NEW STRATEGIC PATHWAYS IN BUSINESS:

LEVERAGING TECHNOLOGIES OF COOPERATION

Technology Horizons Program
INSTITUTE FOR THE FUTURE
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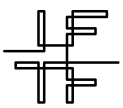

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About the …

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The Technology Horizons Program combines a deep understanding of technology and societal forces to identify and evaluate discontinuities and innovations in the next three to ten years. We help organizations develop insights and strategic tools to better position themselves for the future.

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The Institute for the Future is an independent, nonprofit strategic research group with over 35 years of forecasting experience. The core of our work is identifying emerging trends and discontinuities that will transform global society and the global marketplace. We provide our members with insights into business strategy, design process, innovation, and social dilemmas. Our research generates the **foresight** needed to create **insights** that lead to **action**. Our research spans a broad territory of deeply transformative trends, from health and health care to technology, the workplace, and human identity. The Institute for the Future is based in Palo Alto, CA.

Acknowledgments

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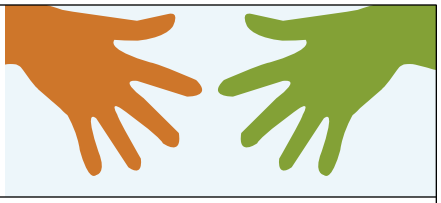
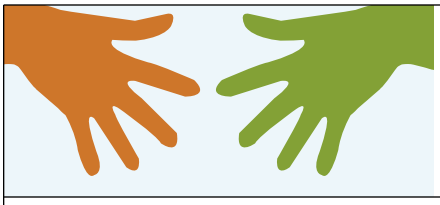


Emerging digital technologies present a range of catalysts for enabling new social arrangements that will transform our business and social institutions. In particular, new technologies of cooperation will enable social arrangements that help us develop new complex cooperative strategies. Such transformation has happened in the past, with the development of the printing press that led to broader literacy and public discourse, which ultimately shaped the development of democratic society. We're on the threshold of a new series of changes that will transform the way people work together to solve problems and generate wealth. Central to this class of cooperation-amplifying technologies are eight key clusters, each with distinctive contributions to cooperative strategy:

- **Self-organizing mesh networks** define architectural principles for building both tools and processes that grow from the edges without obvious limits, that distribute the burden of the infrastructure throughout the population of participants, and that establish the foundation for the emergence of swarm intelligence in systems of people and devices.
- **Community computing grids** provide models for recovering currently squandered resources from distributed sources and for providing mutual security within a network of people and/or devices, supported by explicit choices about when and how to foster cooperation versus competition.
- **Peer production networks** create a framework for volunteer communities to accomplish productive work. These potentially unbounded communities create new value by rapidly solving problems that would tax or stymie smaller workgroups.
- **Social mobile computing** includes a cluster of technologies and principles that allow large or small groups—even if they are strangers—to act in a coherent and coordinated fashion in place and space, supported by information accessed in real time and real space.
- **Group-forming networks** represent ways to support the emergence of self-organized subgroups within a large-scale network, creating exponential growth of the network and shortening the social distance among members of the network.
- **Social software** makes explicit, amplifies, and extends many of the informal cooperative structures and processes that have evolved as part of human culture, providing the tools and awareness to guide people in intelligently constructing and managing these processes to specific ends.
- **Social accounting systems** suggest methods and structures to measure social connectedness and establish trust among large communities of strangers, building reputation along dimensions that are appropriate to a specific context, and creating a visible history of individual behavior within a community.
- **Knowledge collectives** model the structures, rules, and practices for managing a constantly changing resource as a commons, for securing it against deliberate or accidental destruction and degradation, multiplying its productivity, and for making it easily accessible for wide-ranging uses.



Executive Summary

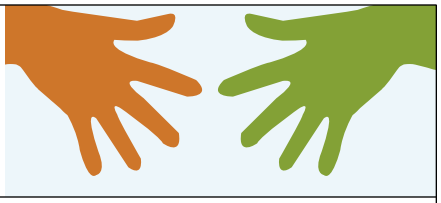
TUNING LEVERS FOR COOPERATIVE SYSTEMS:

- Structure
- Rules
- Resources
- Thresholds
- Feedback
- Memory
- Identity

Each of these technology clusters can be viewed not only as a template for design of cooperative systems, but also as tools people can use to tune organizations, projects, processes, and markets for increased cooperation. Specifically, each can be used in distinctive ways to alter the key dimensions of cooperative systems—structure, rules, resources, thresholds, feedback, memory, and identity. Ultimately these newly enabled cooperative strategies will provide business organizations with new sources of value and alternatives for more sustainable wealth creation.

This report, *New Strategic Pathways in Business: Leveraging Technologies of Cooperation* (SR-927), maps the key concepts and choices associated with the eight clusters of technology, and concludes with a set of key challenges.

Introduction



When social communication media grow in capability, pace, scope, or scale, people use these media to construct more complex social arrangements—that is, they use communication tools and techniques to increase their capacity to *cooperate* at larger and larger scales. Human history is a story of the co-evolution of tools and social practices to support ever more complex forms of cooperative society.

Today's technologies of cooperation position us at the threshold of a new series of social transformations that will disrupt and challenge traditional market and social institutions that frame our daily life. By examining the technologies of cooperation we hope to understand this forthcoming set of shifts from the beginning, with foresight, rather than with hindsight as a history lesson.

Strategy at the Leading Edge: New Cooperative Technologies

Strategy is itself a function of the technologically expanded human capacity to think and act together. It makes sense, then, that the leading edge of strategy is found at the leading edge of cooperative tools and techniques—that deliberate use of these technologies can enhance our deliberate plans for working and living together more effectively.

But today's technologies of cooperation (and perhaps all tools throughout history) exist on the border between deliberate design and unpredictable emergence. Sometimes, the complex human–machine constructions are intentional. Often they are the emergent result of aggregating a large number of individual interactions. And occasionally they are both.

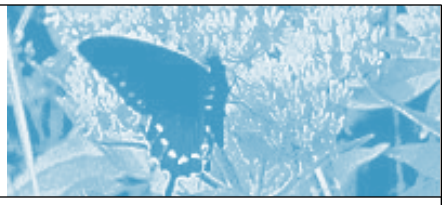
For example, Internet and WWW protocols were technical specifications deliberately designed to decentralize innovation, but eBay and other virtual communities were emergent social phenomena that grew out of the technological network enabled by those protocols. The architectural freedom was built into the Internet because the protocol designers suspected people would think of uses that they couldn't imagine for an interconnected web of computers. A physicist in Switzerland created the Web by giving it away to a few friends; a few years later, that invention enabled students to start Yahoo! and Google on their college computers; these platforms, in turn, enabled the creation of complex online marketplaces for goods and services.

Cooperative strategy thus has two faces:

- One seeks to apply the new tools to situations in which we believe increased cooperation will produce better outcomes—for example, to resolve a social dilemma or simply to increase the effectiveness of teams.
- The other seeks to understand the tools as templates for new kinds of social organization and to anticipate the strategic environment these new societal forms will create—and the choices they will pose.

This report takes into account both perspectives as it explores eight clusters of cooperative technologies that are emerging at this still very-early stage of the digital revolution.

A Strategic Map of Cooperative Technologies



In an earlier report, *Toward a New Literacy of Cooperation in Business* (SR-851 A), we identified seven dimensions of cooperative strategy, along which we can slide a metaphorical lever to increase or decrease cooperative behavior in all kinds of systems, from teams to entire societies. These are:

- **Structure:** From static to dynamic
- **Rules:** From external to internal
- **Resources:** From private to public
- **Thresholds:** From high to low
- **Feedback:** From local to systemic
- **Memory:** From ephemeral to persistent
- **Identity:** From individual to group

In this report, we want to look at how these tuning levers work in eight clusters of cooperative technology:

- **Self-organizing mesh networks** that create societies of cognitively cooperating devices
- **Community computing grids** that support emergent swarms of supercomputing power
- **Peer production networks** that build a constantly expanding commons for innovation
- **Social mobile networks** that foster the collective action of "smart mobs"
- **Group-forming networks** that integrate social and technical networks
- **Social software** that enables the management of personal social webs
- **Social accounting systems** that serve as trust-building mechanisms
- **Knowledge collectives** that extend the nature and reach of knowledge economies

By applying each of the levers to each of the eight technology clusters, we can begin to build a map of the options for cooperative strategy that are emerging as part of the digital revolution. This map includes several features:

- A list of early technologies that are part of each cluster (some of which belong to more than one cluster)
- A characteristic shift that each technology cluster produces for a particular strategic lever (for example, in self-organizing mesh networks, identity tends to shift from "user vs. provider" to "user as provider"); these shifts can be used both to understand the tendency of the technology and the strategic intervention the technology can aid
- A range of key concepts and phenomena that define the intersection of strategic levers and technology clusters

Please note that this map represents an early interpretation of the literature of cooperation and the evolution of technology. Think of it as version 1.0 of the strategy map for technologies of cooperation.

HOW TO USE THIS MAP

The map of cooperation-amplifying technologies is intended to be a thinking tool rather than a comprehensive inventory of technologies.

The map is designed to be used as a vehicle for thinking about the opportunities they enable by stimulating cooperation in organizations or systems.

The tuning levers presented in the left-hand column work in each of the technology clusters in different ways, creating shifts in the relationship to technology, the nature of information or social interactions or other dynamics.

Other concepts and phenomenon are listed at intersections of levers and clusters to indicate new kinds of behavior or issues that emerge.

Here we list some simple activities and processes that leverage the map and can help you engage with your colleagues about how technologies of cooperation increase cooperative activity in your enterprise.

1 | Pick a strategic issue, imperative, or challenge confronting your organization.

- Identify which shifts on the map enable new approaches to this problem? How does the shift enable a new approach? Does it enable new flows of information? Does it create opportunities for new kinds of relationships or change the incentives or perceived threats of acting in a certain way?
- What technologies support the shift? What is the strategic intervention you can make with any of the technologies listed on the map?

2 | Identify key concepts on the map (such as swarm intelligence, geo-coded places, or mutual monitoring). What would they look like in your organization, market, or industry? How would they transform interactions, relationships, and the ways that resources are valued and accounted for?

3 | Divide into small groups and assign a tuning lever (a row) to each. How does moving this lever from one end of the continuum to the other present new opportunities? For example, how does static or dynamic structure shape the possibilities for cooperation? How does this play out across the different technology clusters? What would the impacts be in your organization, market, or industry?

4 | Do a similar small-group exercise using the technology clusters presented in the columns. Do the technology clusters leverage a particular lever most effectively for your organization? How does it help to move the lever and what impact does it have on enabling cooperative strategy?

TECHNOLOGIES OF COOPERATION

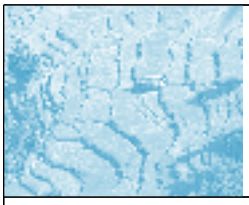
	SELF-ORGANIZING MESH NETWORKS	COMMUNITY COMPUTING GRIDS	PEER PRODUCTION NETWORKS	SOCIAL MOBILE COMPUTING	GROUP-FORMING NETWORKS	SOCIAL SOFTWARE	SOCIAL ACCOUNTING	KNOWLEDGE COLLECTIVES
	DUST NETWORKS MESH RADIO The Free Network Project XML SELF-ORGANIZING SENSOR NETWORKS SMART ROUTERS SOFTWARE RADIO COMPUTER VIRUSES PEER-TO-PEER NETWORKS	SWARM COMPUTING FoldingAthome distributed computing UNITED DEVICES APPLETS COMPUTATION NATIONS SMART CLIENT–SERVER SOFTWARE UBIQUITOUS MIPS	CREATIVE COMMONS LINUX The Apache Software Foundation http://www.apache.org/ GNU: GENERAL PUBLIC LICENSE OPEN STANDARDS OPEN CODE	MOBILE PHONES LOCATION-SENSING DEVICES HANDHELD COMPUTING DEVICES GEOCODED HYPERMEDIA SMS COMMUNICATING SENSORS BROADBAND WIRELESS WEARABLES RFID	CHAT BUDDY LISTS DIGITAL COLLECTIBLES GAMES LISTSERVS MESSAGE BOARDS ebay MASSIVELY MULTIPLAYER ONLINE GAMES AUCTION MARKETS	SOCIAL-NETWORK SOFTWARE INSTANT MESSAGING Meetup PERSONAL MEDIA FRIEND-OF-A-FRIEND (FOAF) NETWORK METAMEDIA BLOGS BUDDY LISTS	AUTOMATED REFERRAL SYSTEMS Epinions.com COLLABORATIVE-FILTERING SYSTEMS RATING SYSTEMS FEEDBACK-CONTINGENT FEE SYSTEMS	SOCIAL BOOKMARKING WIKIS del.icio.us GROUP-VISUALIZATION TOOLS RSS LIST-CREATION TOOLS flickr BETA ONLINE KNOWLEDGE MARKETS BLOGS SHARED ONLINE WORKSPACES
STRUCTURE	**From centrally planned relays to self-creating relays**	**From central, dedicated processor to distributed, ad hoc processing**	**From scheduled proprietary projects to continuously evolving small-scale components**	**From random crowds to self-organizing info-driven crowds**	**From one-to-one or one-to-many networks to facilitated subgroups within a network**	**From limited informal networks to facilitated scale-free networks**	**From branded transactions to rated interactions**	**From proprietary IP management to collective IP maintenance**
Technologies of cooperation emphasize distributed processes, emergent relationships, networks that build from the edges, and small components that can aggregate in flexible ways to form large-scale or scale-free systems.	FREQUENCY PULLING • Rhythm + communication = synchronous behavior THE ORDER PARAMETER *Groups tend to synchronize at an average cycle rate, flanked by two smaller groups with slower and faster cycle rates*	PEER-TO-PEER ARCHITECTURES • Memory • Processing • Communications	MODULARITY • Many distributed players • Many small parts • Short timeframes SCALES OF INFINITY • Infinitely large pools of people (or devices) • Infinitely small tasks • "People do it because they can"—*Benkler*	SMART MOBS • People + • Devices + • Information + • Places and spaces GEOSPATIAL FOCAL POINTS • A merger of physical and digital space • From boundaries to focal points SMALL-WORLD NETWORKS • Clustered groups connected by a few long links reduce the degrees of separation in a network	SCALE-FREE NETWORKS • A few well-connected nodes + many poorly connected nodes POWER LAW	INFOMATED MARKETS • Low cost to get information • Low cost to provide information • Multiple sources of information • Multiple paths to sources	EMERGENT KNOWLEDGE STRUCTURES • Enhance proximity • Manage quality • Encompass diversity • Clearly define roles and relationships • Fill roles and relationships flexibly
RULES	**From legitimate use of spectrum to distributed permissions to connect**	**From exclusionary rules to voluntary practices**	**From contractual obligations to technical rationality**	**From broad social norms to situation-specific instructions and guidelines**	**From rational neutrality to codes of "likeness"**	**From informal social conventions to technically managed procedures**	**From legal sanctions to social transparency**	**From gatekeeping to content update and repair**
Technical rationality and economies of time and effort tend to take the place of moral precepts in the rules of cooperative technology systems—with visible mechanisms for monitoring.	ARTIFICIAL LIFE Programming rules based on social behaviors: • Flocks of birds • Beehives • Anthills MUTUAL SECURITY • Mutual assistance improves individual security	CODE INTEGRITY • Parts of code may be proprietary to prevent reverse engineering and contamination of results ISSUE: Who has the right to volunteer the resource?	FAQs AS RULE SETS • Ownership customs • Cultural procedures • Technical operations "LET THE CODE DECIDE" SUCCESSIVE APPROXIMATIONS • To time • To place • To task AD HOC CULTURES • Task-specific instructions • Simple ways to recognize members • How-to behaviors • Rapid sharing of adaptations	THE RULE OF DIVERSITY • More extreme groups • More extreme rules of engagement within groups • Multiple personal codes of behavior DOMAINS OF COOPERATION • Cooperate locally, compete globally vs. • Compete locally, cooperate globally	SOCIAL NETWORK DESIGN • Sign-up procedures • Mediated access • Statistical referrals • Emergent linking PRIVACY VS. TRANSPARENCY • Transparency shifts emphasis from punishment to prevention	MUTUAL MONITORING • Doing one's own work requires checking another's work • Ease of repairing and updating the commons Ask Me Help Desk
RESOURCES	**From limited bandwidth to self-generating bandwidth**	**From individually untapped processing cycles to economical aggregate cycles**	**From individually untapped time to aggregate productivity**	**From scattered political and economic power to collective power**	**From value of content or transactions to value of the joint resource construction**	**From untapped personal relationships to personal capital**	**From advertising dollars to trusted ratings**	**From scarce knowledge to knowledge as a common-pool resource**
Technologies of cooperation create opportunities for new relationships with property that go beyond public versus private; these relationships create new ways to generate both public and private wealth and suggest principles for protecting and growing common-pool resources.	INCREASING RETURNS • Users share the burden of the infrastructure • Resource grows as users grow BANDWIDTH	CORNUCOPIA OF THE COMMONS • Lower costs • New models of philanthropy • New social solutions MIPS	DISTRIBUTED QUALITY • Work gets organized to get good results TIME SMART MARKETPLACE Markets signal more than simple prices with: • Transaction technologies • Location technologies • Reputation technologies POWER INDIVIDUAL ACTIONS ➡ LARGE PUBLIC RESOUCES		ALTERNATIVE PROPERTY REGIMES Focus on: • Public goods • Common-pool resources CONNECTIVITY	NETWORKS OF INFLUENCE • Alternate models of advertising—for example, bloggers select ads, create ad memes SOCIAL CAPITAL	TRUST MARKETS Trust increases the value of a market: Higher ratings = higher prices paid BUT CAUTION: Markets can always be gamed TRUST	COMMON-POOL RESOURCES • Clear boundaries • Rules match needs and participants can change the rules • Graduated sanctions • Low-cost conflict resolution KNOWLEDGE
THRESHOLDS	**From low thresholds for costly disruptions to high thresholds for easy-to-repair disruptions**	**From high thresholds for dedicated capacity to low thresholds for ad hoc capacity**	**From high thresholds for structured problem solving to low thresholds for emergent problem solving**	**From affective thresholds to informational thresholds**	**From linear thresholds to exponential thresholds**	**From segmentation thresholds to degrees of separation**	**From regulated risk thresholds to context-specific risk thresholds**	**From high thresholds for contributing to low thresholds for repairing damage to known stores**
Thresholds signal a significant change of behavior—a kind of phase shift—and cooperative technologies have the potential to redefine key thresholds for group participation, value creation, problem solving, meaning making, and security in a group or community.	COST TO DISRUPT (high / low) × COST TO REPAIR (high / low) EMERGENT SYNC Synchronization creates emergent phenomena: • Communications traffic jams? • Smart mobs? • Other?	ENSEMBLE FORECASTING • Multiple models • Multiple data sets • Multiple simultaneous runs *"Many eyeballs make all bugs shallow"* ThinkCycle	UNINTENDED COLLECTIVE ACTION What are the information thresholds that separate blind mobs from smart mobs: • In the street? • In the marketplace? • In the political arena? • On the battlfield	MANY-TO-MANY COMMUNICATION Network communities: • 1-to-many grow at 1^N • 1-to-1 grow at N^2 • Many-to-many grow at 2^N REED'S LAW	DEGREES OF SEPARATION • Gaming degrees of separation: Six Degrees of Kevin Bacon	VALUE (low / high) × CERTAINTY (high / low): market price; regulation; rating system; collaborative filtering ADAPTIVE RISK MANAGEMENT SIGNAL-TO-NOISE RATIO • Aggregate statistical referral systems ease search, provide measure of quality	SOFT SECURITY • Anyone can change anything • Everyone is responsible for accuracy • Everything is archived • Updating and repairing are easy
FEEDBACK	**From centrally monitored traffic to locally responsive nodes**	**From peer-reviewed publishing to real-time iterative problem solving**	**From monetary feedback to community recognition and use as feedback**	**From time-delayed remote feedback to instant local feedback**	**From mass trends to fragmented affinities**	**From breadth of influence to depth of influence**	**From post hoc legal proceedings to a priori aggregate ratings**	**From centrally maintained indexes to distributed, real-time filters**
New forms of feedback emerge from cooperative technologies; these forms can influence both cooperative behavior and resolve social dilemmas, providing both rewards and sanctions in ways that might have been inefficient or impossible in the past.	SWARM INTELLIGENCE • Signal strength • Fading signals • Alternate routes MIRRORS & THERMOSTATS • Local feedback produces stable large-scale systems	COMPETITIVE COOPERATION • Teams of donors • Deadlines • Real-time donor statistics • Real-time problem-solving statistics RAPID ITERATION	USERS AS REVIEWERS • Testing cycles • Bug reports RATIONAL RITUALS	QUORUM SENSING Crowds acquire tools for sensing: • Size thresholds • Proximity thresholds • Information thresholds • Reputation thresholds	PRESENCE MANAGEMENT • Media choice • Buddy preferences • Multiple avatars GROUP PROFILING Alternatives to traditional segmentation: • Context • Social networks • Experience • Swarms	SOCIAL METADATA • Social network graphs • Hit counting on personal Web sites • Blog statistics • Trackbacks	THE SHADOW OF THE FUTURE Extending the "shadow of the future" enhances cooperation—aggregate rating and reputation systems make each interaction count *Imagination … that has private, shared, and public spaces*	AD HOC TAXONOMIES Who else is thinking about what I'm thinking about? • Collaborative keywords • Shared note spaces
MEMORY	**From proprietary system performance histories to publicly aggregated node histories**	**From proprietary process notes to public progress records**	**From official documentation to communities of advice**	**From cultural memory embedded in ritual to local memory embedded in place**	**From curated cultural repositories to jointly maintained environments**	**From static personal archives to self-generating social archives**	**From historical highlights to aggregate reputations**	**From archive as back-up to archive as self-healing system**
The combination of automated record keeping, linking, statistical analysis, and visual modeling embedded in many technologies of cooperation changes the ways that groups and communities can remember past actions of its members, changing their cooperative behavior in the present.	NETWORK AS MEMORY • The network is the representation of the history of its members	FoldingAthome distributed computing WORK CREDITS Records of: • Hours or cycles donated • Code donated • What others build on	DISTRIBUTED HELP DESK List serves: • Multiple advisors • Multiple solutions	GEOCODED PLACES Geocoded data enhances— • Places as signals to act • Places as symbols of behavior • Places as records of group intelligence	COMMUNITY MEDIA Media exchange standards • Royalty-free media communities • Media blogs • New IP protection arrangements *Creative Commons offers alternative ways to protect, share, and re-use IP* creative commons	NETWORK AS SOCIAL RECORD Social networks diagram: • Personal capital • Organizational capital • Influence and obligations STUDIED TRUST • High trust ➡ cooperation • Low trust ➡ monitoring	VISIBLE HISTORY The public record is: • Persistent • Broad-based • Scaled • Continuously updated • Collectively created AUTOMATED ARCHIVING Complete records • Version restoration • Change detection *Wikipedia offers one-click version restoration to correct abuse and errors* WIKIPEDIA	
IDENTITY	**From "user vs. provider" to "user as provider"**	**From dedicated professionals to "part-of-the-solution" nodes**	**From contracted employee to resource contributor**	**From "lost in the crowd" to "empowered by the crowd"**	**From a single coherent identity to multiple group-specific identities**	**From demographic profiles to personal brands**	**From a resume to a rating icon**	**From juried contributor to jury member**
Cooperative behavior depends on how much individuals associate their identity with various groups and their participation in those groups. Technologies of cooperation change the opportunities for defining both individual and group identity.	GROUP-ALIGNED SELF INTEREST • Users are incented to protect the resource • No distinction between using and depleting the resource	VALUED NODE STATUS • Personal contribution • Personal connectedness • Personal reward and recognitions SYMBIOTE • Problems + passions + politics • Opportunistic communities	GROUP STATUS • Individual credit is a motivator for participation • "Forking" diminishes reputation	AD HOC, SHORT-TERM GROUP IDENTITIES • Mix-and-match values and beliefs • Fragmentation of long-term affiliations CHALLENGE: Sustainable group identities	CITIZENS OF AFFINITY People define their citizenship rights and responsibilities in relation to affinity groups more than nation states Citizenship rights: • To belong • To define membership • To multiple affinities • To doctrinal education • To choice	NETWORKING IQ • Group participation • Referral behavior • Online lifestyle • Personal mobile connectivity • Locative activity PERSONAL PROFILES • Blog reputations • Technorati stats • Personal media • Full-life archives	IDENTITY MANAGEMENT • Identity iterates with external ratings • Identity is statistically computed • Identity risks are locally high	INTERCHANGEABLE IDENTITIES • User/producer • Reader/author • Player/designer • Buyer/seller

The Technologies of Cooperation: From Examples to Strategic Opportunities

Today's technologies of cooperation are practical tools for organizing people and solving problems that face us right now. But they are also harbingers of new forms of social and economic organization—forms that may help resolve some of the complex social dilemmas that confront the world. So each example of a cooperative technology is also a model for thinking about future social forms as well as future tools; each example embodies principles that can help us think more strategically about cooperation.

We examine eight categories of cooperative technologies—calling out key examples and identifying the distinctive contribution they offer to shaping innovative cooperative strategies. We also identify strategic questions related to how technologies of cooperation specifically can enable cooperative practices and relationships with employees, customers, and value-web partners in support of new forms of wealth creation.

Like any taxonomy, our eight categories are necessarily a bit arbitrary, and the boundaries between categories are sometimes blurry. And as tools evolve, the categories may shift in the future. In fact, as the "cooperation commons" grows and we apply some of these very tools to our analysis, we expect a much more robust "folksonomy" of cooperative technologies to emerge. For now, however, this analysis provides a way to think systematically about the tools and their strategic implications.



1 SELF-ORGANIZING MESH NETWORKS: SOCIETIES OF COGNITIVELY COOPERATING DEVICES

EXAMPLES

Cognitive radios combine the ability of the computer to perform very fast operations with the capabilities of digital signal processing that makes it easier to extract signals from noise—using built-in software that is smart enough to configure the signal to overcome any obstacles and taking advantage of locally available spectrum by adjusting power, frequency, and modulation. They were developed initially for use in emergency and battlefield situations.

Mesh radios act as their own communication routers, sending around packets of data for other radios in the network. The technology has been used to provide broadband wireless access to private LANs, the Internet, and video programming.

What They Are

Self-organizing mesh networks are constellations of devices that can serve as both transceivers and relays or routers, with built-in intelligence to recognize compatible devices and configure themselves as nodes in the network. They thus eliminate the need for any centrally controlled backbone network. Their self-organizing properties may be encoded in either hardware or software.

Contribution to Cooperative Strategy

Self-organizing mesh networks define architectural principles for building both tools and processes that grow from the edges without obvious limits. They distribute the burden of maintaining the infrastructure among all participants in the network, and the capacity of the network as a resource grows—rather than shrinks—with each additional participant. In essence, they form societies of intelligently cooperating devices, as MIT's David Reed has pointed out. If better ways of using resources remain to be discovered, the architectural principles of mesh networks might furnish an important hint.

Strategic Questions

A key theme related to self-organizing mesh networks is the idea of shifting from a resource context of decreasing returns to increasing returns. In this technology cluster, users are the infrastructure. Furthermore, users or nodes in the network are aware of their neighbors and surroundings and are social, leading to a more responsive and flexible network of resources. This is a social as well as technical process, hence the notion of societies of cognitively cooperating devices.

How can the principles of self-organizing mesh networks, especially "increasing" returns and "user as provider," be applied to business organizations?

Employees

Intellectual, human capital is perhaps the most important resource for knowledge organizations. However, current organizational and management structures, and even ITC systems seem to be set up to frame these resources as scarce and rivalrous. As they are used, the stock is depleted rather than multiplied. How can this be flipped around?

How can users of corporate knowledge and talent also provide the infrastructure for more knowledge and talent? Social software could provide one solution (see Social Software on page 22) by helping to make individual intellectual activities more public and thus accessible in flow for others to use.

How can the organization of workers into teams, task forces, departments, and workgroups also include more fluid forms of self-organizing synchronous behavior? What are the key pieces of intelligence or knowledge that individual employees would need to know, or be able to process, to be able to more effectively self organize and quickly get into sync around key issues, challenges, and crises?

Customers

How can your products and services help your customers contribute back resources for other customers or employees to use? How can locally responsive nodes of customers provide feedback about products and services in a more efficient and effective way? Can customers act as responsive nodes to pass on useful customer service themselves, such as user support or testimonials of quality and reliability? The more these customer nodes are tapped the greater the customer knowledge base will grow, as well as the source of new customer nodes.

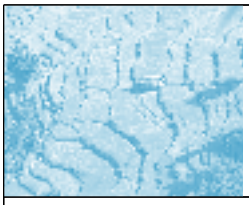
Value-Web Partners

Members of value webs, or supply chains, tend to encounter each other in linear processes. In between interactions they tend to remain isolated. How can self-creating relays among value-web partners create new flows of resources (e.g., knowledge, labor, technology) for your organization? How can a more distributed structure of relays and routing of information and relationships create a new resource platform among members of your value web or supply network? What players are missing from this web or network to provide a more robust resource infrastructure?

EXAMPLES (cont.)

Mesh sensor networks are communicating sensors that likewise serve as routers for other sensors in the network, relaying the sensor readings throughout the network and eventually to some other type of network where the data can be put to use. (e.g., Dust's SmartMesh motes)

P2P file exchanges apply this principle to a more socially defined practice—participants allow portions of their computers to be used as temporary repositories for files that any anyone in the network can access. They may also be required as part of the social protocol to contribute some of their own files to the commons.



2 COMMUNITY COMPUTING GRIDS: SWARMS OF SUPERCOMPUTING POWER

EXAMPLES

Rational drug design uses the collective power of community computing grids to tackle large computational problems associated with designing and developing synthetic drugs. Projects such as Folderol (http://www.folderol.com) and Folding@home (http://www.folding@home.org) use human genome data and volunteers to conduct medically-crucial protein-folding computations.

Peer-to-peer analysis collectives harness shared processing for solving complex analytical problems. Evolution@home (http://www.evolutionary-research.org) searches for genetic causes for extinction of species. Distributed.net (http://www.distributed.net) solves cryptographic challenges. SaferMarkets (http://www.safermarkets.org) seeks to understand the causes of stock market volatility.

What They Are

Community computing grids are computation networks created by volunteers who share excess CPU cycles from their own personal computers to aggregate massive processing power to solve computation-intensive problems. Each personal computer processes a tiny fragment of a huge problem, creating collective supercomputer capabilities that measure in teraflops.

Contribution to Cooperative Strategy

A community computing grid is a strategy for amassing computing power from resources that would otherwise be wasted and creating levels of computation and analysis not easily or quickly available. Such computing structures depend on their social networks of participation in creating a common resource and sacrificing immediate individual costs or resources for the provision of a public good.

Strategic Questions

Community computing grids suggest that new resources can be created by developing appropriate aggregation mechanisms and by lowering the barriers to contribute small, undervalued, or unused resources. Contributors to community computing grids contribute because they desire to participate in the creation of a public good and the cost of contributing is low enough to not require much in exchange.

Employees

How can mundane daily practices of knowledge workers be aggregated and converted into shared commons resources in your organization? What specific information or knowledge practices do employees engage in that could be directed toward creating useful specialized knowledge commons for the good of many? Social software such as blogging, social bookmarking, and tagging are some of the early tools that help accomplish this. As individuals develop their own knowledge base, they create bits of knowledge that get contributed to a larger pool.

Are there other underutilized resources that could be made visible and harnessed through peer to peer structures to create a cornucopia of the commons for employees? Are there discrete activities of senior, or junior, staff that could be contributed to a common pool, that when added up, create training and mentoring opportunities? Are there data

sets that could be shared and aggregated that when combined form a larger knowledge base?

How can your organization aggregate the power of many desktops to do larger and more complex tasks? How would providing supercomputing power at an individual level create new resources for individual employees, teams, and work groups? What kinds of complex problems might they be able to tackle with this new resource?

Customers

There are increasingly many touch points with customers in which valuable information may be unused or unaccounted for. How can such points of contact contribute into a larger database of customer information to develop new approaches for customer service, customer problem solving, or new product or service ideas? As individual pieces they may not seem valuable, but in the aggregate they could be the source of new ideas and innovations.

How can customers themselves contribute small, but potentially valuable, information connections, or resources that can combine to form a shared resource for other customers? How can customers be rewarded for acting as valuable contributors?

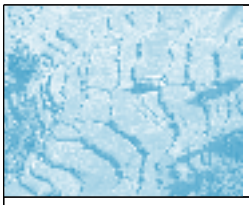
Value-Web Partners

Attracting contributions by value-web partners is a way to develop a stronger sense of affiliation with the web that could become activated in the future for specific projects or needs. It also will help make the value web a more competitive organization in and of itself. By making contributions public, web partners who are valuable nodes will gain status and become more recognizable and attractive as partners, gaining their loyalty to the web.

How can value-web partners be enlisted to donate time, social network resources, information, or even tangible resources, such as data or analytical processes, to provide new resources for the entire value web that would otherwise not be available?

EXAMPLES (cont.)

Ensemble forecasting uses "fuzzy prediction" based on multiple models rather than a single "best guess" forecast. For example, climate change forecasts use hundreds of thousands of state-of-the-art climate models, each with slightly different physics, to represent uncertainties. Distributed processing is a practical strategy for this kind of forecasting.



3 PEER PRODUCTION NETWORKS: BEYOND THE FIRM AND THE MARKET

EXAMPLES

Open-source software networks use commons-based peer-to-peer production methods to create many kinds of software, including operating systems like Unix and Linux, and Web server software such as Apache (which currently enjoys over 60% market share). Open-source software is owned by nobody but produced by various volunteer coders who contribute to larger software objectives by solving small coding tasks.

Open-source research and design networks share their knowledge, IP, and creative innovation to solve large, complex problems. Peer-to-peer networks such as ThinkCycle (from the MIT Media Lab) leverage the collective design expertise, or "think cycles" of many to solve global design problems for developing countries. A recent project designed a compact medical kit to instruct medical teams (including many illiterate trainees) in the use of IV drip-set equipment.

What They Are

Peer-to-peer production networks are ad hoc, emergent networks of actors who participate cooperatively in the creation of a common good or resource without hierarchical control. They are structured around the interconnectedness of nodes rather than on a server–client model. Motivation to participate in peer networks includes diverse drivers and social signals rather than market price and command structures.

Contribution to Cooperative Strategy

Peer production networks aggregate many small, distributed resources to create a larger resource pool, solve problems, and produce goods that no single individual could otherwise. They provide an alternative structure for production and value creation beyond the firm and the market. Peer network principles form the structural basis of many new experiments in bottom–up social and economic models of exchange. Linux and other open-source software are produced by ad-hoc networks of individual programmers, linked by the Internet, a form of organizing for production that Yochai Benkler (in his paper, "Coase's Penguin, or Linux and the Nature of the Firm") proposes as a third alternative to the classic institutions of the firm and the market. Peer-to-peer production networks provide new insight into organizational structures that leverage aspects of hierarchy and network, creating new heterarchical structures of production.

Strategic Questions

A key mechanism in peer-to-peer production networks is the ability of network members to self-select themselves to tasks that need to be completed. Rather than assigning work to members of a team or work group, peer-to-peer production networks organize around goals and directions that have been established by some leadership process (which can vary across peer-to-peer networks). Network members then identify which tasks they want to do depending on their expertise and passion. This process lowers organizational and coordination costs and leverages the motivations of participating members. This dynamic could prove to be a powerful mechanism for re-structuring work in business organizations.

Employees

Tapping into employees' deep passions, expertise, and personal creativity is important for supporting innovations and new approaches to complex problems. The emergent nature of peer-to-peer organization and self-selection to tasks supports this imperative. What are some organizational production processes and value-creation processes that would lend themselves to self-organization and self-selection? What are the ways to allocate a certain portion of employees' time to problems and tasks that they find challenging and critical to the enterprise? Developing a continuum of tasks from the highly structured to highly self-organized could help prioritize work tasks and integrate them.

Customers

Peer-to-peer structures lend themselves well to developing distributed help desk services. Customer problems could be posted with members of the organization contributing bits of knowledge to help resolve them. This would allow customer service representatives to tap a larger community, perhaps even customers themselves. What are ways that customer problems and issues can be posted and addressed by self-organizing groups of employees? How can tacit knowledge of customer experiences be more effectively shared across the enterprise?

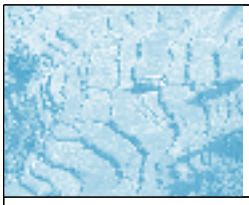
Community resources such as FAQs could be aggregated to help resolve common customer issues. Such a knowledge base would be helpful for assimilating and training new employees. Such knowledge resources may even be directly available to customers to provide self-help for those who are initiated. Using customers in peer-to-peer customer support processes is one way to strengthen relationships with customers, develop new insights from customers, and possibly lower costs of providing efficient customer service.

Value-Web Partners

Distributing large or complex problems over large numbers is one way to increase the efficiency of problem solving. A key to this is making problems modular. Are there ways to create modular tasks and problems (such as sourcing issues, financial models, or manufacturing processes) for distinct nodes in the value web to solve? How can the value creation process of an organization's web of suppliers, partners, designers, and other contributors be broken down to discrete modular units?

EXAMPLES (cont.)

Peer-to-peer media networks allow widespread sharing and creation of music, literature, and other digital art forms to perpetuate creative and cultural innovation rather than enclose it. A notable network is BitTorrent, in which downloaders swap portions of a file with one another instead of all downloading from a single server. This way, each new downloader not only uses up bandwidth but also contributes bandwidth back to the swarm.



4 SOCIAL MOBILE COMPUTING: SMART MOBS

EXAMPLES

Smart mobs have been one of the first pieces of evidence that social mobile computing is indeed in action, particularly those with political action as their purpose. Several examples from around the world demonstrate how mobile communications and social networks with a shared interest can catalyze effective political action. The "People Power II" smart mobs in Manila that overthrew the presidency of President Estrada in 2001 organized demonstrations by forwarding text messages via cell phones. Elections in Kenya and Spain have been similarly influenced. The Internet's capability of connecting people who share an interest, combined with the mobile telephone's ability to access resources from anywhere, helped elect a President in Korea, rocket U.S. Presidential candidate Howard Dean from obscurity to front-runner status, and organize demonstrations at the 1999 WTO meetings in Seattle.

What They Are

Social mobile computing represents the convergence of three trends: mobile communications and computing technologies, social networking applications and processes, and aware physical environments that are embedded with communicating sensors, RFID tags, and other devices. This convergence represents the emergence of aware, social environments that will serve as a new platform for human cooperative and collective activities.

Contribution to Cooperative Strategy

Social mobile computing combines the richness of social networks with the power of pervasive communications networking. By connecting the dots among people, places, and information, social mobile computing will enable people to act together in new ways and in situations where collective action was not possible before. We're only seeing the first-order ripple effects of mobile-phone behavior now. It is likely that these early instances of collective action are signs of a larger social and organizational upheaval in the fuure.

Strategic Questions

New technologies of cooperation are enabling social networks, information, computing, and place to link up. The prospect for catalyzing emergent social group formation around key needs, interests, or fun provides several opportunities for new learning environments, product and service support, and transaction environments.

Employees

We know from our research that social context supports effective learning. How then can employee learning leverage opportunities from social mobile computing? How can smart mobs of employees, linked by mobile computing, information, and social ties improve in-context learning and rapid response?

How can RFID and information embedded in the physical workplace by colleagues create social, enriched learning spaces that stimulate ongoing learning by employees? Are there location-based learning services that could support the specific needs of teams and departments? How can such embedded learning help employees work cross-culturally in other regions? Embedding knowledge in place could help employees discover knowledge pathways of other employees, creating a sort of same place, different time mentoring process.

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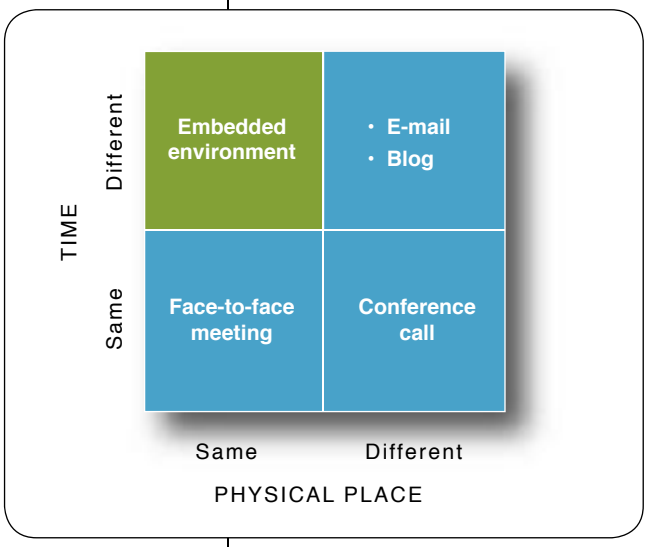
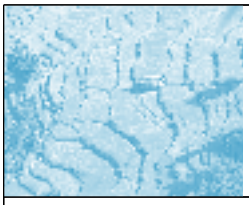


Source: Institute for the Future



4 SOCIAL MOBILE COMPUTING: SMART MOBS (CONT.)

EXAMPLES (cont.)

Mobile gaming is another manifestation of social mobile computing that is gaining ground in urban areas globally. In the summer of 2003, "flash mobs" broke out all over the world: groups of people used e-mail, Web sites, and mobile phones to self-organize urban performance art. Ad hoc groups of young gamers in Scandinavia and Singapore use cellular phones equipped with GPS functionality to play urban adventure games like *Bot Fighter, Street Fighter,* and urban superhero games. With communications embedded in physical objects and places, the city streets and familiar urban landmarks will become the game board for ad hoc groups of social gamers. Experiments in immersive gaming and alternate reality games such as *PacManhattan* and *Can You See Me Now* are early examples.

Customers

Customers and consumers rely on colleagues, friends, family, and professional/social network members for support in the marketplace. Are there ways to catalyze smart mobs among customers that create opportunities for disseminating marketing messages or even services more effectively?

Could social mobile computing become a distinguishing part of new services? What social networks would customers want access to while using particular products or services? How can these networks be mobilized along with use of products and services?

How can the retail locations and other points of service become "smart" by leveraging social networks and technologies such as location-sensing devices, RFID, broadband wireless, handheld computing devices, and wearables?

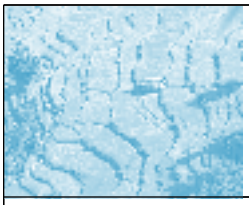
Value-Web Partners

One way to build and maintain value webs is to strengthen lateral ties and relationships among web members through information sharing, social activities, and shared interests. Smart mobs and social mobile computing could be used to help catalyze affinity groups within value webs and help reinforce lateral ties across the entire web.

Are there ways to use social mobile computing to facilitate new connections and ad hoc cultures within the value web? Participating in emergent social groups or smart mobs would provide value-web members an opportunity to get to know each other in a variety of contexts, deepening relationships across the web.

EXAMPLES (cont.)

Location-based services are on the horizon and will be one way to provide customized experiences, services, and environments for social networks. Mobile Internet services that are designed to suit in-place group experiences and individuals who have affinity for a group will further make the physical environment a personal and social space.



5 GROUP-FORMING NETWORKS: INTEGRATING THE SOCIAL AND THE TECHNICAL

EXAMPLES

Social transaction networks such as affinity groups of collectors and hobbyists on eBay reflect the ability of GFNs to create locally meaningful value. Other such networks include FreeCycle (http://www.freecycle.org), which connects people who share an interest in recycling goods and materials and reducing waste; Interra (http://www.interraproject.org/), a community development project that uses connective technologies to collectively direct a small percentage of daily merchant transactions to local organizations and nonprofits; and the Media Venture Collective (http://www.mediaventure.org/call.html), a collective philanthropic venture effort to fund citizens-based media.

What They Are

Group-forming networks (GFNs) represent the combination of human social networks and technical networks. GFNs are essential for understanding technologies of cooperation because they multiply the social and economic value from human–computer networks far more effectively and rapidly than other kinds of networks.

Contribution to Cooperative Strategy

A technical network, like a fax network, grows according to Metcalfe's Law at the rate of N^2 (n=nodes), but GFNs grow according to Reed's Law at the rate of 2^N). This rapid growth reflects how social networks, enabled by e-mail and other communications tools, drove the growth of the Internet beyond communities of engineers to include every kind of interest group. Reed's Law is the link between computer networks and social networks. Rapid group formation by affinity and shared interest increases the likelihood of cooperation by creating lateral links across the organizations among people who would not otherwise meet.

Strategic Questions

The formation of and identification with groups are key features that enable cooperative behaviors in organizations. GFNs expand rapidly because they integrate the networking effects of new connective technologies and the viral flow and peer-to-peer connections of social networks. Spotting opportunities for catalyzing GFNs can speed up diffusion processes (of messages, knowledge, support, standards, and so forth) and create greater opportunities for building group identity. Strong group identity is a key to developing and sustaining commons-based resources and collective action. Group formation will play a key role in the shape of organizations and industries in the new business landscape and in the evolution of work practices.

Employees

Rapid group formation will shape the way employees seek out learning opportunities, share their interests (personal and professional), and solve problems. What are the ways that organizational leadership and policy can facilitate the formation of groups? Networking technologies such as social software will be key, as will relaxing cross departmental, functional, and even organizational boundaries that constrain the socialization of employees.

One way that groups maintain their connectedness and identity is through communicating presence. Creating a sense of sharing presence (virtual as well as physical) facilitates spontaneous interactions, sharing contextual knowledge and insight, and a stronger sense of belonging and group affiliation. What are ways that new technologies and social norms at work can facilitate co-presence? Tools such as instant messaging, buddy lists, shared Web logs, or online wiki spaces are some of the ways that employees can be co-present.

Physical workspace design is critical for supporting group formation. How can workplaces, facilities design, and furniture catalyze and support the formation of groups? How can physical spaces use new technologies to provide home bases for distributed GFNs?

How can organizations re-think knowledge management, which requires setting up top–down structures and rules for access and use, into a more emergent process of knowledge sharing that is driven by social group dynamics?

Customers

Developing strategies and methods of profiling customer affinity groups may provide a new lens or segmentation model for addressing customer needs. How can GFNs help create a deeper understanding of the customer base, and even grow it? What are ways of identifying and supporting distinct customer groups who share specific needs, interests, ways of using a product or service. Are there strategies to facilitate the places and ways that these customers can find each other and form groups? How can you work with retailers and third parties to catalyze groups?

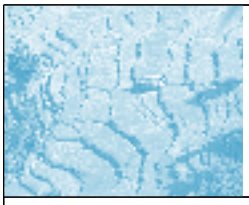
Value-Web Partners

GFNs are at the heart of knowledge networks like Wikipedia and social transactional communities like eBay and FreeCycle. How can they be used to stimulate an organization's value web?

By providing social and professional opportunities to gather (learning seminars, training, social engagements) long links will emerge and connect various subgroups, thereby strengthening the entire web. Affinity groups will be more likely to share expertise with the rest of the group and socially based transactions are more likely to emerge.

EXAMPLES (cont.)

Knowledge networks like the Wikipedia, group Web logs, and open-source peer communities leverage group-forming networks to create trusted communities of practice and production. (See Knowledge Collectives for more.)



6 SOCIAL SOFTWARE: THE MEASURE OF SOCIAL CAPITAL

EXAMPLES

Web logs—or blogs—are easy-to-update Web pages with the entries arranged in chronological order, with links and content that is either critical commentary about the links and/or opinion or diary confessions. Web logs can serve as peer-to-peer filters for the constant flow of information online: each blogger can be a maven who collects important links and passes along important news in a particular field.

Social networking software provides a way to quickly forge or find new social connections and contacts. Each social networking tool has its own procedures for how to join or link to another network or make new contacts. Examples include Friendster, Linked-In, Ryze, Tribe, and Flickr. Attempts to create a standard for decentralized, user-controlled social network sharing, such as friend-of-a-friend (FOAF) protocol, are another effort to integrate social networking software with other applications in a way that preserves individual control of personal information.

What They Are

Social software is a set of tools that enable group-forming networks (GFNs) to emerge quickly. It includes numerous media, utilities, and applications that empower individual efforts, link individuals together into larger aggregates, interconnect groups, provide metadata about network dynamics, flows, and traffic, allowing social networks to form, clump, become visible, and to be measured, tracked, and interconnected.

Contribution to Cooperative Strategy

Social software brings GFNs to life by helping to make them concrete social resources. It provides a rich connective online environment by providing various applications that allow affinity groups, hobbyists, professionals, and social cliques to find each other and connect. It also makes social network assets more visible and quantifiable by using network metadata. As social software converges with location-based technologies and embedded communications tools, it will help integrate social networks across digital and physical spaces.

Strategic Questions

Social software offers business organizations the possibility of creating more lateral connections across and beyond the organizations. This is critical for escaping the tyranny of the hierarchy in terms of constraining information flows, limiting personal and professional associations, and developing a more resilient network fabric to complement the hierarchy.

Employees

How can organizations implement social software tools to catalyze GFNs among employees that create trusted groups with shared interests. These groups could be the source of learning opportunities, information sharing, problem solving, and trust building.

Social software also allows individuals to develop personal platforms for creative expression—either personal or professional. How can organizations use Web logs, wikis, buddy lists, and personal media to allow employees to develop and communicate their individual brands to the organization? As knowledge work becomes more specialized, such social tools will be important for communicating skills and expertise. How can social software tools assist employees, managers, and leaders develop knowledge of "who knows who knows what" (rather than "who knows what")?

How can managers and leaders use networking IQ metrics to identify key social networkers in the organization who can act as important bridges across sub-groups? What are the ways HR departments can provide training in social networking and social capital development? What are key metrics to assess the value of social capital in your organization?

Customers

Social software has the potential to create greater connections with and among customers, developing trusted relationships and useful social capital. How can social software be used to develop broader and deeper relationships with customers? Can blogs and wikis provide diverse platforms for customers to exchange knowledge with each other and company representatives? What are the ways that these tools can be used for product and service feedback and improvement? Think of ways to support customer users as important co-designers and improvers of products and services.

What are ways of using social software to broaden and deepen spheres of influence? How can marketing messages and new advertising models emerge from the customer base and spread across customer networks? Imagine selecting ads from loyal customer Web logs and wikis and seeing them propagate across social networks.

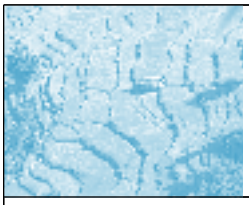
Value-Web Partners

Social software provides a shared record of social capital and reciprocal relationships. It creates a shadow of the future that can create assurance and reduce risk in exchanges. This is critical for developing trust and providing assurance for cooperation in the future. How can blogs, wikis, and other social software tools provide a visible, shared record of obligations, reciprocal interactions, and mutual concerns? Such forms of making social assets visible will help solidify members of the value web and provide possibilities for new ideas and cooperative efforts.

Social metadata can quantify how effectively the value web creates and shares value. What metrics related to value-web interactions, sharing, and communication would be useful to understand hidden and potential assets and wealth in the value web?

EXAMPLES (cont.)

Mobile presence tools transfer online presence media such as instant messaging buddy lists to the realm of mobile devices; they move social networking systems into a dimension of right here and right now: whom do we know nearby, and which of the people nearby would we want to know?



7 SOCIAL ACCOUNTING SYSTEMS: MECHANISMS FOR BUILDING TRUST

EXAMPLES

Transaction rating systems, epitomized by eBay, facilitate billions of dollars' worth of transactions between people who don't know each other and who live in different parts of the world.

Rated reviews, such as *Epinions*, create "webs of trust" as readers rate both reviewers (and other raters) and reviewers get paid on the basis of their reviews.

Self-evaluating online forums, such as Slashdot and Plastic, enable participants to rate the postings of other participants in discussions; the best content rises in prominence and inferior postings sink.

Automated recommendation systems, such as Amazon's, aggregate customer choices to develop suggestions for products based on similar interests and tastes.

What They Are

Social accounting systems are mechanisms for building trust among strangers and reducing the risk of transactions. They include formal rating systems, automatic referral systems, and collaborative filtering to establish the reputation of individuals and organizations as well as products and knowledge.

Contribution to Cooperative Strategy

Reputation is the lubrication that makes cooperation among strangers possible. It's so important that some evolutionary psychologists see it as a possible explanation for the development of speech. Robin Dunbar, for example, points to gossip as a way to extend reputation beyond the small group; speech, then, is little more than a mechanism for gossip. Social accounting systems extend this capacity for gossip with digital technology. By establishing a "shadow of the future, " social accounting increases the level of trust and assurance that others in a system will cooperate.

Strategic Questions

Social accounting (keeping track of who contributed what to whom) allows individuals to keep track of exchange obligations and reciprocal relationships in more effective and efficient ways than by memory and paper. New technologies of cooperation enable social accounting to become more codified, visible, and quantified. Furthermore, the new tools and applications move social accounting from an individual's head to a shared, dynamic repository.

Employees

Social accounting systems offer new possibilities for making rating and evaluating exchanges of knowledge and other resources among employees. How can social accounting systems increase the level and quality of cooperative knowledge building among employees? Rating systems can help evaluate knowledge contributions allowing quality to rise to the top. Referral systems and collaborative filtering can help direct employees to useful content, people, and knowledge within the organization by sharing what other employees in similar context have found useful.

How can employee contributions to common-pool resources be tracked and accumulated to earn them reputation and status? What new reward systems could leverage the credits or points that employees earn from their contributions?

Social accounting technologies also provide useful metrics that communicate individual reputation status among a community. How can these metrics identify hidden or undervalued employees whose contributions could be more recognized, rewarded, and visible? This could help identify key knowledge nodes that merit increased support from the organization. How could social accounting systems be integrated into performance evaluations in which bosses, peers, and subordinates are evaluated more broadly? Already several universities have such systems in which students rate professors. Ratings have become an additional factor in students' selection of classes.

Customers

Trust increases the value of a market for customers. How can social accounting tools help customers develop more trust in the organization and its products and services? What kinds of metrics can your organization make public and visible? What is the next generation of Epinions feedback systems, for example, or eBay's rating system? Can customer service representatives be evaluated by customers and that information be made public? What are all the points of contact with the business organization that could be evaluated? How can this improve service and develop more loyalty among customers?

Value-Web Partners

Social accounting is one way to make value web members more accountable to each other because past interactions are evaluated and made public. By providing measures of accountability, social accounting can help reduce risks involved in interactions in the value web. How can social accounting rating, referral, and filtering systems help reduce risk and increase accountability among value web partners? Are there key interactions among distinct web partners that could be evaluated by peers in the value web? How can web partners evaluate each other, and provide mutual monitoring, in a way to improve performance and accountability? How can these metrics encourage more cooperative interactions across value web partners, such as suppliers with designers, with other professional partners?

EXAMPLES (cont.)

Implicit recommendation systems use statistical analyses to provide "best fit"—for example, Google's search engine lists first those Web sites with the most links pointing to them.

8 KNOWLEDGE COLLECTIVES: ONLINE KNOWLEDGE ECONOMIES

EXAMPLES

Wikis are easy-to-edit group web pages. They enable groups to create large, self-correcting knowledge repositories like Wikipedia, and online encyclopedia. In Wikipedia, anyone can edit any article; a complete archive of previous versions makes it easy to restore old versions, so it's easy to repair errors and vandalism.

Social bookmarking allows people to share their Web bookmarks with others. Pioneered by del.icio.us, the software creates shared lists of bookmarks, grouped by keywords that users create—called "folksonomies" to distinguish them from more formal taxonomies.

Gaming communities are online communities that swarm to solve immersive games or puzzles, using online tools to win prizes. Collective Detective and Cloudmakers are examples.

What They Are

Knowledge collectives are emergent online communities, structures, and processes for "information hunting and gathering." They extend the capabilities of online communities to support collective knowledge gathering, sharing, and evaluation. They are notable for their scale and their ability to create ad hoc distributed knowledge enterprises.

Contribution to Cooperative Strategy

Knowledge collectives offer an alternative way to organize a knowledge economy. Rather than treating knowledge as private intellectual property, they treat it as a common-pool resource, with mechanisms for mutual monitoring, quality assurance, and protection against vandalism and over-consumption. Using some of the same tools as social accounting, they fundamentally transform knowledge sharing by drastically lowering the transaction costs of matching questions and answers. They draw on informal social processes to build collective knowledge and know-how. They use mechanisms to lower the costs of contribution by building on simple tasks that meet individual needs, but add to the collective knowledge base.

Strategic Questions

Catalyzing knowledge collectives is a way for organizations to make buried, siloed, or remote knowledge more accessible to a wide range of people in the organization.

Employees

Corporate knowledge tends to be segregated by function, department, or business unit. Collective-knowledge tools help unearth this knowledge and allow individuals with diverse perspectives and needs to react to and build on it. How can tools such as social bookmarking, group visualization of data, wikis, and blogs help stimulate broader reflection over data and information? What kinds of collective publications can open up knowledge to the enterprise and stimulate innovation?

Sales forecasts, market penetration, and other important metrics could become more accurate and informed by harnessing broad, collective judgment. How can online knowledge markets and predictive markets be used to help focus the collective wisdom of employees on hard-to-solve problems, forecasts, and strategic decisions? How could such tools change strategic planning leaders and managers?

How can shared knowledge communities help to expand and grow important practice areas in your organization? Perhaps there are employees with knowledge that could be critical but it is unknown to peers and managers. More open sharing could stimulate the development of new individual, and ultimately organizational, competencies.

Customers

Customers are increasingly educated and sophisticated. Gaining their input and knowledge is important for customer retention and creating successful products and services. How can knowledge collectives like gaming communities help contribute to product and service innovations and improvements? How can they become interactive forums for extending your product or service? How can they be used to link to other complementary product or services you may offer that customers may not have considered? What are the possibilities for extending brands into online games?

Knowledge collective like the Microsoft UseNet community is an effective way of customers/users providing support and solutions to each other. How can collective-knowledge tools create more robust and responsive help desks, customer service, and support services?

Value-Web Partners

Value-added resellers, dealers, and retailers often have the best information about customers and end consumers. This information frequently never reaches manufacturers or service providers because there are few effective tools, processes, protocols, or rewards for sharing it. Social software and other types of shared online workspaces can provide these important value-web partners with a place to contribute their customer/end consumer information.

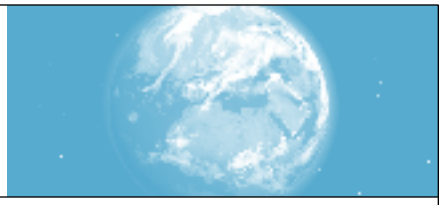
How can knowledge collectives be designed to make knowledge that third parties gather more accessible to the organization? What are the ways that this information can be aggregated to provide increased understanding of the customer for everyone in the value chain? If third parties perceive usefulness by sharing they will be more likely to contribute.

How can aggregated third-party information improve their revenue, reputation, and position in the value web and the market? How can you help your third-party organizations develop the use of knowledge collectives that will increase both their revenues and yours?

EXAMPLES (cont.)

Collective online publishing is a fusion of online conversations, online publishing, and online reputations systems form an alternative model for refereed publication. Slashdot and Kuro5hin are early examples Ohmynews, with 26,000 citizen-reporters, has been credited with tipping the Korean Presidential election.

Conclusions and Key Challenges



The diffusion of technologies of cooperation is setting an important foundation from which new cooperative business strategies, social forms, and sources of wealth creation will emerge. New possibilities for interacting with employees, customers, and value-web partners present business organizations with a new strategic landscape that will challenge current assumptions and traditional strategic practices. While this will create opportunities for reshaping business, industries, and markets there are several challenges and obstacles that will need to be addressed.

Defining the New Cooperative Business Narrative

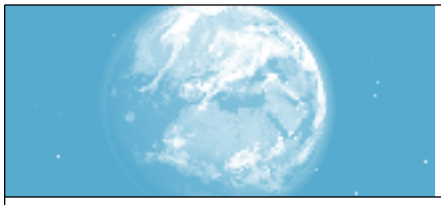
The narrative of *competition* is well known and internalized by everyone in business organizations. Overcoming the dominance of this narrative will be critical for effectively leveraging technologies that amplify *cooperative strategies* to create new social forms and models of wealth creation. Most business strategists, when asked about their strategic goals, respond that they want to be *competitive* rather than, say, grow their market share or improve their return on investment.

The notion of cooperation also connotes to many business professionals, trained at traditional business administration programs, altruistic giving without any regard for self-interest or effective, productive outcome of gifting. Volunteer contributions and participation that is rewarded in ways other than financial are not linked into a broader system of asset accrual, accounting, or value creation. Amazon is just one example of how converting a proprietary resource (its data files on product descriptions, prices, sales rankings customer service reviews, and more) to a common-pool resource could increase Amazon's assets. More than 65,000 Web innovators have used the files to develop new online interfaces, Web sites, and innovative services for thousands of independent sellers.

Perhaps the most important piece of the new narrative is that cooperative strategies do not imply the end of competitive ones. Both present a set of strategies that offer choices and behaviors that are relevant to particular times, conditions, and problems. A key to understanding when to cooperate and when to compete is to develop an understanding of the deep social dilemmas within your organization, industry, or market. How do the tensions of the one and the many compel players to act? And how can situations that are prisoner's dilemmas (when the optimum strategy is to compete and receive a suboptimum outcome) be turned into an assurance game (in which increased information among players creates the trust necessary for cooperation)?

Leadership—Reconciling Control and Empowerment

In 1995 IFTF forecasted that organizational structures would move toward those that optimize the potential for organizational control and the potential for individual freedom (*21st-Century Organizations: Reconciling Control and Empowerment*). By maximizing a balance between these forces organizations could be flexible and creative enough to sustain innovation and coordinate effectively to mobilize resources in a responsive manner. This would redefine the role of leadership from command-and-control practices to those stressing context sensing, direction setting, and meaning making.



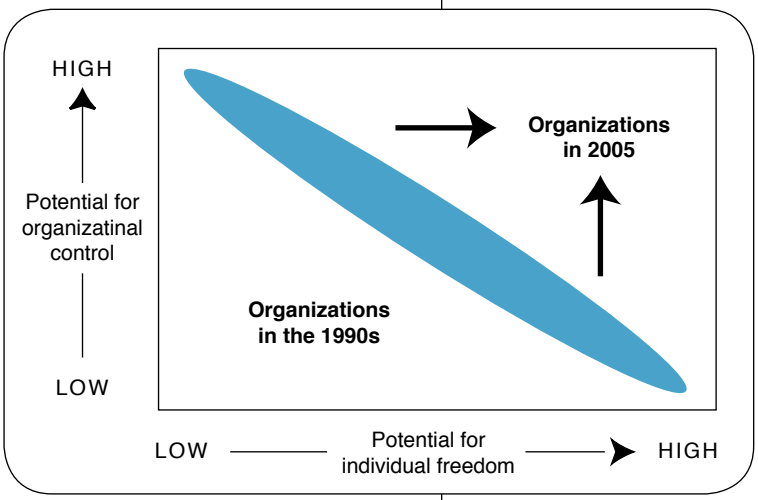
Conclusions and Key Challenges

The new organizational forms we see today in eBay, Google, Wikipedia, Slashdot, ThinkCycle, Flickr, del.icio.us, the Linux, Apache, and other open-source communities suggest that we are rapidly moving in this direction. Tom Malone, in his recent book *The Future of Work*, adds that leaders need to focus on coordination and cultivation of work and organizational environment. Leadership strategies that stress direction by authority and delegation through giving orders will not be as quickly adaptable to the fast changing environment.

Technologies of cooperation demonstrate that there are indeed new ways to reconcile the need for control and for individual freedom and empowerment, albeit in a different way than anticipated a decade ago. These tools provide new mechanisms for leaders to loosen the reins on employees and the boundaries of an organization without losing control all together. However leaders will need to adapt to the new sources and mechanisms of control. They will have to distribute power among the same social and technological networks that enable others to gain power and freedom. There will be a shift from an orientation of "what would the boss do?" to "who should be the boss in this situation?"

This means giving up traditional forms of authority and control over people and processes. With empowered followers, a leader's authority and power is only as strong as the followers' recognition and ratification of that authority. Effective leaders will need to catalyze employees and contributors internally and bring external contributors in the value web. Leaders will need to find ways to create an organizational context that will connect and coordinate people, ideas, information, and resources. Those who cling to traditional forms of power and control will snuff out the creative possibilities afforded by technologies of cooperation.

Organizational Structures in 2005



Source: Institute for the Future, *21st-Century Organizations: Reconcilling Control and Empowerment*, 1995.

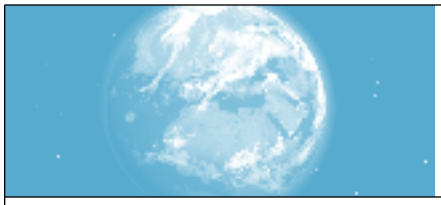
Striking the Right Structural Mix

New organizational forms that leverage technologies of cooperation will likely comprise both hierarchical and network structures. We see this in the early experiments today. Linux leverages peer-to-peer structures for bug identification, code fixes and patches, and other code-development work, yet Linus Torvald and a small group of editors decide which pieces of code make it into the kernel. Linux maintains its mesh-network style of knowledge work to aggregate the bits of knowledge that couldn't otherwise be aggregated and coordinated in something productive as efficiently. Yet, final decisions and direction setting are somewhat determined by a hierarchy. The business challenge is how to craft the heterarchy—the combination of network and hierarchy—so that it can leverage strengths of both structural forms. More organizational experiments need to occur before we can propose the method for making this decision. But as suggested in this report, organizations should be asking themselves where their boundaries can be more permeable? Where would more lateral agreements and relationships increase knowledge flow? Where can decision making and authority be pushed out to the edges to optimize the talent and social capital in the organization?

Redefining Relationships with Knowledge Workers

The new cooperative business landscape relies on a new relationship among employees and between employees and employers. In fact, many new organizational forms emerging today and described in this report (open source, Wikipedia, ThinkCycle, community computing grids) are comprised of volunteers. Business organizations will need to learn how to integrate and manage diverse collectives of both paid and volunteers contributors, each of whom are motivated by different kinds of rewards and compensation methods. Internally, business leaders will need to understand how to develop multiple reward structures and motivational methods to attract and retain employees. When work becomes more linked to personal passions, incentives will need to take new forms, many of which will expand an individual's status, reputation, and involvement in projects.

Likewise performance evaluation processes and metrics for evaluating performance will need to adapt to the new kinds and structures of performance and participation in work activities. Could peer-to-peer ratings of bosses and supervisors and more public reputation assessments become the norm? HR departments will need to think through how



they can revise current practices to meet the desires and aspirations of knowledge workers in cooperative enterprises. Young employees may provide a testing ground for such approaches. They already have developed formative work experiences using new cooperative media and tools and are more likely to respond to new performance and reward structures.

Providing a Platform for Emergence

Technologies of cooperation are really about supporting a social and technological platform for new kinds of interactions and behaviors rather than designing a new organizational structure. Just as Google and Yahoo! emerged from the World Wide Web and in turn spawned emergent forms of online markets, businesses must learn to understand the emergent properties of technologies of cooperation. This means allowing parallel paths of development to co-exist. It means accepting failures and learning from them to identify where the next successful experiment may emerge.