



Global
Innovation
Outlook
2.0

Few words are more ubiquitous in business or society today than “innovation.” It’s rare to walk through an airport, watch an hour of television or pick up a major publication without running across it. It’s on the minds of a growing number of CEOs, government officials, and academic and community leaders as they look for ways to survive and thrive in an increasingly complex and connected world.

We use the word at IBM, too—but that’s nothing new. Innovation has been central to our company for nearly a century. It’s the primary reason our clients do business with us, and the simplest and truest statement of IBM’s purpose in the world. In fact, three years ago, IBM employees affirmed “innovation that matters—for our company and the world” as one of our three core values.

“That matters” is important. Those words say that what we do produces differentiation and real business value for our clients. They say that we’re focused not only on being creative ourselves, but on helping our clients be innovators—and that we do the same for our partners, our suppliers, and our multiple communities of collaborators and co-creators. They say that the work we do together changes the world in meaningful and lasting ways.

That goal is at the heart of IBM’s Global Innovation Outlook, a worldwide conversation about the changing nature of innovation. The GIO examines the opportunities emerging at the intersection of technology, business and society. It uses an open, multidisciplinary approach designed to uncover those ideas and insights that might not surface via traditional approaches.

In fact, the GIO marks new territory for IBM itself. We had long conducted in-house forecasting to determine emerging trends in business and technology. But with the launch of the GIO in 2004, for the first time we opened up our forecasting processes to include thought leaders from businesses large and small, the public sector, academia, citizens’ groups, the venture capital community and other key constituencies.

This remains a unique proposition for our GIO collaborators—and an invaluable opportunity for IBM. We learn from our interactions with one of the world’s richest and most diverse business ecosystems, and the members of that ecosystem benefit by coming together to tackle difficult issues and to learn from one another.

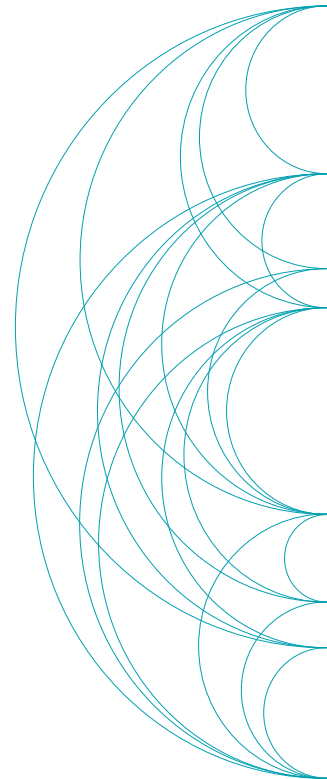
It’s a new approach to problem-solving, and it works—because the participants understand that their best ideas will only get better by being part of a larger conversation, where they can be debated, vetted, expanded and improved. And that’s why we feel so strongly about sharing this work. It’s not just *our* point of view. The insights gathered here have far-reaching implications for individuals, enterprises and institutions everywhere.

My hope is that you’ll find here provocative ideas about the nature of innovation, business transformation and societal change—ideas that you can build on and make your own. On behalf of everyone at IBM, I want to thank the hundreds of people who participated in this year’s GIO. And I look forward to continuing this global dialogue.

Sincerely,



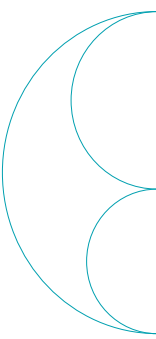
Samuel J. Palmisano
Chairman and CEO
IBM Corporation



The Global Innovation Outlook

The Global Innovation Outlook provides a platform for some of the world's most interesting thinkers—provocateurs and pragmatists alike—to engage in a series of open, candid and freewheeling conversations about important issues of our day, from healthcare to the environment, the role of government to the future of the enterprise. Rather than predicting the future, it is a search for the sparks that will ignite meaningful change for individuals, businesses and the world.

The GIO also investigates innovation itself—and the profound ways in which it is changing. In fact, the most essential finding of the first GIO, which was conducted in 2004, might be that innovation is no longer invention in search of purpose, no longer the domain of a solitary genius looking to take the world by storm. Instead, innovation is increasingly:



Global. The widespread adoption of networked technologies and open standards is removing barriers of geography and accessibility. Anyone and everyone can participate in the innovation economy.

Multidisciplinary. Because the challenges before us are more complex, innovation now requires a diverse mix of talent and expertise.

Collaborative and open. More and more, innovation results from people working together in new and integrated ways. Within this collaborative environment, notions of intellectual property are being re-examined. And those entities that view intellectual assets as “capital” to be invested and leveraged—rather than “property” to be owned and protected—will likely reap the greatest returns.

Perhaps that's why the GIO proves to be such a compelling exercise for IBM and our ecosystem partners. It is an investigation that invariably uncovers themes or patterns that transcend particular industries or interests. Ultimately, the GIO is an investigation of innovation that matters for us all.

For GIO 2.0, **248** thought leaders from nearly **three dozen** countries and regions, representing **178** organizations, gathered on **four** continents for **15** “deep dive” sessions to discuss **three** focus areas and the emerging trends, challenges and opportunities that affect business and society.

Who

The Global Innovation Outlook brings together a diverse set of contributors from many disciplines and areas of influence to examine each of our chosen focus areas. These broad ecosystems of expertise ensure perspectives both conflicting and complementary—a potent combination that provides the friction and the grease necessary for innovative thinking.

In addition to many of IBM's top researchers, consultants and business leaders, the GIO 2.0 sessions drew 180 outside experts with whom we have relationships:

- Academics and university leaders
- Business partners
- Clients
- Government and public sector officials
- Independent experts and thought leaders
- Industry analysts and consultants
- NGOs and citizen interest groups
- Venture capitalists

Participants came from a range of industries, including but not limited to:

- Aerospace
- Agriculture
- Airline
- Automotive
- Chemical
- Consumer packaged goods
- Education
- Electronics
- Energy and utilities
- Engineering
- Environmental services
- Finance
- Food and produce
- Healthcare
- Industrial manufacturing
- Information technology
- Insurance
- Logistics
- Mining
- Shipping
- Sporting goods and apparel
- Telecommunications

GIO 2.0 included contributors from the following companies and organizations:

3i
A.P. Møller-Mærsk Group
ABB Ltd.
AFL Private Ltd.
Alcoa Inc.
Alfred P. Sloan Foundation
All Nippon Airways Co. Ltd.
The Allstate Corp.
América Latina Logística S.A.
AquaBioTronic LLC
Association of Corporate Travel Executives
Australian Business Foundation
Baleno Holdings Ltd.
Beijing Anbound Consulting Co. Ltd.
Beijing Capital Highway Development Co. Ltd.
Bharti Tele-Ventures Ltd.
The BMW Group
The Boeing Co.
Brazil Ministry of Environment
Brazil Ministry of Science and Technology
Brazilian National Council for Scientific and Technological Development
The Cambridge-MIT Institute
Camanchaca S.A.
China Ministry of Transportation
China Petroleum & Chemical Corp. (Sinopec)
China Southern Airlines Co. Ltd.
Circulo de Empresarios
Cisco Systems Inc.
CompuSoluciones
Computacenter AG & Co. oHG
Confederation of Indian Industry
Corporación Nacional del Cobre de Chile (Codelco)
C-Sam Inc.
Datasul S.A.
Daum Communications Corp.
Delft University of Technology
DMS Consulting AG
The Dom Cabral Foundation
DuPont
Empresa de Urbanização de Curitiba S.A. (URBS)
Enel S.p.A.
Energy Innovations Inc.
The Energy & Resources Institute, India
Erasmus University Rotterdam
Ethos Institute
Evergreen Marine Corporation Ltd.
Expresso Mercúrio
Feintool International Management AG
Fiocruz
FIR Capital Partners
Ford Motor Co.
Forrester Research Inc.
Fortis Healthcare Ltd.
Fraunhofer Institute for Autonomous Intelligent Systems
Fuji Xerox Co. Ltd.
Fundación Ciudad Humana
Fundación Santa Fe de Bogotá
GeSCI
Global Online Learning
Gobi Partners
Government of Delhi, India
Grupo Ação Informática
Grupo Amanco
Harita Infoserve Ltd.
Harken Energy Corp.
Hindustan Lever Ltd.
Hitachi Ltd.
Hong Kong Commerce, Industry and Technology Bureau
Hummer Winblad Venture Partners
Il Gruppo Ferrovie dello Stato
Immigration & Checkpoints Authority, Singapore
Imperial College, University of London
India Department of Road Transport & Highways
Indian Institute of Science
Indian Institute of Technology Madras
Indian Railways
InnovationXchange Network
Institute of Technology Bandung
International Business Machines Corp.
Intuit Inc.
Itec S.A.
Javeriana University
Kellogg School of Management, Northwestern University
The Korea Transport Institute
Korean Federation for Environmental Movement
Lancaster University
Landbridge Capital LLC
The Levin Institute
Linde AG
Lisbon Council
The Logistics Institute-Asia Pacific
M S Swaminathan Research Foundation
MAIT
Manila Water Co. Inc.
Manpower Inc.
Mercatto Venture Partners
Movimento Brasil Competitivo
National Association of Private Transportation, Mexico
National Development and Reform Commission, China
National Institute of Environmental Research, Korea
National Institute of Public Finance & Policy, India
National Research Council of Canada
Neusoft Group Co. Ltd.
New Asia E-environmental Foundation, JiangSu
New Zealand Business Council for Sustainable Development
NHN Corp.
Nike Inc.
Nippon Steel Corp.
Norwich Union
NTT DoCoMo. Inc.
Octopus Cards Ltd.
Orient Overseas Container Line Ltd.
Peking University
Pennsylvania State University
Pew Center on Global Climate Change
Pirelli Labs
Port of Seattle
Printing Arts Mexico
The Procter & Gamble Co.
PROFEPA (Federal Environmental Protection Agency, Mexico)
PT Telekom Indonesia
Rabobank Group
Renmin University of China
Rensselaer Polytechnic Institute
Royal Academy of Engineering
SAIC (Science Applications International) Inc.
Samsung SDS Co. Ltd.
Sanyo Electric Co. Ltd.
SES Global S.A.
Shanghai Jiao Tong University
Singapore Management University
Sirius Computer Solutions Inc.
Sociedad Mundial del Futuro
Society of Indian Automobile Manufacturers
Sohu.com Inc.
State Council of Science and Technology of Jalisco, Mexico
State Environmental Protection Administration of China
State Farm Insurance Co.
Stockholm Environment Institute
Suncor Energy Inc.
Sungkyunkwan University
Swiss International Air Lines Ltd.
Symantec Corp.
Taiwan Industrial Technology Research Institute
Taiwan Institute for Information Industry
Tata Iron and Steel Co. Ltd.
Tata Motors Ltd.
TCG Advisors LLC
Techno Venture Management
Tel Aviv University
Telefónica S.A.
Thai Airports Ground Services Co. Ltd
Thailand Center of Excellence for Life Sciences
Tokyo Institute of Technology
TOT Public Co. Ltd.
U.K. Department for Environment, Food and Rural Affairs
U.S. Agency for International Development (USAID)
U.S. Environmental Protection Agency
United Nations University-INTECH/MERIT
United Parcel Service Inc.
Universidad Bartolomé de las Casas
Universidad Carlos III de Madrid
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Universidad de los Andes
Universidad Tecnológica Nacional
Universidade de São Paulo
University of Antwerp
University of Cambridge
University of Texas at Austin
Vietnam Small and Medium Enterprise Association
Wikipedia Foundation Inc.
Woodrow Wilson International Center for Scholars
World Business Council for Sustainable Development
World Resources Institute
Xcel Energy Inc.
Yonsei University
Z + Partners
ZJS Express Co. Ltd.

Where

□ Participants came from 33 countries and regions around the globe.

■ Deep dive sessions were held in five major cities.



What

We begin each GIO cycle by identifying several broad focus areas critical to society, and then consider specific opportunities for innovation and advancement—in the realm of products, services, business processes and models, policy, culture and beyond.

The focus areas for GIO 2.0 were:

1. The Future of the Enterprise, p.15

If the Industrial Age is in fact giving way to the Knowledge Age, what are the new foundational structures and organizing principles that will characterize institutions in this era? How will those principles affect existing corporations and the field of competition? What will they imply for the disciplines of management and current research and development practice? Will basic terms such as “employee,” “employment” or even “enterprise”—which has long been synonymous with “big business”—take on new meaning, or perhaps become irrelevant?

2. Transportation, p.24

If at the core of almost all our lives—and perhaps even our genetic makeup—lies the need and desire to move about freely, will 21st-century technology facilitate increased mobility? If so, how will we balance rapid improvements in long-distance travel with the pressing challenges of navigating high-density mega-urban centers? What new challenges may emerge for today’s urban planners, and what possible path can be taken to support continued economic growth and sound environmental health?

3. The Environment, p.36

If one of the premises of the first GIO was the impossibility of separating the world of business from society and its attendant opportunities and challenges, then what of the relationship between business and the literal environment—our planet? What areas of environmental sustainability hold the most promise for private and public sector innovation? And what are the management implications when these well-known environmental issues are finally confronted?

Although the GIO identifies insights and opportunities specific to particular fields, perhaps even more valuable are the ways in which it surfaces similar insights from across various disciplines and industries, then applies them broadly. Many of the patterns we saw in the first GIO—the need for standards, the trend toward open IP and collaboration, the primacy of the individual—continued to resonate and be refined with this second GIO.

In addition, some entirely new patterns emerged...

The power of networks

The GIO sessions held in 2004 suggested that individuals are finding their influence to be more powerful and far-reaching than ever before. The second set of global discussions made clear that those individuals are not acting in isolation. Their power comes largely from their ability to tap into and sometimes transform a larger network of people and ideas.

Networks are not a new idea, of course. The business world has always comprised constellations of people working together to create value. More often than not, though, these networks were contained within the walls of an individual enterprise. Similarly, scientific progress has relied on networks of colleagues, but it was often about collaboration after the fact—individuals working in isolation and then publishing their findings to fuel further discovery and debate.

However, in the last decade the proliferation of communication networks has not only connected people, places and ideas in unprecedented ways, but also catalyzed the [evolution of social structures](#). Suddenly, it's possible to transcend physical and geographic borders more easily, and that freedom has fostered a new willingness to partner both within and outside the traditional boundaries of organizations and countries.

More than ever, GIO participants suggest, innovation in business and society is fueled by the unifying notion of [“the endeavor”](#)—activities driven by a common set of interests, goals or values. They assert that it soon may be time to redefine what we in the business world think of as “the enterprise.” Further, notions of “employer” and “employee” might become more and more antiquated, as looser aggregations of collaborators form and disband on an opportunity-by-opportunity basis.

In the past, people formed large corporations partly to shield themselves from risk, partly to protect their intellectual assets, and partly to achieve a level of reach and scale impossible on their own. However, GIO discussions in Latin America went so far as to suggest that the future might consist of a billion one-person “enterprises”—people who move freely and

For many participants, innovation must extend beyond the level of technology, product, business model or policy. [“Social innovation”](#)—the creation of new or applied structures that alter the nature of roles, relationships and interactions—will become an essential aspect of business in the 21st century. In fact, most promising technology or business innovations will either flourish or fail based on whether concomitant social innovations emerge—or are designed—to support them.

“ Leaders face new challenges as they look to motivate morale and passion among people working on a project or a team. For some people, the passion may be more for the chip itself than for a Hitachi, a Samsung or an IBM. But that’s okay—it’s also an opportunity to motivate and reward people in new ways.

— Koichiro Nishikawa
Hitachi Ltd.
Japan

”

frequently from project to project as their skills and focus shift. In such a **collaborative, contribution-based** environment, the role of the traditional enterprise could shift to orchestration and facilitation of the endeavors between these individuals or groups of individuals.

In such a world, unifying forces such as loyalty and pride of ownership could be supplanted by trust and pride of contribution. But that also suggests the need for a new set of social standards to help foster collaboration. In many GIO discussions, people kept coming back to the idea of **“reputation capital.”** Think of it as a kind of accumulated trust, a standard of accountability that enables diverse, and often virtual, networks of people to confidently strike partnerships with one another. A perfect example is eBay and its community-run rating system. Reputation capital enables the creation of bonds—be they permanent or temporary. And in these ever-shifting networks, temporary relationships built on confidence and around common goals may become as valuable and powerful as long-term relationships were in the 20th century.

Another implication of the power of networks is a much more **complex set of causes and effects.** As boundaries dissolve and more fluid relationships form, the effects of individual actions take on new properties and proportions. This creates a ripple effect with implications for management structures and leadership competencies. GIO participants assert that the institutions that best understand how to extract value from these ripple effects will reap the benefits of unexpected discoveries. In fact, many of today’s most profound innovations are not only about new ideas but also the novel combination of existing products, services, processes or models.

Line of sight

Many participants suggest that the very nature of **decision-making** for individuals, businesses and the world is being shaped by these larger networks. Local actions now have global consequences, and the reverse is true as well. Yet even as the complexity of operating in an ever-shrinking world increases, the availability of information needed to make informed decisions

“ In Latin America, information is power. And the more you share information, the more power you get and the more you can empower other people.

— Francisco Medina
State Council of Science and
Technology of Jalisco
Mexico

”

and tools to access that information are expanding at a similar pace. Repeatedly—and regardless of focus area—GIO debates emerged around whether **line of sight** into the full consequences of one’s actions might actually inspire a different set of choices.

For example, if business leaders could better understand and anticipate how actions along one plane create stresses or strengths in another, might they proceed differently? Or if people fully understood the true environmental impact of even the most banal everyday activities, from turning on the lights to throwing a battery in the trash, might they make **different choices**? Perhaps. But as we learned during the first GIO, just telling someone the consequences of his or her actions—such as explaining to a smoker that cigarettes cause cancer—may not be enough. The key may lie in exactly when and how the information is conveyed, whether to encourage desired behaviors or stigmatize detrimental actions.

GIO participants suggest that many opportunities exist for new products, services and processes that capitalize on the latest advances in computing power, networked infrastructure and data intelligence to convey a fuller and more compelling picture to decision makers—be it real-time information about energy use, traffic congestion or distributed workforces. Harnessing the wealth of data and information available from increasingly distributed and disparate sources could represent the next huge opportunity for societal and business innovation.

Flipping the equation

Another recurring theme—what one participant referred to as **“flipping the equation”**—suggests further opportunity for innovation. In short, participants believe that the application of intellectual energy in those areas exactly opposite of where it is currently focused could accelerate new breakthroughs and advancements. Why not, they ask, shift research into the decomposition of products rather than the composition, or develop transportation systems that focus on the divergence of people versus the convergence, or create business models that allow easier disaggregation of resources and talent rather than fostering their acquisition?

“ I think the role of innovation can be to push both economic growth and environmental protection. If you see either as a trade-off, then you take positions and you don’t really solve the problem.

—Varun Jha
Tata Iron and Steel Co. Ltd.
India

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In December 2005, the Government of Canada, in conjunction with UN-HABITAT and IBM, sponsored the world's first HabitatJam to address this specific issue. Check out www.habitatjam.com to see what solutions people around the world are proposing.

Many participants expressed concern that the world's priorities for innovation are often skewed in the wrong direction. As Sam Pitroda of C-Sam Inc. said, "The best brains in the world are busy solving problems that don't really need to be solved. They're struggling to design a better watch or struggling to design some fancy product. Why don't they work on designing better slums? Billions of people live in absolutely miserable conditions, and that needs to be fixed."

Flipping the equation is not a simple reversal. In fact, it requires **moving beyond "either/or" thinking**. It demands the ability to manage seemingly conflicting dualities at once. Ultimately, contemporary innovation hinges on the idea that it's not enough to choose one path over another. Innovation often requires solutions that allow economic progress, environmental protection and societal advancement to coexist.

That's **innovation that truly matters**.

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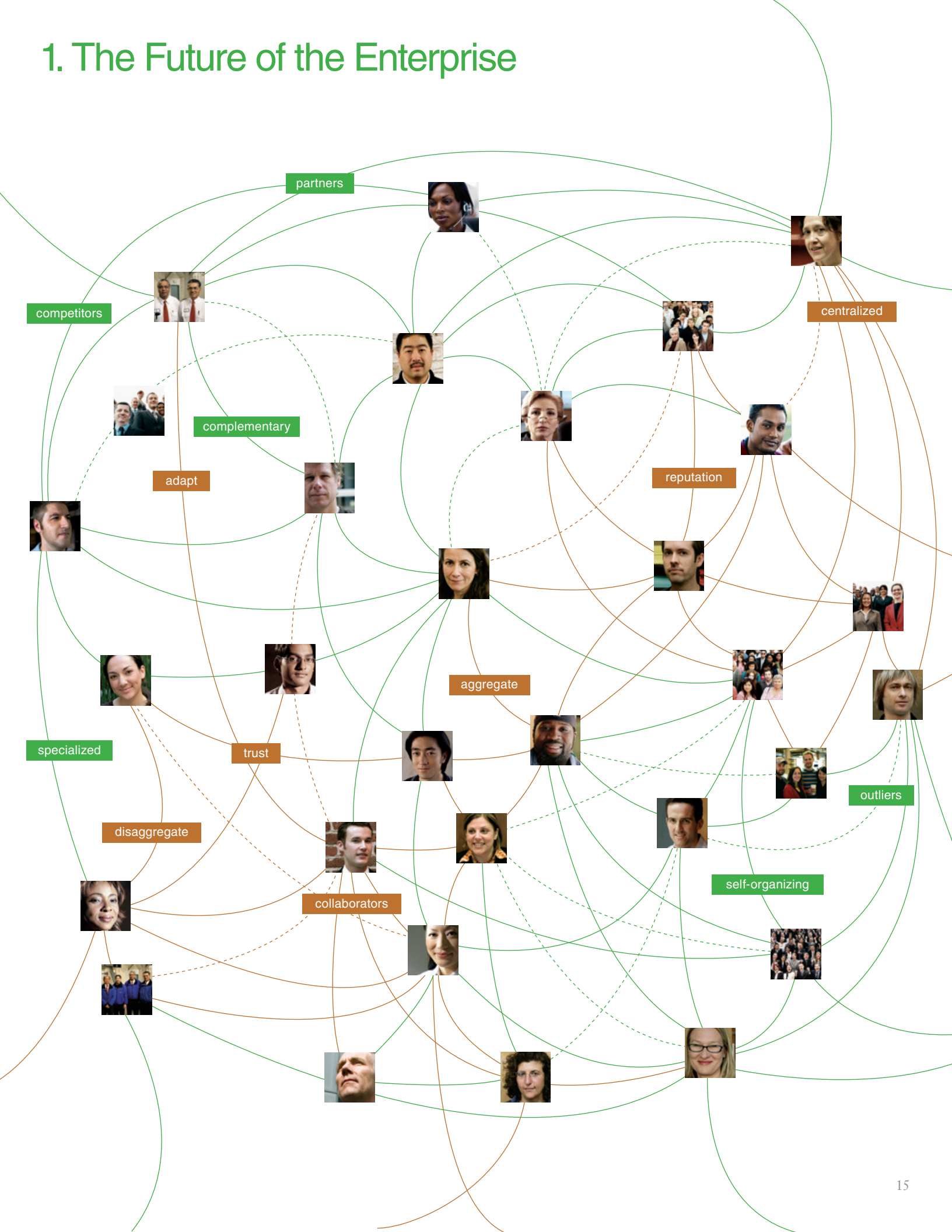
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1. The Future of the Enterprise



partners

competitors

centralized

complementary

adapt

reputation

specialized

trust

aggregate

disaggregate

collaborators

self-organizing

outliers

Is the 20th-century enterprise history?
Increasingly, the motivating force that brings people together for work is less the enterprise itself (a business organization) and more the collective “enterprise” (a joint endeavor or undertaking). If this trend accelerates, it will have profound implications for how companies think about everything from leadership to managing and motivating global talent. It will change the ways they approach innovation itself.

INSIGHT:**Forget about free enterprise.
Think enterprise-free.**

Ever since business management became a discipline, companies have implemented a variety of organizational models to achieve maximum efficiency and growth. They've tried vertical, horizontal and everything in between. They've been centralized, decentralized, matrixed and networked. While none of these models will completely disappear in the foreseeable future, GIO discussions suggest that trying to create a new, improved version of the same institution fundamentally misses the point. Management models of the future will need instead to contend with how to orchestrate a complex and changing network of individuals within and outside the boundaries that previously defined "the enterprise." This implies more than just forging more productive relationships with contractors, partners and even competitors. It means rethinking the basic building blocks of business—and questioning some time-honored assumptions about how to assemble, manage, define and grow a company.

Whereas many organizations continue to seek innovation in the form of the latest gadget or gizmo, GIO sessions repeatedly suggested that innovation in the realm of business processes, business models, and even management or culture is as important, if not more so.

GIO participants overwhelmingly agree that activities driven by a common set of interests, goals or values—**the endeavor**—will increasingly provide the necessary glue between individuals or entities, and relegate the role of the traditional organization to orchestration and facilitation of these endeavors. Z+ Partners' Andrew Zolli, among many participants, likened this potential model to aspects of Hollywood's studio system, in which studios, regardless of size or target market, assemble and coordinate rotating rosters of affiliated talent for discrete projects. Said Zolli: "You create an outside entity, you subscribe internal and external talent to it, you create stuff, and then you have deployment assets."

In part, the change is being driven by a new generation of workers who are much more comfortable with the idea of job fluidity. For many of these employees, their primary identification is less with the company they join and more with the company they keep—the larger network of colleagues and peers who share their interests, expertise or worldview. They are coders or computational biologists or designers or educators first, and employees second.

But a more fluid, flexible and mobile workforce is just one factor driving this change. Also helping to redefine the notion of the enterprise is the confluence of collaborative innovation, networked technology, and viable new business models such as business process outsourcing, customer-driven design and peer-to-peer production.

45%

of workers want to change jobs at least every three to five years.



Source: Spherion's 2003 Emerging Workforce Study

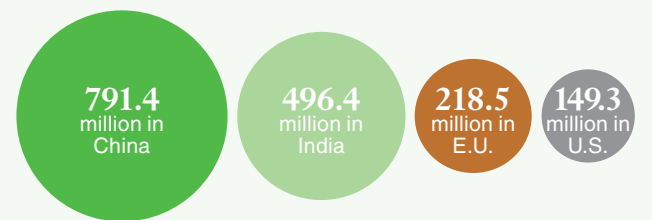
To this point, many participants discussed the increasing viability of the “specialized enterprise.” The ’90s version of this idea focused on “core” vs. “non-core” functions and activities. The goal was to contain what was core, and ship out the non-core to lower-cost providers. The contemporary view is that that’s not good enough anymore. The nature of competition—increasingly intense, global and unpredictable—requires strength across the board. So the objective is to decompose the enterprise into its component parts, understand with great precision what is truly differentiating—where the enterprise has strengths and weaknesses—and then make decisions about how to build, buy or partner for world-class capability.

In this model, companies can focus their energies on their true point of differentiation, instead of trying to master many domains and ultimately squander competitive advantage by dispersing focus and investment. Rather than existing as static and fixed organizations, more enterprises could essentially become an **aggregation of specialized entities** with complementary interests—expanding, contracting and reconfiguring themselves in a way that best adapts to or even anticipates market dynamics.

Paradoxical as it may sound, these super-flexible configurations may prove even more stable over time. As several GIO participants pointed out, self-organizing and self-aggregating entities are often much more adaptable in the face of disruption. To borrow an analogy from biology, it’s akin to the process of separation, alignment and cohesion seen in flocks of birds, swarms of insects or schools of fish—all of which rely on self-organization to move in a dynamic and efficient manner.

How, then, will companies go about defining what to keep internal and what to outsource, co-source or eliminate altogether? Defining what’s core and what’s not core can prove a futile exercise, in part because what’s core tends to shift over time. As consultant and author Geoffrey Moore noted, companies end up investing too many resources in functions that have ceased providing real value and differentiation. Ultimately, the most innovative businesses will continuously and nimbly adjust their partnerships and sources of production. What must remain constant for these companies is a core purpose or vision rather than a core set of activities. Knowing *why* they do what they do, companies can be more flexible in adjusting the “who,” “where,” “how”—and even the “what.”

LABOR FORCES IN 2005



Source: CIA World Factbook

Does specialization mean companies should hire for a more narrow set of skills and capabilities?

Perhaps the opposite, according to several participants. At a time when innovation depends on a company’s ability to pull from multiple disciplines, employers may actually want to assemble a diverse workforce with a fair amount of “mutation” built in.

INSIGHT:

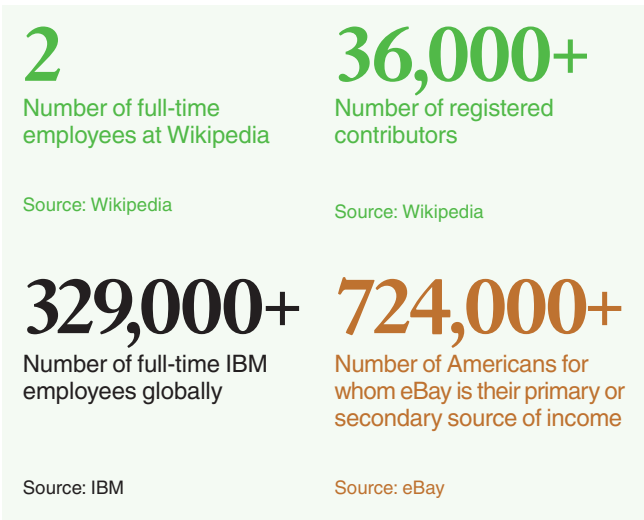
Talking 'bout my reputation

In a world where fewer and fewer companies directly control all aspects of their operations, it's getting harder to ensure that brand experience consistently lives up to brand promise. It's a challenge that will soon confront many organizations—from large companies aggregating and disaggregating their resources to small companies achieving scale through partnerships. How can a company make sure that the individuals and business partners who power its network fully understand its brand—and are motivated to uphold and protect it? There will be little room for error when something as valuable—and as fragile—as a brand is at stake.

Much of the risk in preserving brand integrity would disappear if organizations had full confidence in the ability and integrity of prospective workers and partners. But how will companies be able to make the necessary assessments reasonably and quickly?

Several participants put forth the idea of “**reputation capital**” as a kind of currency for building trust in a prospective worker’s personal and professional qualifications. They cite examples such as Wikipedia and eBay, both of which have built successful brands based on the contributions of hundreds of thousands of non-affiliated individuals. In each case, there are standards in place that allow people to see and rate the integrity and credibility of contributors. And the more a contributor consistently demonstrates a high level of accountability and quality, the more value he or she garners—from commanding a higher selling price on eBay to having more “authority” on Wikipedia. Reputation capital is even beginning to function as a currency outside the parameters of a specific endeavor—some college-age and postgraduate job hunters now put their eBay rating on their resumes, pointing to this “trustmark” as a de facto measure of reliability and desirability.

Even for businesses not built around the contributions of individuals, reputation capital has intriguing possibilities, especially for those emerging global players who have only a virtual presence and no visible brand of their own. What new standards, systems or institutions might emerge to provide the equivalent of the eBay trustmark or the Good Housekeeping Seal for small businesses and other entities looking for partners in the global economy?



Will guilds return?

Participants suggest that, for knowledge workers in particular, a form of 21st-century guild could emerge to facilitate accreditation, skills development and reputation management. Such guilds could ensure level-setting across the “trade,” as contributors move from endeavor to endeavor. Perhaps we’ll even see new mentoring models in which people learn from a variety of masters and apply their skills to a broader array of challenges. Further, individual knowledge workers may one day command “agents” who seek out and negotiate short-term opportunities and effectively manage career paths on their behalf.

INSIGHT:**A small world after all?**

A pervasive digital infrastructure, maturing broadband and wireless capabilities, and changing economic policies have struck down many barriers to global competition and opened up entirely new distribution channels for small and medium-size businesses. Participants point to how firms with 25, 10 or even five employees are increasingly able to conduct business on a global basis.

But in this changed global landscape, matters of size are definitely relative. We're witnessing the rise of a new breed of **very small and highly specialized businesses** that are not only competing globally, but in some cases seriously disrupting existing business models and paradigms. Already there are firms with a few dozen employees doing hundreds of millions of dollars in business. In 2002, California-based consumer electronics maker Apex Digital actually generated more than \$1 billion in revenues with fewer than 100 employees. So, what exactly is the definition of "small"?

Meanwhile, many large businesses are now learning to operate with the agility and flexibility of smaller operations. In a way, the specialized enterprise is essentially an aggregation of small businesses, some internal and some external. Networks of partners run everything from business processes to research and development efforts on behalf of these enterprises, which are more than happy to buy rather than build aspects of their innovation. They may turn to smaller partners to supply specialty products or services, or to reach a small but lucrative market segment. And, increasingly, they are emulating small businesses when it comes to tailoring products or services to specific market segments or regions. In these cases, **smaller is often better**.

Businesses with fewer than **10 employees** make up almost **90%** of all European enterprises.

Source: The European Commission

Small businesses in the U.S. produced **13 times** more U.S. patents per employee than large firms.



Source: U.S. Small Business Administration

Has the leveling of the playing field leveled off?

Several GIO participants suggest that while barriers to entry are lower in some cases, they're rising in others, as technologies mature and consolidation occurs. What has fundamentally changed, though, is that companies enjoy competitive advantage for a more limited time and are far more vulnerable even at the top of their game.

INSIGHT:**Success will depend on how well you play the game—literally**

Being farsighted will no longer be sufficient for tomorrow's leaders. In the future, they will need to envision here, there and everywhere simultaneously, making rapid-fire decisions based on multiple and constantly shifting inputs. Forced to operate in this mode—and short of developing some kind of bionic vision—they will come to rely on new tools and technologies that can enable rapid processing of massive and disparate amounts of information.

Most participants feel that today's MBA programs simply don't prepare future leaders for this business reality. Some even suggest that the next generation of leaders won't carry diplomas or degrees, but rather will be "the outliers"—cultivated on the outer edges of the bell curve rather than inside ivy-covered halls.

As business becomes increasingly distributed and virtual in nature, what kinds of leaders might emerge and what attributes will they have? To answer this, some participants suggest **studying the qualities of leaders** who thrive in environments that contain many of the characteristics of the new business landscape—specifically, those that are massively distributed and virtual in nature.

Perhaps the most intriguing examples can be found at the **polar opposite from command and control management systems**: in the emerging world of massively multiplayer online games, or MMOGs. As unlike traditional video games as universities are from the one-room schoolhouse, they traverse the Internet to enable thousands of players to interact, compete and collaborate with one another in real time. The game play exists in a

persistent universe, where there is no clear beginning and end and no set schedule.

Despite a high level of complexity and uncertainty—not to mention the lack of formal hierarchy—people naturally adopt different roles and responsibilities and then get things done collaboratively. The **connective tissue of this collaboration** is the normalizing culture of the game itself—a common set of rules and standards binding players from different geographies, backgrounds and motivations. And, invariably, certain individuals emerge to set direction and shape the behavior and success of others.

Gaming also suggests other ways companies and individuals can prepare to thrive in these future work environments. The best games build an intuitive level of education into the play itself. Players can't help but learn the skills necessary to master a game while they play, and they usually improve quite rapidly. Similar approaches—building learning intuitively into work processes and procedures—might allow companies to shift from costly and infrastructure-heavy training and development programs to more **flexible contextual learning models** that allow people to develop emerging new skills as needed.

This also raises an intriguing possibility for a better approach to increased productivity: fun. Imagine if employees were as addicted to their work as they are to these games. There may be a vast well of energy, effort and creativity that remains largely untapped if employers continue to make strict divisions between work and play.

In China, an estimated **100,000 people earn their living playing massively multiplayer online games seven days a week** and then selling their characters and other virtual assets to more affluent gamers in the Western world. Some characters can command hundreds of dollars depending on their "levels" and other accomplishments.

Source: The New York Times

Is it time to redefine MBA curricula?

While a number of business schools are trying hard to keep pace with the dizzying rate of change in the world—adding courses or departments on innovation or services sciences, for example—most programs are still largely predicated on theories of business management that are several generations old. Today's management toolkit must be updated and expanded—something that no single institution can accomplish alone. Could academia and companies in developing regions come together to pioneer new approaches that will transform business education for the 21st century?

INSIGHT:**Rewriting the employer-employee “contract”**

Much has been written about the disappearance of the “company man.” In less than one generation, the notion that an individual would devote his or her entire life to a single institution is becoming less and less mainstream. Granted, pockets of lifetime employment still exist in industries. But events over the last decades of the 20th century clearly suggest that the model for interaction between employer and employee is changing dramatically. If the old expectation was something like, “Work hard and stay loyal and you shall be taken care of,” what will be its realistic replacement?

At the moment, few viable alternatives have been compellingly articulated. There is plenty of white space to reinvent the ways employers and employees exchange value, including reward systems that move **beyond stock options, bonuses and retirement plans**. In fact, the very definition of retirement is in flux. Today’s aging—but much healthier—workforce faces economic challenges in large part presented by living much longer than previous generations. Working beyond retirement norms established in the early days of the manufacturing era will likely be necessary. And today’s workers—especially knowledge workers—are far more capable of making valuable contributions to business and society long after traditional “golden year” thresholds. Yet most corporate policies and cultures haven’t been updated to anticipate or account for this shift.

The findings of GIO 1.0 led to many discussions within IBM about programs and policies that could capitalize on the expertise of our aging workforce. In 2005, we launched a Transition to Teaching program, which provides an opportunity for retiring employees with math and science backgrounds to become accredited teachers in local communities.

Who, though, should bear the primary burden of providing social safety nets in this shifting environment? What was once the realm of government gradually shifted to business as companies competed to attract—and retain—the strongest long-term workforces. But as businesses themselves disaggregate, can individuals be expected to take on more of the risk and responsibility? They may have to, in exchange for other options such as increased flexibility and career fluidity.

That’s why some participants believe that **social networks could provide a stabilizing force** that removes some of the individual element of risk. If bands of strangers can come together to play games, write code, share photographs and so on, why couldn’t they also pool their resources to form powerful health insurance collectives, for example?

Or what if networks of businesses themselves banded together to enable more security but also job **mobility for a common set of employees**—not to mention more innovative distribution of intellectual capital? Just as liberal arts colleges in the United States form alliances that enable students to study at any institution in the network, might we see exchange programs between Fortune 500 companies? Procter & Gamble has started to do this with a network of its own retirees and those from other large companies—recruiting retirees from Boeing with knowledge of virtual manufacturing processes, while sending P&G retirees to partners such as Eli Lilly to lend expertise in packaging for consumer products.

“If we try to keep what the employee is doing as part of the enterprise property, we are limiting people and we are limiting the company. We have to think about opportunities that exist in moments of time, knowing that the employee is not going to stay with us for the rest of their lives.

— José Medina Mora
CompuSoluciones
Mexico

”

INSIGHT:**Innovation as a mindset,
not a department**

Successful and sustained innovation, GIO participants agree, demands a shift away from conventional thinking that innovation is chiefly the domain of an R&D group. But to complete this shift, traditional enterprises face another challenge: They tend to rely on existing approaches to solve new problems. An all-too-common “solution” to the innovation challenge should be no surprise: companies establishing new “innovation” departments and job titles.

There’s just one problem. Simple organizational fixes seldom work, especially when the issues they attempt to fix are profound and perpetual.

Evidence supports this claim—current innovation models aren’t doing the job. Over the last several months of 2005, IBM consultants conducted interviews with more than 750 global CEOs for a survey aimed at understanding their innovation agendas. Among the findings:

- While business leaders clearly understand that competitive advantage is predicated on business model innovation, only one in five have put their primary organizational focus on driving innovation into their core business model.
- Those that are most successful in driving business model innovation see it in the bottom line—growing operating margins faster than their competitors.
- The greater the level of collaborative innovation, the greater the financial performance. Regardless of the metric—revenue growth, operating margin growth or average profitability over time—strong collaborators consistently come out on top.

GIO participants strongly recommend that companies ingrain innovation into every aspect of their operations. As both Thomas Tsao of Gobi Partners and Jai Menon of Bharti Tele-Ventures noted (in separate sessions), “Innovation isn’t a department, it’s a culture.” Of course, this is much easier said than done. And there is wide debate about the best ways to create such a culture. Some suggest adjusting incentives and metrics to create an environment

where employees are continually motivated to reject the status quo and even tempt failure. Others suggest loosening organizational restrictions to unlock new ideas. As Manoel Amorim of Telefónica put it, “Create less process and less structure and promote more independent thinking and creativity.” But as Darren McKnight of SAIC noted, “A lot of us think innovation is going to magically happen. It’s not. ‘Culture’ is produced by a series of actions.” McKnight suggests that you need a foundation of communication to build trust. That allows for cooperation, which yields a shared vision. And that then lays the groundwork for collaboration, which ultimately leads to innovation.

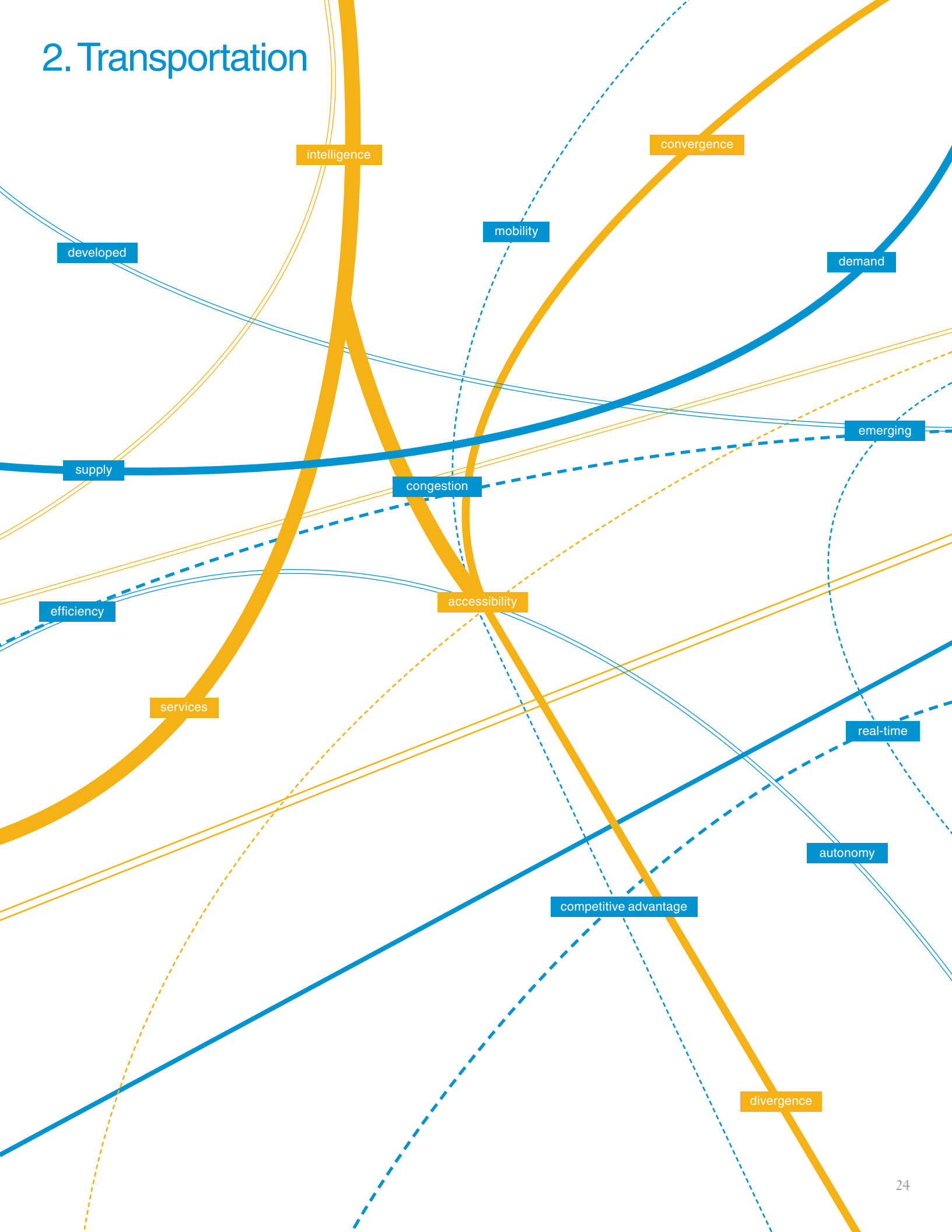
To pursue open, collaborative innovation, companies must find ways to tap into the potential of the skill, talent and creativity of people from different teams in different organizations across the globe, suggests P&G’s Larry Huston. That may mean managing research and development less as a discrete department and more as a supply chain, where the best ideas from around the world are exchanged dynamically. This implies, for instance, that rather than building expensive new research facilities in emerging markets, a greater priority might be establishing “**sensing hubs**” to seek out new ideas and innovation components, as well as ready receivers for the company’s existing ideas. P&G now sources more than a third of its new innovations using this model.

“ I have a much more open-ended, catholic view that says innovation comes in many shapes and sizes. You don’t need to have an in-house research facility, but you better have a process for how you create or generate knowledge and how you diffuse and apply that knowledge.

— Narelle Kennedy
Australian Business Foundation
Australia

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2. Transportation




It's never been easier to get from one place to another. And, at the same time, it's never been harder. Thanks to advances in transportation methods and the easing of geopolitical barriers, people and freight can now move over far greater distances, with far more frequency, than ever before. The problems begin once they get there. Increased congestion on streets and at ports around the world is taking a major toll on productivity, quality of life and the environment. Forward-looking cities and regions can get ahead of these problems—and create economic advantage for themselves—by aggressively seeking innovative answers to society's mobility challenges.

While the U.S. population grew nearly 20% from 1982 to 2001, the time Americans spent in traffic during the same period jumped 236%—from 16 to 47 hours.



Source: U.S. News and World Report




Year	Number of Mega-cities
1950	8
2001	41
2010	59

In **1950**, the **number of mega-cities** (those with populations of five million or more) was eight. In **2001**, that number had climbed to 41. In **2010**, there will be 59 mega-cities, 48 of them in less developed countries.

Source: Population Reference Bureau

Every day, more than **15 million containers** are in transit—at sea, on land or stuck in yards waiting to be delivered.



Source: The Economist

INSIGHT:

Grow, but with flow

The past decade has witnessed an unprecedented migration to urban areas and a vast increase in global trade. Even as the business world seems to be experiencing its highest levels of efficiency, this massive movement of people and freight is placing serious strain on the existing, sometimes aging, transportation infrastructures of the world's older cities. Congestion is creating horrific new logistical challenges for emerging mega-cities, especially in booming regions of Asia and Latin America. Even modest-sized communities around the globe are grappling with increasing levels of pollution, costly delays and overall frustration on the part of people and businesses who feel constrained by their lack of mobility.

No matter what, some degree of congestion is inevitable. Frustratingly, short-term solutions to “eliminate” it are often superficial—simply exporting the problem elsewhere, from city centers to fringes, from superhighways to access roads, from large cities to remote suburbs. Still, many GIO participants suggest that the more a city or region aggressively pursues innovative strategies for managing traffic—on land and at sea, of people and of freight—the more likely those places will continue to grow and prosper.

As Pablo Allard, a researcher at Universidad Católica de Chile, noted, “**Mobility increases market areas**, expands the options for access to goods and creates competitive advantage.” It also helps regions attract new business investment and a higher-caliber workforce. And, on a more philosophical level, increased mobility satisfies a deep human desire that perhaps harkens back to our nomadic past. Exploration and transplantation just might be in our genes.

All of this suggests that those cities that pursue progressive, hyper-efficient transportation systems are making perhaps the most prescient investments in long-term economic development. And those cities that don't get with the flow may actually be imposing insurmountable barriers on themselves. If congestion problems aren't adequately addressed, individuals and businesses may decide to locate elsewhere, trading proximity for freedom of movement. Some suggest that we might actually see the decline of the mega-urban model altogether, as people retreat instead to more sustainable and habitable places.

“It's puzzling—should we try to facilitate greater mobility or try to contain demand for transportation? On one hand, you've got to deal with congestion and on the other, there are the aspirations and expectations of the people in these developing nations. That's where our biggest dilemma lies.”

— P. Srinivasa Raghavan
Harita Infoserve Ltd.
India

The Genographic Project, a five-year research collaboration between the National Geographic Society (a GIO 1.0 participant) and IBM, is studying hundreds of thousands of DNA samples to determine humanity's migratory journey over time. Learn more at www.genographic.com.

INSIGHT:

Headlights into the system

While one might assume that increasing road capacity would reduce vehicular congestion, statistics show that the opposite is in fact true. Effective relief for urban congestion isn't about building more streets; it's about getting smarter in how they are used. GIO participants from every country and region emphasize the pressing need for more [holistic approaches to understanding and managing urban traffic flows](#).

The steady shrinking of sensing and computing devices is making it increasingly possible to gather and analyze massive amounts of traffic and transportation data. At least one leading tire manufacturer is considering ways to embed microchips in its products to allow future interaction with smart devices built into roads and other parts of the transportation infrastructure. And some cities are beginning to explore ways in which they can harness all the information these networks of sensors will deliver. But, participants say, there exists little, if any, real understanding of the many ways in which people, vehicles, freight and goods actually navigate the urban landscape. Only then, for example, could optimization techniques allow cities to better automate traffic flows based on real-time data rather than generalized predictions based on historic trends.

Some cities, such as London and Stockholm, have started to pilot “road-charging” systems that adjust the cost of tolls and access based on peak congestion periods. In London, the plan has already cut congestion by 30 percent in its overcrowded financial district. But many GIO participants express worry that such schemes ultimately create a whole new set of problems, in effect penalizing poor and middle-class workers who can't necessarily adapt their travel patterns but also can't afford higher peak charges. As one participant in Zurich put it, “I don't want to go to a two-class situation where some can afford to travel and others cannot.”

One of the challenges in having a line of sight into an entire system is not becoming blind to the needs of individuals within that system. In many of the GIO discussions, participants faced a fundamental dilemma: Is it better to arm everyone with the best, real-time traffic flow information and trust that “market forces” will drive overall efficiency? Or should that data be used at a system level, allowing integrated, optimized transit systems that are managed in a more federated manner?

A number of participants advocate for the former approach, but others asserted that without a controlling function, it would repeat the classic “sandbox” problem: If the box's size and volume of sand remain constant, all one can do is move sand from one part of the box to another. When all drivers rely on the same real-time traffic information to determine course, the odds are that most will end up clogging the same alternative road—usually one not built to accommodate such volumes. Little wonder that some participants envision automated highways in which all private vehicles are connected to a grid that dynamically routes and redirects them to optimize the flow of traffic.

But [are individuals willing to cede such control?](#) The evidence suggests otherwise. Consider the plight of large cities in developing economies: Their transportation infrastructures are already overburdened, yet a new and emerging middle class will not be denied the ultimate status symbol—their own cars. It's a growing challenge for urban planners everywhere—balancing the health of the whole and the happiness of the parts.

At a time when the mobility of ideas is so unfettered, why is the mobility of people and freight so constrained?

Several participants wondered whether the lessons learned from the virtual transfer of information can be applied to aspects of physical movement. For example, the way in which packet-switching technology optimizes systems for the best overall speed of data transfer could hold clues to how highway traffic might be approached. Of course, people, unlike individual packets of data, have minds and wills of their own. And therein may lie the crux of the challenge.

INSIGHT:

Playing “leapfrog” to move forward

There’s no doubt that the global rise in private vehicle ownership is exacerbating urban congestion. Most of the expected surge in new cars on the road will come in India and China, where a rising [middle class is spiking demand](#) for personal cars. Automakers are delighted at the prospect of a billion new customers, but many GIO participants find the emergence of more U.S.-style car cultures worrisome in terms of sustainability. For example, China now runs close behind the U.S. in greenhouse gas emissions, and may soon overtake the top spot.

So it’s not surprising that many participants see an opportunity for emerging economies to “leapfrog” Western nations by rejecting existing paradigms and embracing entirely new approaches to manage the boom in personal vehicles. (Think of how entire regions never implemented landline telephony yet now are leaders in wireless usage.)

Governments not only might provide incentives to greatly increase the number of alternative-energy cars on the road, they also might focus R&D efforts on ways to produce low-cost alternative energy vehicles. That approach would be a boon for the environment, and it could give nations such as China or India an economic edge by allowing them to tap their huge internal markets before expanding to global opportunities in the still-green industry of “green” cars.

But more alternative cars on the road is still more cars. Emerging economies might also aggressively pursue innovative reduction-oriented strategies like fractional ownership, the car-sharing model that is currently gaining a degree of momentum in some European and North American cities. In this model, individuals pay a monthly subscription cost or per-use fee for access to cars at various locations throughout a city. Members get to enjoy aspects of private ownership while the overall population of cars on the road decreases. Such approaches strike a balance between individual aspirations for car ownership and the systemic need for fewer cars.

Emerging economies currently have an advantage in that they can go directly to approaches that are harder to impose retroactively, enabling them to avoid some entrenched problems faced by more mature economies. Whether they seize this opportunity to innovate remains to be seen.

China, which currently has **20 million cars** on the road, predicts that that number will rise to **140 million** in 2020.



Source: China Daily

Customizing a shared vehicle?

Participants see the potential for a car-sharing model in which a chip-enabled key not only unlocks the door to any car in a fleet but also contains crucial information about your preferences—from driving patterns to music choices to billing information. This kind of personalization might afford drivers a sense of ownership while still containing overall demand for private cars.

INSIGHT:

New paths for public transportation

While much of the world still relies on public transportation systems, which in their most modern forms can dramatically reduce pollution and congestion, many mass transit systems have failed to keep pace with technological innovation. GIO discussions suggest that one of the biggest opportunities for improvement would be better coordination and integration among the different modes of public transit. Yet many public transportation systems are like the vertical enterprises of the past: Housed under one entity, the various modes operate in disconnected silos, with little collaboration or communication in between. For example, while in some cities buses, subways and trains fall under the same authority, no seamless coordination with public taxis, limousines, water taxis and airport transport services exists—both from an overall administrative or end-user perspective.

Some public transit systems are starting to make connections, though. Participants note how Singapore, Shanghai, Hong Kong and other cities are using RFID-enabled smart cards to provide [a common currency](#) across buses, trains, light-rail lines and ferries; some cards even work for taxis and parking lots. While this has certainly made it easier to move more swiftly and easily from mode to mode, there seems to be plenty of room to push such integration further: Imagine optimizing schedules and modes of transportation to meet individual passenger destination and time preferences. How about [integrating the information](#) locked within the public transportation system's own databases and then pushing it out to riders via mobile devices or street-side kiosks? And what about linking not only the transit systems of a single city but also of an entire region or country?

“If you have travel on demand, it basically means that everything is interconnected—you say to your PDA where you want to go, and what your preferences are, and then the system will tell you what form of transit and what routes are best at that time, the fastest way to go, the cheapest way, and the most convenient.

— Eric Vas
Tata Motors Ltd.
India

”

Some participants envision a service that could send information updates to your cell phone, letting you know the number of seats available on the next bus or train; others see the possibility of transit systems that pull data directly from riders' mobile devices to more accurately target where pockets of demand are in real time. In this scheme, transit systems would abandon rigid schedules in favor of more adaptive, on-demand services.

One question that emerged is whether mass transportation should become a little less mass. What would happen if transportation systems were essentially disaggregated? Reversing the growing reliance on big, double-length buses and large trains, cities might create **swarms of smaller, more mobile, more flexible vehicles**. Such fleets would be able to dynamically re-route themselves based on need, while still connected to a larger networked infrastructure that would track their movements. Participants at various sessions were divided on the overall benefits of such an approach.

To some extent, this division highlights a fundamental debate about what to optimize for: Larger vehicles enable transportation systems to better handle peak loads, but they can create inefficiencies at other times. (Consider two people riding a double-length bus at midnight.) Swarms, meanwhile, might improve overall efficiency—but overwhelm systems during peak times. Perhaps there's an answer similar to the re-emergence of micropower solutions in the energy industry: Disaggregated, distributed services won't necessarily replace centralized ones, but they could provide a crucial supplement that enables more versatility and flexibility in the system as a whole.

What's slowing down adoption of electronic transit passes?

Many people cite privacy concerns as a major disincentive. In the U.S. and Europe, in particular, many citizens are wary of giving governments easier ways to track a person's movement. Ultimately, participants stress the importance of building trust into the system—providing reassurances about the security of the information captured. And perhaps even more important, individuals are only willing to trade off privacy when they see clear value, including ease and convenience. (Think credit cards and shopper loyalty programs.)

Can one size fit many?

Many participants bemoan the dearth of common standards for the world's public transportation systems—almost every urban area seems to have its own, proprietary approach. True, variations in topography, population density and climate make the adoption of one global standard seemingly impossible. But might it be possible to develop a set of “urban archetypes”—perhaps a half-dozen city types (e.g., low density/flat, high-density/hilly, coastal port city, riverside)—and then design common transportation solutions for those city types? It may be too difficult to retrofit existing mega-urban centers, but there's considerable appeal for the mega-cities proliferating in the developing world. Standards bodies, such as those that helped develop the Internet, could facilitate such endeavors—perhaps more effectively than government officials, many of whom are out of office before their public works projects reach completion.

```

*/
import java.util.ArrayList;
import java.util.Iterator;
import java.util.List;

import com.ibm.ejet.toast.nav.NavigationMath;
import com.ibm.ejet.toast.nav.data.service.IRouteData;import com.ibm.ejet.toast.nav.data.service.NavigationDataService;
import com.ibm.ejet.toast.nav.mapping.data.NavigationDataManager;
import com.ibm.ejet.toast.nav.mapping.draw.DrawableChunk;
import com.ibm.ejet.toast.nav.mapping.draw.DrawableElement;
import com.ibm.ejet.toast.nav.mapping.draw.DrawableEntity;
import com.ibm.ejet.toast.nav.mapping.service.IMapCanvas;
import com.ibm.ejet.toast.nav.mapping.service.IMapDrawable;
import com.ibm.ejet.toast.nav.mapping.service.IMappableEntity;
import com.ibm.ejet.toast.nav.mapping.service.MapConstants;
import com.ibm.ejet.toast.nav.mapping.service.MapContext;
import com.ibm.ejet.toast.nav.mapping.service.NavigationMapping;
import com.ibm.ejet.toast.nav.mapping.service.NavigationMappingService;

```

The new Airbus A380 contains over **one billion** lines of code.

```

public class NavigationMapping implements MapConstants, NavigationMappingService {

private static final RgbColor COLOR_BLACK = new RgbColor(0, 0, 0);
private static final RgbColor COLOR_CAR = new RgbColor(255, 0, 0);

private NavigationDataManager dataManager;
private IMapCanvas canvas;
private MapContext context;

private List corridor;
private DrawableChunk route;
private ArrayList entityList;

private int shiftLongitude;
private int shiftLatitude;
private int shiftX;
private int shiftY;

private int lastLongitude;
private int lastLatitude;
private int lastX;
private int lastY;

```

GM predicts the average car will have **100 million** lines of code by 2010.

```

public NavigationMapping() {
context = new MapContext();
corridor = new ArrayList();
entityList = new ArrayList(70);
}
/*
 * API
 */

```

In comparison, Windows XP has about **40 million** lines of code.

```

public void bind(NavigationDataService dataService) {
this.dataManager = new NavigationDataManager(dataService);
}

```

Sources: IDG News, ITWorld.com

```

public void unbind() {
dataManager = null;
}

```

```

public void setCanvas(IMapCanvas canvas) {
if (canvas == this.canvas) {
return;
}

```

```

this.canvas = canvas;
}

```

```

public void updateCanvas() {
context.setCanvasCenter(canvas.getXCenter(), canvas.getYCenter());
}

```

```

public synchronized void update(
int centerLongitude,
int centerLatitude,
int degBearing,
int carLongitude,
int carLatitude) {
boolean updateCorridor =

```

```

dataManager.updateCorridor(centerLongitude, centerLatitude);

```

```

if (updateCorridor) {
corridor.clear();
DrawableChunk[] mapChunks =

```

```

dataManager.getCorridor(centerLongitude, centerLatitude);
}

```

Will connected vehicles reach a “complexity tipping point”?

Despite excitement about the potential of connected vehicles, some GIO commentators were concerned that the more complexity added, the more of a “maintenance and operational nightmare” these vehicles will become—“I don’t want my car to ‘crash’ while I’m racing down the Autobahn,” one joked. Concerns over security, and the inevitable rise of hacking and viruses once these vehicles go mainstream, also emerged. Of course, where some saw risk, others saw economic opportunity: In the same way that the Internet gave rise to the antivirus software industry, entirely new industries will likely emerge to maintain and protect the next generation of connected vehicles.

INSIGHT:

Services on the go

Planes, trains and automobiles may seem like the ultimate symbols of the Industrial Age, but more and more these vehicles are becoming intertwined with the Information Age. Rather than remaining relatively simple mechanical devices, they are increasingly imbued with sophisticated software, sensors and chips that turn them into complex mobile information technology devices. And with that transformation, the very definition of transportation is changing. Forget about simply getting people and goods from point A to point B. The real opportunity for innovation is tapping into these connected vehicles to deliver an entirely **new breed of services** built around information and technology.

It doesn't take much imagination to consider the possibilities for content delivery: e-mail on the plane, voice-activated driving directions in the car, web surfing on the train. But GIO participants believe that such services barely scratch the surface of what's going to be possible with these vehicles. Embedded technology has a range of powerful new applications:

- Sensors that can monitor performance and send vital data to drivers or pilots or even third-party maintenance providers—and automatically perform remote repairs and service upgrades
- Software that can optimize routing of trains for more efficient shipping of goods
- Safety systems that make intelligent decisions and take preventive actions under dangerous conditions
- Intelligent engines that know when to switch between different fuel sources based on travel conditions and needs
- “Self-healing” software that can diagnose and treat system failures before they occur, thus minimizing the need for maintenance
- Entirely new ways to link services across different modes of transport and different industries (for instance, real-time e-synching of air passengers' ground transportation and hotel reservations based on their flight departure status)

As smart, connected transport becomes more widespread, participants note, there will also be new opportunities for business-model innovation. The advent of these new planes, trains and automobiles offers the industries supporting the transportation sector the opportunity to create entirely new value for their customers. For example, Norwich Union, the U.K.'s largest auto insurer and a GIO contributor, is piloting a “pay as you drive” program that monitors driving behavior through onboard telematics and creates a personalized insurance rate based on an individual's driving patterns. The premise: The more responsibly people drive, the lower their rates.

GIO participants agree that the advent of services such as these **fundamentally changes the relationship** among drivers, passengers, manufacturers and third-party service providers. In the automotive industry in particular, the shifts could mean that car manufacturers begin to see themselves as service providers first and foremost, with the product becoming almost an afterthought. Rather than focusing on a one-time transaction mediated by a dealership, car manufacturers suddenly have the opportunity to create ongoing interactions and experiences with customers. And that may actually breed a deeper connection with customers in the long run—as well as new and unanticipated forms of innovation.

Open platforms for vehicles?

Most GIO participants think the adoption of a common platform for development of in-vehicle services would be essential to drive innovation. While many of the manufacturers that participated in GIO discussions agree, each also suggests that there already is one—their own—and that all others just need to follow their lead. In some ways, this thinking is reminiscent of the proprietary approaches that plagued the IT industry for so many years. Further collaboration and open-minded approaches to establishing such platforms will be needed to speed real innovation.

Average number of container ships usually waiting to dock at the Port of Los Angeles each day:

30

Source: The Economist

Average number of days it takes a ship to dock, unload its cargo and leave:

7

Source: The Economist

Average cost per day for a ship to sit at anchor waiting to be unloaded:

\$50,000

Source: The Economist

Could virtual borders alleviate congestion?

At the first GIO, participants suggested that nations may come to define themselves more on the basis of unique services and resources than on traditional notions of geography. That idea could have provocative implications for port authorities and customs bodies that were originally established to collect tariffs. As their role shifts to facilitating commerce and ensuring security, might customs functions be accomplished virtually? Given today's technology capabilities, nothing prevents packages and containers from clearing customs hundreds of miles inland, where space is more plentiful.

INSIGHT:

Shoring up shipping

As fluid as the world's global supply chain appears, it's quite shocking that its backbone, the shipping industry, still relies on techniques and processes that are more than a century old. (Or, in the case of paper, millennia old. The average container ship still generates as many as 40,000 paper documents per trip.)

If any industry is due for a sea change, this is it. With a mishmash of different standards, byzantine customs policies, inefficient manual processes and aging infrastructures, many of the world's ports cannot accommodate the massive influx of traffic brought by increased global trade.

Perhaps the biggest opportunity to improve efficiency and reduce costs lies in **standardization and integration** of all the processes associated with shipping. This is no easy task, since there are few common processes or even means of communication among the various players, from the ports and airports to the shipping companies to the corporations shipping goods to the customs and immigration bodies and port authorities. Even within specific industries, there are no common supply chain standards; that means a different set of requirements and practices for each shipping customer. And integration problems multiply by orders of magnitude when linking sea to trucking and rail operations on land.

Port authorities and customs agencies themselves are just as siloed. Unlike the airline industry, which employs a common naming convention for all airports, the shipping industry has no such standard. One port may go by many different abbreviations. Regional differences abound, and even within one country, there may be different protocols at every port.

As Ken Chih of Orient Overseas Container Line noted, "Even within China, there isn't one custom clearance standard. We have to do one EDI for Shanghai, and different EDI formats for Qingdao, because the managing authorities are different." As a result, some participants suggest that the first and most practical step in integration efforts should be focused less on inventing entirely new systems and more on developing "adaptor" or "translation" technologies that enable existing approaches to connect more seamlessly with one another.

Of course, progress here assumes that ports will embrace technology in the first place. Not so long ago, many critical air traffic control functions were done without the aid of today's sophisticated computer tracking and optimization systems. Today, the thought seems as distant as people being transported by horse and carriage. Yet many of the world's ports still rely on laborious and antiquated manual paper processes for booking, manifest information, customs clearing and so forth.

What's holding back change? Often, competing sets of interests. For example, adoption of new technologies often raises fears over the loss of jobs requiring manual labor. As a result, heavily unionized ports, such as those in the U.S., have made little progress toward automation, even though technology also creates new and often higher-value job roles.

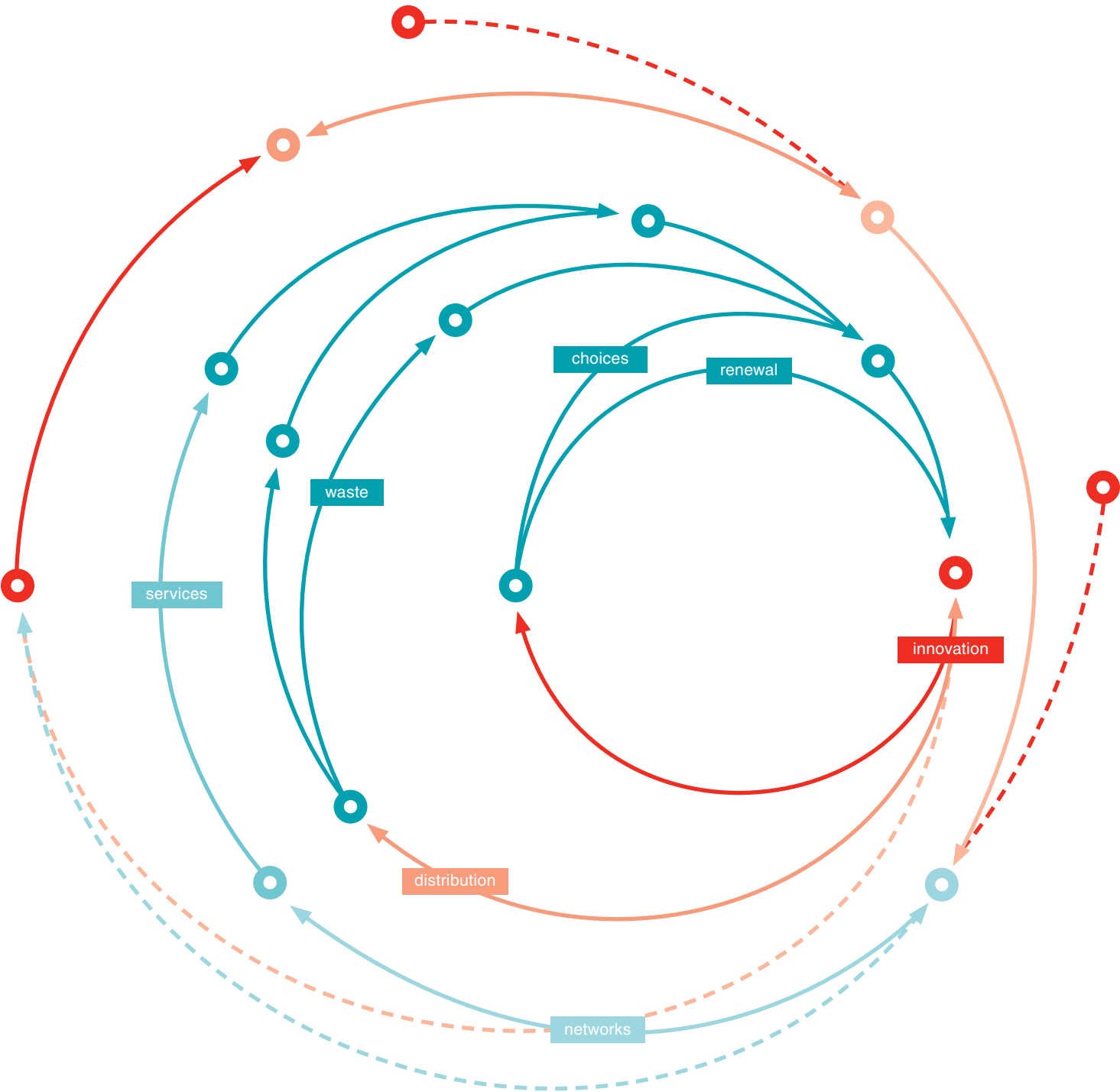
In some regions, governments have stepped in and advocated for advances, in part because they see [traffic management as a huge differentiator](#) and the key to economic advantage. Participants cite the newly redesigned ports in Singapore and Hong Kong as models of what ports could become if all the parts in the systems were properly integrated. A sizeable percentage of the world's containers goes through Singapore, even though it is almost never the final destination for the contents. The government is counting on the fact that efficiencies at its port will drive increased trade.

It's not so far-fetched—many companies will go many miles out of their way to ship to a less direct destination if they eventually make up the lost time clearing port. For example, some Asian manufacturers skip the Port of Long Beach, near Los Angeles, and instead route cargo through Houston, Texas, because it actually gets their goods to market more quickly despite the additional distance.

Could delays at the world's ports reignite local manufacturing and trade?

Quite possibly. While better logistics in shipping originally gave rise to the idea of assembly from raw materials from all over the world, new inefficiencies and spiraling costs associated with shipping could boost intra-regional trade (by land or air) over the next 10-15 years. Shipping problems might result in more customization and a build-to-order model increasing on the local level. Eastern Europe and South America, in particular, could emerge as larger manufacturing economies.

3. The Environment



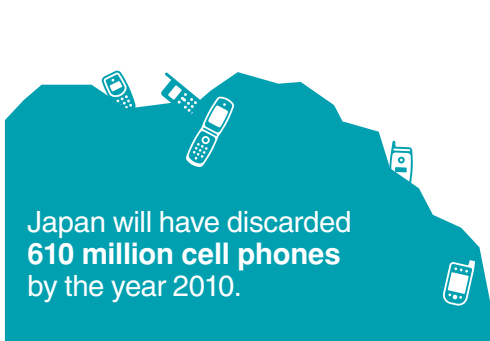
Discussions about the environment tend to place preservation on one side and business interests on the other. But in reality, notions of ecological responsibility and business responsibility are similar. Both reject waste and profligacy; both embrace the notion of responsible stewardship and investment of assets in order to reap greater returns in the long term. And while there's no question that environmental and economic agendas frequently clash, there is equal room to apply innovation to advance both agendas. When viewed that way, it's easier to imagine a world in which environmental protection and economic prosperity are not only compatible but simultaneously attainable.

“ The real innovation has to come at the other end of the process... the approaches that we use to convert waste to value.

— Pat Atkins
Alcoa Inc.
U.S.A.



The U.N. estimates that every year, **20 to 50 million tons of electronic and electrical waste** are generated worldwide.



Sources: U.N. Environment Programme, U.S. Environmental Protection Agency

Are the parts greater than the whole?

Several participants suggest that designing for downstream allows manufacturers to see their products in more modular ways, and focuses energy around parts that truly need to be updated. For example, let's say the majority of components in a digital camera don't change from one model year to another, then why not design cameras in which the small percentage that does change can be easily popped out and replaced with new components and features? It could create a continuous flow of revenue, and encourage new product innovations while dispensing with the most odious aspects of planned obsolescence. The big question: As the focus of product innovation shifts from form to function, would product designers and consumers alike initially balk?

INSIGHT:**All's well that ends well**

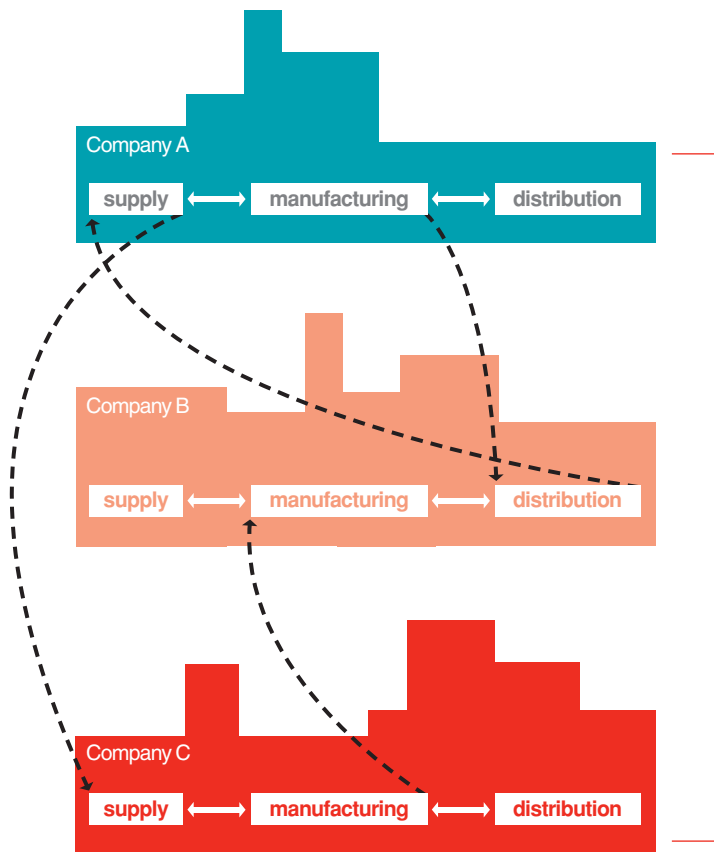
When industrial engineer Brooks Stevens popularized the term “planned obsolescence” in the mid-1950s, he likely never imagined exactly how pervasive an idea it would become. These days, of course, “newer” equals “better” in the minds of most consumers, and the constant flow of new models and features in everything from toasters to TVs to trucks has resulted in more products being disposed of more often. Even Moore’s Law, a prediction of microprocessor improvement, is predicated on the idea that every 18 months something better will come along.

But the problem with this mentality, as noted during GIO discussions around the world, is that it focuses innovation efforts on only one end of the product lifecycle. Currently, the majority of R&D time, money and effort is directed at the composition of products; participants say it’s the back end, *decomposition*, that may actually provide the richest opportunity for breakthrough thinking.

In part, **flipping the equation** to focus on decomposition forces business and society to face up to the challenge of ever-increasing piles of products that have reached the end of their useful lives. Viewing product lifecycles from back to front—starting first with questions of reuse, redistribution and disposal, and then thinking about distribution and, finally, manufacturing and supply—may also point to a host of new opportunities in which smart, progressive businesses and governments can realize economic advantages by pursuing environmentally sound practices.

Designing with the end in sight, GIO participants argue, allows manufacturers to explore innovative new ingredients, products and processes they might not have otherwise considered. Already, we’re beginning to see such ecofriendly products—from cell phones made of corn-based bioplastics (NTT DoCoMo and NEC) to waterless washing machines (Sanyo) to power-saving e-paper (Fuji Xerox). Further, participants suggest, those companies that invest now in new technologies will have a decided competitive advantage later when certain resources become scarcer or governments tighten regulations. What’s more, when companies take the lead in pursuing environmentally sound practices, they may experience a considerable halo effect with consumers and an increasingly influential movement of socially conscious investors.

Thinking more holistically about the end-to-end lifecycle of products may also free manufacturers from the relentless and wasteful pressure of constant new product releases. Rather than curtailing revenues, participants point out that such a shift might actually create new and more consistent revenue streams. Electronics manufacturers, for instance, could maintain or even increase revenue by releasing “soft updates” of plug-ins or other components that enhance the experience of older products. In turn, this might stimulate a move from a product-driven business model to a services-driven one that could strengthen bonds between manufacturers and their customers by providing more touchpoints between the two and, if the experience is consistently satisfying, more brand loyalty.



INSIGHT: The reverse supply network

The “reverse supply chain” is a concept gaining traction today—essentially companies are finding unexpected new ways to reduce costs by reusing old parts. GIO participant Nike, for example, takes the rubber soles from recycled footwear and turns them into surface materials for playgrounds and other sports facilities. Kodak and Fuji both remanufacture their “single-use” cameras after the film has been removed and developed. The positive environmental impact from reducing the amount of waste in the system is obvious.

But our discussions saw an opportunity to push the idea even further, raising the possibility of massive waste reduction through new collaborative relationships within and across ecosystems. What if businesses thought not only about reverse supply *chains* but about **reverse supply networks**? Could new efficiencies, and also revenue streams, open up if businesses networked their reverse supply chains, sending used components and manufacturing by-products back and forth to one another?

Participants in Beijing noted how some companies there are exploring the concept of using treated wastewater to aid oil extraction. Others suggested how the water used to cool steel in the manufacturing process might, once warm, be sent to breweries to aid in the fermentation process. By starting to think of waste as valuable, companies might actually design products and processes in a way that preserves the strength and integrity of the ingredients, so that more of them can be reused more often. In essence, they might begin to see the lifecycle as not so much end-to-end but unending.

Can product lifecycle management work in a virtual world?

Managing end-to-end product lifecycles definitely is a challenge for companies that don’t fully control their manufacturing, distribution and warranty processes—and let’s face it, few do anymore. If much of this work is handled by partners, then how can companies get a better view into and tighter control over the process? Perhaps there’s an opportunity for a new type of service, one that specializes in all aspects of product lifecycle management and oversees it on behalf of those manufacturers who want to focus solely on brand, marketing and distribution.

INSIGHT:**Regulation: innovation's friend or foe?**

Nothing divides a conversation about the environment more than trying to determine where ultimate responsibility lies: with governments, manufacturers, retailers or end users. The GIO discussions were no different, with opinions varying somewhat by geography as to who should take the first step in driving adoption of clean technologies and environmentally sound practices. Many cite the European Union's 2003 WEEE (Waste Electrical and Electronic Equipment) and RoHS (Restriction of Hazardous Substances) Directives as Exhibit A in the case for increased regulation. Producers are now legally accountable for recycling and disposal of electrical and electronic products—including a mixture of their own branded products as well as similar ones produced by other manufacturers, based on current E.U. market share. Since these directives took effect, many manufacturers have begun to develop innovative new processes and products that significantly lessen environmental impact. Some participants suggest that government regulation is, in fact, driving most innovation around product composition and decomposition.

But others note that many companies have already undertaken voluntary design-for-the-environment initiatives and express concern that **regulation may actually impede innovation**. Complying with regulatory measures sometimes requires the use of more expensive components or processes, potentially diverting investment dollars away from developing new technologies. And it could encourage manufacturers to simply comply with minimal standards, rather than reward those with exemplary performance. So, they urge, there needs to be tighter linkage between business and government in determining those approaches that will best protect the respective interests of industry and society. What if business leaders were invited to partner with policy-makers and “green” citizens groups to formulate protocols that balance complementary and divergent interests in a more realistic way? Or, specifically, what if they came together to get ahead of issues associated with relatively unknown and emerging industries such as nanotechnology?

Produced in an open and transparent manner consistent with ways in which the open source movement and wikis operate, perhaps trust and shared responsibility would emerge as drivers of lasting and meaningful progress.

“ I prefer the phrase ‘extended product responsibility’ because it implies that everyone who touches the product—from manufacturers to wholesalers to retailers to consumers—has a role to play. The problem with putting the entire burden on the producer is that it turns us all into a world or a nation of renters where we can absolve ourselves from personal responsibility of what we do with the product when it's in our control.

— Kevin Reardon
IBM Corp.
U.S.A.

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One metric ton of electronic scrap from personal computers contains more gold than that recovered from **17 tons of gold ore.**

Source: U.S. Geological Survey

For every ounce of gold removed from the ground, up to **100 tons of dirt and rock** first must be moved.



Source: The New York Times

Included in the **six million tons of waste electrical and electronic equipment** discarded in Europe in 1998:

2.4 million Tons of ferrous metal	1.2 million Tons of plastic
652,000 Tons of copper	36,000 Tons of aluminum
336,000 Tons of glass	

Source: AEA Technology

INSIGHT:**From trash to treasure**

When one compares the value of the natural resources embedded in the earth versus the ones buried in the world's landfills, the landfills win—hands down. Experts estimate that the amount of aluminum in North America's landfills outweighs the amount of ore that's left in the earth. The same is probably true for copper and gold. So, why is all that valuable material going to waste? What if landfills were viewed instead as **above-ground mines**?

Several GIO participants suggest that it might not be so far-fetched to dig through the millions of tons of waste accumulating on our planet's surface. As Fernando Toledo, from Chilean mining firm Codelco, noted: "My company used to break down mountains to get to two percent of copper. I'm sure if we were to mine the dumps, there would be more than two percent." Some companies, such as Alcoa, already have sophisticated processes for separating metal alloys from one another. Others see deep opportunities for applying advanced data mining and frequency modeling software to identify those locations that promise the best returns with minimal impact on surrounding locales.

While there are obstacles to be sure—methane emissions from large-scale disruption of landfills being the most obvious disincentive—it may soon be possible to turn our electric and electronic castoffs into a compost of sorts. In the future, one person's garbage may literally be another one's gold.

Can the digital divide be narrowed without creating more e-waste?

As countries like China, India and Brazil join the global economy and billions of new middle-class consumers emerge, it's likely that the world will see even more electronic waste unless things change dramatically. Some GIO participants note that even noble efforts to put inexpensive laptops and secondhand electronics products in the hands of millions of children in the developing world may come back to haunt us as those devices reach the end of their useful lives and must be discarded.

INSIGHT:**Seeing is behaving**

It's comforting to think that the solution to our environmental problems might be on the horizon. After all, who doesn't want to believe that human genius, as it so often does, will solve this puzzle by inventing magical new technologies that ease or even fully remove the burden of environmental consciousness from individuals and organizations?

Maybe. But more likely, to realize real progress, what we need are profound changes in behavior—from individual purchase patterns to business processes to societal mindsets. Those behavioral shifts, GIO participants suggest, may be encouraged if individuals and businesses have a clearer and continual **line of sight** into the consequences of their actions. The ability to make more informed decisions about energy and natural resource consumption could help move business and society forward in a more sustainable and affordable manner.

Not surprisingly, technology can help connect the invisible dotted lines by allowing users to see more directly the ripple effects of their actions. Even more promising, it can help model complex future scenarios, and suggest a variety of paths that balance the benefit, costs and consequences of various usage patterns.

Today, when someone flips a light switch on, there's no sense that that action creates emissions or wastes money, and thus no motivation to turn it off quickly or to use long-life bulbs. (And how many people realize that a

plugged-in television, even when not in use, continues to suck up power?) When water flows from the faucet, there's no way to see that there's a finite volume of water in the aquifer on the other end of that pipe. And when people buy a fancy new cell phone less than a year after purchasing the last one, there's nothing that tells them what happens to the old one or the environmental costs that are being paid as a result.

If we accept that clarity and transparency lead to better execution, there's hope. The Swedish Interactive Institute's STATIC project has prototyped a number of everyday household objects that increase people's awareness of how energy is used in order to encourage changes in their "energy behavior." These products range from shower tiles decorated with patterns that disappear with hot-water use to an "aware" power strip that shows energy use through pulses of light.

In a similar vein, GIO participants suggest that homeowners and business owners alike might appreciate integrated, real-time information that shows how quickly electricity, oil and water are being consumed—in effect, a natural resources dashboard. Imagine, they say, how much savings (financial and ecological alike) would be realized if the average CEO could see much more immediate data about what's being consumed across all of his or her plants and facilities—and then take action to cut back on usage.

“ The root cause of many of the environmental issues that we have in front of us is that there's no line of sight between behavior and the environmental consequences of that behavior.

— Gordon Lambert
Suncor Energy Inc.
Canada

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Ingredient Facts

Amount Per Unit

Weight (lbs.)	% of total weight	% Recyclable
Plastics	13.8 (23.0%)	20%
Aluminum	8.5 (14.0%)	80%
Iron	12.3 (20.5%)	80%
Lead	3.8 (6.3%)	5%
Zinc	1.3 (2.2%)	60%
Tin	0.6 (1.0%)	70%
Nickel	0.5 (0.9%)	80%
Silica	15 (24.9%)	0%

INGREDIENTS: Plastics, Lead, Aluminum, Germanium, Gallium, Iron, Tin, Copper, Barium, Nickel, Zinc, Tantalum, Indium, Vanadium, Terbium, Beryllium, Gold, Europium, Titanium, Ruthenium, Cobalt, Palladium, Manganese, Silver, Antimony, Bismuth, Chromium, Cadmium, Selenium, Niobium, Yttrium, Rhodium, Platinum, Mercury, Arsenic, Silica

Inside information?

What if there were a common, verifiable approach to disclosing the content of electronic devices and appliances, so that consumers could see in essence what they are buying? Might that change their purchasing decisions, in the same way that scrutinizing the fat, cholesterol or salt content of a food product causes them to select one item over another? A number of GIO participants believe that just as nutritional labels have actually encouraged food manufacturers to rethink their ingredients in order to appeal to health-minded consumers, disclosing the materials content of electronic and electrical products might push equipment makers to look for new and innovative ecofriendly materials.

INSIGHT:**Mighty micropower**

In the last decade, California has not built one new power plant, but during the same period it has added six gigawatts of power generation through micropower solutions—essentially, home-based or small-scale energy sources such as wind and solar. That’s the amount of energy equal to the total installed nuclear power of the state.

Micropower is often considered **the best energy solution for rural areas**—particularly in developing countries—where no centralized power grid is available. But it is also becoming an increasingly viable supplemental source of power in developed countries because it is more reliable than outdated, overburdened grids. Micropower allows users to sell their excess energy to the central power grid, thus alleviating shortages during peak demand periods. Participants note how environmental concerns in places like California and parts of Scandinavia are also driving demand for alternative energy sources.

In many developing countries, micropower isn’t a choice; it’s the only option. In countries like India with remote villages and no access to the huge capital investments required for centralized grids, micropower might be the only hope for energy as well as economic survival. And participants in India point to a number of high-visibility micropower efforts under way there. In addition to supporting the basic necessities of life, they note, micropower also has the ability to eliminate the some two million deaths there each year attributed to the use of inferior fuels, such as kerosene.

But perhaps the most vital role for micropower is to serve as the catalyst for modernization. Micropower in Indian villages allows basic infrastructure such as telecommunications and financial services. For many in the developing world, micropower is not just an energy source; it is the first step in economic stability.

That said, there are still steep obstacles to its widespread adoption. One technical obstacle that some participants cite is lack of storage solutions for excess energy generated by micropower. Research into this issue continues, but there’s an even more pressing nontechnical issue: affordability. While micropower costs today are estimated to range between \$4 and \$6 a month for rural villages, participants say that until this drops more, government support and further advancements in the technology itself remain the greatest hopes for making micropower pervasive across the developing world.



Between **1.7 and 2 billion people** have no access to electricity and another 2 billion are severely undersupplied.

Source: World Summit on Sustainable Development

The approaches taken by China and India to meet emerging power needs are in stark contrast. While India appears to be pursuing micropower in many regions, China is going after a number of large, centralized solutions. The country is putting the finishing touches on the world’s largest hydroelectric dam and is also investing heavily in nuclear power: It plans to build some 30 new nuclear reactors by 2020.

Sources: Wikipedia, Wired

INSIGHT:**Troubled waters?**

Benjamin Franklin once said, “When the well is dry, the value of water is known.” The global water well is not dry just yet, but reliable supplies of fresh water are scarce in many parts of the world. GIO participants across the board—and especially in parts of Asia, where access to ready, clean water supplies for personal and industrial use is a mounting problem—concur that water is possibly the number one issue of concern to the world’s population in the 21st century.

Despite this pending crisis, water remains one of the most undervalued and misused resources on the planet. Developing sustainable water management solutions is hindered not by a lack of technical innovation, but by debate over the economic value of water. On one hand, the planet’s composition suggests that supplies are vast, and it is one of our few entirely renewable resources. But distribution of usable, easily accessible supplies varies greatly. And unlike virtually any other natural resource, water is essential for human survival—it is, after all, the stuff we are made of. It’s little wonder why we think of it quite differently than oil or other natural resources.

Short of new and enforceable global standards and policies to govern water distribution, what can be done? For one, GIO participants suggest, the private sector can help by attacking a prime contributing factor: waste and misuse of available resources. The private sector can take the lead in designing new processes and practices for sustainable water use—particularly those companies that are aggressively pursuing new business opportunities in water-stressed nations. Operating costs are generally lower in these regions, so perhaps these companies will have greater flexibility to champion new methods of minimizing or reusing water across industries, or ways to more cost-effectively filter and purify wastewater.

Some commentators think that if these companies don’t step up to the issue, they are in for a rude awakening. Many GIO participants assert that the continued rapid growth of emerging markets—the very thing drawing huge investments from global companies—depends on sustainable water supplies. Also, failure by these companies to properly plan and account for how they will access, use, manage and dispose of water in those regions could carry hefty consequences, including increased public scrutiny.

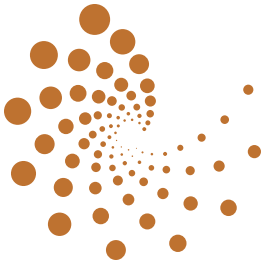
Today, some 1.1 billion people have no access to clean water. By 2025, as much as two-thirds of the world’s population may be subject to moderate to high water stress.

Sources: World Water Council, U.N. Environment Programme

 The average American steelmaker uses 20 tons of water to make one ton of steel.

 Korean steel companies use just three to four tons of water.

Source: The Pacific Institute



When we set out to produce our second Global Innovation Outlook, the biggest question, of course, was “What should we explore?” The first GIO had yielded a huge number of answers, questions, contradictions and implications in the areas of healthcare, government and what we called “the business of work and life.” With the core issues in those areas remaining essentially unchanged—and a number of programs under way to act on the original round of insights—we decided to look at a new set of focus areas.

This move allowed us to tap into the broad ecosystem of contributors to the first GIO. A brief survey revealed clear answers: Nearly 90 percent of our partners in innovation suggested that issues related to the environment and energy would benefit most from a GIO-style investigation. While we considered issues such as global warming and population stress, ultimately we focused on environmental issues with more near-term potential for technology and business innovation.

We also found direct inspiration in the first program’s discussion of changing demographics and population trends related to the business of life. As our discussions drove home the massive urbanization trends under way in the developing world, they also surfaced concerns that existing infrastructures could not possibly cope with the rapid influx of people and vehicles. Congestion, it was clear, would be a major inhibitor to growth if new and innovative solutions to mobility weren’t introduced.

With this guidance shaping our thinking, we eventually narrowed a list of more than a dozen potential topics down to three major focus areas. In doing so, we aimed for a rich mix of topics and subtopics—from ones that affect every person’s day-to-day experience to those that aren’t traditionally thought of as living in the domain of business to those that exist at the intersection of business and technology.

To sharpen our thinking, each GIO cycle begins with a series of internal conversations with hundreds of thought leaders throughout IBM. From there we formulate an initial set of questions, hypotheses and observations. And then we let those ideas loose, initiating a worldwide dialogue with experts from across the ecosystem of each topic. They included representatives

from some of the world's most respected companies, researchers and professors from top universities, venture capitalists, IBM experts from across many disciplines of the company, local and regional government officials, NGOs, independent consultants, change agents and many more. The conversations at the 15 “deep dive” sessions we held in Fall 2005 were full of passion and compassion, with many areas of agreement but also a fair share of lively debate.

While it is impossible to capture every opinion and every nuance expressed at those sessions, this book represents the collective thoughts and ideas of close to 250 thought leaders from across the world. In some cases, we've pulled out insights that rose at every session; in other cases, we've highlighted provocative thoughts that came up in only one locale or from just a handful of contributors. Both sources have value and can provide the stimulus for change and growth.

But this book is not the end of the dialogue. In fact, it's just the beginning. As a result of the first GIO, IBM and members of our ecosystem are pursuing new programs and projects based on many of the insights that emerged. We have already begun to make advances in the areas of integrated healthcare records, IP reform, and emerging global skills and talent. More than 30 potential initiatives stemming from GIO 2.0 are under consideration, and in time, IBM and our ecosystem partners will announce progress in the most promising of these areas.

The insights gathered are already shaping IBM's own internal research, policies and practices, as well as the innovative thinking we bring to bear on behalf of our clients every day. But even more so, we hope the GIO provokes and stimulates new approaches and new thinking by all it touches. And that, ultimately, is why, rather than protect these insights as state secrets, we actively share them with as wide an audience as we can.

“ It's kind of a make it or break it point in humankind. When our grandchildren's generation sits down and looks back, they'll say either we took the initiative and we solved it, or we lost it. I think the time is really right for business and society to get together and address these issues.

—Johan Rockstrom
Stockholm Environment Institute
Sweden

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For more information on
the GIO and its outcomes,
please visit our website at
www.ibm.com/gio.



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