

AFRL-IF-RS-TR-2005-370
Final Technical Report
November 2005



RAPID RESPONSE TO DECISION MAKING FOR COMPLEX ISSUES – HOW TECHNOLOGIES OF COOPERATION CAN HELP

Institute for the Future

Sponsored by
Defense Advanced Research Projects Agency
DARPA Order No. T427

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the Defense Advanced Research Projects Agency or the U.S. Government.

AIR FORCE RESEARCH LABORATORY
INFORMATION DIRECTORATE
ROME RESEARCH SITE
ROME, NEW YORK

STINFO FINAL REPORT

This report has been reviewed by the Air Force Research Laboratory, Information Directorate, Public Affairs Office (IFOIPA) and is releasable to the National Technical Information Service (NTIS). At NTIS it will be releasable to the general public, including foreign nations.

AFRL-IF-RS-TR-2005-370 has been reviewed and is approved for publication

APPROVED: /s/
RAYMOND A. LIUZZI
Project Engineer

FOR THE DIRECTOR: /s/
JOSEPH CAMERA, Chief
Information & Intelligence Exploitation Division
Information Directorate

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 074-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE November 2005	3. REPORT TYPE AND DATES COVERED Final Nov 04 – Jul 05	
4. TITLE AND SUBTITLE RAPID RESPONSE TO DECISION MAKING FOR COMPLEX ISSUES - HOW TECHNOLOGIES OF COOPERATION CAN HELP			5. FUNDING NUMBERS C - FA8750-05-C-0012 PE - 63762E PR - COGV TA - 00 WU - 06	
6. AUTHOR(S) Andrea Saveri, Kathi Vian, Howard Rheingold				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Institute for the Future 2744 Sand Hill Road Menlo Park CA 94025			8. PERFORMING ORGANIZATION REPORT NUMBER N/A	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Defense Advanced Research Projects Agency AFRL/IFED 3701 North Fairfax Drive 525 Brooks Road Arlington VA 22203-1714 Rome NY 13441-4505			10. SPONSORING / MONITORING AGENCY REPORT NUMBER AFRL-IF-RS-TR-2005-370	
11. SUPPLEMENTARY NOTES AFRL Project Engineer: Raymond A. Liuzzi/IFED/(315) 330-3577 Raymond.Liuzzi@rl.af.mil				
12a. DISTRIBUTION / AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED				12b. DISTRIBUTION CODE
13. ABSTRACT (Maximum 200 Words) The nature of decision making reveals many distinguishing features of organizations, from biological organisms to corporate enterprises. Embodied in the process of decision making are assumptions about relationships, value, communication, and resources, as well as infrastructure to implement these assumptions. Most importantly, decision-making processes reflect how organizations reconcile control and creative freedom - a tension that produces innovation and evolution. A new capacity for rapid, ad hoc, and distributed decision making is emerging from the intersection of technologies of cooperation and new knowledge about the nature of cooperation and cooperative strategies. This report investigates the challenges, strategies, technologies, and best practices that will shape this new capacity.				
14. SUBJECT TERMS Decision-making, Cooperative Knowledge Bases, Information Bases, Distributed Decision-making				15. NUMBER OF PAGES 40
				16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UL	

Table of Contents

Executive Summary	1
Introduction	5
1. Challenges to Decision Making: Examples from the Field	6
2. Strategies for Improving Rapid Decision Making.....	17
3. Improving Rapid Decision Making with Technologies of Cooperation	30
4. Conclusion: Elements of Best Practice.....	35

List of Figures

E-1 Four Strategic Domains for Addressing the Challenges to Ad Hoc Decision Making	1
1 Four Strategic Domains for Addressing the Challenges to Ad Hoc Decision Making....	18
2 Four Step Process of Knowledge Creation	23

List of Tables

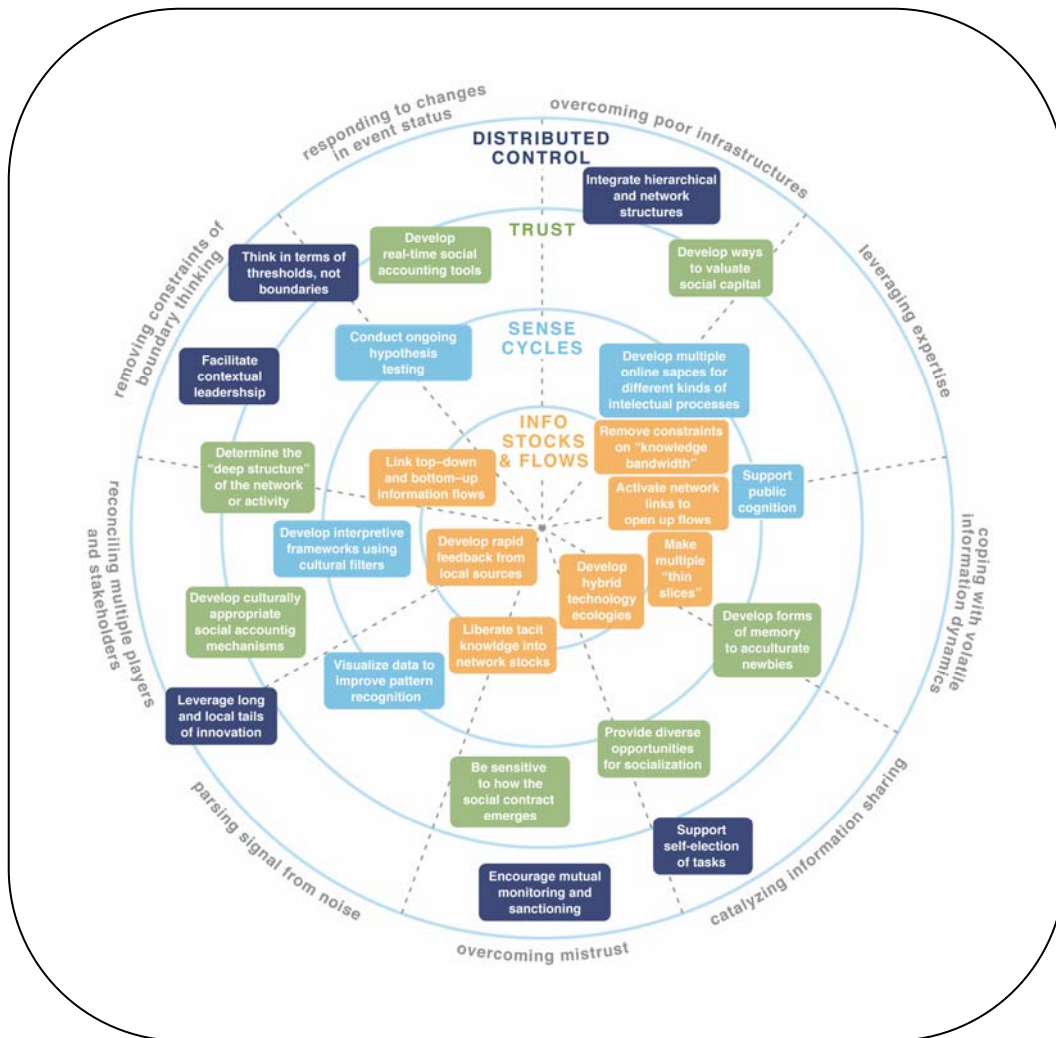
1 Key Concepts for Using Technologies of Cooperation to Improve Decision Making.....	31
--	----

Executive Summary

A new capacity for rapid, ad hoc, and distributed decision making is emerging from the intersection of technologies of cooperation and new knowledge about the nature of cooperation and cooperative strategies. This report investigates the challenges, strategies, technologies, and best practices that will shape this new capacity.

Figure E-1 summarizes our findings. Around the outside of the mandala are the challenges to rapid decision making. The inner circles represent the four strategic domains for addressing these challenges. For each domain we describe strategic actions (the boxes) that decision makers can take to improve their decision-making processes.

Figure E-1
Four Strategic Domains for Addressing the Challenges to
Ad Hoc Decision Making



**Trust is a key currency
among distributed
decision makers and
decision-support experts.**

Executive Summary

CHALLENGES

The challenges arise particularly when decision makers are engaged with complex issues involving multiple stakeholders, unanticipated events, ad hoc structures or groups, and uncertain or unstable environments. Among the key challenges that practitioners report are:

- Overcoming poor infrastructures
- Leveraging expertise
- Coping with volatile information dynamics
- Catalyzing information sharing
- Overcoming mistrust
- Parsing signal from noise
- Reconciling multiple players and stakeholders
- Delineating boundaries of authority
- Responding to changes in event status

STRATEGIES

Four main strategic domains emerge from the analysis of these challenges in the context of technologies of cooperation and cooperative strategy:

- **Develop both stocks and flows of information.** Among the strategic imperatives here are making a multiple “thin slices,” activating network links with experts and specialists to open up flows; liberating tacit knowledge into network stocks; developing rapid feedback mechanisms from local sources; linking top-down and bottom-up information flows; developing hybrid technology ecologies; and removing constraints on “knowledge bandwidth.”
- **Cultivate ongoing sense-making cycles.** Sense making is enhanced by the technologies and practices of collective intelligence. The strategic guidelines for building collective intelligence include visualizing data to improve pattern recognition; conducting ongoing hypotheses testing; developing multiple online spaces for different kinds of intellectual processes; supporting public cognition; and developing interpretation frameworks using cultural filters.
- **Identify surrogates for rapid trust to build social capital.** Trust is a key currency among distributed decision makers and decision-support experts. Identity and the transitive nature of trust play key roles in developing effective strategies. The guidelines here include developing appropriate social accounting mechanisms; developing real-time social accounting tools; developing forms of memory to acculturate newbies; providing diverse opportunities for

socialization, determining what the “deep structure” of the team is based on; developing sensitivity to how the social contract emerges; and investing in institutional ways to value social capital.

- **Distribute control to optimize creative freedom.** Leadership will become increasingly emergent in decision making supported by cooperative technologies and strategies, changing the mechanisms of control. Several strategic principles serve as guidelines here, including supporting self-election of tasks; facilitating contextual leadership; encouraging mutual monitoring and sanctioning; leveraging long and local tails of innovation; integrating hierarchical and network structures, and thinking in terms of thresholds rather than boundaries.

TECHNOLOGIES

A host of new “technologies of cooperation” present significant opportunities for improving ad hoc, distributed decision making. They cluster into eight key categories, each with implications for the strategies described above:

- **Self-organizing mesh networks**, which support new ways of creating and managing stocks and flows of information, as well as sense making, based on the principle of growth from the edges and a distributed burden of infrastructure
- **Community computing grids**, which model efficient use of resources and solve complex problems
- **Peer production networks**, which provide a framework for rapid problem solving and understanding complex phenomena
- **Social mobile computing**, which builds contextual understanding of problems and dilemmas and fosters group identity (and therefore, trust) in ad hoc situations
- **Social software**, which builds trusted networks and networked knowledge bases to enhance sense making, trust, and emergent leadership.
- **Social accounting methods**, which take advantage of rating, ranking, and referral mechanisms to build trust and provide important management controls and levers for leaders.
- **Knowledge collectives**, which demonstrate structures, rules, and practices for managing knowledge as a collectively created common-pool resource.

Leadership will become increasingly emergent in decision making supported by cooperative technologies and strategies.

Executive Summary

BEST PRACTICES

Based on this research, we arrive at seven guiding principles for designing and supporting social and technical platforms that would more effectively support rapid decision making in ad hoc, distributed environments:

- Rapid decision making is an ongoing process that relies on ongoing collective intelligence processes.
- Rapid decision making requires flexible governance.
- Individuals in nested social, cognitive networks make effective rapid decisions.
- Rapid trust building is essential for creating environments for rapid decision making to thrive.
- Culture is a critical interpretive lens for rapid decision making.
- Technologies must focus on social, not database, issues.
- Power is shared among the contributors.

The nature of decision making reveals many distinguishing features of organizations—from biological organisms to corporate enterprises. Embodied in the process of decision making are assumptions about relationships, value, communication, and resources, as well as infrastructure to implement these assumptions. Most importantly, decision-making processes reflect how organizations reconcile control and creative freedom—a tension that produces innovation and evolution.

In situations involving complex issues that require rapid decision making, achieving the right mix of control and creative freedom is critical for sustainable success. These types of decisions often present high stakes and involve ad hoc groups made up of individuals who may not know each other, but who find themselves with the shared need for quick decisions and mobilization of resources. These groups are characterized by distributed information, resources, and participants and emerge in an unplanned or perhaps even unanticipated manner. Too much control paralyzes action; too much freedom diffuses effort and effectiveness. Understanding how to exercise just the right level of control and optimize creative freedom under these conditions is a core function that will distinguish successful and sustainable organizations in the next several decades.

The new technological landscape—enabled by pervasive, mobile, social computing—amplifies cooperative strategies and offers a new way of envisioning the tension between control and creative freedom. As stated in IFTF’s report, *Technologies of Cooperation* (SR-897, January 2005), these technologies offer both new tools to support cooperative behaviors that we believe can produce better outcomes and new templates for social form that are more sustainable and adaptable to a rapidly changing and volatile environment.

This report draws on a practitioner workshop with decision makers in complex environments and integrates our research to date on cooperative strategy and the technologies of cooperation to explore best practices for rapid decision making related to complex issues:

- **Chapter 1** describes the key challenges to rapid decision making, with examples and high-level lessons.
- **Chapter 2** presents four strategy domains and specific strategic actions for each.
- **Chapter 3** examines the role of specific technologies of cooperation in these strategies.

Finally, we conclude with a set of basic principles for developing best practices.

1 | Challenges to Decision Making: Examples from the Field

There are many challenges to making effective decisions rapidly, particularly when the decision involves a complex issue involving multiple stakeholders, unanticipated events, ad hoc structures or groups, and uncertain or unstable environments. Cross-cultural contexts—whether technological, organizational, or ethnic—also complicate the conditions for making effective decisions rapidly.

Traditional decision-making theory focuses on five basic activities:

- **Information gathering**—collection of information from various sources, including private and public sources
- **Sense making**—reflecting on information to extract meaning and insight and to develop applicable knowledge
- **Validation**—qualifying interpretation and insight, either with experts or other processes
- **Resolution**—arriving at a decision or making a choice among several options, which involves either collective processes (including consensus, voting, or other deliberative processes) or solitary processes.
- **Implementation**—using results from the decision-making process to take action or mobilize resources

These traditional activities intersect many of the emerging new practices in cooperative strategy and technologies of cooperation. Our goal here is to use the traditional frame of reference while highlighting new concepts that emerge from the literature of cooperation to break the traditional frame of reference.

Challenges to Decision Making

Of course, there are many detailed tasks within each of these activities. We describe them at the general level here to frame our discussion of the challenges and strategies in more detail. Please note that these activities do not necessarily play out in a linear model of decision making. Any individual activity may lead to any other. Increasing insight may require further information gathering. Likewise, a change in the status of the event or decision may require a new kind of interpretation or validation process. In fact, the challenges we describe not only make it difficult to accomplish these activities, but they often require that these activities occur simultaneously and in different sequences. The extent to which an individual or group can cycle quickly through these cognitive and emotional processing activities will shape their success with rapid decision making. Cooperative strategies and technologies present some new possibilities for achieving this goal.

In this section, then, we identify several challenges to rapid decision making in complex situations, provide examples from the field, and describe lessons about how cooperative technologies can help address these challenges.

The challenge: Inadequate or non-existent information and communications infrastructures increase the difficulty of rapidly gathering relevant information and making sense of it to support decision-making processes. Information sits in silos (specific departments or groups) or in local experts and informants. These important stocks of information cannot be converted into flows to which the rest of the decision-making community can add value.

FIELD STORIES:

- Development practitioners in Cambodia wanted to stimulate a demand for information to create a more vibrant public sphere where political and civic decisions could be made more democratically. To do so, they needed to build a basic information and communications infrastructure. Without a publicly accessible communication infrastructure, information about voting, dissent, support, and specific issues was subject to misinformation, suppressed by fear, and shared only at the most local, kin levels.
- A closed information system in a large corporate enterprise, without adequate sensing functions to pick up new information about glass-ceiling issues, challenged managers to easily share information about cross-cultural management issues. This lack of infrastructure perpetuated existing glass-ceiling problems, which escalated without managers knowing about them, ultimately limiting their time to respond and to address the problems.

LESSONS:

Rapid decision making depends on the free flow of information. In creating or rebuilding infrastructures, it is important to allow for communities and constituents to add value to the system as a whole. This means not only adding new information, but creating new kinds of interactions, new relationships, and new methods of filtering or viewing information. Cooperative technologies such as metadata systems, rating and filtering mechanisms, and social software networking are examples of the critical tools for building infrastructures that can remain open and flexible to change with their users.

The challenge: Expert knowledge helps provide key insights into problems and decisions. It helps develop fine-tuned interpretations of data and information as well as validate hypotheses and future consequences of potential decisions. Specialists and experts, however, may have different and conflicting knowledge trees that can slow down decision-making processes. One expert's interpretation of data may contradict another's. While such diversity can actually be useful, it may create problems in arriving at a decision quickly. Experts may also have narrowly defined boundaries of expertise that create knowledge gaps in an overall decision process—as well as defensive ownership of particular aspects of a decision. Or, in contrast, it may be difficult to engage experts who define their specialty in very narrow terms.

FIELD STORY:

- Emergency medicine depends on rapid diagnosis and getting patients to the appropriate medical experts at the right time. A major challenge is to integrate the expert knowledge of sub-specialties into the whole knowledge picture. Experts have distinct languages for describing their problems. In emergency-room settings, resident physicians often face a challenge of getting enough information to justify calling in a specialist. And being in high demand, the specialists will take precautions to screen each case to see if it merits their attention—the “is it my organ?” test. Thus medical specialists may be difficult to engage if they perceive that the diagnosis is not related to their specialty.

LESSONS:

Flexible knowledge mapping and interfaces to interdisciplinary knowledge can address some of the concerns brought up by the challenges of working with experts.

Complex problems that involve multiple kinds of knowledge and interdisciplinary perspectives need to allow specialists to quickly tap into a body of knowledge from a particular contextual point of view that integrates the key disciplines. New ways of supporting more “folksonomic” or bottom-up filters could allow for such personalized interfaces and maps of knowledge landscapes. Personal views of interdisciplinary knowledge could help provide rapid decision makers with the necessary “contact language” to discuss and resolve complex problems.

The challenge: The information landscape is dynamic, and rapid decision-making processes need to be able to cope with this volatility. Decision makers often have little time to go back and review information that has been gathered, making sure all relevant data is known before moving on to the decision process. New events or procedures add to new information that might have direct relevance to the problem. Also, some information flows are faster than others and create imperfect information sets that make it hard to make sense of information. Information in hierarchies tends to move more slowly than information in networks. Depending on information from a variety of flows will create imbalances and irregularities in information stocks. Thus, cycling back to sense-making activities may be required, jeopardizing a rapid decision.

FIELD STORIES:

- Emergency service providers such as firefighters and search and rescue teams must reconcile the uneven flows of information between what they observe and learn in the field (which happens in minutes) and responses from county, state, and federal authorities (which may take hours or days). Here the challenge is managing between the glacial speed of bureaucracies and hierarchies and the minute-by-minute developments of the field. Developing useful interpretations and confirmation of knowledge in this setting increases the difficulty of making a rapid decision and response.
- It is difficult for emergency-medical practitioners to get accurate and complete information from the field. They are constantly getting updates from ambulances, for example, on the way to the hospital. Upon arrival, new information may support or contradict what was reported in the field. They are constantly assessing the shelf life of information.

LESSONS:

Principles of synchrony tell us that rhythm plus communication creates synchronous behaviors. Cooperative strategies and technologies that can help identify thresholds of both rhythms and communication of information may help coordinate information flows in a volatile information environment. Knowledge about the intensity and flow of different information cycles (bureaucratic, field level, team level) under certain conditions could help inform strategies for how to detect when and how synchrony may emerge. This could help decision makers plan better and anticipate when certain kinds of information would be available

1 | catalyzing information sharing

examples from the field

The challenge: Unfettered information sharing is essential for rapid decision making but hard to achieve. Indeed, in organizations and institutions with multiple layers, departments, and internal and external relationships, there may be disincentives for sharing widely. Reward systems may value information hoarding rather than sharing. Groups may compete with each other for financial reward, status, or other advantages in the organization. There simply may not be any benefits in common (economic or social) that would stimulate sharing. Even if the desire to share exists, sharing may be perceived as extra work, requiring too much effort, especially in time-critical situations. In some cases, political pressures and security issues may prevent sharing. Fear and absence of a “safe place” (essentially a lack of trust) to share may also constrain individuals or groups from sharing.

FIELD STORY:

- Making standards decisions for new technologies (software, hardware and services) offers the promise of new opportunities and efficiencies for information sharing, innovation, and collaboration. But it also raises the concern of losing proprietary rents. Companies participating in standards discussions find themselves caught between incentives to share information and discover new opportunities and withholding information to retain IP and market advantage. Gaming the system creates distrust among members of a standards-setting group and acts as a disincentive to sharing. Both disincentives and a lack of trust prevent sharing information necessary to develop an effective, equitable standard. These barriers lengthen the decision-making process for setting up useful standards that will stimulate markets and innovation.

LESSONS:

The importance of group identity is critical for stimulating cooperation and sharing at the peer level. There are several ways that technologies of cooperation can help improve group identity and the sense of affiliation. First is to address boundaries of likeness and shared interest. Providing ways for individuals to recognize similar concerns and goals at broader levels will help expand the domain of cooperation. Developing incentives and rewards to cooperate locally in order to compete more globally may help shift the focus on competition and prevent information hoarding. Supporting group-forming networks through social media—such as chat, buddy lists, message boards, and even auction-style networks—may help create affinities where they were previously not visible. Using technologies to make cooperation and sharing visible and transparent will also help lower the costs of contributing to shared information stocks. The dynamics of alternative-reality games (ARG), in which strangers cooperate in emergent fashion to solve complex problems, offer instructive insights into catalyzing information sharing. One strategy could be to develop ARG-like systems for ongoing information sharing with points awarded to individuals and groups who contribute heavily and share. This may help inculcate a more cooperative set of behaviors related to sharing.

The challenge: Lack of trust is a major obstacle that runs through the entire decision-making process, slowing it down and even making it impossible to come to a decision within a short time period. Low trust leads to reaction rather than decision. Perhaps the most difficult challenge is overcoming the lack of trust among strangers: building trust among them often requires time that is not available when making rapid decisions in ad hoc and high-stakes environments. Decision makers need to develop trusted relationships quickly with experts, consultants, translators, non-paid staff, new organizational members or employees, team members, and members of different organizations. This trust-building is essential for information sharing (as described above), but also for encouraging contributions to interpretation of data, for confirmation of knowledge, for promoting buy-in to decisions and commitment to implement a decision. Lack of trust is a breeding ground for misinformation and the spread of damaging and distracting memes that can derail a decision-making process.

FIELD STORIES:

- In emergency medical teams, practitioners need to rely on translators for non-English speaking patients. Translators often are the primary conduit of information about the patient's condition, about actions or events that led up to the illness, and about medical history. Often, family members make the worst translators in crisis situations, but they are the only ones available. Practitioners cannot confidently trust them with the information they provide.
- In firefighter teams and emergency rescue squads, high trust is paramount. New members to these groups need to be acculturated to the language, processes, and implicit cultural values that bind the team and help it quickly process information, arrive at a decision, and implement it.

LESSONS:

In cooperative strategy, creating a "shadow of the future" is a concept for thinking about how to create trust among strangers. The notion is to aggregate cues and indicators from the present and past that will reduce uncertainty about another person's future action. The auction site eBay does this by providing a rating system for sellers. Buyers rate their experience with sellers, so that prospective buyers have some indication of how a particular seller performed. If rating, ranking, and reputation systems can be created for other kinds of contexts, they can be used to help reduce the fear and mistrust among strangers in quick-response situations. For example, if organizations made peer-based ratings for key indicators of cooperation available companywide, individuals use these indicators as a proxy for direct experience. Also, strategies that leverage the transitive nature of trust can help reduce the risk and uncertainty of interactions with strangers. Making social networks and degrees of separation visible could serve as proxies for how a person is connected to others with whom there may be a great deal of trust.

1 | parsing signal from noise

examples from the field

The challenge: A common complaint today is that we are overloaded with information. It is increasingly difficult to separate the information wheat from the chaff. Decision contexts characterized by instability, rapid change, multiple partners and stakeholders, and volatile information raise two challenges—filtering and sense making. Sense making becomes difficult when some information is a distraction and does not add to the narrative emerging from the field or problem event. Such information confounds the advancement of plot points and the reconstruction of what really happened to cause a problem, crisis, or illness requiring a rapid decision. Sometimes the information landscape seems to present multiple realities of what may be true or relevant. Different stories and interpretations may all be plausible and lead to very different conclusions. Filtering out irrelevant, incorrect, or purposefully misguided information helps focus attention, but requires dedicated time and coordinated effort to do efficiently and effectively.

FIELD STORY:

- Fostering political participation and civic engagement in developing countries is hampered by a sea of disinformation, red herrings, and contradicting accounts. Corrupt politicians and power elites continue to pump out information that prevents citizens from making independent decisions about their political participation and contribution to a public, civic space.

LESSONS:

Distributed development of narratives is an important strategy for developing meaning in complex situations. A few single sources cannot build rich enough narratives to integrate the new level of information. Collective gamers, such as the Cloudmakers and other gamer communities who came after, learned to do this kind of narrative-building effectively. Their use of multiple media forums for discussion and conversation played an important role in their success. Blogging, discussion boards, chat, and wikis are tools that allow multiple narratives—and synthesis—to emerge. They provide opportunities for remixing, a rapidly emerging practice with social and personal media. Blogging alone provides a good example of how individuals can remix story threads and points of view to create new narratives from a host of information sources and invite comment. Other sites such as Slashdot encourage multiple narratives from diverse sources but provide evaluation mechanisms (a rating system) whereby the most valued or powerful narratives rise to the top. Imagine multiple types of ratings that could be used to filter distinct narratives based on different sets of evaluation criteria.

reconciling multiple players and stakeholders

The challenge: Many distinct players and stakeholders can complicate the tasks of developing shared interpretations of knowledge and the validation of conclusions. Arriving at a decision that everyone endorses is less likely to happen under these conditions. Multiple players and stakeholders have different, often conflicting agendas. They may be motivated by different outcomes and have unspoken objectives. Adding to the challenge, each of these players may operate based on different kinds of processes and rules, some formally and explicitly mandated and others more incentive-based and emergent from within their organizations. A challenge here is to determine how to leverage individual self-interest and objectives to motivate a more cooperative decision-making process—more information sharing, deliberation, sharing of assumptions, and transparency of agendas and objectives.

FIELD STORY:

- Technological standards are important because they lower transactions costs and create a more equitable playing field for market participants. However, some companies recognize near-term advantages of not having standards if they already have a “lock-in” on customers and reap the benefits of a winner-take-all strategy—despite the implications for public benefit (e.g., lower costs, better products). One semiconductor company, for example, left a standards-setting organization and developed a patented technology that was discussed in the standards meetings. It later sued other companies for using that technology when it became a standard, claiming they had already developed it. Lack of disclosure and transparency of objectives among the standards-setting body, the participating companies, and the government contributed to this outcome.

LESSONS:

Conflicting agendas arise even in the context of well-defined institutions. But in addition, a host of new kinds of institutions are now emerging, often with different reward systems and objectives. (Consider open-source software production communities or knowledge collectives like the Wikipedia). These new institutions reveal a shifting granularity of “stakeholder interests.” While participants in open-source production and Wikipedia are interested in supporting collective efforts, they are also interested in the implications for their personal reputations and personal brands. This could be a key wedge in creating a basis for cooperation across institutions and groups. IFTF research on youth and their career expectations is also showing that their focus has shifted from climbing the corporate ladder or becoming leaders to a focus on “personal brands.” These new players are going to organize their cooperative stances around personal reputation and personal relationships, which may lead to new ways to develop cooperation across organizations and institutions.

1 | removing constraints of boundary thinking

examples from the field

The challenge: Multiple players and stakeholders tend to focus exclusively on boundaries of authority that make it difficult to allocate and mobilize resources. This frame of thinking implies that if there are no clearly delineated domains of authority and accountability, resources will be ineffectively mobilized and wasted. The challenge here is to not think in terms of the boundaries of institutions but the decision-making flows that connect various organizations. Clarity around span of control, specific responsibilities and accountability, and how distinct entities of authority interact need to be reframed beyond boundaries to allow for more cooperative solutions.

FIELD STORY

- Boundary drops are areas in fire districts in which two or more districts or response zones meet. When a fire or other emergency occurs in a boundary-drop zone, it may involve multiple authorities. Decisions about resource allocation and control become complex. Necessary equipment (e.g., fire trucks, emergency-response gear, rescue dogs) may be closer in a neighboring district or response unit. Coordinating communication across response units and establishing accountability for their use and payment can slow down response time and effective deployment.

LESSONS:

Smart-mob strategies can help shift the focus on boundaries to a focus on decision-making focal points that represent a merger of physical and digital space. These geospatial focal points are the convergence of people, devices, information, places, and spaces. Developing swarm-like behavior, by distributed smart mobs, to tackle different parts of a decision-making process could help break down the constraints of boundaries. This will help shift the decision-making process from conflicting, centrally monitored “authorities” to locally responsive self-organizing, information-driven crowds.

The challenge: In the course of making decisions, unexpected events emerge and transform the decision space. Sometimes variables in a decision-space reach a threshold and the status of the crisis, problem, or decision changes or takes on new characteristics. Such a transformation may require new kinds of information, new expert opinion and judgment, and new information-assessment and knowledge-validation processes to make sure a decision will be effective and match the new situation. Sometimes these tipping points or thresholds transform the entire set of behaviors and patterns necessary to solve a problem. The challenge is to recognize the new patterns and sets of behaviors quickly and shift resources to support them.

FIELD STORIES:

- Burning Man is a festival that creates an emergent city of over 35,000 people in the Nevada desert to celebrate radical self-expression, inclusion, and self-reliance. For the one week each year that Burning Man convenes, Black Rock City is the fifth largest city in Nevada. Maintaining safety and security is a key concern for the Black Rock Rangers. The Rangers act as the lubricant among Burning Man inhabitants, officials of the Bureau of Land Management, and other local law enforcement agencies. A key challenge for them is to navigate the rules and expectations of each of these stakeholders while maintaining the mission of Burning Man. Sometimes behaviors cross a threshold point, in which radical self-expression detracts from the positive experience of the entire community. These moments can emerge rapidly and require quick action on the part of the Black Rock Rangers. A situation first characterized by a variation in extreme self-expression can lead to threats against individual artists and can escalate into a riot very quickly.
- In a large corporate enterprise, frustrations by high-level Asian managers reaching a glass ceiling can escalate into a massive brain drain. The decision space transforms from an exclusive focus on preventing managers from quitting to include dealing with the consequences of losing key staff.

LESSONS:

Visualization tools that help make interactions, information flows and bottlenecks, and other relationship cycles and dynamics transparent may help to reveal new patterns as they form. Tools that track flows and recognize thresholds can focus attention on these moments of “phase change” and help us understand the social dynamics of these critical junctures—to recognize when cooperative problem solving or participatory decision making might shift to destructive mob behavior, or vice versa. It is important that to note that different kinds of thresholds may interact: personal, social, and information thresholds can all trigger phase shifts that change the event status.

2 | Strategies for Improving Rapid Decision Making

We identified four strategic domains for developing practices and mechanisms that address the challenges that decision makers face and that support rapid decision making:

- Develop both **stocks** and **flows** of information
- Cultivate ongoing **cycles of sense making** and interpretation
- Identify **surrogates for rapid trust** to build social capital
- Distribute **control** to optimize creative **freedom**

These strategic domains represent a synthesis of what we learned from our discussions with expert practitioners as well as several key sources from the cooperation literature.

Figure 1 (on page 20), summarizes our findings. Around the outside of the mandala are the challenges to rapid decision making. The inner circles represent the four strategic domains for addressing these challenges. For each domain we describe strategic actions (the boxes) that decision makers can take to improve their decision-making processes.

2

Figure 1
Four Strategic Domains for
Addressing the Challenges to
Ad Hoc Decision Making



Source: Institute for the Future

DEVELOP STOCKS AND FLOWS OF INFORMATION

Improving the circulation of information so that it can be processed and interpreted quickly is critical for initiating a rapid decision-making process. The strategy here is to grow individual **information stocks**, but also to convert them into **information flows** that grow the overall stocks of the network or organization. These flows, in turn, must be synchronized effectively. Thus, information structures, information flows, and timing of those flows are all part of the strategy.

In a network, flows between members act as stocks for the network as a whole. Also, individual stocks are transformed into flows when the individual joins a network and shares those stocks. Sharing turns individual stocks into network stocks by increasing the quantity and quality of flows. Thus, in an information/network age, **if we take flows and stocks as measures of wealth, sharing dramatically increases both.**

A key aspect of enriching stocks and flows for rapid decision making involves liberating tacit knowledge from local, context-based sources—either domain experts and specialists or people in the field with practical know-how in specific contexts. Tacit knowledge stocks are hard to develop since this knowledge is located in the minds and experiences of people, often distributed geographically.

In his popular book *Blink*, Malcolm Gladwell illustrates how experts make rapid decisions within seconds, something he calls “thin slicing.” He attributes thin slicing to tapping into the emotional, intuitive sense-making processes rather than relying on rational, analytical processing. Others, such as psychologist Gerd Gigerenzer of the Max Planck Institute, describe this as leveraging heuristics or mental short cuts that have been developed over the years of intensive practice. When presented with a new decision, an expert uses existing mental templates built from a stock of experience and data to come up with a decision more quickly. By using deep personal stocks, experts are able to detect the “underlying signature pattern” that Gladwell points to as a key to rapid cognition.

Indeed, developing a pattern language from tacit knowledge that can be shared with others would greatly enhance organizational stocks and flows in support of rapid decision making.

2 | Strategies for Improving Rapid Decision Making

STRATEGIC ACTIONS AND QUESTIONS

Make multiple thin slices

Develop ways to use the power of thin slicing, but don't limit it to the initial few seconds of a decision process. Extend the concept of thin slicing by conducting ongoing "slicing" activities that can be shared with a broader group of experts for rating and evaluation. Tools such as rapid voting, rating, and ranking, (similar to that used by Slashdot knowledge community) can raise highly ranked expert opinion to the top. This ongoing form of tapping expert knowledge stocks provides a sort of continuous "group blink" that could improve decision making in complex situations.

Activate network links to open up flows

Develop networks of experts and continue to feed those network relationships so that they can be called in rapidly. Develop and share visual maps of expert tacit knowledge—maps of "who knows who knows what?" Many organizations have networks of experts that extend beyond the organization, but fail in their efforts to mobilize them rapidly, which is essential for rapid problem solving. One solution to this is to have experts continually engaged in problem-solving activities that can quickly shift focus to emergent problems when expert attention is needed. Creating an organizational knowledge commons or alternative-reality games that experts and specialists participate in regularly may provide a platform for them to "practice" anticipating and resolving potential solutions to the kinds of problems that will ultimately require rapid attention.

Liberate tacit knowledge into network stocks

Develop processes for capturing mental frameworks from experts into more shareable, codified forms that can serve as network stocks. One approach is to create tools for flexible mapping of that knowledge commons; such maps allow tacit knowledge frameworks to become alternative interfaces to the knowledge base. The basic idea is a broad common knowledge store and tools for rapidly querying that knowledge base using ad hoc qualitative frameworks that fit the context. For example, suppose that a FEMA knowledge commons covers all kinds of emergency disasters and there is a situation in which a large cultural enclave community is ground zero for a bioweapons attack. Decision makers should be instantly able to invite ten experts from different fields to create their own distinctive maps of the database and share them with one another. The overlaps among the "search results" from these maps might be particularly interesting in revealing logic patterns and insights that previously would have been unavailable as deeply embedded tacit knowledge.

DEVELOP STOCKS AND FLOWS OF INFORMATION (cont.)

Develop rapid feedback from local sources

Provide ways for locals to add “street” knowledge into flows. These can be locals in the field without any affiliation or temporary, “fluid” employees who tend to pass through organizations. Keep in mind that the most important information from the streets may come from totally non-affiliated people. The role of amateur videotapes in many large events, from 9/11 to Rodney King, provided views of events that were never captured by official/professional media. In a world where half the population has camera phones with some kind of location ID, the ability to tap and filter this resource is critical, especially as problems become layered and complex and emerge rapidly. How can a social geo-annotation network quickly be redirected toward emergency response? How can everyone become an emergency worker in these situations? What if camera phones all came with instructions that said “What to do with your phone in an emergency”?

Link top–down and bottom–up information flows

Many organizations or collections of organizations dealing with a rapid response decision will have information flows that follow various structures. Find the points at which they intersect and see if those are the right places for them to intersect. Also, look for ways to create alternative intersections that provide more seamless and smoother information flows. A key set of tools here will be visual mapping of information flows, network relationships, and decision-making rights among various players. The key is providing transparencies that reveal critical knowledge intersections.

Develop hybrid technology ecologies

Use old technologies (such as paper-based communication and couriers) to support flows. They are effective as back-ups but also can be the most appropriate way of circulating information in some contexts. Alternative-reality games provide a rich source of experiments for learning how multiple media ecologies work and how additional media adds or diminishes value. This would be an important area for study to determine the most effective way to layer media.

Remove constraints on “knowledge bandwidth”

Identify the potential barriers to creating “broadband” knowledge flows—such as time, infrastructure, interest, and reward. Lessons from peer-to-peer knowledge collectives and community computing grids like seti@home and Stanford's protein-folding collectives are instructive in how to expand bandwidth by optimizing individual contributions. Likewise, open-source production models seem to have explored ways to optimize individual contributions that balance motivation and incentives with the work they receive from contributors.

2 | Strategies for Improving Rapid Decision Making

CULTIVATE ONGOING SENSE-MAKING CYCLES

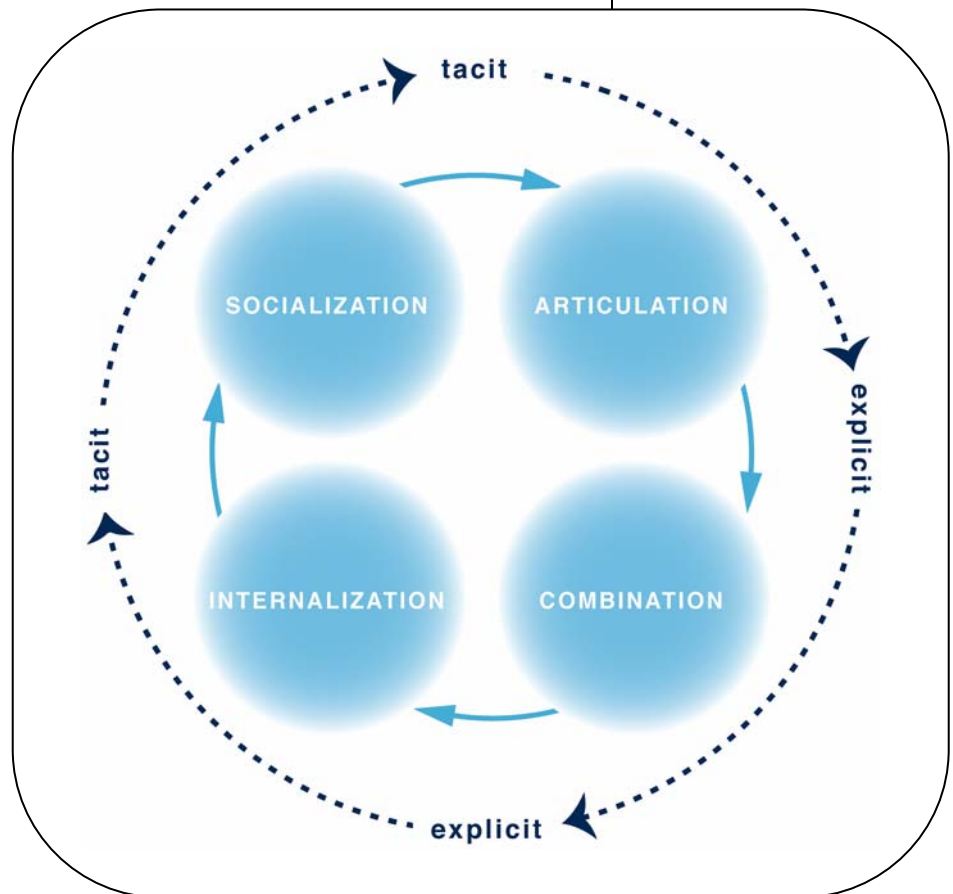
Flows and stocks are useful to rapid decision making only if they feed processes of interpretation and synthesis that create new knowledge and insights to advance a decision. Essentially, practitioners of rapid decision making need to engage in ongoing emergent learning. In a fast-paced, unpredictable context of rapid decisions, this means developing collective intelligence from networks of distributed and diverse members.

As IFTF research director Alex Pang writes, “*collective intelligence is not a database, is often tacit, and can’t be designed.*” Indeed, developing rapid collective intelligence to apply to emergent problems and decisions requires a context that cultivates multiple, lateral links among people and ideas. As links and nodes emerge, patterns of metadata can begin to point to new insights and set the stage for ongoing learning. At the heart of collective intelligence, is **performance**. Successful development of collective intelligence requires individuals to become more public in their intellectual processes and exchanges with others. Public intellectual performances transfer tacit knowledge more effectively and add to network stocks of tacit knowledge.

Similarly, Olivier Zara, author of *Managing Collective Intelligence*, 2004, distinguishes between **collective communication** and **collective reflection**. Collective communication focuses on exchange of information (sharing), while collective reflection focuses on intellectual cooperation in which information becomes meaningful and transforms into new information. Many knowledge management systems get stuck at the collective communication stage.

A traditional concept in Japanese practice is *ba*, pioneered by Professor Nonaka of Hitotsubashi University; it offers another perspective on emergent learning and knowledge sharing. *Ba* refers to the social-cognitive **place** where knowledge is created. Nonaka models a four-step process of knowledge creation: socialization (tacit ➔ tacit) to externalization (tacit ➔ explicit) to combination (explicit ➔ explicit) to internalization (explicit ➔ tacit) and back to socialization (see Figure 2). The process illustrates the conversion of tacit stocks into codified, explicit knowledge that can be aggregated (increasing network stocks) and then internalized to add to individual tacit stocks. Bottom-up social software presents many opportunities for developing *ba* and creating platforms for individual and collective intellectual performances by integrating social and information networks and providing tools that make intellectual processes and knowledge relationships social and visible. Tools such as Technorati’s metadata, open-source methods of attracting widespread contributions to resource commons, friend-of-a friend networking techniques are all creating a new infrastructure for sense making at a more granular level than current institutions such as mass or academic media.

Figure 2
Four-Step Process
of Knowledge Creation



Source: Adapted from, Nonaka, I.
Careers as Repositories of
Knowledge: A New Perspective on
Boundary and Careers. *Journal of
Org Behavior*, Vol. 15, 325-344
(1994).

CULTIVATE ONGOING SENSE-MAKING CYCLES (cont.)

STRATEGIC ACTIONS AND QUESTION

Visualize data to improve pattern recognition

Making data and information relationships visible can help distributed individuals make connections and detect patterns. These pattern analyses need to include data and information about people and their social networks. A new source of pattern analysis comes from innovations in creating bottom-up taxonomies—called folksonomies—using metadata tools like del.icio.us (in which users create their own tags for bookmarking Web pages and sharing the bookmarks with colleagues).

Conduct ongoing hypotheses testing

Use social networks, public deliberation, and discursive settings to continually develop and test hypotheses. Allow individuals to propose hypotheses and self-elect which ones they want to work on. Social software like blogs and wikis, as well as alternative-reality games, have proven to be effective media for these kinds of efforts. In addition to using computers to run complex simulations, experiment with mobilizing these kinds of tools, together with communities of experts and practitioners, to run human-based simulations in these real-world media environments.

Develop multiple online spaces for different kinds of intellectual processes

Massively multiplayer games, whose members engage in collective intelligence and decision making, provide “in-game” and “out-of-game” spaces to discuss information and potential decisions. They provide public and private platforms for exchanging and evaluating ideas. Let these kinds of spaces emerge from the knowledge community and broader decision-making environment so that they can address the kinds of interactions local groups need. We’re at the beginning of an explosion of new online forms. Blogs, wikis, social bookmarking, and other social media are just the beginning of collective knowledge spaces that will evolve quickly. It is important to experiment with them and to anticipate new forms, but also to learn how they effectively support rapid decision making.

Support public cognition

Public cognition is what happens when individuals “think out loud,” often in public forums. Public cognition requires both technical platforms and social structures for public or group intellectual processes, including incentives and rewards for participating. Make sure that there are spaces for unfinished and incomplete ideas. Part of making individual cognition public is overcoming the perceived need to “publish” only completed ideas and finished work. At the same time, it is important to allow these unfinished and incomplete ideas to mature. Several tools and processes can support this maturation: more sophisticated rating and ranking systems that don’t necessarily banish the outlier results; systematic tracking of the bottom of the pile as well as the top of the pile because that may be a source of original (if unconventional) thinking; multimedia tools like photoblogs that support more personal self-expression publicly; and collaborative environments for developing game sequences and animations (like Second Life). The latter are especially interesting for what they might reveal about group processes sense making and joint decisions about narrative, vision, and game play.

Develop interpretive frameworks using cultural filters

Make sure that local groups, with distinct and possibly ad hoc cultural frames of meaning, are enabled to participate fully. Diverse interpretation frameworks will add to richer sense making and more finely tuned decisions. A comparative review of social media by multiple cultural groups would be very useful in developing culturally informed interpretation frameworks. First, examining how different behaviors around social media emerge in groups with **mixed ethnic and cultural participants** would reveal how social media support a wide range of interpretative frameworks. And second, examining how a single group with **one distinct cultural pattern** uses social media to construct narrative, to engage in sense making, or to conduct other decision-making activities, would reveal detailed understanding of that cultural group.

IDENTIFY SURROGATES FOR TRUST TO BUILD SOCIAL CAPITAL

Developing rapid trust is one of the most critical aspects of ad hoc, rapid decision making. Trust lowers the transaction cost (i.e., risk) of participating in exchanges with strangers and provides assurance that cooperation will be reciprocated.

Effective strategies that develop trust quickly—particularly among strangers, new employees or team members, and remote experts or consultants—will help increase and improve the emergent learning and collective-intelligence processes described in the previous section. When timeframes for sharing, deliberation, sense making, and response are compressed, it becomes essential to be able to develop surrogates for trust.

Trusted relationships often require extended periods of time to develop—as well as a framework of social contracts for the future. Reputations need to mature, and past histories and performances must accrete to provide a backdrop for evaluating a person’s trustworthiness. And as Robert Axelrod states, the shadow of the future—how past performance can provide insight on future performance or how anticipation of the future affects present-day exchanges— is significant in signaling trustworthiness and enabling cooperation.

Identity is a key factor here. Peter Kollock, UCLA professor and author of *Social Dilemmas: The Anatomy of Cooperation*, suggests that a sense of shared identity has profound effects on enabling cooperation and providing solutions to social dilemmas that damage collective action. He even proposes that in the absence of communication, identity and the ability to identify with another person or group is a powerful motivator for cooperation. Realization of shared interests, values, goals, or other affiliation will help increase trust among individuals by making interdependencies visible and more tangible.

However, not everyone is comfortable exposing a deeper level of identity, particularly among strangers and in ad hoc, fast-paced settings. Bernardo Huberman’s research shows that the transition of personal information from the private to the public space depends on the extent to which the information or trait is deviant from the perceived or actual norm. In other words, people will share private information if they think they are close to the norm of the group in a particular situation. As they perceive themselves farther from the norm, they will require higher “payment” to reveal private information. Managing perceptions of deviancy from social norms, then, will need to be a part of any strategy for building rapid trust.

Once trust is established, social networks are critical for diffusing it more broadly. As Robert Putnam points out in *Making Democracy Work*, social networks allow trust to become transitive. If I trust you and you trust her, then I will trust her. Transitivity is thus another critical dynamic to manage in strengthening trust in an ad hoc collective setting. Note, in particular, that trust multiplies as it is used, but is depleted through non-use. It is a moral resource that follows a dynamic of increasing returns.

2 | Strategies for Improving Rapid Decision Making

STRATEGIC ACTIONS AND QUESTIONS

Develop culturally appropriate social accounting mechanisms

Allow members to rate or evaluate each other's performances so that participants develop a sense of mutual accountability (a shadow of the future). In this process, be sure to develop social accounting methods that are complex and culturally sensitive. The ranking and rating criteria for socially and culturally appropriate indicators of performance and behavior need to emerge from the group to assure that they have local cultural meaning. With these emergent criteria, participants' performance histories and past transactions can be made available to the broader network or community and evaluated more explicitly in terms that are meaningful to the members of the group.

Develop real-time social accounting tools

For rapid decision-making teams, developing ways to make social accounting mechanisms real-time reflections could build localized trust. For example, can a response team for a forest fire use a simple mechanism for commenting on reliability of people that are in near proximity to one another that gets aggregated and fed back to them? Also, leverage the transitive nature of social capital and trust. If a firefighter from company 5 knows a firefighter from company 4, and 6 of his team members are in that person's social network, can those social connections be communicated quickly (and perhaps visually) to transfer trust to them?

Develop forms of memory to acculturate newbies

Develop record-keeping mechanisms for decisions and social norms to create an acculturation process for newbies. Develop a collective history, even a collective mythology that helps orient new participants to values and codes of conduct. This collective history will lower transaction costs and foster reciprocity. There are opportunities for emerging wearable technologies to provide cultural history in decision-making contexts. Just as coats of arms were symbols for the characteristics of families, fiefdoms, and armed troops, digital "coats of arms" might reflect the strengths and perspectives of the participants, both for communication with newbies in the group and for people from other groups. Locative information could also provide some of this acculturation—for example, signaling "I'm new to an area, a context." Additionally, local media feeds (not necessarily data but rather expressive or emotional annotations) could help individuals quickly sense the values of the locals and adapt behavior to them, reducing perceived foreignness.

IDENTIFY SURROGATES FOR TRUST TO BUILD SOCIAL CAPITAL (cont.)

Provide diverse opportunities for socialization

Diverse opportunities for socializing with known colleagues and potential collaborators will increase the likelihood of rapid trust in the field. Toyota successfully created trust among competing suppliers by providing informal forums and events for them to socialize and connect. Successful virtual communities provide informal spaces to discuss personal interests such as pets, kids, hobbies, and other non-work topics, creating touch points that can bud into trust when needed.

Determine the “deep structure” of the network or activity

Find out what the effective unit of work is in different networks and settings and then focus on how to build trust there. Individually oriented performance, as occurs in a police department, may require person-to-person trust mechanisms, while more team-oriented performance, as in a fire department, may require multilateral forms of trust.

Be sensitive to how the social contract emerges

Pay attention to how social contracts emerge in the field. Determining the currencies that matter to emergent groups will help support trust and motivate cooperative performance. Does the group follow rules of technical rationality (as do open-source contributors whose motto is “let the code decide”)? Or does it seek more codified rule sets such as FAQs, or even laws. Mechanisms for translating tacit social contracts into explicit contracts—such as Creative Commons licensing—is another way to manage social contracts. A general theme of the new media seems to be more complexity and finer distinctions and differentiations in social protocols that lead to more explicit and relevant measures of trust.

Develop ways to value social capital

Make sure that social capital is valued and fungible across the organization. Methods of valuating and measuring social capital will reflect “advantaged” networks and individuals. These can be used to build effective ad hoc teams. Social capital systems can also be used to foster self-organizing problem-solving teams, where people can select the people they want to work with on a problem, both within and outside the organization; they can use personal networks, friend-of-a-friend networks, and rating systems to find each other and then choose appropriate opt-in style systems (like wikis or multiplayer games) to do the problem-solving. These types of tools and structures allow social capital to be exchanged more explicitly—and their value realized more broadly across the organization.

DISTRIBUTE CONTROL TO OPTIMIZE FREEDOM

Organizations that support rapid decision making will need to develop forms of control that allow the broadest freedoms possible without sacrificing strategic direction and coordination. New sources of power and control will come from a new structure of decision rights that distribute leadership, allowing those with the highest stakes or best knowledge to assume leadership and make decisions in the appropriate contexts.

In network forms of organization and knowledge economies, membership is fluid. Young people in particular are more interested in developing broad skills and personal brands than climbing hierarchies, which will drive this trend. The option to move from one network, organization, or project to another challenges traditional hierarchical power. This power dynamic is illustrated well in open-source software production, in which the option to fork code and leave a particular peer production network is always available. In the case of Linux, Linus Torvald's power as leader is reflected and made concrete by the number, tenure, and loyalty of his followers—the many coders and reviewers who spot bugs, solve coding problems, and make incremental improvements to the kernel.

Leadership in these settings will emerge from ad hoc situations and will be shaped by a particular bounded concept. Questions of leadership will shift from “What does the boss want?” to “Who should be the boss in this context?” This mechanism of allocating power respects expertise and takes the form of temporary hierarchies rather than rigid ones.

Finally, peer-to-peer network structures offer alternative production modes and organizational models that appear to strike a new balance between control and creative freedoms. Whether at the regional level (as Woody Powell describes in *Neither Market nor Hierarchy*) or at the organizational level (as Yochai Benkler proposes in *Coase's Penguin*), the power of leadership shrinks from concentrated centers of control and spreads out to the edges of social production networks. As sources of power and control emerge from the periphery, increased creative freedoms stimulate new ideas, connections, and knowledge.

STRATEGIC ACTIONS AND QUESTIONS

Support self-election of tasks

Peer-to-peer methods of production—such as open-source software systems—develop quick processes for spotting problems and solving them because they allow participants to select their work tasks. Selection is based on personal passions, expertise, and other individual motivations beyond direct financial reward. Self-election empowers participants to own more of the process and output, and increases their stake in the success of the final product. It also is a form of bottom-up control that balances the power of any centralized leadership role or function.

Facilitate contextual leadership

In distributed peer-to-peer social network structures, tacit knowledge will support effective leadership at the local level. Distributing power of leadership to local experts in specific contexts will facilitate sense making and decision making because more tacit knowledge will be applied to the problem. Learn how to spot and cultivate temporary hierarchies and contextual leaders that emerge from ad hoc networks and emergent situations. Make sure that temporary hierarchies are simple structures with local spans of control. A general rule is 5 people, plus or minus 2. This prevents the development of additional large, slow hierarchies.

Encourage mutual monitoring and sanctioning

Local-level forms of governance are important for successfully distributing control and expanding creative freedom. Develop ways to make mutual (peer-to-peer) monitoring and sanctioning a part of the social norms in bottom-up network structures. Social norms that model this kind of behavior will help coordinate emergent actions into powerful and productive outcomes.

Leverage long and local tails of innovation

Aggregation methods are a critical success factor in bottom-up systems. Amazon, eBay, Google, grid computing, and open-source software production all

leverage methods of aggregating small contributions, incremental innovations, and bits of resources into larger sources of value (or intelligence). Develop simple processes for enabling local, small-scale creative contributions to be valued and aggregated into larger sources of value.

Integrate hierarchical and network structures

Examine where and how hierarchies and networks will intersect in your organization. How can each structural form support the other and leverage its strengths? Routing information, task self-election, group formation, knowledge resource allocation, and other activities may be more appropriately organized through networks. However, strategic direction, platform building, and vision may be best maintained through a hierarchy. Social network/flow tracking software can help make visible where the informal power centers are (nodes that get the most traffic). Learn to use these network nodes to focus discussion and share information—as well as track who is active in which contexts over time. Build a formal structure that allows the rapid engagement of these nodes with the strategic and legal leadership of the organization. Clarity about where the information is flowing may help support more ad hoc forms of leadership. Consider fostering a decisions commons in which some decision rights are held in common while others remain the domain of functional leaders.

Think in terms of thresholds, not boundaries

Boundaries between teams, departments, and external organizations need to be more permeable to develop rapid information gathering and cognitive processes. Collective intelligence will not emerge from siloed groups with no opportunity for interaction and unconstrained flow of ideas and resources. Recognizing thresholds rather than boundaries may be an important part of the new strategy. Different situations and issues may create different thresholds of connectedness. What are the criteria for raising or lowering thresholds of connectivity?

3 | Improving Rapid Decision Making with Technologies of Cooperation

Technologies of cooperation can significantly improve ad hoc, distributed, rapid decision making. They support many of the specific strategic actions related to developing information stocks and flows, cultivating ongoing sense-making cycles, developing rapid trust, and distributing control to enable creative freedoms. They can also amplify cooperative and collective practices that help develop rapid cognition and collective intelligence in support of rapid, ad hoc decision making.

In our earlier, work we developed two key frameworks for understanding cooperative strategy: the **Technologies of Cooperation** map identified eight key clusters of cooperative technologies and the **Cooperative Strategies** map identified seven levers for tuning systems to amplify cooperation. In this section, we identify the key decision-making concepts and practices that emerge when we look at the intersections of these technology clusters and tuning levers. For example, self-organizing mesh networks (a technology cluster) catalyze forms of feedback (a cooperation tuning lever) that can enable swarm intelligence (a key concept) in a system or organization. We then match key concepts and practices to the strategy domains that they best support. Swarm intelligence, for example, can provide new ways of thinking about ongoing sense making by providing alternate intellectual routes and ways of thinking about a problem or decision.

Table 1
Key Concepts for Using
Technologies of Cooperation
to Improve Decision Making

	Develop Stocks and Flows of Information	Cultivate Ongoing Sense-Making Cycles	Identify Surrogates for Rapid Trust to Build Social Capital	Distribute Control to Enable Creative Freedom
SELF-ORGANIZING MESH NETWORKS	- Increasing returns - Locally responsive nodes - Network as memory - User as provider - Emergent sync	Swarm intelligence		
COMMUNITY COMPUTING GRIDS	- P2P architecture - Cornucopia of the commons	- Rapid iteration - Real-time problem solving - Ensemble forecasting		
PEER PRODUCTION NETWORKS		- Users as reviewers - Emergent problem solving - Distributed quality - Value node status		- Modularity - FAQs as rule sets - Resource contributors - Forking - Aggregate productivity
SOCIAL MOBILE COMPUTING		- Quorum sensing - Geocoded places	Ad hoc group identity	- Smart mobs - Ad hoc cultures - Unintended collective action
GROUP-FORMING NETWORKS			- The rule of diversity - Presence management - Exponential thresholds - Citizens of Affinity	- Small-world networks - Domains of cooperation - Value of joint resource construction
SOCIAL SOFTWARE			- Networks of influence - Degrees of separation - Social metadata	- Scale-free networks - Networks as social record - Risk thresholds
SOCIAL ACCOUNTING			- Shadow of the future - Visible history - Identity management	- Transparency - Trust markets - Infomated markets
KNOWLEDGE COLLECTIVES	Common-pool resources	- Emergent knowledge structures - Collective IP - Ad hoc taxonomies - Real-time filters		- Mutual monitoring - Interchangeable identities

All of this comes together in Table 1, which plots key concepts from the technology of cooperation literature on a matrix of technology clusters and our four strategic domains for improving decision making. There is no definitive or exclusive one-to-one matching of a technology cluster and a specific strategy, of course. Some concepts may support many strategic actions, and each technology cluster may support strategies in all four strategic domains. However, we use this matrix to highlight those intersections where we think the greatest benefit will emerge.

SELF-ORGANIZING MESH NETWORKS

The most important insights from this technology cluster come from the end-to-end principle of growth from the edges and distributing the burden of infrastructure to participants themselves. As a template for information stock and flow development, self-organizing mesh networks can be instructive in how to set up basic relationships, feedback mechanisms, sensing mechanisms to increase awareness, and information-routing structures, all of which will help stimulate flows and building stocks. These insights help create the basis for swarm intelligence that will support the beginnings of sense-making processes.

COMMUNITY COMPUTING GRIDS

Community-based computing grids provide models for recovering previously squandered resources from distributed sources. In particular, they demonstrate ways to multiply various kinds of processing cycles—computing or human—in order to amass powerful cognitive processes that can be directed to complex problems that cannot be solved by isolated individuals or small groups. This cluster is most useful for thinking through issues related to information stocks and flows and cultivating ongoing sense-making cycles.

PEER PRODUCTION NETWORKS

Peer production networks provide a framework for volunteer contributors to accomplish creative work. These ad hoc communities of production are able to rapidly solve problems and come to new understandings of complex phenomena that would stymie individuals or small groups. Peer production networks hold great promise for the emergent problem solving and rapid decision making by turbocharging the sense-making process and by infusing it with optimal creative freedom.

SOCIAL MOBILE COMPUTING

This cluster of technologies and principles allows groups of people—even if they are strangers—to act in a coordinated fashion in both physical and digital spaces. Using real-time information and real geographic contexts, social mobile computing links cyberspace, social networks, and physical settings in a way that can improve

Technologies of cooperation can significantly improve ad hoc, distributed, rapid decision making.

Improving Rapid Decision Making with Technologies of Cooperation

contextual understanding of problems or dilemmas—and offer more nuanced and sensitive interpretation of information and knowledge. Mobility and real-time information, as well as social-network access, provide more flexibility to knowledge activities and allow knowledge workers and decision makers to be more creative and experimental in their cognitive processes.

GROUP-FORMING NETWORKS

The principle of group-forming networks is critical for supporting identity and creating trust in larger networks. Understanding the triggers for catalyzing and supporting group-forming networks will help build trust more rapidly in large distributed organizations and ad hoc communities. Group-forming networks represent ways to support the emergence of self-organized sub-groups within a large-scale network, creating exponential growth in the network and shortening the social distance among members. These are critical activities for rapid trust building and supporting more joint creativity out of ad hoc groups.

SOCIAL SOFTWARE

The underlying principles and tools of social software make group forming and social network cooperative activities more explicit and extensible. Social software tools make it possible to create social metadata, visualize social networks, link to other social network nodes, and develop more effective ways to nurture social and creative knowledge processes by establishing trusted communities and safe places for exchange. Social software could become an important set of tools for leaders and managers to provide softer control mechanisms that don't limit creative freedoms. Blogs can syndicate local knowledge, creating flows of who knows who knows what; wikis can instantiate collective knowledge, enabling the rapid accretion of knowledge from a distributed group.

SOCIAL ACCOUNTING METHODS

Methods of performing social accounting are critical for creating trust and enabling a variety of cooperative practices that are central to rapid decision making. Tools such as rating, ranking, tagging, and referral mechanisms help shift dilemmas characterized by uncertainty and doubt to situations of assurance by developing and communicating reputation. Social accounting helps to measure the social connectedness and make trust and reputation visible to the community in a context-appropriate manner. These tools and mechanisms provide important management and control levers for leaders. They provide ways to perform mutual monitoring, sanctioning, and regulating of behavior from the bottom up by individuals themselves.

Understanding the triggers for catalyzing and supporting group-forming networks will help build trust more rapidly in large distributed organizations and ad hoc communities.

KNOWLEDGE COLLECTIVES

Knowledge collectives demonstrate the structures, rules, and practices for managing knowledge as a collectively created common-pool resource. The tools and examples in this cluster are relevant for developing information stocks and flows, cultivating sense-making processes, and for structuring organizations that provide creative flexibility to the users and participants of a knowledge-commons community. In particular, tools such as RSS, tagging (and the consequent development of folksonomies), wikis, and group visualization tools all help multiply the individual creativity of knowledge workers and decision makers. These tools help unlock tacit expertise that would be difficult to communicate and share otherwise.

4 | Conclusion: Elements of Best Practice

Considering the challenges and strategies discussed in this report, we suggest several principles that would support best practices for ad hoc, rapid decision making. These are meant to be guiding principles for designing and supporting both social and technical platforms.

- **Rapid decision making is an ongoing process that relies on ongoing collective intelligence processes.** Decisions transform the status of situations, events, people, and choices. They can act as triggers that create state changes that may lead to new decisions. This generative process requires constant intelligence building—continuous information stocks and flows as well as ongoing sense making and validation of knowledge. Technologies of cooperation offer new possibilities for ongoing shared creation and visualization of information; organization of information into ad hoc knowledge categories, access to social networks, and display of nodes of connectivity. They bring a new persistence to knowledge creation and collaboration that supports continuous collective-intelligence processes.
- **Rapid decision making requires flexible governance.** Strategies for governing ad hoc, rapid decision-making structures benefit if they span three different forms—norms, rules, and laws. Norms are the most implicit form of regulating behavior, while laws are the most explicit. As one moves from norms to rules to laws, communication and use of these governing mechanisms need to shift from implicit to explicit practices. Cooperative strategies and technologies use all three types of governance. Learning when and how to use each one will become a core capability of successful organizations. Social software and social accounting methods are particularly effective in creating mechanisms for supporting and communicating implicit norms and rules; technical rationality emerges as a governing principle in peer production networks; and ad hoc cultural norms are characteristic in smart mobs and other forms of social mobile computing.
- **Individuals in nested social and cognitive networks make effective rapid decisions.** Rapid decisions seem to arise best from individuals who are connected to a rich, dynamic set of social networks that can provide rapid cognitive loops and refinement of judgment. Consensus processes for rapid decisions in ad hoc environments can only be successful if there are effective rapid processes of sense making, very high levels of trust, and broad creative freedoms among network members. Individual decision makers will need to learn how to catalyze and capitalize on the value created by these network processes.

Rapid decisions seem to arise best from individuals who are connected to a rich, dynamic set of social networks that can provide rapid cognitive loops and refinement of judgment.

- **Rapid trust building is essential for creating environments for rapid decision making to thrive.** The most important currency of most teams, groups, and communities engaged in rapid, high stakes, ad hoc decision making is trust. Trust helps to define the deep structure—the unit in which the most effective work gets completed. Finding proxies that help the rapid development of trust, especially among strangers, is a key element in effective ad hoc, distributed decision making. Trust is important for creating social capital that is transitive across people and fungible across a network.
- **Culture is a critical interpretive lens for rapid decision making.** Developing rapid cultural understanding is a key to developing better interpretive frameworks and faster, more informed decisions. Trust and language are two important inroads for developing cross-cultural meaning and connection. Cooperative technologies that support deep personal expressions, identity management, and extensive linking to people and ideas offer ways to glimpse and understand cultural values and norms. The ability to leave personal traces of ourselves—what Marc Smith calls a “pervasive inscription revolution”—may open up new possibilities for learning about new cultures and acculturating more rapidly.
- **Technologies must focus on social, not database, issues.** Technology infrastructure must support social processes, such as group-forming networks, social-capital development, and reputation and trust building. These are the critical building blocks of rapid decision making rather than databases of explicit knowledge and information. Also, be prepared to use hybrids of high and low technologies. Often paper-based technologies or face-to-face exchanges will be the most effective method for communicating rapidly and clearly.
- **Power is shared among the contributors.** Distributing power to contributors on the periphery enables rapid decision making. Shared power is an important incentive for catalyzing participation and cooperation. It increases the stakes for distributed individuals, provides access to locally relevant tacit knowledge, and also spreads the burden of accountability. Forms of mutual monitoring and sanctioning are forms of power that can effectively regulate and direct behavior in distributed, ad hoc groups and networks. For example, the power of any production line worker at Toyota to stop the production line is a very real manifestation of power that shapes behavior. The ability of any open-source contributor to fork code is another form of power that balances the power of centralized leadership.