Culture: The Battle for the Commons

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

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

Commerce: Commons Drive Innovation

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

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

Politics: New Commons, Same Tragedy?

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

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

Cooperation: New Understanding

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

—Howard Rheingold

Institute for the Future

Howard examines the emerging technology and literacy of cooperation

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Andrea Saveri is leading IFTF's work with Howard to develop a new literacy of cooperation. If you would like to co-sponsor this work, please contact her at asaveri@iftf.org.

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

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

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

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

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

D E T A I L S

1 Value of Networks Varies with Kind
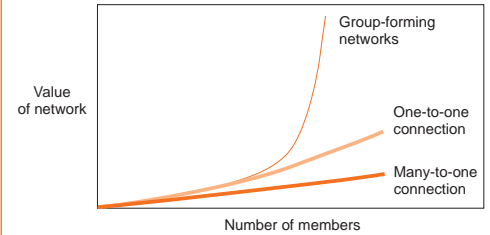
Source: David P. Reed, 2003.

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

2 Different Networks Serve Different Needs
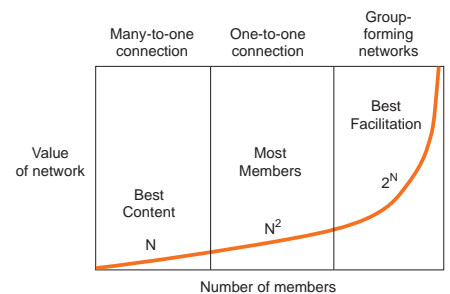
Source: David P. Reed, 2003.

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

GROWTH OF OPEN SOURCE SOFTWARE

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

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

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

THE ECONOMIC VALUE OF OPEN SOURCE

James Bessen, a visiting scholar at MIT's Sloan School of Management, argues that in order to understand the true economic value of open source software, you need to understand the interplay among custom needs, standards, and property rights.

He notes that less than one-third of the overall investment in software goes to pre-packaged software; the rest is custom and self-developed software. Bessen suggests that complexity is the key variable in the economic value of open source software: "With complex software, standard products cannot satisfy all consumers and proprietary customer solutions are not always offered. Open source allows consumers to meet their needs by customizing the code themselves. When such user-customizations are then shared, open source products grow in quality and features. Open source thus extends the market for complex goods."
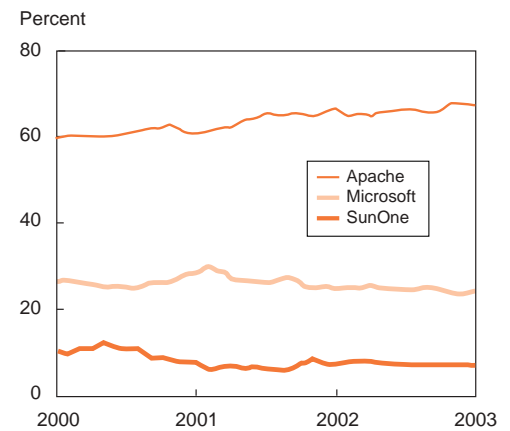
See James Bessen, "Open Source Software: Free Provision of Complex Public Goods," www.researchoninnovation.org/opensrc.pdf.

▶ **3 Current and Expected Software-Developer Commitments to Operating Systems**
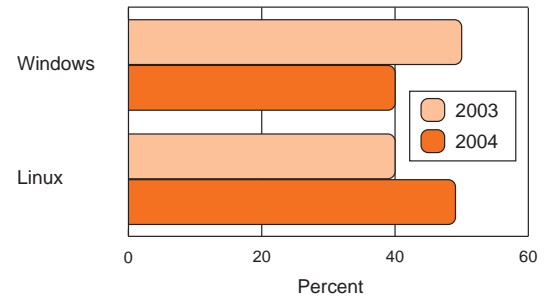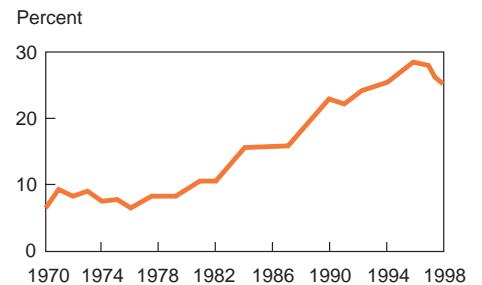

Source: Evans Data Corporation, Nicholas Petreley, 2003.

4 Market Share for Active Servers Across All Domains

Source: Netcraft, 2003

▶ **5 Share of Investment in Pre-Packaged Software**

Source: James Bessen, 2002.

BLOGGING GROWS COLLECTIVE INTELLIGENCE

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

To understand the scale of this new kind of collaborative mapping of the world, consider the size of the "blogosphere" as it's sometimes called: There are currently about 1.5 million active blogs, with the total expected to exceed 10 million by the end of 2004. (These numbers don't include blogs that are managed from private servers or are inside a firewall.)

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

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

▶ **6** Millions of Active Hosted Blogs

Source: Perseus Development Corporation, 2003.

SOCIAL SOFTWARE: THE TOOLS OF THE TRADE

Social software is not just social. It's a tool for accomplishing everything from finding a job to electing a president. Here's a quick summary of a few of the most interesting experiments in group-building software:

Ryze | www.ryze.org

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

Focus: Building business networks
Business model: Free basic subscription, added charge for special services
Network growth model: Peer-to-peer matching, with members in more than 100 countries

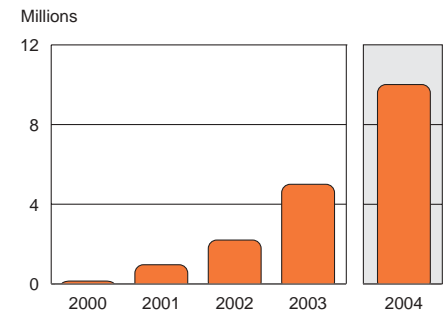### Friendster | www.friendster.com

Privately held startup founded by Jonathan Abrams in 2002.

Focus: Dating and making friends
Business model: Free during beta, will move to differentiated services model
Network growth model: Private invitation by existing members— personal network can exceed 100,000 in first week

Ryze | www.ryze.org

SOCIAL SOFTWARE... (CONTINUED)

Tribe | Tribe.net

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

Focus:	Classified ads by referral
Business model:	Free membership with charges for some kinds of postings
Network growth model:	Creates small networks of high value rather than large networks of low value

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

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

Focus:	Finding location-based contacts and services using laptops and handhelds
Business model:	Free during beta, licensing under consideration
Network growth model:	Peer-to-peer matching

Trepia | www.trepia.com

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

Focus:	Instant messaging with people in close proximity
Business model:	Free right now, perhaps to be licensed through wireless service provider
Network growth model:	Peer-to-peer matching

Meetup | www.meetup.com

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

Focus:	Organizing local gatherings about topics of interest.
Business model:	Free basic service with a combination of special fee services, text ads, and meeting venue listings
Network growth model:	Open topic-based meetings, with simultaneous meetings worldwide (more than 800,000 members, 4000 topics, 600 cities)

MoveOn | www.moveon.org

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

Focus:	Mobilizing grassroots action in response to political issues
Business model:	Contributions
Network growth model:	E-mail referrals

WEB CRAWLING

As social software has evolved, so have the web crawlers that track links.

For example, Technorati (www.technorati.com) is a window on the "cosmos" of blogging. It's essentially a web crawler that tracks the number of visits to blogs and the number of links to them—and can also show you the company you're keeping via links. For bloggers, it's perhaps a big ego trip. For people who are interested in tracking ideas and information, it's a way to tap into the otherwise invisible, but highly interconnected world of bloggers. Unfortunately, Technorati only tracks hosted blogs, so it misses blogs that are published from private servers or inside a firewall.

Google also has a similar service within its search. You just type "link:" before the blog's URL to get a count of links to that blog.

And a number of independent programmers have created spider software to graphically map Friendster networks, too.

THE VOCABULARY OF FRIENDS

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

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

The advantage of FOAF over other methods of managing identity across services (such as Microsoft's Passport) is that it is decentralized. Individuals control of their own profiles, and there's no central database that could be hacked or misused.

Books

Axelrod, Robert. *The Evolution of Cooperation.* Basic Books, 1985.

This was Axelrod's revealing exposition of how cooperative behavior could win over competitive behavior in decentralized systems. It has been followed by a more elaborated view in *The Complexity of Cooperation* (Princeton University Press, 1997).

Margulis, Lynn. *Symbiotic Planet.* Basic Books, 2000.

In this book, Margulis provides a biologist's view of the processes of cooperation and symbiosis in the evolution of a complex living whole. Other books in which her theses are developed in more detail include *What is Life?* (University of California Press, 2000) and *Microcosmos* (University of California Press, 1997).

Ostrom, Elinor. *Governing the Commons: The Evolution of Institutions for Collective Action.* Cambridge University Press, 1991.

Ostrom challenges the basic analyses of both state-controlled and market-driven solutions to common pool resource management, finding novel and successful alternatives that involve voluntary communities and organizations.

Watts, Duncan. *Six Degrees: The Science of a Connected Age.* W.W. Norton and Company, 2003.

Watts combines his research in small world networks with other disciplinary perspectives to understand how collective action can solve complex social problems.

Articles and Web Sites

Bessen, James. "Open Source Software: Free Provision of Complex Public Goods." www.researchoninnovation.org/opensrc.pdf, 2002.

In this article, Bessen presents a mathematical understanding of the economics of open source software in complex development environments, arguing that as the complexity increases, open source performs better.

Jenkins, Henry. Interactive Audiences? The "collective intelligence" of media fans. In *The New Media Book.* Dan Harries, ed. British Film Institute, 2002.

In this article, Henry Jenkins, Director of Comparative Media Studies at MIT, presents an alternative to the "Us vs. Them" story of media giants and media consumers, examining what he calls a new "participatory culture" at the intersection of new media tools, a subculture of do-it-yourself media production, and economic trends that favor horizontally integrated media conglomerates.

Reed, David. "That Sneaky Exponential—Beyond Metcalfe's Law to the Power of Community Building." http://www.reed.com/Papers/GFN/reedslaw.html,1999-2003.

This article lays out the mathematics of Reed's argument that group-forming networks grow exponentially.

Saveri, Andrea, Lyn Jeffrey, and Alex Pang, *New Entertainment Media: Transforming the Future of Work.* Institute for the Future, Technology Horizons Program; SR-813, 2003.

In this report, Saveri and colleagues explore the new social behaviors that are emerging as new entertainment media (including blogs, reality games, and music sharing) gain ground in the culture. They also examine the implications of this new kind of collective behavior for work practices in the future.

Wood, Elizabeth Jean. "An insurgent path to revolution: Popular mobilization, economic interests, and regime transition in South Africa and El Salvador." *Comparative Political Studies* October 2001; pp 862–888.

This article looks at the process of cooperation and conflict resolution in modern civil wars.