collective health practices, life extension technologies, and supercognition.



WORKERS:

Watch for workplace interpretation of quantum metaphors

If quantum metaphors begin to take on religious significance for a significant subset of the population, they may subtly—or not so subtly—redefine the workplace and work practices. Just as terms like bandwidth and cycles became metaphors for describing personal and organizational capacity in the wake of digital technology, quantum metaphors may shape the way workers think about themselves, their colleagues, and the proper way to organize work.

For example, look for the ways that the “clouds of probability” from quantum physics are likely to be mapped, operationally and metaphorically, onto tag clouds—the tools of collective intelligence and emerging context-aware environments. Perhaps the workforce will even try to use a quantum mechanical model of the brain—in which dual wave/particle characteristics of protein

tubes in the brain dance in uncertainty until they collapse into a position of certainty—to improve cognitive performance. (For more, see Stuart Hameroff’s work at the University of Arizona.) Such concepts may give religious meaning to workplace practices in the next half-century.



ENVIRONMENTAL SUSTAINABILITY:

Expect new messages, new players, new conflicts

Whatever form our religious beliefs take, one thing is nearly certain: the environment will be a key focus. For the last half-century, the environment has been a battlefield between those who see a need to protect it and those who don’t. Over the next half-century, nearly everyone will align around the need for environmental intervention, and new battle lines will be drawn between institutions, strategies, and marketing messages. The move of conservatives to take over the Sierra Club is perhaps the first volley in this new war of environmental righteousness.

The new configuration will not only challenge existing political action groups, it will also challenge those who market under a “green” label because the underlying concerns, beliefs, and preferences will become more diverse. Segmentation of green markets will become essential. And big companies that have supported fledgling sustainability programs may now find sustainability a central and volatile issue—not only in the market place, but also in the way they organize themselves internally and in their partner networks.



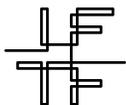
URBANIZATION: SOCIAL CITIES

Demographers and economists alike have focused world attention on the global megacities that integrate their regions into the world economy, often serving at the convenience of large multinational corporations and generating a disproportionate share of revenues for their host nation-states. Yet a different kind of city is emerging as an alternative to this vision of global development. This is a city that functions more as a center of localization than globalization. It is a city that is *socially* more than *economically* developed. And in a connected world, such “social cities” may define the leading edge of human culture.



At the leading edge of
global urban
development is a list of
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LOCALIZATION AND DECENTRALIZATION: A MEASURE OF URBAN INDEPENDENCE

To understand the trend toward localization, IFTF developed an Urban Decentralization Index (UDI)—identifying cities that have constitutional rights to act independently of their national governments in both financial and governance issues. Using United Nations data, the index tapped 76 cities as leading the trend toward decentralization.

The top-ranking decentralized cities form an unexpected mix:

- The largest group includes Latin American cities in countries that have recently undergone major constitutional reforms.
- Many European cities in the list were previously part of the Communist Soviet Union but are now acting with a vigorous sense of independence.
- Decentralized cities in Asia tend to form a counterpoint to the economically developing centers of China and India, perhaps suggesting a distinct cultural path for those who don't want to become satellites of these behemoths of global development.
- In Africa, a small percentage of cities cluster together as socially stable cities that rank high in the index.
- For a small contingent of “outlaw” cities around the world, independence stems from war, civil strife, or criminal unrest rather than constitutional reform or long-term stability.

SOCIAL DEVELOPMENT: A DISTINCTLY ALTERNATIVE PATH

What most of these cities have in common, distinct from low- or medium-ranked cities, is a profile that suggests a premium on social connectedness, stability, and participatory democracy.

In contrast to the global megacities, which are growing more rapidly than their ability to provide infrastructure, social cities have well-developed infrastructures for water, sewage, power, and communications. With a few exceptions, they are not among the largest cities, and their population growth rates suggest that their infrastructures are likely to remain adequate. At the same time, high levels of literacy will enable them to adopt and exploit new connective technologies to still greater social advantage. And finally, they tend to foster local participatory planning processes.

A HYPOTHESIS: SOCIAL CITIES WILL LEAD

With their balanced approach to economic and social development, with their emphasis on local participatory governance, and with their skills and values predisposing them to success in a connected world, the social cities in our list may define a new template for urban society. The fact that they do not include many of today's big names in global cities—or many North American cities—points to a possible fork in the road of global development.

—Mani Pande, Kathi Vian
& Anthony Townsend



INTERVIEW: HONG-BIN KANG

Professor Kang highlights the challenges local policymakers have struggled with as Korea democratizes and decentralizes in the Internet era.

Q | During your tenure as Vice Mayor of Seoul, you were a pioneer in managing government decentralization. What were the challenges and opportunities you faced in that historic transition of power from the national government to a new, independent city government?

Mayor Goh and I entered office at the height of the 1997 financial crisis and left in 2002 just after the completion of the World Cup games. These two extraordinary historical events largely framed our perception of the challenges and opportunities of decentralization. The financial crisis, which resulted in a major IMF intervention, signaled the demise of the old state-led regime in the face of a changing world economic order. But by 2002, our hosting of the World Cup (with Japan) was a sign of our hope for a better future—and our city's and nation's quest for enhanced status in the world.

The first priority was rebuilding urban competitiveness. Seoul bore the brunt of the economic slowdown that followed the financial crisis. Hundreds of firms went bankrupt daily and many thousands became homeless overnight. We had to modernize our ill-equipped welfare machinery but at the same time try to shift the economy into more knowledge-based industries.

We also took the opportunity to reshape the city government into a small but strong body. The city's bureaucratic culture, with its emphasis on supplying standardized services, was clearly outmoded and was no longer capable of meeting demands imposed by the changing times. We acted to make city government more responsive, efficient, productive, and transparent.

Q | You led an all-out war on corruption in the Seoul metropolitan government. Why was this so important to develop confidence in the new local government?

Bureaucratic corruption compromises rational decision making, reduces efficiency, raises costs, and weakens responsiveness. A corrupt government is bad enough in ordinary times; in times of crisis, it is a disaster. In order to meet the challenges we faced during my years in office, the city government had to exercise strong leadership. But to accomplish that, we needed the confidence of both citizens and city employees. The confidence of city employees was essential—while they had become the targets of administrative reform, they were, in fact, the agents who would put the reform measures into practice.

Q | How important is the Internet in the wave of government decentralization we are seeing around the world?

The Internet promotes decentralization by eliminating barriers in three directions: horizontal, vertical, and peripheral.

Horizontally, the Internet brings government and citizens into direct, customized contact. Citizens bypass branch offices and bureaucrats to directly conduct their business with government. At the same time, the Internet provides government officials the ability to directly engage citizens without employing layers of subordinates. Vertically, the Internet helps flatten administrative hierarchy. Easy access to information encourages the reduction of rank barriers and speeds review processes. Decision makers can then spend their time and energy more effectively. Finally, the Internet permits easy access to a vast array of peripheral information about competing cities and best practices that had been previously difficult and expensive to obtain.

So the overall effect of the Internet on government structure is the replacement of rigid hierarchical structures by flexible networks. Decenteredness and decentralization are the natural consequences.

Q | The Internet was tremendously important in the last few national elections in Korea, especially among young voters. Do you see the Internet having the same effect in local elections?

Probably not. Compared to national elections, the effect of the Internet in local elections will be much less significant. Clearly, the Internet has proven to be extremely powerful (even more so when it is linked with cell phones) in transforming geographically scattered, individualistic young voters into a “smart mob.” However, in local elections the power of the Internet as a “space-binder” is inevitably less influential. Local elections are generally less glamorous than national elections and thus less likely to incite enthusiasm from young voters who are the main users of the Internet. The Internet, however, can be an effective weapon for exposing damaging information in the last minutes of a campaign—a dreadful prospect.

HONG-BIN KANG was Vice Mayor of Seoul, South Korea from 1998–2002. During his long career in public service he directed planning for the 1988 Olympic Games and the 2002 FIFA World Cup. Currently, he teaches planning theory and history at the University of Seoul.

Q | You spent a great deal of time and energy developing new cultural facilities and events in Seoul: the Media City Seoul Festival in 2000, the Museum of the City of Seoul, to name a couple. What is behind this new cultural reawakening and what might it mean for local governance and democracy?

Although economic development has long been the goal of the national as well as the municipal governments, economic development cannot be an end in itself; it is a means to improve the quality of life. If one defines culture as the pursuit of what is best in life and in civilization, then it is clearly one of the most important goals that any city government should strive to attain.

On a political level, culture not only enriches individuals, but also teaches individuals to become responsible members of the community. Culture reinforces civics and civility. Improving the city's cultural infrastructure and supporting creative activities of artists are integral to the goal of building democracy and open society.

On a more practical level, what is good for culture is often good for the economy as well. Culture promotes the creativity on which innovation thrives; without innovation, there cannot be an improvement in productivity. Culture is an important asset in today's environment of urban competition. Only cities endowed with cultural amenities can compete nationally and globally.

Q | You were the principal planner for two megaprojects that reshaped the face of Seoul: the 1988 Summer Olympic Games and the 2002 FIFA World Cup. Do you think that the trend toward decentralization means the end of megaprojects?

The age of megaprojects is not over but, in fact, coming back to Korea. The current populist national government and pro-growth local governments have started one megaproject after another: the relocation of the capital to Yeongi-Gongju, the restoration of the Chonggye Stream in downtown Seoul, and the construction of various "innovation cities" throughout the country.

Ironically, decentralization does not seem to be slowing down megaprojects. The only difference between the old and new versions is that instead of being driven by national governments, megaprojects today are propelled by pro-growth coalitions of corporate and local government interests. The public-private partnership is itself very much a product of decentralization.

This situation is by no means unique to Korean cities. The globalization of the world economy makes cities, more than nations, the principal players in the competition to attract the

money, knowledge, and firms that have all become extremely mobile and footloose. In this environment, the city itself becomes a commodity, and city marketing is accepted as the modus operandi of local administration. In such a dynamic world, megaprojects are one way of attracting attention.

Q | One of the last projects you initiated was Seoul Digital Media City, a new town designed to become a window for the world into Korea's sophisticated urban cyberculture. What kind of face do you hope Korea will present to the world in this new place?

Digital Media City (DMC) is still in the making and so is the new Korea. I envisioned DMC as a kind of place where differences become sources of creative transformation, rather than sources of conflict. I see DMC as a laboratory for a new kind of innovation culture in Korea—one based on cooperation as much as competition. To me, DMC is more of an attempt to nurture social capital than to make quick profits on real estate development.

The kind of place that most resembles this vision is a university campus—rich with intellectual stimulation, a bold and venturesome spirit, all warmed by an accommodating heart. It was in that kind of place that I could see many polarized worlds connecting—real space and cyberspace, business and culture, scientists and artists, local and global, and public and private.



Anthony Townsend, an IFTF Research Director, asked Professor Kang about his tenure as Vice Mayor of Seoul.

THE URBAN DECENTRALIZATION INDEX

The IFTF Urban Decentralization Index (UDI) was built from the Global Urban Indicators database in the United Nations Human Settlements Programme. The database sampled 232 cities worldwide, and the IFTF index uses six indicators of decentralization from this database:

- **Indicator 1:** Higher levels of government cannot close the local government
- **Indicator 2:** Higher levels of government cannot remove local officials from office
- **Indicator 3:** Local government can, without permission from higher government, set local tax levels
- **Indicator 4:** Local government can set user charges for services
- **Indicator 5:** Local government can borrow funds
- **Indicator 6:** Local government can choose their own contractors for projects

The index is weighted as follows:

- **Indicators 1–2:** 3 points each
- **Indicators 3–5:** 2 points each
- **Indicator 6:** 1 point

Thus the index ranges from 0 to 13 points, with cities clustering in three groups:

- **Minimal decentralization:** 0 to 4 points
- **Medium decentralization:** 5 to 8 points
- **High decentralization:** 9 to 13 points

Those with highest decentralization scores cluster in Latin America and Eastern Europe, with only one city—Hull in Canada's Quebec province—in North America.

1 Geographic Distribution of Highly Decentralized Cities



Source: U.N. Global Urban Indicators, 1998; Institute for the Future, 2005.

2 Geographic Distribution of Cities with Medium Decentralization



Source: U.N. Global Urban Indicators, 1998; Institute for the Future, 2005.

3 Geographic Distribution of Cities with Minimal Decentralization



Source: U.N. Global Urban Indicators, 1998; Institute for the Future, 2005.

WHAT HIGHLY DECENTRALIZED CITIES HAVE IN COMMON

Using IFTF's UDI, we performed an analysis of variants to identify the key differences among cities with low, medium, and high scores on the index. We compared the cities for 28 variables and found significant differences in the following areas:

- **Infrastructure**
- **Literacy**
- **Economic health**
- **Role of citizens**

These are shown in Figures 4 through 7, which display the values for key indicators of cities that score low, medium, or high on the index. The high column thus profiles the leading-edge social cities. The indicators L, M, and H indicate the significance of differences with the other two categories. For example, an L in the high column indicates that cities with high UDI scores are significantly different from those with low scores. We found no significant differences in the following variables: formal ownership of property, percent tenancy, percent squatters, total population, metropolitan area, percent unemployed, local government expenditures per capita, affiliations to associations of local authorities, violence index, violence policy (prevention) index, and local environmental plans index.

4 Decentralized Cities Have Better Social Infrastructures

	Low	Medium	High
Percent households with water	61 ^{M H}	77 ^L	83 ^L
Percent households with sewage	51 ^{M H}	77 ^L	72 ^L
Percent households with electricity	72 ^{M H}	89 ^L	91 ^L
Percent households with telephone	34 ^{M H}	56 ^L	57 ^L
Disaster prevention index	1.1 ^{M H}	1.7 ^{L H}	2.2 ^{L M}

Source: U.N. Global Urban Indicators, 1998; Institute for the Future, 2005.

5 Decentralized Cities Score Better on Social Indicators

	Low	Medium	High
Percent female literate	60 ^{M H}	76 ^L	86 ^L
Percent male literate	72 ^{M H}	84 ^L	90 ^L
Percent under-five mortality	10 ^{M H}	5 ^L	3 ^L
Female life expectancy	62 ^{M H}	69 ^L	72 ^L
Male life expectancy	59 ^{M H}	65 ^M	67 ^L
Percent population growth (1993–98)	3 ^H	2 ^H	1 ^{L M}

Source: U.N. Global Urban Indicators, 1998; Institute for the Future, 2005.

6 Decentralized Cities Have Strong, But Not Leading Economies

	Low	Medium	High
Percent below poverty line	30 ^{M H}	21 ^L	20 ^L
Percent in informal sector	48 ^{M H}	31 ^L	28 ^L
City product/capita	1,441 ^M	9,054 ^L	6,522
GNI/capita	1,354 ^H	3,553	5,501 ^L
Local revenue/capita	76 ^M	803 ^L	575

Source: U.N. Global Urban Indicators, 1998; Institute for the Future, 2005.

7 Decentralized Cities Emphasize Citizen Participation

	Low	Medium	High
Citizen participation index	1.2 ^H	1.6	1.9 ^L

Source: U.N. Global Urban Indicators, 1998; Institute for the Future, 2005.



**DECENTRALIZATION:
A WORLDWIDE PHENOMENON**

Our social cities span the globe, with the largest concentrations in Latin America and Northern and Eastern Europe. These concentrations may give the world a different political, economic, and cultural landscape over the next few decades, shifting attention from North America and Western Europe to these new regions of social innovation.

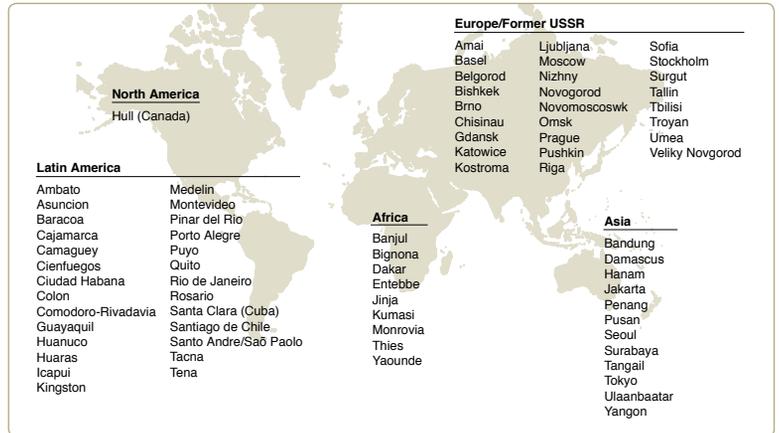
**DECENTRALIZATION AND SOCIAL
DEVELOPMENT**

Additional evidence for our hypothesis that social cities are the leading edge of a decentralization-oriented development path comes from the United Nations City Development Index (CDI). The authors of the CDI characterize it as a “measure of depreciated total expenditure over time on human and physical urban services and infrastructure.”

The CDI correlates strongly (0.67) with our Urban Decentralization Index, suggesting that investment in social infrastructure may pave the way for increasing decentralization, and that many cities are taking this path to the global future.

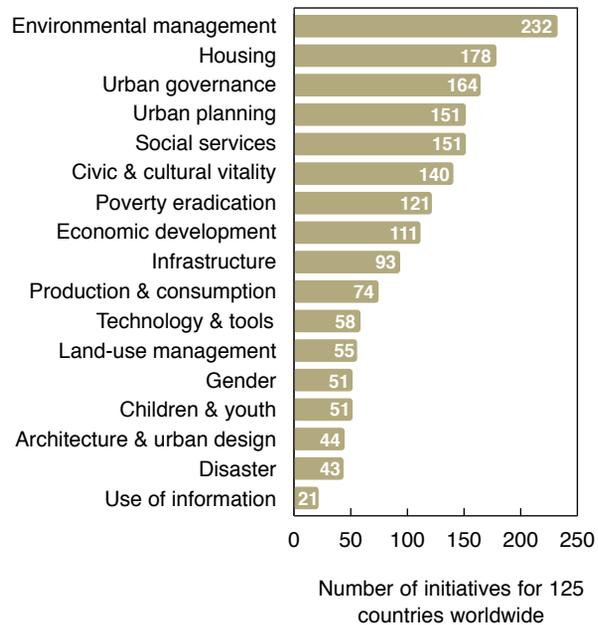
The United Nations Best Practices database further emphasizes local social development as a strategy for building a strong, locally directed position in the global economy. As the developers report: “Cities ... in developing countries have realized that strategies that will allow them to effectively compete for foreign and domestic investment and tourism are best activated through social, economic, and environmental policies that benefit, first and foremost, their own citizens.”

8 Highly Decentralized Cities by Region



Source: Institute for the Future, 2005.

9 Social Initiatives Dominate U.N. Best Practices List



Source: U.N. Best Practices Database, www.bestpractices.org, 2002.

THE CASE OF CURITIBA

While not included in the United Nations database, the city of Curitiba in Brazil is perhaps a template for a new kind of urban development that emphasizes social development and the important role of local authorities. Sometimes called the “social capital” of Brazil, Curitiba has tripled in population in 25 years, while managing to improve access to physical and social infrastructures, including a transportation infrastructure that serves 1.3 million passengers per day, while preserving distinctive local neighborhoods as well as healthy natural environments.

A key to Curitiba’s success appears to be the independent role of local authorities in generating microeconomies, as well as the articulation of strong local core values and experiments with creative local solutions rather than standard solutions borrowed from global practice. The city’s focus on integrating land-use guidelines with a strong transportation infrastructure also appears to be central to its success—and suggests that a focus on local infrastructures, together with the evolution of new lightweight peer-to-peer technologies for these infrastructures, may be key to creating sustainable social cities in developing economies.

THE SHADOW SIDE: LAWLESS ENCLAVES

In most of our social cities, decentralization appears to go hand-in-hand with stability and the development of strong social and physical infrastructures. Yet there is an alternative pattern of radical decentralization in which both stability and infrastructure are lacking—resulting in the so-called “feral city.”

Richard Norton defines a feral city as one with more than a million people where the state government has lost the ability to maintain the rule of law. Criminal factions or civil war tend to dominate these cities, which lack the most basic social, health, and security services. Control is exerted by pockets of criminals, armed resistance groups, clans, tribes, or even embattled neighborhood associations.

If we try to understand the difference between these shadow cities and the social cities that seem to point the way to development, we might hypothesize a tear in the social fabric. In some cases, a strong central government may be unable or unwilling to provide for the rapidly growing local population; in others, traditionally decentralized leaders fail to adapt to life on a large urban scale. Both scenarios pose serious challenges for a rapidly urbanizing world.

10 Curitiba’s Mass Transit Line



Curitiba’s transportation system was integrated with land-use planning to encourage its citizens to live and work in distinctive local neighborhoods.

Source: Horizon Solutions, 2003, www.solutions-site.org/artman/publish/article_62.shtml.

11 Profile of a Feral City

Government	Negotiated zones of control
Economy	Local subsistence, illegal commerce
Services	Privately contracted from a few; otherwise, nonexistent
Security	Paid protection

Source: Adapted from Richard Norton, *Feral Cities*, 2003.



SOCIAL CITIES: MONDAY MORNING

Old infrastructure meets new in this RIXC locative media project from Riga about milk delivery.



MARKETS:

Identify and secure local ecologies of identity

Cities have always laid claim to individual identity, shaping the way people think of themselves as citizens, as workers and artists, as members of a social world. Yet as localization gains momentum, the distinctive urban solutions of social cities will likely increase diversity in the ecologies of identity that guide people's lives—and strengthen the pull of local urban identity.

For marketing organizations, this trend will call for yet another layer of customization beyond traditional demographic segmentation and beyond regional or national marketing plans. The city becomes a marketing target in its own right, and location-based information and services will only reinforce this practice. At the same time, socially developed cities are more likely to place demands on commercial enterprises to provide local social value well beyond the economic value of goods and tax revenues.



COMMUNITIES/POLICY:

Build local commons and regional affiliations

If social cities with locally strong governments are the leading edge of global development, a key question for global governance is how they may alter the current hierarchy of global institutions (such as the World Bank), regional institutions (such as the EU), national governments, provincial or state governments, and finally, local government.

Several factors make social cities likely change agents in this global order. With their emphasis on social infrastructure—that is, broad access to basic human needs—they are likely to look for innovative ways to support public commons. Their emphasis on microeconomics suggests that they will favor diverse local economies over standardized global economies. And their regional similarities suggest that they may value loose regional alliances over strong national identities. Together, these interests all point toward new strategies for organizing the global commons and managing cooperation among its many users.



INNOVATION:

Use multiple measures of urban vitality

Richard Florida's recent work on the rise of the creative class has focused attention on the features of a city that are likely to make it a center of innovation. While Florida's work focused primarily on the nature of the employment market—types of jobs and age of the workforce, for example—the profile of social cities suggests, that there may be deeper roots of innovation.

Region by region, we find social cities that seem to be pushing the edge of social, cultural, economic, environmental, or political innovation: Riga in Europe, Curitiba in Latin America, Seoul in Asia, to name just a few. Some have stable infrastructures but are experimenting with new ways of governing. Others are trying to work around a lack of economic resources. But they all seem to have a strong social fabric and an authentic local culture based in local governance. It may be that these are the determining characteristics of the creative cities of the future.



CITY PLANNING:

Adapt new infrastructures to participatory planning

One of the features of the new social city is an increased emphasis on participatory planning processes. At the same time, it is clear that infrastructures, especially connective infrastructures such as telephony and the Internet, are important in shaping the sociability that make social cities more stable and potentially more innovative than traditional urban leaders.

The next decade will see a host of new networked infrastructures begin to replace or update existing infrastructures—or create them for the first time in regions where they have never existed. (See this year's *Perspective* on Infrastructure: Lightweight Networks). These represent opportunities for individuals to participate more actively in planning the future of a neighborhood, a city, or a region. Look for opportunities to link civic education to individual choices in building out these networked infrastructures.

SCIENCE:

INNOVATION IN THE CITY

For decades, the ideal R&D or science center was a self-contained, introspective place. IBM's Yorktown laboratory, Japan's Tsukuba Science City, and Xerox's Palo Alto Research Center were all intellectual hothouses that reflected a commitment to advancing science, a faith in the ability of corporate or state funders to direct innovation, and a belief that investment in basic research would readily translate into regional economic development. But today, ambitious ventures around the world are building more integrated urban spaces to foster new kinds of science and R&D, and to revitalize neighborhoods and local economies at the same time.

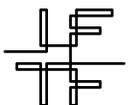


Changes in the location and practice of R&D will create new environments for innovation, novel forms of research, and vibrant new urban spaces

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INNOVATION ZONES: FROM SCIENCE CITY TO SCIENCE IN THE CITY

The concept of the *science city*—a city built from the ground up to house scientific and technical research—emerged during World War II. Allied and Axis powers created isolated R&D facilities. The British concentrated cryptography researchers in Bletchley Park; German rocket developers were centered at Peenemunde; and most spectacularly, America's Manhattan Project built remote complexes dedicated to atomic bomb research and production in Washington and New Mexico.

After World War II, science cities and regions grew around the world. California's Silicon Valley and France's Sophia Antipolis were outgrowths of existing urban regions. Others were located in sparsely inhabited regions: Korea's Taedok Science Town and Russia's Akademgorodok were meant to be engines of regional economic development to counterbalance scientific metropolises. Military research was often located in remote areas for security reasons.

Today, this isolated, autonomous model is challenged by a new model: the innovation zone. Innovation zones stand at the intersection of the state, industry, academia, and civil society. They harness diverse scientific, financial, and managerial skills and play upon a variety of interests. Many, including Seoul's Digital Media City and Denmark's Katrinebjerg, are adjacent to universities and serve as homes for academic-industrial joint research projects or incubators for startups commercializing academic research.

But innovation zones are not just about commercializing science and technology; they are also knowledge-intensive urban renewal projects. They promise to create new local industries by nurturing the social and intellectual networks that allow cities to thrive in the high-tech global economy. Innovation zones are often joint ventures involving national and local governments, real estate developers, and academic institutions. Such complex alliances exert a natural pull toward underdeveloped land in or on the edges of existing cities.

GLOBAL SCIENCE: FROM ELITE PRACTICES TO THE THIRD WORLD

Two important trends will shape how science and technology evolve in the coming decades. First, innovation zones will have deep implications for the structure and practice of science. As Martina Hessler puts it, the ideal of the isolated scientist focused exclusively on his work "has been replaced by an ideal of integrating science into society. ... Scientific research is not thought of as an autonomous project any more."

Second, new innovation zones are likely to emerge in and around cities in rapidly developing countries like India, China, Korea, and Brazil, as firms in these countries move up the economic value chain. While state policy, military contracts, and R&D investments will continue to be enabling factors, these clusters will emerge through local interactions among universities, large corporations, entrepreneurs, and the urban workforce.

—Alex Soojung-Kim Pang & Anthony Townsend



INTERVIEW: MICHAEL JOROFF

Mike talks about the growth of “new century cities” that are designed to bring together scientists, engineers, entrepreneurs, and government officials.

Q | You’ve been talking recently about new century cities. Can you tell us what they are and how you got interested in them?

I went to Seoul, Korea about six years ago to a conference about science cities. The Koreans were planning Digital Media City, and they wanted to learn from the science cities that were built in Asia and Europe in the 1970s and 1980s. I realized that while they were talking about science cities, what they were planning was really something radically different from what had come before.

Q | Why was it different?

The circumstances had changed since the 1970s and 1980s, when science cities were first planned.

First, there’s globalization. It was once possible to have a place that was fairly self-contained; now you find everything interlinked, including R&D. Technology has also changed a lot. It’s possible now to have places that are linked continuously even though they’re not physically connected. There have also been generational changes. Most of the people who planned science cities in the 1970s were familiar with television and maybe computers; today’s planners have grown up with wireless, which gives you a very different sense of place and how people connect to each other and how you concentrate activities. In fact, today you have four generations in the workforce with different skills and different ways of working.

Finally, business models have evolved over the last 30 years. Companies are more interested in open R&D networks than closed R&D processes. Business models assume that companies have to be fast, lean, and agile. They also assume that no matter what your technology is now, it’s going to change.

Q | What is driving corporations and R&D managers to enter into these projects and these partnerships?

For some, it’s just a reasonable piece of real estate. Others see an opportunity to position themselves and link with other companies—and to find other people who can help them to leverage their own interests and build long-term capability. For example, in Seoul Digital Media City, you get different kinds of companies that have similar activities. By being together, they make links that will be very beneficial for their business. BBC in London is seriously considering moving its digital media activities—about 2,500 jobs—out of London to Manchester, which they believe has the potential to develop into a major media center for Europe. BBC will go there in

force, but they want that whole area to develop in a way that helps them. That means not only bringing other companies of a similar nature there, but also building the social institutions and the educational institutions that will improve the larger environment.

Very few companies believe now they can do anything on their own. Increasingly, they see the benefits of being in open-source networks, of being physically collocated, or virtually collocated. At one extreme, the Western Governors’ Association—the governors of the western United States—wants to create these kinds of places in a region where there are few cities and no possibility of large-scale aggregation. It hopes to use electronic means to connect.

But collocation doesn’t automatically generate benefits. Something that is not so successful is Canary Wharf in England. It provides an aggregated place for financial institutions, and it places England in a good place by attracting these people and companies, but it doesn’t go beyond that, and it’s not building long-term capability.

Q | Are there differences in the way that cities view these science areas?

Cities have realized two big things. More of them are thinking long-term and doing what I call future-proofing. If you’re a city, you want to make sure that, as the technology changes and the focus changes or the competitive environment changes, you’ve got the muscle, the strength, and social capital to move on. In a place that you want to become a digital media city, it’s not just bringing in the hot new technology company, but making sure that they are either physically or virtually associated with those companies that are going to use that technology.

When I started working at MIT in the 1960s, the area around MIT was very successful in missile guidance systems, mainframe computers, and minicomputers. None of these industries is there any longer, but because MIT was successful in building the basic social capital and human capital that could take it to the next generation, the area is still vibrant. One of the very positive things about MIT is it has a new president who’s a life scientist, and that’s an area of the future. She’s not saying that we should do away with engineering—MIT is all about engineering—but she’s saying, in effect, how does engineering change, given the rising importance of life sciences? That’s future-proofing.

MICHAEL JOROFF is Senior Lecturer in the School of Architecture and Planning at MIT and a worldwide consultant in corporate real estate strategy and “workplace-making.”

I also think that, as cities have matured, they’re realizing that not everybody can be world-class in everything. The ones that are finding success really look hard at what local strengths they have and build upon them. It doesn’t preclude you from going in new directions, but if you have nothing that connects to stem cell research, you’re not going to just build it from scratch. But figuring it out is still a challenge. For example, York, England was designated a science city by the British government this year. I visited there recently, and people are talking about how, “we want to be world class, world class, world class.” Well, they have one of the most historic cities in the world, right? Every American student spends a few days studying English history sometime, but they study from very boring textbooks. Well, if York used technology to deliver its cathedrals and monuments to classrooms in America, it would be an enormous business. It’s not as glamorous as stem cell research, but it really could be significant for them to do it using technology.

Q | You’ve done a lot of research over the last couple of decades on how the corporate workplace is changing. Is there any connection between what’s happening in these streetscapes and public places and what’s going on inside the buildings where the work’s getting done?

Absolutely. Driving both these things are really basic changes in how we live, how we connect, and big changes in the business and social environment. It’s not just the technology.

In the workplace, we’re really redefining the place of work. It’s no longer an activity confined to a fixed place; corporations now recognize that people spend relatively little time in a formal office, and they support people wherever they are. Likewise, at the city level, we’re redefining where value gets created.

Q | Where are the Helsinkis or the Seouls of the future? How do you find them?

Who would have guessed five years ago that Florianopolis, Brazil, or Seoul would develop as they have? Florianopolis’ university created the first innovation park in Brazil, the world’s first electronic voting machine, and the whole ATM network for Brazil. Seoul is heavily wired, and it’s got all of these startup companies around that. They saw they had a world position in digital media because of how wired they are and how they’re using it but also the role they play in transmitting culture from the west to China.

So you look for places where people are thinking hard about “what are we, what’s our niche?” You look for places that have some degree of innovation (technologically and organizationally); that have companies that are very innovative; or a government that’s trying to do something new.

You also need leaders who are willing to experiment with innovative ways of financing these projects, bringing together the development industry, academic institutions, and government. A good example is University Park at MIT. MIT actually bought the land and put up half the development money, which significantly reduced the risk. They can use the good name of the university to help borrow money at better rates. Finally, they brought in a development partner who was attracted to the project because MIT was an active partner that would create a good, long-term environment. So MIT actually took that risk, put the money in, eventually took their money out, and now have a 75-year land lease on the property.

I think you’re going to find new kinds of financing packages that will bring universities, developers, and corporations together in ways they’ve never done before. Universities have an enormous amount of money and power tied up in their land that they haven’t learned how to release yet. They’re beginning to. This whole movement is just beginning.



Anthony Townsend, IFTF Research Director, asked Mike about the new role of the cityscape in the practice of science and technological innovation.

FROM SCIENCE CITIES TO INNOVATION ZONES

Innovation zones differ from science cities in some fundamental ways. Here are some key comparisons.

SCIENCE CITIES	INNOVATION ZONES
<p>Single developer and tenant</p> <p>Science cities were often developed by single agencies or companies. Even government-funded science cities like Japan's Tsukuba or Korea's Daedock were built by single agencies, or at most, partnerships between national and local governments. In many cases, corporate developers were also the primary—or even sole—resident of a science city. Xerox PARC, and the work that went on within it, was the property of Xerox.</p>	<p>Multiple developers and tenants</p> <p>Innovation zones are the result of partnerships that can include real estate developers, national and local governments, universities, state-owned enterprises, and multinational corporations. They attract lots of companies and combine academics, entrepreneurs, corporate managers, venture capitalists, and government officials. The presence of collaborators, suppliers, partners, and even competitors is one of the key attractions.</p>
<p>Isolated</p> <p>Science cities tended to be located on undeveloped land, often removed from city centers. Government-run science cities were situated in remote states, sometimes to promote economic growth in underdeveloped areas, sometimes to protect facilities from espionage.</p>	<p>Urban</p> <p>Innovation zones are often located within or on the edge of cities. Some are part of urban redevelopment projects—the high-tech equivalents of shopping malls or downtown baseball parks.</p>
<p>Managed innovation</p> <p>Science cities were efforts at managing innovation. For much of the 20th century, R&D was dominated by large corporations that wanted a steady supply of improvements to their product lines. Many labs were founded to provide those improvements. Companies were also able to control disruptive technologies produced by R&D staffs. However, the downside was that the rigid management of science cities could not exploit disruptive innovations effectively.</p>	<p>Disruptive innovation</p> <p>The R&D landscape has become much more complex in the last 20 years, and innovation zones reflect that complexity. The innovation zone is not a space organized around a single, overarching research program; it is designed to be more like a trading zone where diverse players meet, collaborate, and trade. Occupants of innovation zones take for granted that disruptions are part of technological and economic life—better to be creative here than elsewhere.</p>
<p>Company town</p> <p>Science cities were the intellectual equivalent of the company town, dominated by a single firm—or even a single division of a large corporation.</p>	<p>Long-term capital</p> <p>Innovation zones are designed to attract people from a variety of companies and industries. Ideally, they generate a reservoir of intellectual and social capital that can move from company to company (or start new companies) and build global links, but still contribute to the local economy. A successful innovation zone is self-sustaining and can be productive despite technical and economic disruptions.</p>
<p>Lab space</p> <p>Science cities were collections of laboratories: spaces in which nature and new technologies could be isolated and studied without the distractions of the marketplace.</p>	<p>Space as lab</p> <p>Some innovation zones are showcases and test beds for new products and services and include a substantial population of ethnographers who study how people use both the space itself and the products it generates.</p>

DETAILS

THE GEOGRAPHY OF INNOVATION ZONES

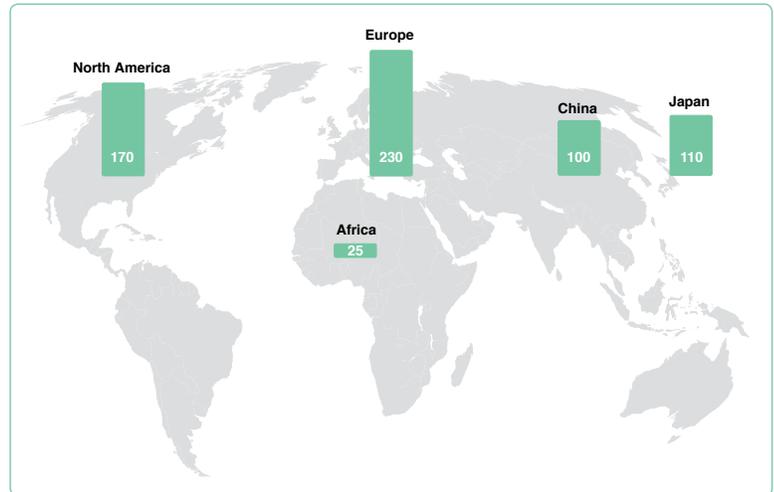
Innovation zones appear throughout the world, and not surprisingly, they concentrate in industrialized nations and regions. European and North American countries—the birthplaces of the science-cities movement in the 20th century—have the largest number of science and technology parks, incubators, and other facilities. Japanese corporations and government agencies have also built a large number of parks since the 1960s.

The most rapid recent growth in science parks, incubators, and innovation zones has been in Asia. In the 1980s, the examples of Silicon Valley and Tsukuba Science City led a number of Asian governments to launch science parks as catalysts for regional and national development. China announced 52 “new high-tech development zones” in the early 1980s. India planned 19 “science and technology entrepreneur parks.” Korea and Japan planned significant expansions of their science-city projects, and Malaysia, Thailand, Singapore, and other countries developed science parks.

These early efforts tended to be state-driven enterprises and often did not feature universities as major partners. Some were also marginal successes or outright failures: even Japan couldn’t replicate the success of Tsukuba. By the mid-1990s, observers noted a shift away from top-down, centralized efforts toward partnerships between local and city governments, real estate developers, and corporations. Some older science parks were privatized. For example, in 1990, Technology Parks PTE Ltd. took over management of the Singapore Science Park, which had been founded by the government in the previous decade. Further, many science parks began to look beyond major corporate tenants, and incorporated incubators, offering special facilities and services to new companies.

These newer, more robust innovation zones are also attracting expatriate Asian scientists and engineers back to their home countries. Beijing’s Zhongguancun Science Park, for example, is now host to thousands of small high-tech companies. Roughly 1,800 of them were started by Chinese expatriates lured home from the United States and Europe in the late 1990s and 2000s. India’s Bangalore has likewise become a magnet for Indian engineers and entrepreneurs from Silicon Valley.

1 University- and Government-Based Science Parks Worldwide, c. 1995



Source: UNIDO Technology Park Survey (Africa) and UNESCO Technology Park Survey (all others). Neither survey includes corporate and military facilities.



ASSOCIATIONS SUPPORT “PRACTICE” OF INNOVATION ZONES

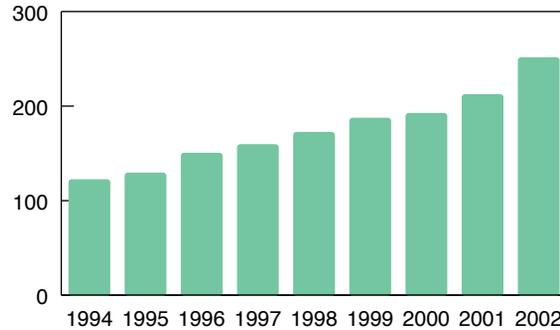
Over the last decade, a number of organizations have emerged to help science parks and innovation zones develop best practices, attract additional funding and tenants, and brand the regions, cities, and even neighborhoods they occupy.

The International Association of Science Parks, for example, is an eclectic group of long-time practitioners, newcomers, and hopefuls in the science park community. In the last decade, their membership has more than doubled. And their statistics reflect the trend toward more heterogeneous urban parks—the average distance to city center is just over six miles. On average, members are within 12 miles of a university and share services and infrastructure with universities.

Biospace is another association that helps biotechnology and bioscience organizations develop regional identities and brand them as “hotbed communities.” A Biospace map of the tri-state area around New York City, for example, provides an at-a-glance view of the knowledge and commercial infrastructure of bioscience in the region.

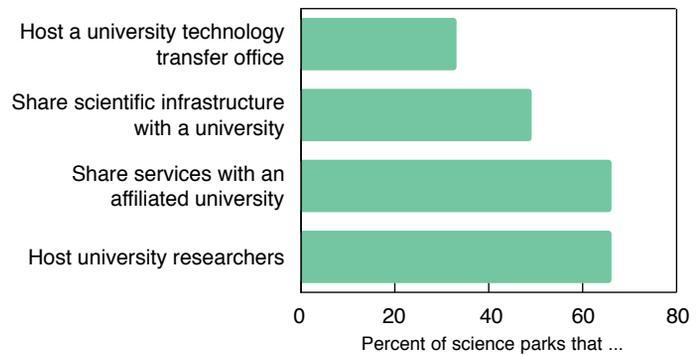
2 International Association of Science Parks’ Membership Growth

Members



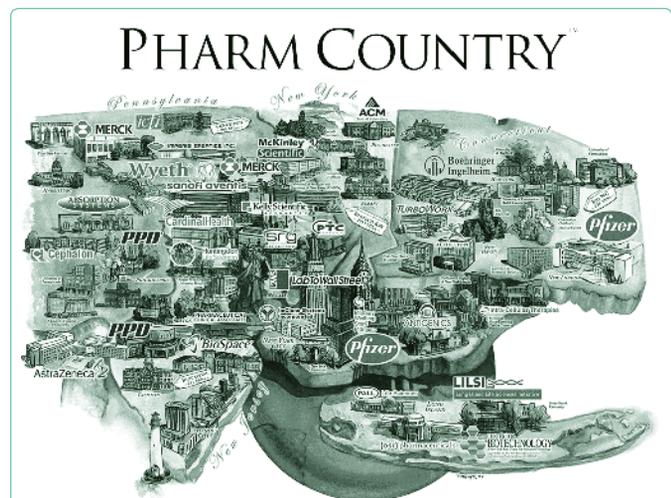
Source: International Association of Science Parks, www.iasp.ws.org, 2002.

3 How Science Parks Work with Universities



Source: International Association of Science Parks, www.iasp.ws.org, 2002.

4 Biospace’s Map of New York City and Its Surrounding Area



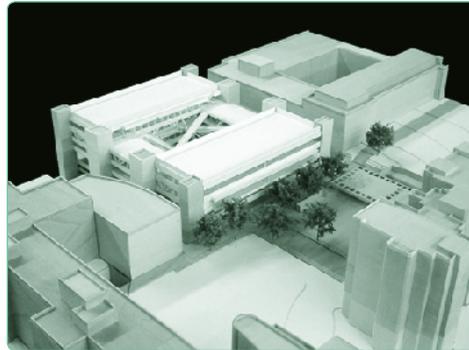
Source: www.biospace.com, 2005.

PROTO-INNOVATION ZONES: UNIVERSITY-INDUSTRY NANOTECHNOLOGY CENTERS

The global market for nanotechnology products in 2004 was approximately \$180 billion and growing at a rate of 30% annually. Worldwide, some 4,000 companies are active in this sector, many with strong growth potential—some 200 nanotech IPOs are expected in the next few years.

These companies all need space to innovate and grow, and in the United States, nanotechnology has set off something of an arms race between states eager to establish an early critical mass of researchers, firms, and facilities. Because nanotechnology applications are so closely tied to existing areas of science and engineering such as biology, medicine, and information technology, the innovation zone approach allows localities to leverage their university research assets through targeted investments in facilities that can serve as the hub of an emerging cluster. These facilities will bring together state funding, university talent, and business acumen to develop highly effective pipelines for commercializing R&D output in regionally distinctive cross-disciplines.

5 California NanoSystems Institute



Source: California NanoSystems Institute.

The California NanoSystems Institute (CNSI) building in Los Angeles is an urban campus that will house researchers from the University of California, Los Angeles and Santa Barbara. Approximately 30 corporate alliance partners will contribute funding and resources to support joint research projects. Corporate partners will share industry researchers, CNSI faculty, and students in precompetitive projects.

6 Center of Excellence in Nanoelectronics, State University of New York at Albany



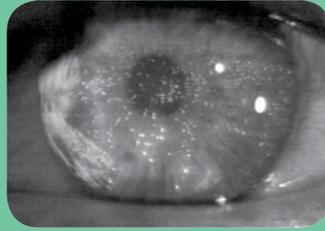
Source: Center of Excellence in Nanoelectronics.

In Albany, New York's capital city, the Center of Excellence in Nanoelectronics complex brings together over 100 industry partners on-site and has generated more than \$500 million in government support and over \$2.5 billion in corporate investments. It is already becoming a vital part of the region's emerging nanoelectronics cluster, where IBM's East Fishkill semiconductor plant is a pioneer in small-scale electronics manufacturing.



INNOVATION IN THE CITY: MONDAY MORNING

Science pervades the dystopian world of *Blade Runner*, from the Tyrell Corporation to genetic-engineering street vendors.



RESEARCH & DEVELOPMENT:

Support researcher externships—alone or in teams

While protecting intellectual property and tacit knowledge resources is a major priority for any company, industry researchers can become isolated from the cutting edge and lose track of broader trends outside their narrow area of expertise. Locating a research team or new business development group in an innovation zone is one way to expose your team to ambient innovation.

Another is to encourage individual researchers to take a leave of absence or sabbatical in a new innovation zone, perhaps even in another region of the world. Establishing relationships with multiple innovation zones—and working out contractual opportunities for researcher externships in them—will become an increasingly valuable way to refresh in-house scientists and develop partnerships that can be leveraged in future endeavors.



KNOWLEDGE WORKERS:

Exploit open tools and processes to engage the larger community

Innovation zones tend to attract not only scientists and engineers; they attract highly skilled and creative knowledge workers who can contribute substantially to cross-pollinating new ideas and technologies. In fact, an increasing share of new science and technology will emerge from the contributions of the informal economy in science-rich urban areas—knowledge workers who use collaborative tools to contribute, on their own time and in their own ways, to a growing pool of public science resources.

Those engaged in human resource development and policy should pay particular attention to this trend, looking for new models of engagement with the informal sector and tracking new issues that will arise as both formal and informal workers collaborate more openly and publicly at the frontier of science and technology.



COMMUNITY/POLICY:

Anticipate local impacts of science policy debates

Science policy debates have tended to be divorced from local communities—argued in national and international forums that cross institutions and seldom directly touch the day-to-day experiences of local communities.

However, as science moves into communities and as communities tie their fortunes to specific scientific fields of inquiry, expect science controversies to be increasingly local. Just as local industry often spurs local debate about health, environmental quality, and working conditions, urban science may produce surprising new issues at the city or neighborhood level. A proactive, local strategy to recognize and deliberate issues before they become polarized will be good for the community and the science it supports.



URBAN CULTURE:

Monitor artists' use of science as lead indicators

As William Gibson said in *Neuromancer*, the street finds its own use for things. In recent years, companies and cities alike have realized the role that users can play in innovation and product development. Moving R&D to urban innovation zones will allow companies to tap the “wisdom of the crowds.”

As innovation zones become firmly enmeshed in cities, they will offer companies opportunities to test prototypes with core customers; conduct ethnographic studies of users; and follow hackers as they find new uses for technologies. For cities, vibrant, challenging user communities will be valuable assets, attracting R&D and investment and future-proofing local economies.

Weak signals of more distant futures may be found by following science-based conceptual art. Groups like Australia's Tissue Culture and Art Project (which uses leading-edge tissue cloning and culture techniques to create art) are already probing the implications of objects that cross the boundaries of art, technology, and nature—precisely the boundaries at which many innovation zones will be located.



DEMOGRAPHICS: WOMEN ON THE MOVE

Traditional portraits of international migrants often depict underprivileged men working at hard labor to support families thousands of miles away—or itinerant families moving from place to place in search of seasonal work. But the profile of migrants has changed in recent decades. Most notably, the majority of those migrating to developed nations are now women, and they are increasingly migrating without families or husbands. Over the coming decade, these women migrants will struggle to define a new future for themselves—and possibly reshape global migration in the process.

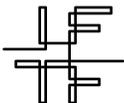


In spite of extreme obstacles, women are changing—and will continue to change—the face of global migration

TEN-YEAR FORECAST
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MIGRATION DRIVERS: EDUCATION AND EMPOWERMENT

Migrating in large numbers for the last 50 years, women reached a milestone in 1990 when 51% of all migrants to developed nations were female—a majority for the first time. And while poverty and political upheaval are often cited as drivers, two other factors may play a role.

The first is education. Demographers argue that education has a liberating effect, ameliorating the status of women in society and empowering them to make their own decisions about fertility, work, political activism, and migration. And contrary to public perception, the majority of immigrants are better educated than family members left behind.

Education doesn't tell the whole story. As the Global Commission on International Migration points out, "negative attitudes in countries of origin toward women, coupled with the fact that many women now have better access to education and greater awareness of their human rights, will provide further incentives for women to seek jobs and new experiences abroad."

MIGRATION CHOICES: BALANCING PAY AND PAIN

Women migrants may gain a measure of financial independence and cultural freedom, but the tradeoffs are often costly in self-esteem, personal safety, and well-being. They may have to give up low-paying professional jobs at home to take higher paying menial work abroad—often gender-segregated occupations, such as domes-

tic work and waitressing. These jobs sometimes come with poor working conditions and no job security, benefits, or human rights protection. Even in semiskilled factory and food-processing jobs, migrant women frequently find themselves segregated by gender. With global markets demanding increased flexibility and lower prices, the costs and risks are too easily passed on to this weakest link in the chain.

In fact, the path to work abroad is fraught with real personal danger. Choosing arranged marriages as an escape route, women may fall victim to domestic abuse and sexual exploitation. And resorting to illegal immigration assistance, they are often pressed into prostitution.

MIGRATION PATHWAYS: CREATING A MOBILITY INFRASTRUCTURE

Still, more migrant women are also working in professional and entrepreneurial roles—breaking barriers and stereotypes and creating a pathway for educated women to move up the economic ladder in a single generation.

Every census conducted in the United States since 1880 has reported a higher level of self-employment among immigrants than among natives. U.S. studies have also found that entrepreneurial immigrant women help incubate the businesses of other immigrant women. With increased global connectivity and the increasing ease of self-organizing communities, these women may be laying the groundwork for a new upward mobility infrastructure for global women on the move.

—Mani Pande



INTERVIEW: MANI PANDE

Mani reflects on her experience as an immigrant, a member of the Indian diaspora, and a sociologist.

Q | In some ways, you are like the new brand of women migrants you've been studying. You migrated from India on your own and are certainly pursuing an independent career path. What factors figured into your decision to leave family and friends in India and come to the United States?

It was not easy for me to make a decision to come to the United States. I didn't know a soul here, and I had to leave behind all that was familiar, especially my family and friends. But ultimately the "pull factors" triumphed.

One of the main reasons I wanted to come to the United States was to experience diversity, to meet people from different countries. One can experience diversity in India, but I grew up in a middle-class and upper-caste family in India, and I sometimes like to joke that I am the Indian version of a "Republican from the Midwest." I belong to a community that has held social, economic, and political power in India since independence. Most of my friends belonged to that community. I worked in a profession that was dominated by members of the upper caste. So I wanted to experience something different, to make friends with people who come from places that I had read about and seen on the world map.

I was also dissatisfied with my job. Soon after finishing graduate school, I got a job working as a crime reporter in the largest-selling English daily in India. The position brought with it a lot of influence and power. For example, we decided to do a series on the traffic problems in New Delhi because many people were run over by private buses as the drivers raced each other to reach the bus stop first and thus pick up more passengers. The series has had a lasting impact on traffic in New Delhi. I can proudly say that I was responsible for the new rules that were enforced by traffic police in Delhi for buses. When our series ran, even the police chief came down on the streets to direct traffic. But despite the power and the rush of seeing my byline on the front page of the newspaper, I was unhappy. The pay was low; I worked very long hours. There was also a lot of nepotism, and I didn't see many opportunities for moving up the ladder.

Q | As a sociologist, you've been very interested in migrant women's assimilation experiences. Thinking about your own experience, what have been the biggest challenges?

Assimilation into a foreign culture is difficult for most people. It involves unlearning your culture, mannerisms, language, and even accent and then re-learning them so they are more synchronous with the mainstream culture. As a sociologist, I like to study human behavior, and one of the things I

find intriguing about immigrant professional women is their accents. Most of them change their accents as much as possible in order to blend with the dominant culture. Although I have been speaking English since I was a baby, I had to Americanize my accent in order to be more acceptable in American society. Globally, I feel there is a hierarchy of English-language accents, with the British accent being on top. My Indian accent is closer to the bottom of the ladder, so I make a conscious attempt to speak more like an American when I am in a professional setting.

Often immigrant women professionals have to work harder to prove their mettle. While in graduate school, I taught an undergraduate course on Sociology of Women. I often faced a lot of resistance from the students; it seemed that they did not want this woman from a developing nation (who, in their minds, perhaps walked five steps behind her husband) telling them that women are behind men on many fronts in the United States. I had to work harder to earn their trust. I always had to have the right answer to all their questions.

For professional women, the desire to assimilate runs high. One of my friends studied law at Cambridge University in England and was the first foreigner to be selected student body president. But when she moved to the United States, she nevertheless took a seminar that taught Indian immigrants how to assimilate into the larger culture.

Q | You've had some exchanges with Annalee Saxenian at UC Berkeley. She has been studying innovation, immigration, and entrepreneurial networks for over a decade. What does she say about changes in the role of women since she has been observing them?

Saxenian points out that there were no technology immigrants to speak of in the 1960s and early 1970s. The first highly educated immigrants to Silicon Valley didn't arrive until the 1970s, and didn't start businesses until 1980s. Women immigrants in the earlier period tended to go to Chinatown and work in low-skill immigrant enterprises such as restaurants and textiles.

Saxenian pointed me to a number of Indian women entrepreneurs in the region, such as Radha Basu, CEO of SupportSoft, a Silicon Valley IT company. As a young girl in India during the 1970s, Basu rebelled against her parents and enrolled in an engineering college. Later, to the dismay of her parents, she decided not to get married and instead came to the United States for graduate studies. She was one of the first women to head an R&D project at Hewlett-Packard. Twenty years later,

MANI PANDE is a Research Manager at IFTF responsible for our biannual core survey and statistical analysis. She has a Ph.D. from Kansas State University.

she headed HP's e-business software department. Then she left HP to start her own company.

Another inspiring woman is Vani Kola. She is founder of Nth Orbit, a local B2B company. With \$25 million in capital, she sells her product-purchasing system at \$250,000 and upwards. She was pregnant with her second child when she started her company, pitching her product to prospective customers, including Fortune 500 CEOs. Another immigrant woman entrepreneur who has made a mark in the Silicon Valley is Vinita Gupta, founder and former CEO of Quick Eagle Networks. Despite early challenges that included her partner opting out and later a class action law suit, Vinita was able to turn her company into a success.

Q | You've since married and started a family here. How do you draw on the Indian diaspora today in both your personal and professional lives, and how do you see your future role in relation to India?

For most Indian immigrants, the Indian diaspora is a family that you can fall back upon. Indians have been successful in building a community around temples. The priests are the bridges between members of the community. For example, when I wanted to find a nanny for my son, the priest of the local temple recommended someone to me. Temple is also a place where you can reaffirm your Indian identity functions for various Hindu festivals. Attending them makes you feel you are back in India again.

I often tap into the Indian community for professional reasons, too. When an IFTF team decided to conduct a study of technology adoption in India, I drew on my professional contacts from India to help us identify participants in India and conduct the interviews. We also used my contacts in the Indian diaspora in the Bay Area to help identify an Indian family for another study.

I have been away from India for almost seven years, so my relationship with the country is a little tricky. I have a socially marginal identity. I don't feel I completely belong here, but every time I go back to India, I feel that the country is drifting away from me.



Annalee Saxenian on Immigrant Women Entrepreneurs In Silicon Valley

There is a small but significant group of immigrant women entrepreneurs in Silicon Valley today. They are very impressive women, and their presence has grown significantly in the last decade. There were none that I am aware of during the 1980s, and only a small group in early 1990s. Of course, this mirrors the overall trend in immigrant entrepreneurship.

These women have served as important role models for other women in both the Chinese and Indian communities in the Valley, and they play a role in building transnational communities. Take the experience of Radha Basu, who set up the Hewlett-Packard India operation in Bangalore in 1985. She set up one of the first offshore development centers in India, and it now employs thousands. In addition to the direct employment impacts of the HP lab, she served as a role model in India and was crucial in subsequent U.S. technology investments in India. She also played an active role in advising the Indian government under Rajiv Gandhi on development policy regarding the electronics industry.

Women immigrants, of course, face significant challenges as mothers and entrepreneurs in traditionally male dominated cultures. These are highly educated women who are very savvy and confident. Clearly, higher education is key to the independence of women and their ability to move out of enclaves.

Annalee Saxenian is Dean of the School of Information at University of California, Berkeley.



Kathi Vian, Ten-Year Forecast Program Director, asked Mani about her first-hand experiences as an immigrant woman in the United States.

THE FEMINIZATION OF MIGRATION: MORE WOMEN, MORE VISIBLE

Until recently, most writings on international migration focused primarily on male migrants because, in studies of labor migration, the assumption was that most migrants are males. However, women and girls have actually accounted for a high proportion of all international migrants for a long time, and their numbers continue to grow. At the current rate of growth, more than 100 million women will be migrating internationally by 2015.

MORE WOMEN THAN MEN LAND IN DEVELOPED COUNTRIES—AND THE MIDDLE EAST

Over the last 40 years, the share of women migrants in developing countries has been more or less constant—and slightly less than the share of men. In developed countries, however, the share of women migrants has grown slowly but steadily until women migrants now outnumber male migrants in those countries. This may be a weak signal that women, faced with the decision to stay or leave, perceive greater opportunities in the developed world than men do.

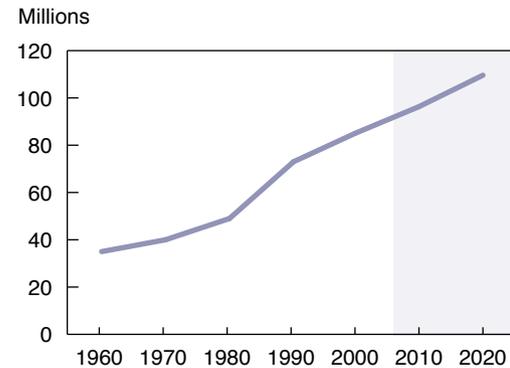
There are important exceptions. For Asian women, who are migrating in larger numbers than women overall, the Middle East has become a prime destination.

SPECIAL CASES: SRI LANKA AND THE PHILIPPINES

In Asia, women make up the majority of expatriates working abroad, and among them Sri Lankans and Filipina women tell a story of single women working abroad to support not just their families, but their national economies. In 1999, Sri Lankan women contributed 62% of the private remittances to the country, accounting for 50% of the trade balance and 145% of gross foreign loans and grants. Three-quarters of these women worked as housemaids, primarily in the Middle East.

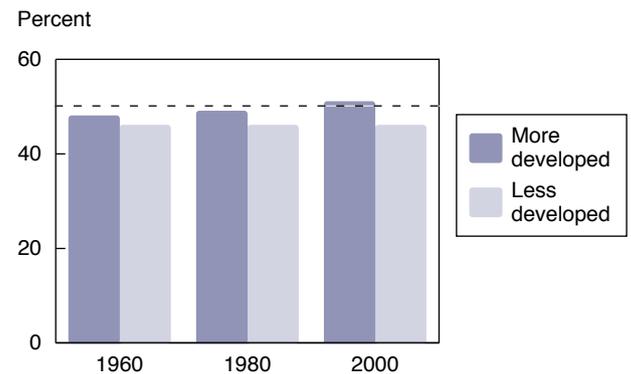
The Philippines is the largest source of registered nurses (70%) working abroad. Filipina migrant women remitted US\$6.2 billion to their native economy in 2001. The national government has actively promoted labor migration since the 1970s, especially to the oil-rich nations of the Middle East. Migrants get special status in Philippine society, which each year celebrates Migrant Workers Day, with awards for “modern-day heroes” who demonstrate moral fortitude, hard work, and a track record of sending money home.

1 Projected Growth of International Women Migrants to All Countries



Source: United Nations, “International Migrant Stock,” 2002.

2 Migrant Population That Is Female



Source: Hania Zlotnik, “The Global Dimensions of Female Migration,” www.migrationinformation.org/Feature/display.cfm?id=109.

DETAILS

INTERNAL MIGRATION: THE CASE OF CHINA

In addition to international migration, rural to urban migration is a key story for the coming decade, and China provides a portrait of the issues women face as they move from countryside to urban work settings.

About 130 million Chinese—roughly the equivalent of the entire population of Bangladesh—were living away from the places in which they were registered in mid-2001. And while the overall ratio of migrant men to women is 2:1, the ratio is reversed in the export-oriented areas of Southern China, like the Pearl River Delta. Here rural migrant women are the backbone of the workforce in the textile industry and in the manufacturing industries of the Special Economic Zones; they also dominate domestic service, waiting tables, and prostitution.

Today's Chinese government development programs tend to overlook women's roles and rights, and a survey conducted by the All-China Women's Federation in 2001 found that the status of women had declined over the last decade. Rural Chinese women, who make up the majority of women migrants, have been pushed to the bottom of the social hierarchy, suffering more than urban women in the process of modernization. They are more likely to be victims of social and economic harassment because many do not have the necessary permits (*hukou*) to live in urban areas. At the same time, local governments depend on them: in Shenzhen, taxes levied on migrant workers account for 70% of local government revenue.

In a study conducted on migrant women workers in the Pearl River Delta, researcher Zhang Ye found that women migrant workers face poorer conditions than their male counterparts. Male migrant workers earn almost double that of women. Women migrant workers tend to work longer hours, averaging 11–12 hours per day, with no holidays or weekends. They shoulder large family responsibilities, with many remitting most of their income home to support their families.

FUTURE SOURCES OF FEMALE MIGRANTS

Forecasting migration has always been a challenge because the push factors have often focused on political unrest and environmental factors that aren't easy to anticipate or project. However, if we hypothesize that women's migration patterns are influenced by two key variables—education and low gender empowerment—we might be able to point to some new or unexpected countries from which women migrants might come in the future, as well as speculate about their aspirations.

To conduct this analysis, we used two data sets: female enrollment in tertiary education institutions as of 2001 and the gender empowerment measure (GEM) developed by the United Nations Development Programme in 2002. (This measure includes the percent of seats in parliament held by women; the percent of female legislators, senior officials, and managers; the percent of female professionals and technical workers; and the ratio of estimated female-to-male earned income.)

Female tertiary education enrollment ranged from 0.10% to 94.5% for the countries in our data set.

GEM index scores ranged from .127 to .847 for our data set.

For each measure, we divided countries for which we had data into three groupings—high, medium, and low—and then grouped these countries to plot the likely source of women migrants in the future.

Of course, many factors could change these projections, including extreme changes in local political and environmental climates. Nevertheless, the analysis suggests not only some possible migration hot spots, but also the type of women that might come from them.

The following distribution of percentiles was used to group countries in our data set.

LITERACY

Low	0.10 – 9.0120
Medium	9.0121 – 38.3420
High	> 38.3420

GENDER EMPOWERMENT

Low	.127 – .49986
Medium	.49987 – .59400
High	> .59400



Culture Seekers:

High Literacy, Low Gender Empowerment

Countries in which women are highly educated but are not participating in politics or senior-management and professional positions are likely to be the top source of women migrants over the next decade. In addition to improving their pay, many of these women will be looking for exciting educational and employment opportunities to realize their full potential. While they may not succeed in these aspirations, they will be drawn to rich cultural centers in the developed world.

Self-Improvers:

Medium Literacy, Low Gender Empowerment

A second tier of countries may contribute to the pool of migrant women in the near future, though the drivers here are not as strong. Women from these countries have a medium education and low gender empowerment, but their education enrollment rates are on the rise, particularly in Romania, Chile, and Paraguay. If this trend continues, these women will move into the Culture Seeker category within a decade. In the meantime, they will be a less obvious pool of migrants, and when they migrate, they will also be more likely to take lower-status jobs with smaller gains in pay.

Power Seekers:

Medium Literacy, Medium Gender Empowerment

For a third group of countries, the choice to migrate today is more difficult; women from these countries have medium enrollment rates and medium gender empowerment. However, among these countries, the Czech Republic, Colombia, and Cypress are all experiencing increases in the rate of education enrollment. As a higher differential between literacy and empowerment develops, we can forecast a push for these migrants, who already enjoy a certain level of empowerment, to seek better opportunities elsewhere and to expect more for themselves.

3 Some Top Sources of Culture Seekers in the Near Future

	Literacy (Percent)	Empowerment (Index Score)
Russia	80.0	.440
Lithuania	79.1	.499
Ukraine	62.5	.406
South Korea	61.0	.363
Panama	42.1	.471

Source: UNESCO and World Bank databases, 2001; United Nations Development Programme, 2002.

4 Possible Sources of Self-Improvers in this Decade

	Literacy (Percent)	Empowerment (Index Score)
Georgia	36.8	.381
Chile	35.9	.467
Romania	33.8	.460
Moldova	32.9	.468
Venezuela	31.4	.441
Paraguay	21.5	.412
Turkey	20.9	.290
El Salvador	18.1	.459
Honduras	16.2	.408
Iraq	9.8	.253

Source: UNESCO and World Bank databases, 2001; United Nations Development Programme, 2002.

5 Possible Sources of Power Seekers a Decade from Now

	Literacy (Percent)	Empowerment (Index Score)
Czech Republic	35.2	.579
Philippines	35.1	.539
Peru	31.4	.521
Cyprus	28.4	.542
Colombia	25.3	.501
Costa Rica	22.2	.560
Mexico	21.0	.516

Source: UNESCO and World Bank databases, 2001; United Nations Development Programme, 2002.

WOMEN MIGRANTS: A HIGHER REACH

While migrant women often find themselves working below their capacity in service and domestic jobs, they outreach migrant men in securing jobs. In the United States, foreign-born women are better represented in service jobs and, to a certain degree, in professional specialties that usually require a college degree. Only in the low-skilled categories of operators, fabricators, and laborers—as well as farming, forestry, and fishing—do migrant men hold strong leads over women.

However, it's important to note that, compared to native-born Americans, both foreign-born men and women are underrepresented in the top-paid occupations, and foreign-born men are overrepresented in the lowest paid, lowest status jobs.

MIGRANT WOMEN MAKE THEIR OWN WAY AS ENTREPRENEURS

In the United States, immigrant women are rapidly making their mark in the business sector. In 2000, 8.3% of employed immigrant women were business owners, compared to 6.2% of employed native-born women.

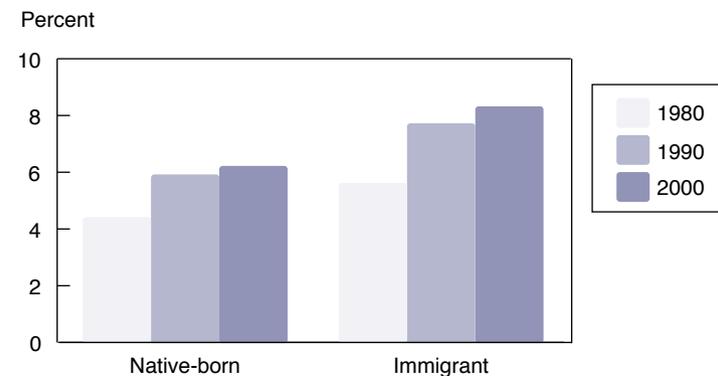
Many immigrant women have started their own businesses after discouraging experiences in the conventional labor market, exacerbated by cultural and language barriers. But immigrant entrepreneurs are still concentrated in feminized industries. The top five industries for immigrant women are domestic services, followed by child-care centers, restaurants and other food services, beauty salons, and services to buildings and dwellings.

6 Percent of Foreign- and Native-Born Employees by Occupation, United States, 2000

	Men		Women	
	Foreign	Native	Foreign	Native
Executive, administrative, and managerial	9.8	15.8	10.0	14.8
Professional specialty	12.9	13.6	14.5	18.5
Technicians and related support	2.7	3.0	3.2	3.6
Sales occupations	8.7	11.8	11.3	13.1
Administrative support	4.6	5.6	15.3	24.5
Service occupations	13.4	9.5	26.9	16.4
Precision production, craft, and repair	19.0	18.7	3.6	2.0
Operators, fabricators, and laborers	22.7	18.8	13.5	6.1
Farming, forestry, and fishing	6.3	3.3	1.6	1.1

Source: Abraham T. Moisa, "The Role of Foreign-Born Workers in the U.S. Economy," *Monthly Labor Review*, Vol. 125, No. 5, 2002.

7 Employed Women Who Own Their Own Businesses



Source: "Today's Immigrant Woman Entrepreneur," American Immigration Law Foundation, 2005.



WOMEN ON THE MOVE: MONDAY MORNING

In the documentary *Another Horizon* produced by SamRen.org, women argue for the need to recognize the reality of women migrants.



Another Horizon



MARKETS:

Match products to migrant women's aspirations

As more immigrant women become financially independent, businesses and service organizations should focus on the growth paths and changing needs of these women in order to develop products and services that help them fulfill their potential. They also need to recognize the values and aspirations that bind these women into a potentially powerful new market.

Despite different backgrounds and cultures, immigrant women often share some common experiences. For example, a few years back, Dove aired advertisements with real immigrant women from East Asia and India, showing the younger generation caring for the elderly in the family. Although the ads depicted women from different parts of the world, the common threads that bound them together were family ties and respect for elders—familiar values in the East.

Similarly, immigrant women all over the world appear to come together on issues of domestic violence. Women's organizations like Family Violence Prevention Fund are educating immigrant women about their rights and developing their leadership skills. Marketing messages for both products and services that focus on strong women making their own choices will appeal to these immigrants, wherever they hail from.



TECHNOLOGY:

Design social tools for globally mobile women

Women are leading users of social software, adept at finding communities to support their interests and affinities. Stay-at-home moms make up one of the biggest Meetup.com groups in the United States, and immigrant women have also turned to the software to create their own communities. For example, expatriate Indians have Meetup groups that get together to share their interest in Bollywood movies and music.

Migrant women form natural market segments for such social tools and services, but these offerings need to be tailored to their language, their pocket books, and their needs. Look especially for opportunities to franchise services to entrepreneurial women who can quickly identify their compatriot markets and create custom services that meet their cultural and mobility needs.

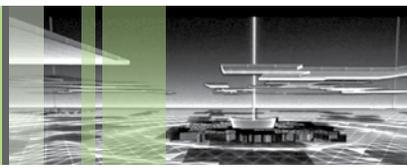


COMMUNITY/POLICY:

Innovate local and global policy to challenge the divide

While economic imperatives are often seen as the driver of migration, the role of education and empowerment suggests that migrant women will play an increasingly important role in shaping the communities to which they migrate. In developed countries, new social tools combined with distinctive cultural viewpoints could catalyze a host of innovative strategies for well-educated women to escape the low-status worlds they come from and contribute strongly to both their host and native countries.

At the same time, structural inequities threaten to exacerbate a growing divide between rich and poor migrant women. From the *hukuo* permit systems of China to immigration policies that recruit workers with experience often denied to women in their home countries, countries consistently condemn women to lower status jobs and social vulnerability. (For example, only Canada has an immigration policy designed to avoid gender discrimination.) Meanwhile, the liberalized global markets undermine traditional protections and create conditions that exploit unprotected women. Such problems need to be addressed at every level of society. The emerging global economy is an economy of disruption; that disruption can create innovative opportunities for improving the role of women in communities and worldwide or it can drive a bigger wedge between poor and rich, and between women and men.



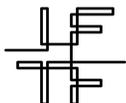
TECHNOLOGY: THE END OF CYBERSPACE

Since the 1980s, computer users have been going online in search of a better place: cyberspace. Thanks to science fiction writers, techno-pundits, and cyber-libertarians, computers were seen as portals to an alternate world of data—not only separate from but also better than ordinary reality. In cyberspace, information would be liberated from the surly bonds that tied it to books, trapped it in classrooms and laboratories, or allowed it to be monopolized by priestly classes. In cyberspace, information would be free, in every sense of the word: immaterial, placeless, and available to all. But the portal may soon close.



The notion of cyberspace will fade over the coming decade as the material, geographic, and social qualities of information come to the fore

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CYBERSPACE: LIBERATING METAPHOR OR RESTRICTIVE TOOLSET?

The idea of cyberspace as an alternate dimension, separate from and superior to the real world, is one of the most familiar and influential concepts of the digital age. It has affected everything from interface design to copyright law—and it's completely unique. As Geoffrey Nunberg points out, “We don't talk about visiting a novel or going to the TV news.” So why does the concept of cyberspace seem so natural?

Hackers have long seen the personal computer as a technological new world to be explored. This sensibility went mainstream in the 1980s and 1990s. Video games put players in very simple digital worlds. Science fiction novels and movies promoted the computer network as an alternate universe. Techno-prophets declared cyberspace a frontier where copyright and intellectual property laws were obsolete. The dotcom bubble swelled on the idea that, as the *Cluetrain Manifesto* put it, “The Internet is a ... real place where people can go to learn, to talk to each other, and to do business together.”

Computer design and use reinforced the idea of the screen as portal. The graphical user interface was a space in which users interacted with information, while Web browsers taught users to think about “surfing” to information residing on “Web sites.” Yet for all their promise of opening new worlds, computers actually restricted a user's ability to interact with people and information at the same time. Going online and being in the real world were mutually exclusive.

PHYSICAL SPACE: THE REAL FRONTIER

Over the next decades, an emerging generation of cross-impact technologies, including flexible displays, wireless devices, ever-smaller processors and memory, physical and digital tags, and geolocation technologies will let us move computing and communications off our desks and laps, and out into the world. This shift will have deep implications for the way we think about the relationship between information, technologies, and people, and for the way we use information technologies.

The either-or logic of cyberspace will become irrelevant. Rather than prepare for a future where cyberspace has rendered books, newspapers, libraries, offices, and universities obsolete, we will experiment with devices, spaces, and practices that blend the digital and physical. This is exciting because while the Internet may be immaterial, placeless, and free of social ties, information is not: materials, geography, and sociability all help define how we create, share, and use information. Personal computers, software, and networks have dealt very poorly with these physical dimensions of information. Our newfound ability to integrate information fluidly into objects, places, and social interactions will change the way we organize knowledge, design workplaces, collaborate with each other, and legislate the relationship between the digital and physical realms.

—Alex Soojung-Kim Pang



INTERVIEW: WILLIAM MITCHELL

William talks about where cyberspace came from, why it's going away, and what its erosion will mean.

Q | I want to begin with a question about why the idea of cyberspace as a place seems so compelling. As Geoffrey Nunberg observed, “the language we use to talk about the Internet is always uniquely spatial.” Why has that been so appealing?

I think Geoff Nunberg is absolutely right on this. The spatial metaphors are very compelling and are inseparable from metaphors of navigation. The World Wide Web is explicitly built on navigational metaphors and ideas of origin and destination and movement from an origin to a destination. So I think it's absolutely inevitable that the spatial metaphors have come out that way.

Q | In your latest book, *Me++: The Extended Self in the Networked City*, you wrote, “the trial separation of bits and atoms is now over.” What's driving that breakdown?

Computational capability and networking capability are getting embedded in just about everything these days. It used to be that there were these things called computers that created the sense that, when you entered into the world of the computer through the screen, you were entering into some sort of disembodied realm of bits. Now we have cell phones in our hands and our automobiles are full of digital control devices. The world is becoming permeated with loads of information, so the realms have come back together again.

Q | Are there places where you can see most clearly what the elimination of this boundary is going to mean?

Let me give you a couple of very concrete examples.

Over the last couple of years, my teaching has changed as a result of students having wireless laptop computers in the classroom. The moment I mention anything in a seminar, some student immediately Googles it and injects the result back into the conversation. You get a very different and extremely interesting and exciting dynamic in the classroom. And what's interesting about it is precisely this combination of the fact that it is a face-to-face social setting—and that's one essential element in the situation—and it's a physical place.

Another really compelling example is in medical education. In teaching clinical procedure now, they use PDAs and iPods that have videos of the various procedures. If somebody is about to perform a procedure, they actually dash out of the operating theater, crib it on their iPods, and then go back in and carve somebody up! This combination of the right kind of

digital information with a very particular kind of setting and task is very different from the old idea of sitting in front of a PC and surfing the Web.

Q | A decade ago, some people were declaring that place was not going to matter any longer. Today, cities offer wireless connectivity to make themselves attractive to creative workers. Place still matters, but will it in the future? If we get to a point where we have fully immersive virtual reality that is entirely realistic, is there a point where the technology actually renders place irrelevant?

Well, fully immersive virtual reality is an extreme, obviously. But even with fully immersive virtual reality, if you walk into the wall, you walk into the wall. Place never becomes irrelevant, because your body is always someplace. Place really actually matters more now, I'd argue: if you can work anywhere, the value of high-value places really becomes evident. If you can do office work anywhere, then places that are pleasant and fun to be in again have much more value than places that are not.

Q | It struck me, while reading about the new Stata Center at MIT, that a lot of effort was spent creating spaces to promote serendipitous collisions between different groups of people or to facilitate collaborative work.

That was very explicit. And one of the important things about the Stata Center is that it explicitly takes advantage of the fact that a lot of work is mobilized. It understands that people are carrying around their laptops, everything is wirelessly connected, and you can sit down anywhere and work. So it provides a huge amount of unassigned space that can be appropriated in ad hoc ways as needed for particular purposes. Serendipity really depends on that. You don't get much serendipity if people are all sitting locked in their private offices staring at their computer screens!

The Stata Building has socializing space throughout. It also has operable windows throughout, and natural light throughout. That might not sound very high tech, but it is.

In architecture, adjacency is a scarce resource. Everybody would like to be next to the coffee machine and simultaneously next to the best view and simultaneously next to the people they work with. That's impossible.

WILLIAM J. MITCHELL is Academic Head of the Program in Media Arts and Sciences at MIT. Formerly Dean of the School of Architecture and Planning at MIT, he also directs the Media Lab's Smart Cities research group and is the author of *Me++* and *e-Topia*.

When you introduce wireless connectivity, though, you eliminate a bunch of requirements for adjacency. You no longer have to be adjacent to a network jack to have connectivity or adjacent to paper files in order to do your work. Now, demands that had previously been latent and unsatisfiable have become satisfiable, so they take over, and recluster-ing begins to emerge. We are seeing a very clear movement toward much more flexible and nomadic occupation of space—of architectural space, of urban space.

Another thing is that as digital technology becomes really good, it becomes really small, really reliable, really capable, and really ubiquitous—it can disappear. The more high tech a space really is, the less high tech it has to look. Do you remember old-fashioned computer labs that used to be darkened spaces because the screens were so dim? Well, you don't need that anymore because screens are bright; they just work better. Now you can go back to very basic human things like light and air and build the architecture around the human beings rather than the technical systems. It's a tremendously exciting thing for architects.

Q | Computer scientists and philosophers argue the kinds of knowledge that can be rendered in code and used by artificial intelligences, and the kinds that can never be separated from social context or human cognitive and perceptual processes. Where does your work draw this line?

Well, I think that's a very interesting and fundamental question. I think there is a gigantic amount of tacit, situation-specific knowledge that either you can't reasonably imagine capturing and encoding in a computational way. Or it just wouldn't be the worth the effort, or the situation would have changed anyway by the time that you got it all encoded. I think there's a vast amount of stuff that, in the foreseeable future, is going to be available for the social understanding of sensitive human beings and will remain very, very difficult to put into a computational device.

But I would not draw the conclusion that you can't do anything. I think you can do a huge amount with relatively small amounts of contextual knowledge that, in fact, you can capture and do useful things with. A very good example of this is way-finding in automobiles and automobile navigation systems. All you need for that to be pretty good is a reasonably up-to-date map of the city and GPS coordinates on your car. It works, and it's fabulous, and it changes your relationship to the city. So there's contextual knowledge being used there—there's a map of the city and you know where the automobile is.

It is location-based, absolutely. It's pretty dumb, but it's still intensely functional and does some wonderful things.

Technology at any given moment will toss up a bunch of functional capabilities. The question a designer always faces is: "Given what I can lay my hands on right now, what's the human benefit I can wring out of this?" I'd argue very strongly that you can wring a huge amount of practical human benefit out of fairly small and straightforward bits of context awareness.

Let's go back to the case of location awareness. When I'm walking down the street, I'm immensely sensitive to the history of the street, what's going on socially all around me, and the particular time of day and year. I don't expect a computer to do that. But as a designer I can wring a lot out value of the technologies we have. Take a navigation system. Now add one more thing, which is technically easy: add orientation awareness so you know what direction you're looking. As soon as you do that, you can use a device like a cell phone to point and click in the real world. So you can point your cell phone at a bus stop, and it will tell you when the next bus comes. Point it at the museum, and it will tell you the opening hours. That's just adding orientation awareness to location awareness—just one field more, if you like, of context awareness that's technically easy to get but provides you with a huge amount of functional benefit in what you can actually design and build.



Alex Soojung-Kim Pang, Research Director at IFTF, asked William to think, as an architect and media expert, about the shifting metaphors and technologies of computing.

TIMELINE OF CYBERSPACE

The idea of computers containing worlds is as old as the computer itself. Arguably, the idea of information existing in an alternate dimension is as old as Western philosophy. The specific construction of cyberspace, though, is of much more recent vintage. The notion of cyberspace as a real place took off in the 1980s, fed by video games, the graphical user interface, and William Gibson's *Neuromancer*. The claim that cyberspace was superior to the real world—at least as a place to create and share ideas and to conduct business—was advanced in the 1990s by pundits, futurists, and dotcom boosters.

But even as cyberspace seemed poised to change everything, new technologies emerged to challenge the concepts and practices that defined cyberspace. Recommendation agents, wireless, RFID, flexible displays, and social software all have offered new ways of interacting with data and new reasons for going online. In the coming years, they'll combine to undermine the foundations of cyberspace, even as they're used to build its successor.

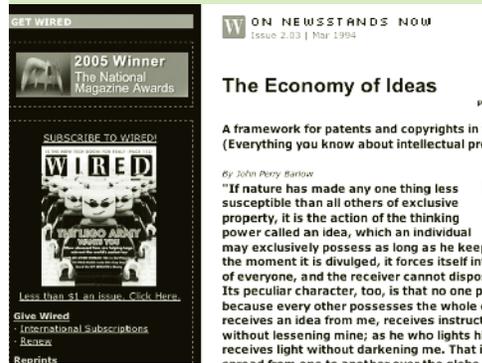
1 Building Blocks of Cyberspace—And Its Challengers

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|-----------|--|-----------|---|
| 1968 | Doug Engelbart demonstrates oNLine System (NLS) | 1997 | Instant messaging creates new language for online communication |
| 1969 | CompuServe is founded | 1998 | Social navigation research confronts problems of online anonymity |
| 1971 | ARPANet begins operation | 1998 | MoveOn.org taps Web for political activism |
| 1972 | Xerox PARC develops first video game, <i>Space War</i> | 1999 | <i>Cluetrain Manifesto</i> declares "the Internet is a place" |
| 1977 | Apple II and RadioShack TRS-80 establish microcomputer category | 1999–2004 | <i>Matrix</i> trilogy explores disembodied reality |
| 1978 | Space-based video games appear | 2000 | Xerox PARC spins off e-paper company Gyricon |
| 1980 | <i>Tron</i> creates a film image of cyberspace | 2000 | Civilians get access to accurate GPS |
| 1981 | Apple's Lisa brings GUI to PCs | 2001 | John Seely Brown and Paul Duguid's <i>Social Life of Information</i> challenges "informed" world view |
| 1982 | The Whole Earth 'Lectronic Link (WELL), an influential virtual community, opens | 2002 | Howard Rheingold's <i>Smart Mobs</i> describes IT-enabled self-organizing groups |
| 1984 | William Gibson's <i>Neuromancer</i> introduces the term "cyberspace" | 2002 | Wi-Fi begins to take off |
| 1985 | AOL is founded | 2003 | LinkedIn and Friendster bring attention to social-software movement |
| 1989 | Tim Berners-Lee publishes HTML specification | 2003 | Social bookmarking service del.icio.us launches informal tagging |
| 1992 | John Perry Barlow pens the "Declaration of Independence in Cyberspace" | 2003 | Freecycle opens |
| 1992 | George Landow writes <i>Hypertext</i> ; Jay David Bolter, <i>The Writing Space</i> | 2003 | RFID begins to enter supply chain |
| 1994 | John Perry Barlow publishes "Economy of Ideas" in <i>Wired</i> | 2004 | Cell phone use exceeds fixed-line use |
| 1994 | Dotcom bubble begins; bursts in 2000 | 2004 | Opening of DVD-, CD-, and book-sharing service Mediachest |
| 1995 | Esther Dyson publishes "Intellectual Value" in <i>Wired</i> | 2004 | "Web 2.0" emerges as a term for describing social software and new programming methods |
| 1995 | World Wide Web introduces geographical language of "surfing" and "Web sites" | 2005 | "Social browser" Flock is released |
| 1995 | Firefly commercializes recommendation agents | 2005 | Tech columnist Michael Swaine asks, "Is cyberspace dead?" |
| 1995–2005 | "Second enclosure movement" brings property rights to cyberspace | | |

RETHINKING CYBERSPACE:

MATERIALITY PUTS DATA IN OUR HANDS

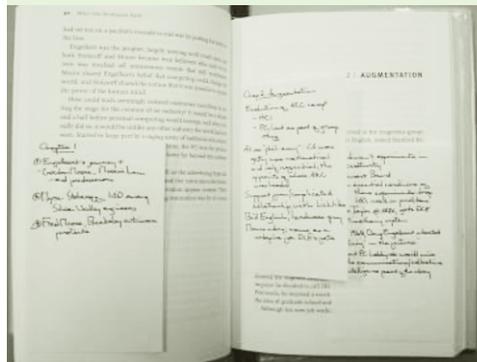
The promise of cyberspace



John Perry Barlow's "The Economy of Ideas" presented cyberspace as the next stage in the evolution of media.

Cyberspace was supposed to free information from books, newspapers, and other rotting media, giving it a new life in the global Web where it would be available to everyone, everywhere. In this vision, physical media were constraints that held information back from a fuller (digital) state, existing only to be overcome. It was only a matter of time before books, newspapers, magazines, libraries, and even universities disappeared.

What's wrong with this picture?



Reading as martial art: Post-its and underlining document a reader's interaction with John Markoff's *What the Dormouse Said*.

In reality, materiality matters. Page layouts in books and newspapers organize and communicate information: they tell readers what's important, how arguments are structured, and how disparate bodies of content are connected. Reader-generated marks like annotations, underlining, dog-ears, and notes are all efficient tools for adding and retrieving information.

Conversely, the Internet isn't a disembodied alternate dimension following its own immutable laws. Information lives on hard drives and rides on wires, all of which can have shorter half-lives than paper.

The future

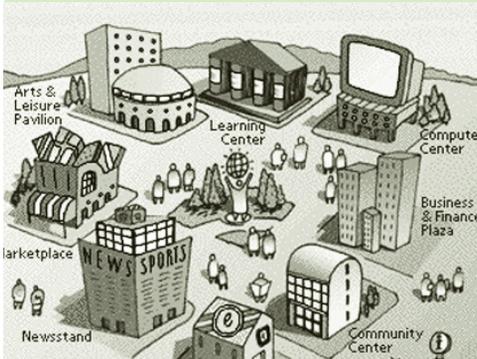


Flexible electronic screens and e-paper will give digital functionality to traditional materials.

In the near future we'll be able to create information technologies that work with, not against, the materiality of information. Ever-smaller processors, printable electronics, and flexible displays will all help smart designers put digital functionality into "things." Rather than creating virtual desktops or files on computer screens, we'll be able to distribute storage and intelligence in the physical tools of daily life—whether we're knowledge workers or organic gardeners—thereby preserving the advantages of physical scale while retaining the virtues of digital data.



GEOGRAPHY PUTS INFORMATION IN THE RIGHT PLACES



Apple's eWorld used a village metaphor to make its virtual space easier to understand.

Cyberspace promised to be everywhere and nowhere. Buyers and sellers would meet online, without the need for physical proximity; e-mail and video conferencing would eliminate the need for most business travel; companies could hire workers from all over the world and turn them into virtual groups that worked together without ever meeting in physical space.



Places like Dublin's famed Trinity College Library aren't just storehouses of books, but workshops for scholars.

Information has a geographical dimension. Some information can only be created in specific kinds of places. Most scientific knowledge, for example, is produced in laboratories, particle accelerators, and observatories.

Creating information is also a spatial activity. Knowledge workers arrange their offices in ways that support their personal work styles; road warriors in cafés or airport lounges tend to create little mobile offices around them.

The track record on information technologies and collaboration is mixed. Information technologies have made communication between far-flung colleagues easy and cheap. But computers are a poor medium for collaborative work—the kind of work that often requires big wallboards, constant interaction among team members, and negotiation over qualities of a product or concept that are more easily shown than described (say, the sound and feel of a car door closing).



The Jedi Library in *Star Wars: Episode 2* was a meeting place for scholars and warriors.

Information technologies will be able to work with the geography of information. We'll link information to places, either by tagging information (for example, with a geographical markup language based on XML), or by using physical tags that store information about an object or place.

The growing use of Web-enabled mobile devices will popularize the notion of retrieving information *in situ*. Just as workers have become accustomed to having “real-time” information delivered to their desktops, so, too, will users of mobile phones and other devices come to take for granted “real-place” information—information about a place, made accessible and visible in that place.

New kinds of infrastructures, embedded with intelligence and information, will change the economics of moving people and objects in physical space—creating new patterns of travel, commerce, and social interaction in real places.

SOCIABILITY PUTS INTELLIGENCE IN GROUPS



Howard Rheingold's *The Virtual Community* imagines a future in which online communities enrich our social lives.

In cyberspace, no one would know that in real life you were a dog—or a high school student, or disabled, or painfully shy. The anonymity of the Internet, and the opportunity it offered users to fashion alternate identities, would make cyberspace a social Utopia where people from around the world could come together, free of the distractions that separated minds in the real world. Good ideas would come from anywhere, go everywhere, and be available to everyone.

The most thoughtful boosters of virtual communities (like Howard Rheingold and Stewart Brand) did note that, as Brand put it, “the strongest online communities are also real ones.” But in the 1990s, such caveats were often lost, and many enthusiasts saw virtual communities’ separation from the real world as a virtue, rather than a flaw. Virtual communities would be supported by the exchange of pure information, and the existence of relationships unencumbered by real-world prejudices.



The members of Hovey-Kelley Design (later IDEO) did some of their most innovative work in cramped quarters and on company retreats.

Underlying this vision was the assumption that collaboration is just a form of information sharing—that it would naturally be made more efficient by moving from words and pages to bits and stripping away social cues and conventions.

But when creating and evaluating information, anonymity is more often a bug than a feature. Lots of valuable information is what sociologists call tacit knowledge, which can’t be explicitly described and shared over networks, but can be communicated among members of social groups. Standards that define an elegant mathematical proof or the “thin-slicing” that informs intuition, reveal the cultural roots of tacit knowledge. Elegance is hard to describe, but practitioners can agree when they see it.

Not only are computers bad at dealing with informal or tacit knowledge, they can *disrupt* the social relations that are essential to creating such knowledge. Computers and networks that enrich communication between people thousands of miles apart can get in the way of people working a few feet apart.



This Tokyo “smart mob” foreshadows a future in which groups use social media to rapidly organize.

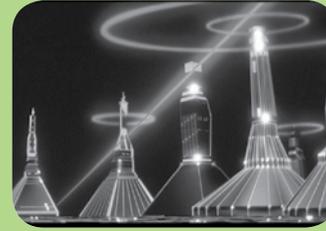
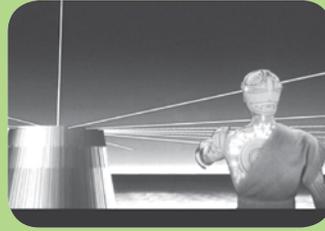
Connective technologies will turn information technologies into social technologies. Computing and communication devices will become smaller and less obtrusive. They’ll be woven into the daily fabric and installed under the hood of other products. The result will be information technologies capable of supporting social interactions instead of disrupting them.

But more importantly, new technologies will make it easier for people to find each other, to create new group identities, and to build group intelligence. In fact, they will drive a new group culture that is neither the smart mob *nor* the corporate work team *nor* the distributed group on the Internet. Rather this group culture will use new tools and methods of coordination and sharing to provide ad hoc group scaffoldings to define the spaces they jointly occupy—physical–digital scaffoldings for everything from organizing resources to creating new forms of entertainment.



THE END OF CYBERSPACE: MONDAY MORNING

Tron moved the idea of networks as worlds from the computer screen to the silver screen.



KNOWLEDGE WORKERS:

Focus on designing a physical–digital scaffolding for group interaction

A decade ago, we thought that the great impact of wireless technologies would be the dispersal of workers and the disappearance of the office. Instead, the big story is the way these technologies allow people to congregate in new, more creative ways.

For example, traditional offices have focused on providing essential services—functional seating, access to the Internet and intranet, and physical and digital storage for files. The goal was to support workers in improved productivity using standardized processes.

Today, with home offices and ubiquitous (or ubiquitous enough) wireless Internet access, and with knowledge-intensive organizations placing more value on innovation and creativity, workspaces are where people can link up for creative exchange. As designer Max Duffy puts it, “The workplace has been reinvented as an arena for idea exchange, a drop-in point for mobile workers, and a forum for professional and social interaction.” The critical need, then, is to provide workers with spaces that they can shape to suit their physical needs, encourage creativity, and be arranged to support group processes.



PRODUCT DESIGN:

Look for ways to combine bits and atoms

If the personal computer has become a portal into another dimension—one that competes with ordinary human activity, geography, and social life—the quintessential information technology of the future will be more like a good typeface. As Beatrice Warde, one of the great graphic designers of the 20th century put it, the best typeface is like a crystal goblet: experts might appreciate the design, but it should never distract from the content. Today, computers aren’t just a medium through which information and communication flow; their design, virtues, and limitations color and shape everything they touch.



COMMUNITY/POLICY:

Anticipate the impacts of physical–digital mergers on copyright law

In the future, unlocking the power of information technology will often require creating devices that don’t seem like computers; devices that merge the flexibility of bits with the interface advantages of atoms. Says William Mitchell, “Ironically, as information technologies become more complicated, products can become more natural.”

As legal theorists have noted, the idea of cyberspace has helped justify extending property rights to digital assets. If cyberspace is a place, the thinking has gone, someone should have jurisdiction over it. The irony, as Stanford law professor Mark Lemley notes, is that a concept originally developed to define cyberspace as separate from and “unregulatable by territorial governments” has become a tool “to justify application of traditional laws governing real property to this new medium.”

As the concept of cyberspace loses its potency, current applications of intellectual property law will be thrown into confusion yet again. If people cease to believe that it’s a place, cyberspace will no longer be a solid foundation upon which to reason about property rights. The reattachment of some digital information to things and places may allow lawyers to reassert that real-world property rights can apply to some digital information. But the growth of collective intelligence tools and ad hoc networks will create even bigger legal challenges.