

The Rise Of Collective Intelligence

Decentralized Co-Creation of Value as a New Paradigm of Commerce and Culture

A Report of the Sixteenth Annual Aspen Institute
Roundtable on Information Technology

By David Bollier



THE ASPEN INSTITUTE

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This report is written from the perspective of an informed observer at the conference. Unless attributed to a particular person, none of the comments or ideas in this report should be taken as embodying the views or carrying the endorsement of any specific participant at the conference.

Foreword

When President John F. Kennedy quipped at a dinner honoring 49 Nobel Prize winners that “this is the most extraordinary collection of talent, of human knowledge, that has ever been gathered at the White House—with the possible exception of when Thomas Jefferson dined alone,” he gave proper homage to individual genius. Others have noted the familiar expression that if you want something done right, don’t assign it to a committee. Einstein’s special theory of relativity, Duchamp’s “Nude Descending a Staircase,” and Franklin’s bifocals did not come from a group of people methodically addressing a problem. We have become accustomed to expect creativity, innovation, and problem solving from individuals.

In the new millennium, however, spurred by the ability of individuals to connect in time and place to virtually anyone, anywhere, an old mode of thinking—collectively—has taken a new turn. Thousands of people from around the world edit an online encyclopedia, producing 8.2 million articles in 253 languages; individuals all over the world classify craters to help NASA map the planet Mars; hundreds of chess players voting on each move give Garry Kasparov his toughest chess challenge.

More broadly, companies, governments, and organizations are finding that “commons-based peer production,” in Yochai Benkler’s words, can solve problems that individuals cannot. Decentralized co-creation can create value in diverse settings such as InnoCentive, where—for a fee of \$5,000 to \$100,000—strangers bid to solve business problems; the very successful Li & Fong apparel company, in which entities throughout the value chain learn from each other; or even the Google search engine, whose search algorithm is based on the aggregated links of millions of Internet users. Decentralized co-creation also can create value in nonmarketplace settings, from social networks to community and governmental uses.

Collaborative value creation is a perfect topic for an Aspen Institute Communications and Society Program activity because the Aspen roundtable process is based on that very principle. Dialogue among diverse thought leaders generates new insights on the topic, proposed solutions to particular problems, or recommendations for collective action.

The Report

From July 31 to August 3, 2007, the Aspen Institute Roundtable on Information Technology sought to use these methods to understand advances in applying peer production approaches to create economic and social value. Along the way—as David Bollier very ably reports—participants in the Roundtable tried to understand when, where, and why co-creation approaches are advisable. They also explored who to connect and in which circumstances, citing example after example of both collective intelligence and collective stupidity. They sampled varying platforms for business value creation, passion-based collaborative learning, and contributing to the new paradigm of user-generated content in media.

This report also offers a fascinating glimpse of a predicted world of cloud computing—set forth in the Roundtable by Cassatt founder Bill Coleman but enhanced by nuances from the rest of the participants. This vision of software utilities allows for greater, more personalized capacities at the edge, while offering much of the more basic computing power further upstream.

Although the potential of cheap computational power on demand excites software engineers, technologists, and social optimists, it also alarms governments striving to protect national security; individuals who fear a loss of privacy, identity, or autonomy; and businesses that are not ready to make that leap—all of whom can erect speed bumps to the realization of that vision. Not least among those speed bumps, as related to the group by former U.S. Secretary of Defense William Perry, are those posed by the national security establishment as it tries to sort out the tension between security and privacy in these potentially perilous times.

I am always impressed by the way rapporteur David Bollier is able to capture the insights that arise over a three-day period, placing them in an understandable context and narrative. In this report, he touches on the technological, economic, social, and psychological aspects of co-creation, giving us a thought-provoking yet readable account of a very complicated topic.

Acknowledgments

We thank our senior sponsor McKinsey & Company for its leadership in developing this Roundtable. In addition, we thank Cassatt Corporation, Google, In-Q-Tel, the Kunzweiler Foundation, Netsystem, and Text 100 for sponsoring this conference. We also thank John Seely Brown, Shona Brown, Bill Coleman, Aedhmar Hynes, James Manyika, and Jerry Murdock for their suggestions and assistance in designing the program and recruiting participants. Most especially, we thank each of the Roundtable participants, listed in the Appendix, for their valuable input. Finally, I thank Mridulika Menon, Project Director, and Tricia Kelly, Assistant Director of the Communications and Society Program, for their efforts in producing this report and the Roundtable itself.

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Executive Director
Communications and Society Program
The Aspen Institute
November 2007

**THE RISE OF
COLLECTIVE INTELLIGENCE**

**DECENTRALIZED CO-CREATION
OF VALUE AS A NEW PARADIGM
OF COMMERCE AND CULTURE**

David Bollier

The Rise of Collective Intelligence

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David Bollier

The complicated dance between humans and computers appears to be moving to a new stage of development. As the Internet becomes a pervasive platform for commerce and culture, it is giving rise to radically new platforms for creating collective intelligence. This new generation of Web-based software, sometimes known as Web 2.0, has powerful capacities to help people share, collaborate, and interact as social communities. The Web 2.0 universe is exemplified by innovations such as blogs, wikis, social networking Web sites, and metadata tools for organizing information. By facilitating new types of social interaction and collaboration, the new platforms are gradually remaking many varieties of market behaviors, business strategy and organization, educational practices, and modes of cultural expression.

Every year, the Roundtable on Information Technology of the Aspen Institute Communications and Society Program examines a timely issue that is posing perplexing new challenges for business, culture, and society. In 2007, Roundtable participants met to explore the many ways in which network-based communities are becoming socially and economically significant. The phenomenon has been called “decentralized co-creation of value”—the process by which social communities and loose networks of people use Web 2.0 platforms to generate useful new types of collective intelligence.

Although the value that is created tends to be social in origin, it has far-reaching economic implications for business and for nations. Online communities often are rich sources of innovative ideas, specialized knowledge, timely and sophisticated market intelligence, and niche consumer demand. Moreover, because this decentralized value-creation is occurring online—and therefore is widely available—it is capable of diffusing rapidly and disrupting entrenched institutions and societal practices.

A memorandum by the consulting firm McKinsey & Company puts the matter starkly: “Value chains are breaking up and re-forming.” Linear value chains are reconstituting themselves as loose social communities that, thanks to the Internet and Web 2.0 software, are creating value in innovative, decentralized ways.

To get a purchase on the issues at stake, the Aspen Institute invited 27 technologists, entrepreneurs, computer industry executives, management consultants, venture capitalists, and academics to meet in Aspen, Colorado, from July 31 to August 3, 2007. The discussions were moderated by Charles M. Firestone, Executive Director of the Communications and Society Program. This report is an interpretive synthesis of those discussions.

The Rise of Collective Intelligence

Collective intelligence has existed as long as humans have been around—in the form of families, companies, countries, armies, and other institutions. In recent years, however, the Internet has spawned several new paradigms of collective intelligence, said Thomas Malone, the Founding Director of the Center for Collective Intelligence at the Massachusetts Institute of Technology (MIT). Web-based software tools are enabling people to interact and collaborate in new ways.

The Google search engine represents one such innovation. Its PageRank system analyzes massive numbers of Web links, created by millions of people, to determine which Web pages are the most popular and thus most likely to be useful. Wikipedia also represents a new system of collective intelligence, Malone said. It has enlisted “thousands of volunteers around the world to collectively create a very large and amazingly high quality intellectual product, with very little centralized control,” he said.

Other examples readily come to mind. Digg is a community-based Web site that uses social bookmarking, blogging, and syndication to identify and showcase articles about technology and science that have popular appeal; it has been called “a form of non-hierarchical, democratic editorial control.”¹ NASA Clickworkers is a project that uses tens of thousands of volunteers to classify the size of craters on the surface of Mars, saving NASA the expense of having to hire highly trained planetary scientists.

In his 2006 book *The Wealth of Networks*, Yale Law School professor Yochai Benkler called this style of co-creation “a new modality of organizing production: radically decentralized, collaborative and nonproprietary, based on sharing resources and outputs among widely distributed, loosely connected individuals who cooperate with each other without relying on either market signals or managerial commands. This is what I call ‘commons-based peer production.’”²

To provide an idea of how collective intelligence may or may not work, Professor Malone offered four examples that yielded varied results:

Can fans manage a baseball team through online voting? In 2006, the Schaumburg (Illinois) Flyers, a minor-league baseball team, invited fans to vote over the Internet to make all the decisions that would ordinarily be made by team management—the batting order, pitching rotation, starting lineup, and so forth. “They had a disappointing season,” said Malone, “and a lot of people thought the decisions made by the fans had actually made the season worse.” The experiment may be “an instructive failure,” he said: It showed that fans just didn’t have the expertise or motivation to make the right decisions, whereas management probably did. Some observers even wondered whether fans for opposing teams might have voted to sabotage the Flyers’ chances of winning.

Web-based software tools are enabling people to interact and collaborate in new ways.

Can chess fans informed by expert advice collectively beat a world chess champion? In 1999, Gary Kasparov, then the world champion, agreed to play a chess game against “the world,” which would vote over the Internet about which moves to make. Each side was given 244 hours to decide which move to make. The thousands of chess fans who were collectively playing against Kasparov participated in extensive online discussions before voting. Significantly, they were guided by the commentary of five well-known chess experts who

offered their analyses after each move by Kasparov. Although Kasparov won, after 62 moves (and four months of play), he conceded that it had been the most difficult chess game of his career.

Can tens of thousands of volunteers write and compile an accurate encyclopedia? In only six years, Wikipedia has emerged as an improbable success in its ability to coordinate mass collaboration in writing an encyclopedia. With an annual budget of less than \$1 million and seven paid staff members, Wikipedia has enlisted the help of tens of thousands of volunteers to produce an online reference Web site that contains more than 8.2 million entries in 253 languages. In a December 2005 assessment of Wikipedia's accuracy, *Nature* magazine found it roughly equivalent to *Encyclopedia Britannica*.³

Can thousands of volunteers successfully collaborate on a book? A joint project by the Sloan School of Business at MIT, the Wharton Business School, and Pearson Publishing sought to produce a book called *We Are Smarter Than Me*. More than 4,000 people registered to participate in the wiki-style project. Ultimately, only a few dozen people actually contributed material, and deadlines were missed, prompting the publisher to hire a team of professional writers to write most of the book.

As these examples suggest, Malone said, the decentralized co-creation of value is not "magical." It often does not work and, indeed, often may result in a kind of collective stupidity. Artificial intelligence pioneer Jaron Lanier, in fact, has railed against what he calls "Digital Maoism."⁴ If anything resembling collective intelligence is going to emerge, Malone warned, we must consider three key questions:

- How can we collect the right people and computers?
- How can we connect them in the right ways?
- In what situations will these things actually work?

Malone's presentation triggered a larger discussion about these questions. What factors are necessary for the decentralized co-creation of value to succeed?

The first threshold of judgment must be "what are you trying to achieve?" A project that is attempting to brainstorm new ideas will have different design parameters and features from a project that is trying to build open source software or manage a corporate wiki. In short, there is no single approach to online collaboration that can apply to all situations. Context matters. The particular online community matters. Having noted this fact, Roundtable participants agreed that one of the most influential aspects of successful online communities is the personal motivations of participants.

Why Collaborate and Share?

In his study of online collaboration, Malone said that "over and over again, the most important issue that I have seen is the whole question of motivation and incentives." Several Roundtable participants shared the view of John Kunzweiler, a retired senior partner of Accenture: "I believe in voluntarism, but I also believe that everything needs to have an incentive structure. People are busy, and talented people are really busy, and what gets them to do this stuff? What are the incentives for people to apply their intelligence to someone else's project?"

Brad Johnson, Principal of McKinsey & Company, noted that "there is increasing evidence that contribution leads indirectly to financial remuneration." At the Web site TopCoder, which builds and sells software programs, "people who receive high ratings are likely to earn higher wages and get better jobs in the future," said Johnson. He worried that "if people's incentives are nonfinancial, and if they're not directly linked to your site, how do you prevent them from migrating away?" Fun, fame, and entertainment may be forms of motivation for people to contribute to a project, but after the "novelty effect" wears off, will anything persist?

Chad Hurley, Chief Executive Officer (CEO) and Co-founder of YouTube, conceded that people upload videos to his company's Web site "because they want to be seen and they also want to have fun doing it. There is also the promise that they could potentially become famous." In catering to this motivation, YouTube enjoys the benefits of network

effects, said Hurley. YouTube has attracted the largest audiences for user-generated videos, so it is the site that is more likely to make an amateur videomaker famous.

Hurley emphasized, however, that YouTube does not just cater to its video contributors; it also caters to its viewers. “A relatively small percentage of people are actually uploading,” he said. “The larger majority of people are consuming, and there are two types of people who are consuming: the passive consumers, who view the site without using any of the features to mark their favorite videos, for example, and the engaged consumers.”

The community must be regarded as a “two-sided network.”

Don Proctor

Although user voting helps identify the most popular videos, Hurley said, YouTube is trying to find ways to “leverage people’s collaboration just through their passive use of the site.” The goal is to try to “create a better discovery experience.... The less we can ask of [users] to do specific actions, I think the more successful we will be.”

To encourage continued participation on YouTube, Hurley said, the company has recently started compensating not just its top partners but about “30 to 40 of our top users.... At first, we didn’t want to create a community that was based on monetary rewards,” he said, “but we feel that our community is large enough now that we can move in that direction.”

In thinking about co-creation, Donald Proctor, Senior Vice President of the Collaboration Software Group at Cisco Systems, emphasized that the benefits must be shared by consumers and contributors; the community must be regarded as a “two-sided network.” “We need to think about the value that the consumer is getting from co-creation,” said Proctor, “but we also need to think about what value the contributor is getting, whether that is commercial value, reputation-based value, or other types of value.”

The real issue, said Max Mancini, Senior Director of Platform and Disruptive Innovation at eBay, may be *motivation* more than *incentives*. “We live in a world where we think about how to measure the value of your contribution, but co-creation is not that. Co-creation has its incentives elsewhere,” Mancini said. He suggested that those “incen-

tives” are, in fact, deep personal motivations—the desire for personal expression, for social connection, for cooperating to advance shared ideals. By contrast, incentives are about easily measurable deliverables—specific, executable outputs that can be quantified.

Shona Brown, Senior Vice President for Business Operations at Google, said that her company has tried to foster a sense of personal motivation, a desire to collaborate and create community rather than focus on incentives. “We are a very informal, project-oriented, relatively loose organization,” Brown said. “If you actually participate and collaborate with lots of others, you learn. You will become part of the ‘densest node in the network,’ which is a by-product of collaboration. Second, if you participate in informal collaboration, where you help others, you’re actually better at getting things done. Third, you’re actually respected as someone who knows how to get something done.” In these ways, she said, Google tries to encourage community-building as a “way of being” rather than focusing on specific job competencies.

“You will become part of the ‘densest node in the network.’”

Shona Brown

The paradox of a community as a locus of value-creation is that it can be highly effective in performing certain tasks, but individual performance can be difficult to isolate and measure. It is the web of relationships, and their unpredictable synergies in a loosely controlled context, that generates value.

This paradox may help explain why voting in online networks may be too crude a tool for generating collective intelligence. “Where integration [of judgment and ideas] is critical—choices about what goes in, what stays out—those can’t be resolved through a basic voting mechanism,” said John Hagel, Co-Chairman of the Deloitte & Touche Center of Innovation in San Jose.

Jacques Bughin, Director of McKinsey & Company, agreed: “If you vote, maybe it’s right or wrong. But the question here is, *Who’s* going to vote?” Just as the market can fail to deliver on its stated ideal, so voting can have skewed outcomes, said Bughin, who co-leads the McKinsey Technology Institute with James Manyika. Bughin wondered whether “the average of the voting is the right metric” for determining the collective intelligence because in voting or group recommendations people

tend to be either overly negative or overly positive. This polarity leads to a bi-modal distribution of votes, and the average obviously is not the right metric.

Dan E. Khoo, Vice President of the Business Strategy and Transformation Unit at the Multimedia Development Corporation in

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Malaysia, noted that voting that carries no consequences for the voters can make outcomes less reliable: “Sometimes if there are penalties involved, as in the market when you vote with your money, you can get better results. In those cases, if you don’t vote well, you lose money.”

In relying on voting systems, there is a fine line between “mob rule” and the “wisdom of crowds,” noted Robin Harper, Vice President of Marketing and Community Development at Linden Lab, the company that runs the immersive online environment

Second Life. “What’s rising to the top, and is it really the best? Is it reflective of people’s involvement in the content, or is it reflective of some other dynamic going on?” Harper asked. “It may have nothing to do with collective intelligence and everything to do with gaming the voting system.”

Attracting the “Right” People

In the quest to harness decentralized co-creation of value, a conundrum quickly arises: You want the right people to participate, but how do you know in advance who the right people are? This problem is evident in *We Are Smarter Than Me*, the wiki-based book-writing experiment cited by Thomas Malone of MIT. Padmasree Warrior, Executive Vice President and Chief Technology Officer for Motorola, asked, “How do you know who the right people are? We have to be careful, when you say, ‘let’s connect the right people,’ to not change *collective* intelligence into selective intelligence. There’s a danger in excluding different viewpoints.”

One interesting way of dealing with this problem, said Malone, is through self-selection. He cited the Web site InnoCentive, which allows

“seekers”—often major multinational corporations—to anonymously post their research and development challenges on the site. “Solvers” can then come forward with their own proposed solutions. More than 100,000 people from around the world have used the Web site, which awards cash prizes ranging from \$5,000 to \$100,000 for problems solved.

Malone explained, “Filtering is done by the potential problem-solvers because thousands of people can look at a problem, but they have no real incentive to go to work on it unless they think they have some advantage in solving that problem. You can let the vast community self-select those who are the right ones to be working on this particular project.”

Certain types of collaboration, however, require structured constraints to generate any collective intelligence. Arjun Gupta, Founder and Managing Partner of TeleSoft Partners, noted that the new tools are making decentralized co-creation more unconstrained, so you’re getting dramatically larger numbers of participants. This leads back to the familiar software development principle, the “mythical man-month”—the title of a 1975 book by Fred Brooks—which holds that assigning more programmers to a project will actually delay a software project because adding more participants requires greater overhead and complexity to coordinate the work, while simultaneously producing more errors that then have to be corrected.

Thus, any decentralized co-creation of value must consider the optimum size of the project and the system for coordinating and synthesizing work. “There must be some way for group norms to take root—where overproducers start becoming ‘experts’ or nonproducers start to be ejected,” said Gupta. “At the end of the day, someone has to synthesize things into something real.”

In this process, the absolute size of a community can matter. Jacques Bughin pointed out that “2 percent of the people who contribute material to YouTube contribute 90 percent of the content. So it is no wonder, if you have a corporate wiki in a company of 1,000 people, that there are so few contributors of content. With Wikipedia, which has a huge body of contributors, however, it works.”

There is a fine line between “mob rule” and the “wisdom of crowds.”

Robin Harper

The unacknowledged reality of many communities of co-creation is that a handful of participants tend to have a disproportionate influence. Some contributions are more valuable than others, after all. Hence, hosting a diversity of people means managing a diversity of social roles: the online bullies, the workhorses, the lurkers who may have a great deal to contribute.

This observation prompted Kris Hagerman, the Group President of Data Center Management at Symantec, to note, “As we’re building these different communities to create value, either within a corporate setting or outside of it, we need to think through how you set it up, what kinds of people you attract, what kinds of tools you put at their disposal, and then how you manage that, so you can stay in front of the extracurricular activity that is not really based on the merits.”

“Two percent of the people who contribute material to YouTube contribute 90 percent of the content.”

Jacques Bughin

Unlike a workplace, where people are assigned job responsibilities and roles, people who voluntarily join online communities self-select themselves to fill certain niches in the social ecology. “People tend to take on roles in that community,” said Robin Harper of Linden Lab. “One of the challenges that we have, then, is how do we help people feel comfortable with those roles? How do we make sure that those roles stay relevant?”

Leadership and governance structure play important roles. Collective intelligence requires a diversity of talents and perspectives, but that diversity needs to be managed. Unconstrained diversity can end up being chaotic, unwieldy, and dysfunctional if it is not coordinated to serve a shared goal.

Diversity may be largely irrelevant, said MIT’s Malone, “if you have a problem that is simple, in a certain sense. In some cases, diversity can even be counter-productive. People with very diverse viewpoints may find it hard to talk to each other, and that can actually slow things down, if you have too much of it where it’s not needed.”

More generally, however, diversity is likely to add value. John Seely Brown, Director Emeritus of Xerox Palo Alto Research Center (PARC),

cited a book by University of Michigan professor Scott Page, *The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies* (Princeton University Press, 2007). Page does not define diversity in the conventional sense of cultural acceptance of differences in ethnicity, gender, or sexual orientation. Page's thesis is that a diversity of mindsets, expertise, and personal styles are critical to developing a collective intelligence; in his words, "diverse people, working together and capitalizing on their individuality, out-perform groups of like-minded experts."

Brown elaborated on Page's themes: "You want people with diverse perspectives; you want people with diverse heuristics; you want people with diverse interpretations within a given perspective, and also people who have diverse predictive models: 'How do you predict what's going to happen if we do x?'"

In Page's sense of the word, diversity is not just an enlightened cultural norm, it is a functional imperative. Diversity can be important in helping to solve "hard problems," said John Seely Brown—problems that require so much time that no one can solve them alone. "Such problems—exemplified by global climate change—are amenable to distributed parallel agents that show the kind of diversity that Scott Page talks about," said Brown. "That is actually how we're providing optimal solutions to problems that can't be solved through exhaustive thinking and research."

The online gaming community serves as a kind of living Petri dish for observing the power of diverse perspectives and talents. John Seely Brown noted that the single most important thing in the online game *Worlds of Warcraft* is building a guild. "And the success of the guild turns on how you get the right kind of diversity. Now, we all *say* this in the corporate world, but in the gaming world, they *know* this—and furthermore, they do it!"

Governance of a guild—or any online community of co-creation—requires rules and norms. Although the design principles for online communities have not been rigorously studied (the phenomena remains relatively new), some observers look to a literature on the com-

Diversity is not just an enlightened cultural norm, it is a functional imperative.

mons that draws on political science, sociology, and anthropology. Scholars such as Elinor Ostrom have identified several important design principles for sustainable commons: clearly defined boundaries of community membership, rights of access and participation, conflict-resolution mechanisms, policing against free-riders, and graduated sanctions against miscreants.⁶

Such principles apparently are at work at Wikipedia. Joichi Ito, Co-founder and Board Member of Digital Garage, described that community's set of escalating governance models for dealing with conflict: "First you try to reach consensus," Ito said, "then you vote, and then it goes to the board, and then to the benevolent dictator"—which, in Wikipedia's case, is co-founder Jimmy Wales. "The point is that you really have to look at these groups of people as communities rather than as markets or bundles of workers," said Ito.

As Troy Pearsall, Executive Vice President of Technology Transfer for the intelligence community's strategic investment firm, In-Q-Tel, put it, "A lot of these business models develop around stewardship of a community. The challenge is to steward a community in a way that creates value—while ensuring that the community doesn't revolt."

Varieties of Collective Wisdoms

If decentralized co-creation of value is so potent, yet variable in how it manifests itself, there is an inevitable desire to find ways to judge the efficacy of a given instance of collective intelligence. "Can we find ways of measuring the ability of a group to perform well on a wide range of tasks in a sensible way?" asked MIT's Thomas Malone. "Can we measure their flexibility or adaptability in the same way that general intelligence measures that sort of thing?"

The answer may hinge on what *type* of collective intelligence is being judged. There is no generally recognized taxonomy or typology for assessing such communities. However, as a thought experiment, Dan Khoo of Multimedia Development Corporation of Malaysia, proposed a framework for evaluating collective intelligence from a procedural perspective—input, throughput, and output. The idea is that different metrics might be applied to the efficacy of an online community, based on its process functions.

An *input model* is illustrated by YouTube, in which the key task is to gather material from contributors and post it on the Web site; this model contains very little “throughput” such as selection, editing, synthesis, and so forth. A *throughput model* is exemplified by InnoCentive, the Web site that adds value by providing detailed analyses of research and development (R&D) questions. A collective intelligence based on an *output model* is exemplified by the Schaumburg Flyers example, in which fans voted on how the minor league baseball team would be managed. The “output” was the actual performance of the team.

Because the communities that generate collective intelligence vary so greatly, another way of judging them might be to pit one model against another. “One of the strategies could be, How do you use collective wisdoms to beat collective wisdoms?” said Gilman Louie, Partner of the venture capital firm Alsop Louie Partners. Louie noted that most collective-intelligence models are based on sharing, whereas market-based economies are based on finding ways to exploit momentary advantages in the marketplace. Could an experiment be devised to see whether people can use collective wisdom to exploit discontinuities in market performance? Louie cited a new company that is trying to use collective intelligence systems to try to beat the stock market.

This possibility raises a provocative question: In what circumstances is decentralized co-creation better than a market-based model? Jacques Bughin of McKinsey and Company believes that collective intelligence may play a powerful role in identifying “information asymmetries” in the market, which nimble entrepreneurs can then exploit. Decentralized co-creation also may be able to generate new types of innovation more rapidly than the market. In economic terms, said Bughin, “If your demand side has demand externalities, maybe sharing part of the consumer surplus is a much better model than anything else.”

This dynamic is well-illustrated by the work of Eric von Hippel, a professor of management and innovation at MIT and author of *Democratizing Innovation*. Von Hippel studied a variety of “innovation communities” of users, particularly in “extreme sports” such as extreme sailplaning (gliding), boardcross (a kind of snowboarding), and kite-sailing. In these sports, fanatical user communities are vital sources of new ideas that often have commercial value. These amateur-driven innovations bear a close resemblance to the kinds of innovation generated by open source software hackers.

The point is that an innovation commons can generate a demand-side surplus that can be shared by the community, yet still is plentiful enough for manufacturing firms to make proprietary products and profits.

Another example of “sharing the demand-side externalities” is the learning that occurs in “process networks” of hundreds of suppliers. John

“Co-creation is a by-product of a successfully balanced, powerful community.”

Joichi Ito

Seely Brown described how apparel maker Li & Fung in China has assembled a vast network of suppliers who cooperate and learn from each other (described in greater length below). “In Detroit,” said Brown, “no one learns from each other. But if you look at the way process networks in China are working, it’s just amazing the amount of learning that’s actually happening between these guys. That is their motivation, as much as rent distribution [i.e., a larger share of market revenues].

We tend to think of rent-distribution as the sole goal, but the value of accelerating capability in learning is also important.”

For all the excitement about using online communities as a base for profitable business models, Joichi Ito of Digital Garage cautioned that an online community is not a business model, and it must be respected on its own terms. (Besides being co-founder of Digital Garage, a Web solution provider and business incubator, Ito is chair of the Creative Commons.) “I run a lot of online communities,” said Ito, “and we don’t really use words like ‘markets’ or ‘incentives.’ Those words make the Internet sound like a thing that creates stuff that you access—but it’s actually more like a place where communities share co-presence, where you go to hang out.... I hear the language of business being used to describe co-creation, but to me, co-creation is a by-product of a successfully balanced, powerful community.”

Collective Intelligence in Business

As the foregoing discussion suggests, the rise of decentralized co-creation of value has some profound implications for business. It is an alternative, nonmarket vehicle for generating useful information and innovation—one that does not necessarily conform to conventional economic theory and market practices. For individual firms, in particular,

decentralized co-creation is posing perplexing challenges for business strategy, business organization and culture, and corporate branding.

Open Networks and Business Strategy

As open networks have empowered individuals and user communities, the very roles of “producer” and “consumer” have started to blur. Some business analysts have used the words “prosumer” and “prosumption” to describe—in the words of a McKinsey & Company briefing paper—“the increased involvement by customers and end users in various aspects of product design, development, marketing, selling and servicing. Just as technology allows businesses to interact more directly with their customers, the next logical step is the inclusion of customers directly into value-delivery systems.”⁷

At a certain level, businesses recognize the need to incorporate the principles of decentralized co-creation of value into their business models, said Jacques Bughin of McKinsey & Company. Roughly one-third of all companies that McKinsey surveyed are trying to use collaborative technologies, and about 20 percent of these companies are trying to use collaborative tools to go beyond classical knowledge management within their companies, and go to the edge.⁸

This strategic reorientation is spurred by the shifting locus of value-creation—from business-to-business commerce to consumer-to-consumer intelligence, said Bughin. “The competitive advantage that companies had hoped to get is no longer with Web services. It’s really about trying to harness collective intelligence on the demand side. At least, that’s what they hope to do.”

Brad Johnson of McKinsey & Company offered examples of companies that use consumer-to-consumer intelligence to develop “mass customization” strategies.

Adidas, the shoe maker, is now selling custom-designed shoes to ordinary consumers. “After measuring your foot, you can specify the level of padding you want, the type of padding you want, the aesthetics of the design, etc.,” said Johnson. “Adidas takes your input and makes your shoe.” This “mass customization” also is a tool for acquiring highly refined market intelligence, said Johnson: “By aggregating input from all the folks who are making their individual shoes and understanding a little bit about their demographic background, Adidas gets a

much better idea of lead-edge demand. That's what Adidas and other apparel manufacturers are starting to do."

Johnson also cited the innovations by Longine in using decentralized expertise in producing motorcycles. "This is physical manufacturing that is done in a distributive way. The lead manufacturer specifies a high-level architectural design, and then a network of co-creators compete to build, for example, an exhaust system or chassis or whatever. This system has enabled Longine to decrease its costs by 70 percent and make massive share gains in markets like Vietnam, which they entered."

The toymaker Lego is famous for inviting its customers and others to design and suggest specific Lego pieces the company should produce and market. "In 2005, the company actually created something called the Lego Factory," said Johnson. "You can go to the Web site, download basically a CAD [computer-aided design] package, and design your own Lego pieces, as well as the assemblage of those pieces, such as a castle, fire truck or whatever."

"What's interesting is that Lego holds an annual competition," Johnson continued. "They actually select designs from this huge pool of contributions to enter into their retail sales. The winners get 5 percent of whatever the cumulative retail sales of their designs are. So there is a clear potential economic value. Seventy-seven thousand models of Legos have been designed in this way. Lego is expecting two benefits, which are only partially realized now, because the experiment is new: a 10 percent decrease in design and labor costs and a 10 percent increase in revenue."⁹

A final example offered by Johnson is the Open Prosthetics Project (www.openprosthetics.org), which uses distributive co-creation to develop customized prosthetics for amputees. The project "is a system by which people can contribute to both the design of a prosthetic limb and/or the specification of prosthetic limbs that ought to be designed—even if they don't know how to do it. This has come up with some pretty interesting things—like limbs that are specifically adapted for rock climbers and an arm designed for fishing."

The real power of these models is their capacity to amass dispersed and specialized consumer preferences and then use this knowledge as the basis for innovative new business models. Jacques Bughin cited the fascinating case of insurance sites in Germany that are using the Web as

a new “infomediary” model, whereby people provide additional information for risk underwriting in a way that is as effective as local independent brokers. By using this information, the brokers are able to pass along savings on insurance to consumers while making a greater profit themselves. Having acquired 3–4 percent of the market in Germany, these brokers are now proposing to underwrite the insurance premiums of major insurers on a commission basis.

Startup companies that are so immersed in the collective intelligence of their customers—in an ongoing, responsive, evolving way—are “beta-forever companies,” said Gilman Louie of Alsop Louie Partners. “It turns out that customers are much more loyal to companies that respond almost immediately to the wiki-blogs about the product than those companies that do not,” Louie said. “We’ve watched companies with inferior products gain market share and eventually bypass the superior product because they’re willing to iterate every day. There is a relationship between the customer and the people building the product.”

Chad Hurley of YouTube said that this approach is precisely what his company strives for: “It’s about listening and adapting—and getting your organization into a place that can move at that speed. When Steve [Chen] and I developed the site, we were pushing out changes to the site every day. Now there are more people involved, and more development, and we have a push every five weeks. That’s still rather quick in terms of turning things around. You just can’t wait an entire quarter, or an entire year, to make a change. When you receive feedback, you have to take that feedback and figure out how to make changes as you go along.”

The demands for real-time feedback and innovation apparently are becoming exponentially more difficult as the Generation X demographic goes mobile with cell phones, personal digital assistants, text-messaging, and other mobile devices. Web pages and Wikipedia may not be the model for collective intelligence-gathering for the mobile generation, Gilman Louie predicted. “The next generation doesn’t care

The real power of these models is their capacity to amass dispersed and specialized consumer preferences and use this knowledge as the basis for innovative new business models.

about Web pages because they're mobile. They've got a screen about *this big*," he said, holding his thumb and forefinger together. "And they don't really care about brand. They care about instantaneous information. From a corporate strategy point of view, the question is, How do you turn that real estate into something of value? It really comes down to the time-value of information. It isn't who owns the information, or who owns the customer, but who can integrate that information and provide that market intelligence quicker than the next guy."

The time-value of information is intensified by the growing use of mobile communications and computing. The presentation of content is no longer confined to the computer screen; it has become far more fluid because people can "place-shift" and "screen-shift" their content to different appliances so readily. Therefore, the Web is not the sole venue on which decentralized co-creation of value will occur.

Building an Organization and Culture that can Leverage Decentralized Co-Creation

The rise of decentralized co-creation as a new value proposition has daunting implications for business organization and culture. Existing systems are not likely to enable the rapid learning, adaptation, innovation, and mindsets required to compete in a networked environment.

As Jacques Bughin of McKinsey and Company put it, "Currently, management is hierarchical, competence is considered a matter of job function, and contributions are made by job description. We need to move toward more modular co-creation and 'edge competence' in order to capture the kinds of innovation that occur at the grassroots." The familiar conflicts between marketing and R&D departments, Bughin said, are mostly an artifact of existing organizational forms. A system of decentralized co-creation shows how they can be integrated more seamlessly.

Similarly, Bughin said, the supply chain (production) and demand side (consumption) should not be regarded as separate entities. The two sides need to become more integrated, modular, and cooperative; he cited Google and eBay as platforms that sit astride both consumer contributions (recommendations, reviews, reputation systems) and sales. These companies are exemplary in sitting in the middle of consumer-to-consumer intelligence, he said.

In light of these emerging trends, Bughin hypothesized that “your organizational model has to change drastically. It’s probably a bad system because systems are usually very structured. And guess what? Knowledge management has failed badly simply because it’s too structured. The reason is because most information is *not* structured, and will never be captured in knowledge management systems.” The most natural, accessible form of knowledge, he said, is “conversation.”

Online games provide some clues about how knowledge platforms ought to be designed, Bughin said. The best ones—such as *SimCity* and *Second Life*—provide a platform on which collective intelligence can emerge. No contract can design the proper incentives for this to occur, but the design platform itself can encourage people to share useful information, he said.

**The most natural,
accessible form
of knowledge is
“conversation.”**

Jacques Bughin

Companies face some formidable challenges, however, in moving from old organizational structures to new ones that can leverage decentralized co-creation. Brad Johnson of McKinsey and Company enumerated some of the key issues: control over intellectual property, quality control, liability, operational risks, and branding. Shona Brown of Google pointed out another reason large companies have trouble revamping their organizational structures: They are invested in the old business models and have not yet figured out the risks of the new models. They may see genuine opportunities, but those opportunities entail new content formats, risk factors, and revenue models. Relinquishing the old and embracing the new can be very difficult.

“The only way to get large companies to deal with such issues,” said John Hagel of Deloitte & Touche, “is to figure out pragmatic migration paths. How can they start to participate in decentralized co-creation of value in small ways, consistent with their current market assumptions?”

Bughin agreed that making the transition from a legacy system is very difficult. He wondered, however, whether revamping legacy systems in a piecemeal fashion is even worth trying: An effective path migration is “not about doing it step-by-step and saying, ‘I’ve changed my organization to be more flexible...or simpler...or more relation-

ship-based,' and all that," said Bughin. "No, actually, you need to change everything.... It's about dynamic capabilities. It's about transparency. It's about loose control."

When innovation is so fast-paced and driven by mobile customers, one may be tempted to believe that one has solved one's organizational problems by installing a new wiki Web page, for example. This idea is laughably inadequate, said Gilman Louie: "We know things are bad when the intelligence community stands up and says, 'Our solution to bad intelligence is to create a wiki.' I mean, that is the strategy they are using. But it doesn't work if the fundamental culture hasn't changed in the first place."

John Hagel believes that even the InnoCentive Web page (discussed above) is something of a halfway measure: "There is not a lot of distributed collaboration around that. It's more transactional. There are no long-term relationships built through that kind of mechanism."

Large public companies may discover that finding an effective migration path can be blocked by their own attitudes toward control and trust. In a milieu of decentralized co-creation, innovation requires *less control* and *greater social trust*—yet public companies are used to exercising a great deal of control to deliver predictable results to Wall Street.

John Seely Brown described the conundrum: "Large companies get predictability by having extreme control. When you have extreme control, you actually *lose* trust. So basically, you might say that they have high-control environments because they don't trust, or conversely, because they assert control, they don't have trust. It's not clear which comes first; it is chicken-and-egg. But the point is that there is a very deep relationship between being unwilling to trust and wanting total control."

Brown suggested that there are some attractive alternatives to strict corporate control. He described the "Creation Networks" that Chinese apparel maker Li & Fung has developed as a way to orchestrate diverse design and manufacturing capabilities. As described in his book, *The Only Sustainable Edge* (co-authored with John Hagel), Li & Fung has few assets but a global supply network of more than 10,000 companies.¹⁰

"If you join the Li & Fung network," said Brown, "it will guarantee buying at least 30 percent of your goods, but never more than 70 percent. So, if you are a supplier, you are encouraged to develop other relationships. The system is a very interesting accelerant of trust and also

an accelerant of learning.” Suppliers have a keen incentive to learn from each other, collaborate with and trust each other, and collectively innovate. An important reason for the company’s 30–50 percent return on investment and \$5 billion in revenues is its institutional ethic of “low control and high trust.”

Max Mancini of eBay echoed and elaborated on Brown’s conclusion: “When you’re trying to create a co-creation model centered around community, it is our instinct to try to control it, because that creates predictability. The reality of a community is you cannot control it; the community controls you. Ultimately, the community directs you and takes you in directions you may not have otherwise understood—and ultimately creates value that you probably wouldn’t have otherwise understood.”

These trends are putting enormous pressure on today’s chief information officers (CIOs), said Terry Waters, Senior Vice President and Chief Marketing Officer of Garner. Companies are having increasing difficulty keeping pace with Web 2.0 innovations and the impact on IT budgets that are increasing only 3–4 percent per year—essentially keeping pace with inflation—while decentralized business leaders are driving the consumerization of IT across their enterprises. “IT leaders are absolutely being pressed to do more with less—reduce costs, reduce staff, improve productivity,” said Waters. “At the same time, CIOs are being asked to innovate and leverage these new IT capabilities. They’re being asked to move faster. They’re being asked to leverage their technology infrastructure in new and different ways. They are being asked to help the company grow.”

As technology moves toward Web-based services and consumerized services, it “fundamentally changes how CIOs and business leaders architect IT systems to be able to deliver value across the enterprise as well as to suppliers, customers and business partners,” said Waters. “The key question that I have is: Do CIOs have the imagination, the vision, and/or the time to lead this effort, in a world that’s very short-term focused?”

If you come to this challenge with a zero-sum mindset, it’s going to be very hard to adopt new organizational and business model requirements.

John Hagel

The most formidable barrier to embracing decentralized co-creation models, then, may be mental. “At the end of the day,” said John Hagel, “the key roadblock has to do with assumptions. It goes back to the zero-sum-game versus positive-sum mindset. If you come to this challenge with a zero-sum mindset, it’s going to be very hard to adopt new organizational and business model requirements. Yet large companies, for a variety of reasons, tend to have a zero-sum mindset.”

There also may be a generational difference in how one looks at these questions, pointed out John Kunzweiler, formerly of Accenture. “In my business world, we care a lot about intellectual property, defending the brand, quality control, and so on. But with the newer business models, the things I cared about might simply reflect an old guy’s view of the world.”

The mental barriers plaguing the “old” generation of business executives may stem from a misunderstanding about the decentralized co-creation model: It is not a zero-sum game, as Hagel pointed out, but a regime that tends to make the “pie” grow larger. Tapping into collective intelligence is about generating a plethora of positive externalities and expanding a market sector, which innovative first-movers are then strategically positioned to dominate. Hagel concedes that one cannot always know in advance which scenarios are positive-sum and which are zero-sum situations. The recurrent story of decentralized co-creation, however, is one of using collective intelligence to unleash exponential growth, transforming a sector into something quite new.

Branding as a Corporate/Community Conversation

In companies that have developed symbiotic relationships with online communities, what becomes of branding? Do brands still matter? How should branding be conceived and protected in an environment of decentralized co-creation?

There was broad consensus among Roundtable participants that brands will continue to exist and be important, although they will function in different ways. The role of brands as an indicator of quality is likely to diminish, said Thomas Malone of MIT; instead, they will increasingly serve as indicators of one’s experience with a product. In the open, transparent environment of the Web, search and discovery about products is much easier. People can do comparison shopping,

make instant purchases, and browse and buy from mobile devices. In this environment, brand reputations are not as “sticky.”

Jacques Bughin of McKinsey and Company agreed: “We are seeing 50 percent of products becoming totally commoditized. That’s because you can search the Web site for products to find the lowest prices for the same features. If your brand is about product attributes, and that’s the way you earn your market share, you are in big trouble. On the other hand, if your brand can work on more intangible drivers, opportunities to engage people on those drivers are multiplied many times. Sixty percent of people we surveyed on Second Life are willing to co-design and participate in brand products and service, for instance.”

“Increasingly, communities are promoting a brand.”

Aedhmar Hynes

The more important shift may be in the user community’s increasing control over the meaning of a brand. “The importance of brands is not decreasing,” insists Aedhmar Hynes, CEO of Text 100 International, a public relations firm. “But *who promotes* the brand is changing. Increasingly, *communities* are promoting a brand.”

John Hagel of Deloitte and Touche agreed: I think we are seeing a shift from what I call ‘vendor-centric’ brand promises to what I call ‘customer-centric’ brand promises. The brand is not a promise about the product or my company, but a promise that I know you, as an individual customer, better than anybody else, and you can trust me to configure the right products and services to meet your needs.” Hagel added that “distributed co-creation is hugely important in building on this kind of brand promise” because it opens new conversations between the corporation and the community about the meaning of the brand.

Thus, the brand owner must pay due respect to the customers. “You can’t get away with trading on a brand,” said Gilman Louie of Alsop Louie Partners. “In fact, there are penalties for ‘BS’ because you get instant customer feedback. Brand managers have a higher requirement to maintain a brand because of the risk of overnight reprisals. You can lose customer loyalty the moment you become inauthentic.”

Joichi Ito of Digital Garage compared brands to a popular nightclub: “The arrogant owner thinks he’s the one who’s made the place so hip, but in fact it’s the crowd that makes your place cool, not you.” Brand is

not a thing with fixed identity, Ito said, but a “hangout for like-minded people.” It’s an evolving, socially created value. Hence, the responsibility of the brand owner is to assure that the brand is a place where people want to hang out. Ito cited his own experiences in helping to lead two “community-operated brands”: the open-source Firefox browser and the Creative Commons licenses. In 2004, the developers and users of Firefox collectively contributed enough money to buy two full-page ads in the *New York Times* announcing the release of the free browser.

Decentralized Co-Creation in Media and Education

The Explosion of Amateur Video

The most visible manifestation of decentralized co-creation may be in video. User-generated video content is soaring, helping to spawn new genres of expression: short amateur videos on YouTube, video mashups, “machinema,” amateur pornography, and hybrid schemes that combine user videos posted online with conventional broadcast and cable television.

Chad Hurley of YouTube noted that the ratings and audience share of television, newspapers, and DVDs are declining, largely because people have many more choices of how to spend their time. They use the Web, play online games, and use cell phones and other mobile devices. “So while there is a greater fragmentation of media, there is also a greater consumption of media,” Hurley said.

The real challenge facing the new media, especially those based on decentralized co-creation, is to develop sustainable business models. This transformation may entail new types of subscription or sponsorship models, or perhaps partnerships of the sort shown when YouTube joined with CNN to host a debate of Democratic presidential candidates. Traditional media may have trouble embracing the online media, Hurley predicted, because their business universe is based on scarcity and dominance of distribution—but in the Internet world, of course, everyone enjoys open access to distribution and plentiful supplies of content.

Max Mancini of eBay explained why user-generated video is proliferating. At the most basic level, ordinary people can produce video cheaply and easily. In addition, people have become comfortable with

online reputation systems, which are a useful tool for sorting huge quantities of uploaded video. Structurally, the Internet provides open access to anyone, and the computing power of basic PCs continues to grow. Although professional content “is not going to go away,” Mancini said, the supplies of user-generated video are going to increase.

John Seely Brown gave a quick survey of some of the more robust types of decentralized co-created video. One of the most popular genres is machinema, a production technique that blends filmmaking with online games to produce computer-generated imagery. “Basically, you can take Second Life or Worlds of Warcraft and have a set of avatars run by people all over the world, that come together and create their own movie, and then you can ‘YouTube’ the movie,” said Brown. Machinema emerged from the underground gaming community and has become a hugely popular genre of decentralized video co-creation.

Other social practices are emerging that may ripen into genres. The practice of communicating through short videos—from one platform to another and among large groups of people—may soon emerge as people discover the compatibility of YouTube videos and cell phone screens. Brown also noted that rise of “distributed co-watching” that occurs on Second Life. “People from all over the world are sitting together watching a simulcast. It sounds kind of bizarre, but it is kind of like watching a movie with a crowd, but people know you are really sitting in your living room.”

These platforms are likely to give rise to new types of storytelling as people discover the special properties of the medium. Just as film initially was a re-creation of theatrical plays—until directors discovered cutaways and collage and so forth—the video clip may become the basis for new types of storytelling.

One form of user-generated videos may become the feedstock for a television program in 2008. Arturo Artom, President and Chief Executive of *Your Truman Show*, plans to showcase people’s blogging and self-created video profiles and invite Internet users to “rate the life” of other people, using scales of “calm/exciting” and “drama/comedy.”

Brand is not a thing with fixed identity, but a “hangout for like-minded people.”

Joichi Ito

Reviewers themselves also will be rated and ranked and can attract their own fan base. The winners of various categories—best documentary, best blogger, best entertainer—will then be featured on a weekly television show.

The show is another example of how decentralized co-creation of media is becoming hybridized with conventional media. In the 2006 elections, an amateur video showing Virginia senatorial candidate George Allen uttering the slur “macacca” was picked up by the mainstream news media and given wide coverage. More recently, YouTube and CNN joined forces to host a presidential debate, resulting in an intriguing clash of styles—the solemn formality of network television combined with the puckish amateurism of ordinary citizens.

It is too early to know how the new social practices will shake out; some will be transient novelties, others may become enduring genres, as blogging has. Consider, however, the range of innovations that leverage ordinary people’s participation and creativity:

- Justin TV (www.justin.tv) is a free platform for broadcasting and viewing live video. Some people are using it to create 24/7 “lifecasts”; others have used it to broadcast live from Baghdad, showing war-related events.
- Yahoo and Reuters have teamed up to invite millions of people with digital cameras and camera phones to become photojournalists, submitting their eyewitness photos of news events.¹¹
- One World TV (<http://tv.oneworld.net>) is a social activist Web site for people in developing nations that enables them to use storyboards to construct video stories about situations in their communities. The videos can then be uploaded to the Web for viewing.
- Onmynews.org in South Korea uses 36,000 citizen-journalists to write up to 200 online stories a day. According to a national magazine poll, the publication is considered the sixth most influential media outlet in Korea.

Despite the power and range of these sorts of innovations, “the advertising industry is struggling to adjust,” said Aedhmar Hynes of

Text100 International. “Advertisers are used to speaking at larger audiences of coerced listeners rather than communicating with small communities of vocal individuals. However, the new media is moving us from ‘prime time’ shows aiming for big brand awareness to ‘my time’ conversations of people sharing their little brand experiences. As long as the advertising industry doesn’t find an appropriate response to this new setting,” said Hynes, “it is in crisis.”

Several Roundtable participants affirmed this view. Robin Harper of Linden Lab, host of Second Life, reports that advertisers frequently come to her and ask, “What’s your cost-per-thousand [CPM]?”—the standard advertising term for the cost of reaching 1,000 people. She laughs: “I tell them I know what that is, but I don’t think we have one.” The point of online communities is not to reach a certain number of eyeballs with a certain efficiency ratio (CPMs) but to deepen consumer engagement with the brand.

Jacques Bughin of McKinsey and Company said that a recent McKinsey survey also confirmed the limited knowledge of advertising agencies and advertisers. Although approximately one-third of companies surveyed are trying new ad vehicles such as blogs, virtual worlds, podcasts, and social networks, this activity remains very experimental, Bughin said. One of the key reasons companies cited for *not* using these new ad vehicles is the absence of such skills internally; in addition, however, advertising intermediaries are not “on top of those techniques.”

Shona Brown of Google suggested that businesses still focus on advertising because it remains the primary “engine of monetization.” She added, however, “It’s clear to me that we have to evolve a broader definition of the monetization opportunity. Voting on the preferred ending of a movie; listening to people’s input; asking people to rate different versions of a new product—we used to call such activities ‘market research,’ but they are actually *engagement* with your product or service.” The online environment offers different and better opportunities for such engagement than traditional advertising, said Brown, because “you can create *experiences* with your product or service that are much more meaningful than a billboard or a targeted text ad.”

“The new media is moving us from ‘prime time’ shows ...to ‘my time’ conversations....”

Aedhmar Hynes

It is important to keep in mind, Chad Hurley of YouTube added, that “all of these new formats don’t just necessarily drive toward revenue. They provide new opportunities to engage an audience, drive them to different formats and develop partnerships.” Hurley cited YouTube’s partnership with CBS, which involved putting CBS shows on the YouTube site. Although this exposure resulted in ratings increases of 5–7 percent, the revenue opportunity was indirect.

Learning Platforms that Enable Tinkering and Sharing

John Seely Brown of Xerox PARC, a student of “open learning” and how it is changing educational practices, made a presentation about “tinkering as a learning platform.” He noted that the rise of the Internet—and especially the World Wide Web in the mid-1990s—has inaugurated a powerful surge of “tinkering” and sharing among ordinary people as an enjoyable social activity. For the “born-digital generation,” tinkering takes many forms: open source software, amateur videos posted online, immersive online environments such as Second Life, simulation games such as Civilization, amateur anime cartoons, and “game modding” (user-created derivatives of commercial software games).

In this participatory culture, consuming and producing are not separate activities but a seamless cycle of yin and yang. “The assumption is that anything I produce will be built on by others,” said Brown, “making for a remix, open source, blogging culture.” People build their identities by participating in communities of sharing and rebuilding, he said. The Web 2.0 environment differs from the mass media and Web 1.0 environment in precisely these ways. Professionals dominate creativity in the latter culture, whereas amateurs (*amator*: Latin for “lover”) are the dominant creators in the participatory media of Web 2.0.

Some fairly sophisticated types of information and creativity are emerging as the professional and amateur classes find each other and begin to collaborate. Brown noted how amateur astronomers armed with Dobsonian telescopes and digital sensors (as in digital cameras)

In this participatory culture, consuming and producing are not separate activities but a seamless cycle of yin and yang.

are sharing their discoveries and discussions on blogs, Yahoo! groups, online forums, and even collectively managed databases.

This culture of amateur sharing via open platforms is starting to spread to education at all levels, said Brown. It arguably got its start in 2001 when MIT President Charles Vest asked his faculty how the Internet should be used in higher education. Vest's proposal: "Use it to provide access to the primary materials for virtually all our courses—for students, faculty and other learners, anywhere in the world, at any time, for free." The first project begun under Vest's vision was MIT's pioneering OpenCourseWare (OCW) Project, which put all primary materials for virtually all of the university's courses on the Web, where they are accessible at no charge. The OCW Project has caught on, and scores of college and universities in more than a dozen nations now participate in an OCW Consortium.

Meanwhile, the culture of open sharing and participating has spawned a wide variety of educational resources: free textbooks, open repositories for scholarly work, open-access scholarly journals, open-curriculum development, peer-to-peer platforms for collaborative learning, and much more. The level of activity is so great that, in a major report to the Hewlett Foundation, Brown and two co-authors declared in 2007, "The conditions now exist, we believe, to consolidate understanding, technology and incentive from multiple threads of activity in an open participatory learning infrastructure." There is, in fact a new international "open educational resources" (OER) movement of many dimensions that is now organizing itself.¹²

Just as the Long Tail¹³ has made niche markets viable in many businesses, it is creating a new social ecology in education in which "virtual niche learning" is feasible. People who are passionate about a niche topic can have opportunities to truly engage in the topic and learn more, in collaboration with other passionate learners. One such example is "The Valley of the Shadows, 1859–1870," a Web site on Civil War history that features primary documents from two communities of the North and South. Another is the virtual three-dimensional classrooms that can be hosted on Second Life—"a platform for a world-wide class discussion, which in turn can be augmented with a social network for virtual study groups," said Brown.

As open education models proliferate, Brown said he foresees some major transformations in fundamental processes of education. The new models will be based on “demand-pull by passionate niche communities and individuals,” said Brown. Several developments are now converging—the OER movement, new initiatives in eScience and eHumanities, and the ongoing growth of the Web 2.0 environment—and Brown predicts a “perfect storm of opportunity” that could reinvent education in ways that foster participation and collaboration on a global scale.¹⁴

Roundtable participants found Brown’s vision of open education inspiring and encouraging, but they also noted the hard realities of moving existing educational systems to higher ground. John Kunzweiler of Accenture is a volunteer who is helping a San Francisco Bay-area high school with an economically troubled student body. High school teachers are forced to “teach to the standardized tests” and have more limited freedom in how they can innovate in the classroom, Kunzweiler said. As a result, many teachers actively resist the idea of open education.

The challenge is to find a way to let students get enthusiastic through a participatory project. Brown said that some kids make video mashups after school, and the projects evolve to become vehicles for general learning. If the learning can be situated in a “real world” context—which for today’s students means music, video, computers—the pedagogy that normally occurs in the classroom can be integrated into participatory learning.

Citing his own youth, Joi Ito of Digital Garage noted how traditional education can encourage the development of smart conformists but often discourages critical thinking and risk-taking. By contrast, niche-based learning in an open environment can elicit the passions that are latent in most young people. Ito noted how many Wikipedians are “outcasts from traditional education,” in the context of the Wikipedia project, however, they have become “bookworms for the common good.”

The New Frontier: Cloud Computing

As if the epochal trends described in preceding sections are not enough, William Coleman, the entrepreneur who started BEA Systems and recently started the Cassatt Corporation, made a bracing presenta-

tion about the changing economics and capabilities of the IT industry over the next 30 years. Coleman's "Big Picture" scenario has sweeping consequences for virtually all parts of society. The changes would stem from the transformation of the Internet from a set of independent computers and networks into a global utility on which services, collaborations, and interactions are produced dynamically in response to the demands of the "ends," whether they are individuals, groups, corporations, or governments.

This "cloud" can be regarded as the computational equivalent of the network of telecommunication service providers today, which provide wired and wireless audio and digital communications services. The new cloud for computing will dramatically lower the cost of services and enable mind-numbing increases in interactive collaboration, content creation, and intelligence augmentation.

Coleman suggested a simple example of how the Cloud might work. Imagine a tourist with a personal digital assistant (PDA) who accesses the Cloud as she wanders through the Louvre. Knowing her interests, history, and education, the system guides her to the objects of most interest, connects them to her own history, and brings them alive just by tapping into the Cloud. Perhaps this experience triggers a desire to share the experience with two old friends she hasn't seen in years; when she reaches out, the linkage is accepted, and the friends re-live a shared experience in the moment.

The path to the Cloud must be considered in the context of the history of computing. Coleman started by identifying five distinct cycles in this history, each of which took about 10 to 12 years to play itself out. The first cycle was the invention of semiconductors in the 1960s, which was followed by the commercialization of computers, the development of computer networks, and finally in the 1990s, the growth of the Internet and the World Wide Web. During each of these successive cycles, said Coleman, there has been a period of invention, followed by a boom and then a bust, a broader build-out of the innovation and consolidation of the companies in the sector, and finally the commoditization of the technology.

In each cycle, investors have used the technology to add a new class of users by "extending the ends." For example, semiconductors were first placed in minicomputers, then put in the workplace and the lab, and then

on every desktop. When the Internet arrived, the semiconductor revolution was extended to individuals and localities everywhere on the globe.

“The key point here,” Coleman said, “is that we’ve reached the final end. There are no more ends to which we can extend the technology. Now everyone can participate in the ‘conversation.’ We can go end-to-end to everything and everywhere now. So that actually turns the equation upside down.”

**“The ends”
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Coleman means that large numbers of disaggregated users can be leveraged for business gain in new ways. There is a “new value proposition.” The first instances of this new dynamic was Dell Computer’s innovation of taking customers’ orders and money before Dell had even actually ordered the parts to build the computers. With this ingenious scheme, Coleman said, “Dell leveraged the ends and dramatically lowered its costs, so the cost of its capital was *negative*—so now cap-

ital is no longer an expense, and Dell became the first corporation to enter the Information Age.”

The larger point, Coleman said, is that commerce is moving “from a push, mass-consumer, mass-marketing world to a pull/micro world. This is the killer application—*the ends* are in charge.” Decentralized co-creation of value is a major example of how “the ends” are asserting their capacity to manifest collective intelligence and innovate. This dynamic represents a profound challenge to conventional business notions of how value is created. In Coleman’s words, “Pull is the ‘killer application’ of servicing the ends.” It does so by leveraging network effects and the Long Tail at the same time.

Coleman sees three structural drivers of this process: *transparency* throughout the commercial/cultural field, *straight-through processing*, and commercial *reach* to micro-niche levels.

- *Transparency* according to Coleman, is the ability of a business venture to “see the customer, the suppliers, and everybody else at once. Companies can compare vendors and products from one market segment to the next, keep track of consumer behavior in the marketplace, and monitor new developments as they occur.”

- *Straight-through processing* is the ability—enabled by transparency—to change business activity in the middle of the process, in real time, to adapt to what’s happening in the marketplace. “There could be a shortage of wide-screen TVs the day before Christmas or a pricing dislocation that enables a company to charge a premium in one location on a given day,” Coleman said.
- *Reach* is the ability to effectively leverage the Long Tail and network effects to market one’s product and services to micro-niche markets.

**“Pull is the
‘killer applica-
tion’ of servicing
the ends.”**

Bill Coleman

Coleman sees three companies whose business models are based on these three principles: Amazon, eBay, and Google. They all leverage community information—by creating lists of recommendations or reputation systems—which enables them to exploit network effects and the Long Tail and thereby market effectively to very small market niches and, indeed, to individuals. Although Dell was the first to leverage “the ends,” Amazon, eBay, and Google have used transparency, straight-through processing, and reach to take this capability to whole new levels, Coleman said.

Which cycle are we in now? Coleman sees us coming to the end of cycle 4, the Internet journey—a period from 1990 to 2020. The first phase of invention, boom, and bust occurred from 1990 to 2001, in which the World Wide Web was invented and the tech sector boomed and then crashed. The period from 2001 to 2010 has been the build-out and consolidation era, in which broadband, wireless, search, online communities, and applications will consolidate and then start to be commoditized—a process that will last until 2020. This process is, in effect, the end of the IT industry as we know it, Coleman said.

In the meantime, however, cycle 5, the Pull Revolution, also is underway. It began in 2000 when “cloud computing” started to emerge. We know cloud computing by its earliest precursor, Web 2.0. This cycle is the period of the invention of new models of decentralized co-creation of value. According to Coleman,

This period resembles the eight blind men trying to describe the elephant—because, except for Google, eBay, and Amazon, we don't know how it's actually going to evolve for all the other industries. But by the end of this decade, those models will begin to emerge. It will take the whole next decade to build out those models, and then they will transform the Web-builds on top of them. And I posit that, meanwhile, the technology will disintegrate and turn into “the Cloud.” That is what this is all about. I think cycle 5 is going to be based on the technology of data and identity being able to become transparent and ubiquitous, and the individual will control their identity any time, any place.

By the time the Cloud emerges, Coleman said, the “triple convergence” of voice, data, and video will have been consummated. In an Internet Protocol (IP)-based world, all forms of content will be digitized and flowing through the networks. As this happens, most of the applications and data storage that now reside on PCs will migrate to the Cloud, and computing will become a utility service. Vendors will supply capacity on demand.

This transformation will have many profound implications, Coleman said. First, software applications will become a commodity, effectively ending that industry. “Open source software—what I call the ‘good enough syndrome’—will evolve to the point that it is good enough for all the generic applications that you need,” Coleman said. “But they will be loosely coupled enough that people can still add value to them and customize them. Computing will be a utility service, and generic open-source software applications will be a set of services that are assembled appropriately—by professionals and amateurs who do ‘mashups’—for whatever computing domain or market that you are in.”

As for the utility computing industry, Coleman predicts:

The incremental cost of generating more capacity will start to approach zero as time goes forward—just as we are seeing in the cellular industry today. As that happens, the service provider winners will be those that can invest capital as quickly as possible to gain more scale—and take the risk for convergence. What that

will do is destroy the telephone service industry, the cable industry, the Internet service provider industry, and part of what is the portal industry today. So the survivors will be—I call them the “Google-rizons”—the ones that have both the access to a huge amount of capital and the willingness to take risks in this converged world.

This, then, is the Cloud—the “creative destruction” of the IT industry as we know it today. Coleman believes the computer hardware industry will shrink to a fraction of itself as hardware and software become interchangeable commodities, as the telecommunications equipment industry is today. Only a handful of companies will survive, and their products will be generic commodities, for the most part, just as the telecommunication equipment industry is today. Application software as we know it today will be gone—integrated into loosely coupled services that will be part of the generic Cloud infrastructure. A small number of utility service providers—combining telecommunications, cable, Internet service providers, and portals—will control 80 percent of the global market by 2020.

Before cycle 5 can truly get underway, however, Coleman believes some key issues must be solved. Because there will be huge amounts of data flowing into the Cloud, new ways of marking data files—with metadata—will need to be invented. The Semantic Web, which has tried for years to accomplish this, will need to mature into Semantic Web 2.0. Coleman defines this environment as one in which “all data is self-describing and can therefore be manipulated in ways that you can’t possibly think of beforehand. We need a lot more knowledge and understanding of data and data services, which I believe is what all of the next decade’s invention will be all about.” The point will be to devise new ways to automate the interaction of data.

The other major issue that must be solved, Coleman said, is the issue of digital identity. “We have to create an identity system in which human beings can control their identity, to some degree.... We don’t have a concept of [digital] identity yet; we have a concept of security and passwords, but they’re all one-to-one links.” To Coleman, the issue is what information constitutes a digital identity and how much of it must be exposed, in what circumstances. The ideal, he said, would be

for people to be able to set their identities to be expressed automatically in role-dependent and context-dependent ways. For example, certain information will be expressed in a healthcare context, with stipulated exclusions and sharing of information.

The technical challenge in constructing digital identity, Coleman said, is finding a way to “separate identity from authentication and authorization, so that I get to control my own identity.” The government will have to play a role in helping to facilitate policies and systems for constructing digital identities, he said.

Some Implications of Cloud Computing

Although the Cloud, as sketched by Coleman, seems to be a visionary scenario with many open variables, Roundtable participants generally agreed that, based on existing trends, it is likely to materialize. The Cloud is a general framework for imagining the future of computing, telecommunications, software, and all the activities that flow from them—that is, nearly everything. All sorts of secondary technological and economic factors will affect what the Cloud will in fact come to be, however. This section looks at some of the large, novel challenges that will have to be surmounted. The following section explores some potential “speed bumps” that could modify, delay, or derail the Cloud.

The Cloud is a general framework for imagining the future of computing, telecommunications, software, and all the activities that flow from them.

However compelling the macroeconomic and technology trends, the Cloud raises deep, unprecedented issues in computer science.

“We in computer science have no understanding of what will occur when massive amounts of data intersect with massive amounts of computing,” said John Seely Brown. There is an incredible noise-to-signal ratio that would need to be addressed. Brown predicted that computer science will invent some fundamentally new types of data-mining techniques. Although this challenge may sound daunting, the truth of data-mining is that “you only have to ‘lift’ data a little bit to be able to identify brand new patterns.”

The metadata problem also is a huge issue. “You need to be able to get through all the crap that’s out there, to find what’s meaningful to you,” said Max Mancini of eBay. “This is the biggest challenge that we all face.” Although several Roundtable participants expressed little confidence that the Semantic Web will solve the metadata problem, Coleman said that term may be the wrong one. “What we’re talking about is being able to assimilate and get as much signal out of the noise of an increasing amount of data, without having to manually manipulate it,” he said.

Some Roundtable participants expressed excitement about the new set of technical challenges in the Cloud: “When data begins to understand its relationship to other pieces of data that are out there, you have a markedly different kind of world,” said Gilman Louie of Alsop Louie Partners. One of the biggest changes would be the arrival of “dumb” client appliances on a mass level, Louie said.

“For the first time, the experience of the client service relationship that we’ve been talking about for the last 40 years is finally coming true for the mass market,” Louie said. “And that means that the client—the device for delivering things—doesn’t really matter any more. You will have browser-less browsing. You will have real utility computing. You will have computation powers on demand. Finding the data will be free. That is a whole different world.” Although there will be some very large providers of commoditized services, Louie said, there also will be many opportunities for newcomers because of the “huge fragmentation” of products and services for specialized niche needs.

What Could Thwart the Cloud?

Because the Cloud will not occur in a social or political vacuum, it is likely to provoke resistance, many Roundtable participants agreed. James Manyika, Director of McKinsey & Company, pointed out that previous cycles of the semiconductor/computer/networking/Internet revolution were compatible with existing institutional and governmental frameworks. They did not threaten the powers of nation-states, governments, intellectual property, and so forth. The Cloud is going to test the limits of all of these structures, Manyika said.

The key issue now, Manyika elaborated, is that the technological capabilities have far outstripped our institutional arrangements, which

were set up when most things were not digital, and transaction costs were high. One need only look at how we think about issues such as identity, intellectual property, location-independence, and so forth to appreciate this increasing gap. Without the emergence of frameworks

The key issue now is that the technological capabilities have far outstripped our institutional arrangements.

James Manyika

for the era we are entering, we are likely to see responses by threatened governments, institutions, and businesses to limit or thwart the Cloud, Manyika said.

William Perry, former Defense Secretary (under President Clinton) and now Senior Fellow at the Hoover Institution at Stanford University, agreed: “When the government realizes that its roles and its laws are made more and more irrelevant by this happening [the Cloud], government will resist it—and it will have the power to resist it.” William Coleman of the Cassatt Corporation agreed

that governments around the world will resist, although such resistance will have consequences that may be unpalatable: “When China has virtually free computing power accessible everywhere and the United States doesn’t, we will become a Second World country in a matter of a few decades. So you’re just going to have to let economics work that one out,” Coleman said, conceding that such an attitude is not a full answer. At the least, government regulation will shape the character of the Cloud.

Some “speed bumps” will result from the Cloud’s scale and complexity. Distributed global innovation is only going to grow, but that growth will result in greater fragmentation of technologies. How will those technologies be standardized and made interoperable? Padmasree Warrior of Motorola said, “I would argue that the view that Bill [Coleman] has presented does not take into account the global nature of innovation that has to happen, which has pros and cons. The good part is that innovation will be more distributed; the bad part is that it’s going to be much more fragmented. But a company or nation can’t just set a standard and say, ‘We’re getting the whole world to follow that.’”

William Perry predicted that “this whole system is highly vulnerable to breakdowns of various sorts—either accidental breakdowns or deliberate breakdowns when people attack it” (see following section). William Coleman was more sanguine on this point, however, arguing that the

whole technical infrastructure of the Cloud will be “self-configuring, self-healing, and self-optimizing.” Coleman added, “I’m not worried about that side of it. We do have to figure out how to beat any attack. But we have to figure that out in any case, even without utility computing.”

Nevertheless, this enormous technical challenge may or may not be solved. John Hagel of Deloitte and Touche said, “Essentially, you’re talking about long-lived, loosely coupled, asynchronous transactions that occur across very heterogeneous, diverse participants on a global scale. Today there is very little IT that actually provides that kind of support—and it’s an architectural issue versus the components and platforms that are coming into play.”

How will that new architecture be imagined and built? Hagel pointed out a paradox embedded in the Cloud computing concept: that massive, centralized, scale-intensive facilities will be necessary to facilitate decentralized co-creation of value at “multiple levels and layers.”

Who will have the capital to finance it? The risk factors for building the Cloud are huge because of the technical, economic, and policy complications. Brad Johnson of McKinsey & Company saw two approaches. Under one scenario, Johnson said, the triple convergence of audio, video, and text would occur, and the computer hardware industry would actually help build it, even though investors probably would suffer as their products become low-profit commodities (as in all previous technological cycles described by Coleman). Under another scenario, investors would learn from the past and be dubious about the value they would reap from the Cloud—and decline to invest in it.

National Security, Privacy, and Other Obstacles to the Cloud

William Perry of the Hoover Institution raised a new series of potential disruptions that could prevent the IT infrastructure of the Cloud from emerging. Global climate change and energy disruptions could radically change commerce and everyday life, Perry said. So could a major war or an act of catastrophic terrorism. Nation-states might feel profoundly threatened by the redistributions of power the Cloud entails, especially its erosions of national sovereignty and power.

At least in democracies such as the United States, individual privacy concerns also could impede development of the Cloud, Perry said. The government will continue to have legitimate national security interests

in preventing future acts of terrorism; much of this effort is now coordinated through decentralized communications networks. At the same time, new data-mining techniques may enable the government to identify terrorist threats—but such surveillance could result in privacy abuses of ordinary citizens.

Perry is convinced that “we cannot simply walk away from data-mining because the prospects of a catastrophic nuclear or biological terror attack are quite real. Yet they are also quite preventable.” Interception and analysis of cell phone traffic could be effective, he said. Data-mining of Internet traffic would be very difficult and necessarily intrusive. An example of such data-mining, he said, might be development of databases that compile information about all passengers who have flown from Beijing to Peiyong Yang over the past three years; all passengers who had flown into New York City and Washington over the past three months; all persons who had rented vans or trucks at the airport; and all persons who had made short-term rentals of buildings in those cities.

“This data-mining probably does not find the needle in the haystack,” said Perry, “but it certainly makes the haystack quite a bit smaller. This, combined with other efforts by police and intelligence analysts, give us a shot at preempting that second attack. So this is an argument, I believe, to undertake a serious R&D program in data-mining.”

“Can data-mining be both effective and protect privacy?” Perry asked. His response:

It is conceivable but not demonstrated. But if the executive branch of government does design a data-mining system, it will be a powerful tool that could easily be abused. Thus, the proper use of this tool will depend on establishing and enforcing good practices in carrying out the data-mining. Such practices will necessarily encumber the executive branch and probably diminish its effectiveness. History argues that we cannot depend on the executive branch always enforcing such good practices, in the absence of strong oversight.

Perry believes that such oversight should consist of two components: some form of prior approval from the judicial branch, similar to that prescribed in the Foreign Intelligence Surveillance Act (FISA), and

some form of auditing by the legislative branch, similar to legislative oversight of covert intelligence operations now done by the select Intelligence Committees of Congress.

Roundtable participants worried that a powerful data-mining system could open the door to some troubling new practices and norms. Brad Johnson of McKinsey & Company said that “as we gain the ability to do more and more sophisticated pattern recognition, we will have to punish *potential* crimes in order to prevent terrorism. Once you embrace that philosophy, it extends to other things. For example, if I googled [about] how to dispose of a body, where can I buy lime, and how do I dig a six-foot trench, do I get punished for that?”

Joi Ito pointed to the troubling abuses of systemic profiling in Japan, where people whose parents or grandparents once subscribed to left-wing publications are tracked across generations on the presumption that they pose a higher national security risk. “Profiling has a higher probability of causing a chilling effect on speech and association,” said Ito, “parents in Japan make sure that their children never read or subscribe to those things, check those books out of the library, or hang out with certain people. For somebody with left-wing political views, it is still very difficult to get a visa to get into the United States. Even though you’re not committing crimes, these cross-generational relationships alone are exceedingly important in determining who you get married to, what companies will hire you, and what universities you get into.”

Gilman Louie of Alsop Louie Partners, who participated on a Markle Foundation panel studying these issues several years ago, said that the basic conundrum about national security and privacy is that we cannot have one without the other: “If you push too hard on national security at the expense of privacy, then the data-mining program gets shut down, and you don’t have national security. But if you go too far in protecting privacy, a bomb goes off—and you end up having no privacy. We’ve just got to understand the context of coming to that world.”

The basic conundrum about national security and privacy is that we cannot have one without the other.

Gilman Louie

One potential tool to ameliorate the tension between privacy and national security is to “anonymize the data,” Louie said. Anonymizing data means putting “large parts of computational problems up into the Cloud” and letting computers automatically sift and sort the raw data, without exposing it to human beings. This approach would help minimize the potential abuses of privacy. New R&D would be required to develop data-mining techniques that could do this kind of sifting, but Louie believes such systems could be created.

Striking a balance between national security and privacy is fundamentally a problem of trust.

John Kunzweiler

tional data, such as flight manifests and truck-rental information.

Striking a balance between national security and privacy is fundamentally a problem of trust, said John Kunzweiler of Accenture. “It does come down to the trust we have in the [surveillance] institutions and what they’re going to do with this information. If their practices are trusted and transparent, I think it’s less of a concern. It comes back to checks and balances and our trust in the institutions behind them.”

However the data-mining debate proceeds, William Perry of the Hoover Institution emphasized that the most important priority should be “keeping the damn materials out of the country in the first place. There are a whole set of programs that could do that with high probability, but we’re not doing it.” The United States needs to pay the utmost attention to this problem, Perry urged, not just to prevent the damage and panic that another 9/11-type attack would entail but to prevent “government overreactions that would trample on civil liberties in ways that would seem minor compared to what’s going on today.”

Conclusion

The emergence of decentralized co-creation of value is not entirely new or surprising; open source software and Web collaboration have flourished for many years. As this Roundtable made clear, however, the types of online communities that are emerging today are more varied and more powerful. Not only is the technical infrastructure maturing to host more sophisticated kinds of sharing and collaboration, Internet users themselves are becoming more accustomed to, and enthusiastic about, active participation in online communities. The innovations that are underway are as much social as technological.

As these innovations play out, however, they also are assuredly economic. Although decentralized co-creation springs from deep personal and social impulses, it has proven to be a potent platform for generating valuable information and creative works. As such, online communities are irresistibly attractive to businesses seeking to capitalize on new sources of value-creation. Yet businesses—at least those that are conventionally organized and run—face many special challenges in harnessing the power of decentralized co-creation. Social communities frequently have different values and priorities than those of the market and may or may not welcome attempts to monetize or sell their collective intelligence. A great deal of attention is being paid, therefore, to how new business models can work with collective-intelligence communities in sustainable, respectful ways.

Web 2.0 innovations seem likely to be merely a prelude for a giant leap into the Cloud—a far more capacious, versatile infrastructure for social computing than the Internet as we know it today. Although technologists are understandably excited about the prospects opened up by cloud computing, the forces of resistance—among governments, social groups, and individuals—could be intense. The vision of the Cloud itself may have to pass muster with the world's collective intelligence, however imperfectly configured, before it can be actualized: a paradoxically appropriate condition for moving forward.

Notes

1. *Wikipedia* entry on Digg, at <http://en.wikipedia.org/wiki/Digg>.
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12. Daniel E. Atkins, John Seely Brown and Allen L. Hammond, *A Review of the Open Educational Resources (OER) Movement: Achievements, Challenges, and New Opportunities*, report to The William and Flora Hewlett Foundation, February 2007 at <http://www.hewlett.org/Programs/Education/OER/OpenContent/Hewlett+OER+Report.htm>. The report describes that Open Educational Resources as a way of promoting eScience which is described in *Wikipedia*, at <http://en.wikipedia.org/wiki/E-Science>, as "computationally intensive science that is carried out in highly distributed network environments, or science that uses immense data sets that require grid computing; the term sometimes includes technologies that enable distributed collaboration, such as the Access Grid."

13. See David Bollier, “When Push Comes to Pull: The New Economy and Culture of Networking Technology,” reporting on an Aspen Institute conference on the Pull economy that explains the “Long Tail”—the title of a much-cited article by Chris Anderson in the July 2005 issue of *Wired* magazine—and refers to the huge, untapped markets that exist among low-volume books, CD and DVDs. An example the author cites is that more than half of Amazon’s book sales come from books ranking below its top 130,000 titles.

14. See Richard Adler, “Minds on Fire: Enhancing India’s Knowledge Workforce,” Aspen Institute 2007, reporting on an Aspen Institute conference in India that highlighted how Learning 2.0 of the variety John Seely Brown describes could address some of India’s workforce and educational problems.

APPENDIX

**The Sixteenth Annual Aspen Institute
Roundtable on Information Technology**

***Beyond the Edge:
Decentralized Co-Creation of Value***

The Aspen Meadows Resort • Aspen, Colorado
July 31–August 3, 2007

Roundtable Participants

Arturo Artom

President
Netsystem
and
President and Chief Executive
Officer
Your Truman Show

David Bollier

Independent Journalist and
Consultant

John Seely Brown

Director Emeritus
Xerox Palo Alto Research Center
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Shona Brown

Senior Vice President,
Business Operations
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Jacques Bughin

Director
McKinsey and Company

William (Bill) T. Coleman III

Founder, Chairman, and Chief
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Cassatt Corporation

Charles M. Firestone

Executive Director
Communications and Society
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Arjun Gupta

Founder and Managing Partner
TeleSoft Partners

John Hagel

Co-chairman
Center on Innovation
Deloitte & Touche

Note: Titles and affiliations are as of the date of the conference.

Kris Hagerman

Group President, Data Center
Management
Symantec

Robin Harper

Marketing and Community
Development
Linden Lab (Second Life)

Chad Hurley

Chief Executive Officer
and Co-Founder
YouTube

Aedhmar Hynes

Chief Executive Officer
Text100 International

Joi Ito

Co-founder and Board Member
Digital Garage, Inc.

Ken Ito

Chairman and Chief Executive
Officer
FX Palo Alto Laboratory, Inc.

Brad Johnson

Principal
McKinsey and Company

Dan E. Khoo

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About the Author

David Bollier (www.bollier.org) is an author, activist, and consultant with a varied portfolio of projects, many of them involving digital technology, the commons, and intellectual property.

Much of Bollier's recent work has focused on developing a new language of the commons—a project that began with his 2002 book *Silent Theft* and continues through his blog and Web site, www.OntheCommons.org, sponsored by the Tomales Bay Institute. His forthcoming book, *Viral Spiral: How the Commoners Built a Digital Republic of Their Own* (New Press), focuses on the creativity and commerce made possible by free and open source software, Creative Commons licenses, and new online communities.

Bollier has long been interested in the public's stake in intellectual property law, and in 2002 he co-founded Public Knowledge, a Washington policy advocacy organization. As part of this work, Bollier published *Brand-Name Bullies: The Quest to Own and Control Culture* (John Wiley & Sons, 2005), a collection of stories about copyright and trademark abuses and their effects on creativity and public life.

Since 1984, Bollier has worked with television writer/producer Norman Lear on a variety of special projects and policy issues and has worked as Senior Fellow at the Norman Lear Center at the University of Southern California Annenberg Center for Communication. He is the author of nine books. He lives in Amherst, Massachusetts.

Previous Publications from the Aspen Institute Roundtable on Information Technology

The Mobile Generation: Global Transformations at the Cellular Level (2007)

J.D. Lasica, rapporteur

The 2006 Roundtable examined the profound changes ahead as a result of the convergence of wireless technologies and the Internet. The Roundtable addressed the technological and behavioral changes already taking place in the United States and other parts of the world as a result of widespread and innovative uses of wireless devices; the trends in these behaviors, especially with the younger generation; and what this could mean for life values in the coming decade. The Roundtable tackled new economic and business models for communications entities, social and political ramifications, and the implications for leaders in all parts of the world. 66 pages, ISBN Paper 0-89843-466-1, \$12.00 per copy.

When Push Comes to Pull: The New Economy and Culture of Networking Technology (2005)

David Bollier, rapporteur

The author considers how communications, economics, business, cultural, and social institutions are changing from mass production to an individualized “pull” model. *When Push Comes to Pull* describes the coexistence of both push (top down or hierarchical) and pull (bottom up or networked) models—how they interact, evolve, and overlay each other in the networked information economy. The report explores the application of “pull” to the worlds of business and economics; the content and intellectual property industries; the emergence of an economy of the commons; and personal and social dynamics, including leadership in a pull world. It also touches on the application of the pull model to learning systems; the military, in the form of network-centric warfare; and the provision of government services. 78 pages, ISBN Paper 0-89843-443-2, \$12.00 per copy.

*Information Technology and the New Global Economy:
Tensions, Opportunities, and the Role of Public Policy* (2004)

David Bollier, rapporteur

This report provides context and insight into the unfolding of new economic realities arising from the information revolution—how the world’s players will live, learn, innovate, offer, consume, thrive, and die in the new global economic landscape. *Information Technology and the New Global Economy* draws a portrait of a changing global economy by describing new business models for the networked environment, exploring topics of innovation and specialization. Among the more creative concepts propounded at the roundtable was an analysis of the world’s economy in terms of video game theory that suggests that if developing countries are not incorporated into the world economic community in some acceptable way—if they cannot make economic progress—they could become disrupters to the entire economic or communications system. The report also explores issues of outsourcing and insourcing in the context of digital technologies moving work to the worker instead of vice versa. Participants concentrated on developments in India and China, taking account of some of the vulnerabilities in each of those countries as well as the likely impact of their rapid development on the broader global economy. 57 pages, ISBN Paper: 0-89843-427-0, \$12.00 per copy.

People / Networks / Power: Communications Technologies and the New International Politics (2003)

David Bollier, rapporteur

This report explores the sweeping implications of information technology for national sovereignty, formal and informal diplomacy, and international politics. Bollier describes the special challenges and new rules facing governments and nongovernmental organizations in projecting their messages globally. The author further explores the relationships between the soft power of persuasion and the more traditional hard power of the military and discusses how governments will have to pay close attention to newly burgeoning social communities in order to prosper. 68 pages, ISBN Paper: 0-89843-396-7, \$12.00 per copy.

The Rise of Netpolitik: How the Internet Is Changing International Politics and Diplomacy (2002)

David Bollier, rapporteur

How are the Internet and other digital technologies changing the conduct of world affairs? What do these changes mean for our understanding of power in international relations and how political interests are and will be pursued? *The Rise of Netpolitik* explores the sweeping implications of information technology for national sovereignty, formal and informal international diplomacy, politics, commerce, and cultural identity. The report begins with a look at how the velocity of information and diversification of information sources are complicating international diplomacy. It further addresses the geopolitical and military implications as well as how the Internet is affecting cross-cultural and political relationships. It also emphasizes the role of storytelling in a world where the Internet and other technologies bring our competing stories into closer proximity with each other and where stories will be interpreted in different ways by different cultures. 69 pages, ISBN Paper: 0-89843-368-1, \$12.00 per copy.

The Internet Time Lag: Anticipating the Long-Term Consequences of the Information Revolution (2001)

Evan Schwartz, rapporteur

Some of the unintended consequences of the Internet and the freedoms it symbolizes are now rushing to the fore. We now know that the network of terrorists who attacked the World Trade Center and the Pentagon made full use of communication technologies, including e-mail, Travelocity.com, automatic teller machines (ATMs), data encryption, international money transfers, cell phones, credit cards, and the like. Is the Internet an epochal invention, a major driver of the economy for many years to come, or just a passing fad? Will the new phenomena of recent years—such as the contraction of hierarchies, instant communication, and lightning-fast times to market—last beyond the funding bubble? What is the next new economy? What are the broader social consequences of the answers to those earlier questions? This report takes a wide-ranging look at the economic, business, social, and political consequences of the Internet, as well as its wide-ranging ramifications for the process of globalization. 58 pages, ISBN Paper: 0-89843-331-2 \$12.00 per copy.

Uncharted Territory: New Frontiers of Digital Innovation (2001)

David Bollier, rapporteur

This report looks critically at key insights on the new economy and its implications in light of the digital revolution. The report begins with an examination of the interplay between the current economy and the capital economy and then probes the emerging world of mobile commerce and its potential for driving the next great boom in the economy. It further explores new business models resulting from the combination of mobile communications and the new economy. 68 pages, ISBN Paper: 0-89843-307-X 12.00 per copy.

Ecologies of Innovation: The Role of Information and Communications Technologies (2000)

David Bollier, rapporteur

This report explores the nature of innovation and the role of the information and communications sectors in fostering ecologies of innovation. In this context, the report examines the ways in which the creation of new ecologies are affecting significant societal institutions and policies, including foreign policies, industry and business structures, and power relationships. 44 pages, ISBN Paper: 0-89843-288-X, \$12.00 per copy.

The Global Wave of Entrepreneurialism: Harnessing the Synergies of Personal Initiative, Digital Technologies, and Global Advance (1999)

David Bollier, rapporteur

This report examines problems arising from the growth of entrepreneurialism and digital technologies. 41 pages, ISBN Paper: 0-89843-264-2, \$12.00 per copy.

The Global Advance of Electronic Commerce: Reinventing Markets, Management, and National Sovereignty (1998)

David Bollier, rapporteur

This report addresses issues of electronic commerce in the context of global marketplace impact and the transformation of national sovereignty. 64 pages, ISBN Paper: 0-89843-236-7, \$12.00 per copy.

The Networked Society: How New Technologies Are Transforming Markets, Organizations, and Social Relationships (1997)

David Bollier, rapporteur

This report explores how electronic networking—the Internet and intranets—is transforming commerce, organizational performance and leadership, business and social relationships, and personal identity and allegiances. 43 pages, ISBN Paper: 0-89843-213-8, \$10.00 per copy.

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About the Communications and Society Program

www.aspeninstitute.org/c&s

The Communications and Society Program is an active venue for global leaders and experts from a variety of disciplines and backgrounds to exchange and gain new knowledge and insights on the societal impact of advances in digital technology and network communications. The Program also creates a multidisciplinary space in the communications policymaking world where veteran and emerging decision makers can explore new concepts, find personal growth and insight, and develop new networks for the betterment of the policymaking process and society.

The Program's projects fall into one or more of three categories: communications and media policy, digital technologies and democratic values, and network technology and social change. Ongoing activities of the Communications and Society Program include annual roundtables on journalism and society (e.g., journalism and national security), communications policy in a converged world (e.g., the future of video regulation), the impact of advances in information technology (e.g., "when push comes to pull"), advances in the mailing medium, and diversity and the media. The Program also convenes the Aspen Institute Forum on Communications and Society, in which chief executive-level leaders of business, government, and the nonprofit sector examine issues relating to the changing media and technology environment.

Most conferences use the signature Aspen Institute seminar format: approximately 25 leaders from a variety of disciplines and perspectives engaged in roundtable dialogue, moderated with the objective of driving the agenda to specific conclusions and recommendations.

Conference reports and other materials are distributed to key policymakers and opinion leaders within the United States and around the world. They also are available to the public at large through the World Wide Web at <http://www.aspeninstitute.org/c&s>.

The Program's Executive Director is Charles M. Firestone, who has served in that capacity since 1989. He also served as Executive Vice President of the Aspen Institute for three years. He is a communications attorney and law professor who formerly was director of the UCLA Communications Law Program, first president of the Los Angeles Board of Telecommunications Commissioners, and an appellate attorney for the U.S. Federal Communications Commission.