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Collaboration in the National Security Arena: Myths and Reality -

What Science and Experience Can Contribute to its Success

June 2009

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FOREWORD

The inter-agency/multi-disciplinary white paper provided in the following pages includes 35 articles addressing USG agency and operational perspectives, scientific disciplines studying collaboration, common barriers to collaboration, findings from applied research on collaboration, and finally potential enablers for collaboration. It is primarily intended for the operational and policy community in DoD, the Intelligence Community (IC), DHS, and other US Government agencies. The authors are from the IC, Services, USG agencies, FFRDCs, academia, and the private sector.

The white paper addresses the following set of critical questions:

- What kind of collaboration is required to accomplish the mission?
- What barriers to that kind of collaboration exist in the status quo?
- What actions facilitate this kind of collaboration?
- What systems will best enable these actions?

By way of background, we developed the concept for this white paper after completing an SMA[*] effort during 2008 to develop approaches to anticipate rare events such as the nexus of terrorism and WMD. That effort highlighted the fragility of the models and the need for a multi-disciplinary, multi-agency approach to deal with anticipating/forecasting, detecting and interdicting such events. That effort led to the following:

1- Publication in November 2008 of a white paper entitled "Anticipating Rare Events: Can Acts of Terror, Use of Weapons of Mass Destruction or Other High Profile Acts Be Anticipated? A Scientific Perspective on Problems, Pitfalls and Prospective Solutions" (copies available upon request).

2- Development of a concept for an Inter-Agency Limited Objective Experiment (IA LOE) as described in the current white paper

This collaboration white paper is published as an adjunct to the aforementioned experiment.

Key observations highlighted in this white paper include:

1- The post 9/11 operational and analytical demands which consistently highlight the central role of collaboration across USG Agencies and the negative impact resulting from the absence of common framework, definitions, and vocabulary

2- The lament that many, if not most, US Government organizations follow the hierarchical models developed after WWII which constrain collaborative planning and are now challenged by the following:

   a. Rapid advances in information technology and related disciplines
   b. The information "Tsunami"
   c. Globalization trends and resulting geographically distributed social networks where no one person has the monopoly on what is needed to get the job done
   d. The growing dispersal of expertise, as the boundaries between analysts, operators, and collectors become increasingly fuzzy

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[*] This white paper is a product of the Strategic Multi-Layer Assessment (SMA) effort. For those not familiar with SMA, it provides planning support to Commands with complex operational imperatives requiring multi-agency, multi-disciplinary solutions that are NOT within core Service/Agency competency. Solutions and participants are sought across USG. SMA is accepted and synchronized by Joint Staff and executed by STRATCOM/GISC and OSD/DDRE/RRTO.

   e. Military need for National-to-tactical integration
   f. Outdated regulatory and legal policies that impede information sharing and dissemination
   g. Organizational cultures that disincentivize collaboration

3- Finally, technologies and tools by themselves will NOT improve collaboration. This collection of papers deliberately challenges the all too prevalent view that collaboration is a pure technology issue. Improvements in collaboration will come from innovative ways and incentives to transform and re-tool organizations, focus attention on the cultural and social impediments, and develop the means to empower individuals while establishing accountability.

As a prospective reader, please do not be put off by the size of the report. The short articles are intentionally written to stand alone; however, while a selective reading would offer its own rewards, you are encouraged to read the whole report to expand and enrich your perspective of this critical problem space.

I would like to take this opportunity to extend my thanks to the numerous contributors, to the editorial board chaired by Dr. Jennifer O'Connor (DHS), and to Dr. Nancy Chesser (DTI) for compiling the manuscript.

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PREFACE

Our ability to effectively solve today's problems while preparing for tomorrow's challenges will not only require us to work together within the Whole of Government, but effectively collaborate beyond traditional boundaries into national and international areas of expertise in an increasingly unified and collective approach. This trend necessitates multidimensional integration, smart organizations, and responsive policies which empower collaboration and knowledge sharing to operate at increasingly higher levels of performance. Furthermore, we face this challenge in many areas the United States Government faces, which is the ongoing challenge of transforming hierarchical structures developed after WWII during the Cold War.

Such organizational structures often reinforce formalized, hierarchical information sharing over emerging ones which encourage a horizontal and vertical collaborative culture. Today's globally connected world is holding such traditional hierarchical cultures hostage through rapidly evolving technology, creating an information "Tsunami" compounding limits of sharing from one stovepipe to another. Furthermore, the challenge of sharing within an environment of information overload is only likely to grow increasingly more difficult to manage as the globalization of distributed social networks or Web 2.0 makes our world even smaller and more interconnected.

In response, we must identify barriers to collaboration, including regulatory and legal policies, which inhibit rapid knowledge sharing and distribution - for example, focusing on key issues such as innovative ways to transform and re-tool organizations to empower individual and team collaboration while simultaneously maintaining accountability and security of sensitive information. Finding the appropriate balance between the need to protect and secure and the simultaneous demand to effectively share as broadly as possible is a significant undertaking. The challenge to foster a collaborative culture is needed to leverage our experiences and expertise.

Technologies and tools alone will not lead us into such a culture. Technology can only serve as an enabler in support of developing mutually-beneficial relationships, in some cases only existing virtually, across a wide range of inter-related communities and teams. Leadership and education, along side other important domains which all work in concert with technology such as human factors based architecture, are also important contributions to bringing such transformations to bear in a significant way.

This timely and important collection of papers is a critical step in realizing, in practice, the collaboration concepts required to create change in response to today's demands and to prepare us for those we have yet to face. Through sharing the hard fought lessons learned and experienced, we can create a common collaborative culture and effectively continue to sustain today's leadership and competitive advantage well into the future.

P.K. Keen
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Executive Summary (Jennifer O'Connor - DHS)

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> "At 8:46 on the morning of September 11, 2001, the United States became a nation transformed." 9/11 Commission Report – Executive Summary

The purpose of this compendium of white papers is to explore various perspectives on the state of the art in our understanding of collaboration, including insights on the key factors that influence the who, what, when, where, and how of this topic. Collaboration traditionally refers to multiple people or organizations working towards common goals, but there are many other perspectives and definitions. The objective of this compendium is to identify and discuss the issues:

- how analytic tradecraft can be enhanced through collaboration
- when expansion of access to information take place and if this approach adds value to analysis
- how to facilitate collaboration within and across government organizations
- who collaborates and how do they collaborate to identify emerging threats
- what can be done to improve analysts' ability to understand and apply social and behavioral science methods and findings.

The basis for all assertions will be given from both scientific and practical bases and areas of dissent and debate will be noted in the papers.

By way of background, this compilation was created after completing a Strategic Multilayer Assessment (SMA) effort during 2008 to develop approaches to anticipate rare events such as the nexus of terrorism and WMD. That effort highlighted the fragility of the models and the need for a multi-disciplinary, multi-agency approach to deal with anticipating/forecasting, detecting and interdicting such events. That effort led to the following:

1. Publication in November 2008 of a white paper entitled "Anticipating Rare Events: Can Acts of Terror, Use of Weapons of Mass Destruction or Other High Profile Acts Be Anticipated? A Scientific Perspective on Problems, Pitfalls and Prospective Solutions"
2. Development of a concept for an Inter-Agency Limited Objectives Experiment (IA LOE) as described in the current white paper

This collaboration compendium is published as an adjunct to the aforementioned experiment.

In the months after the tragic events of September 11, 2001, it was discovered that indicators were there which could have led to the prevention of these terrorists' acts. The 9/11 Commission Report, in looking at this issue, subsequently recommended "Unity of Effort" and a focus on Information Sharing. As we have thought through how best to move from a "need to know" to a "need to share" system, those human issues which contribute to the current "need to know" system have not changed. What *has* changed, however, is our understanding of human organizing processes and collaboration technologies.

This compendium of papers illustrates that theory, research, and applications are available for enabling collaboration. More importantly, collaboration technologies are now shaping organizing processes – whether our policymakers use them or not. These papers illustrate the breadth of issues involved in institutionalizing the concept of *sharing* that we now call *collaboration*. For

readers new to this topic, the papers are ordered to minimize the time it will take to gather a working knowledge of the concept of collaboration, what the key constraints and enablers are to collaboration, and what potential paths forward entail.

Section one focuses upon Agency and Operational Perspectives. McIntyre, Palmer and Franks (Section 1.1) quote the President's Memorandum for Heads of Executive Departments and Agencies on Transparency and Open Government, issued 21 January 2009, which states "Executive departments and agencies should use innovative tools, methods and systems to cooperate among themselves, across all levels of Government, and with nonprofit organizations, businesses, and individuals in the private sector." McIntyre, et al., bring to our attention the Director of National Intelligence (DNI) Vision 2015 highlighting the need for establishment of "a collaborative foundation of shared services, mission-centric operations, and integrated management…"

The next two papers illustrate the military and law enforcement perspectives on collaboration. Harm and Hunt (1.2) note that collaboration is not a new thing for the military. In fact, Goldwater-Nichols empowered collaboration across defense agencies. The current generation of young military looks forward to their joint assignments. Harm and Hunt focus upon recent advances and evolutions in technology, culture, processes and people driving the current effort to create effective collaboration. Two interesting themes are now starting to emerge: collaboration is defined differently depending upon the culture of the organization, and, there is a need to start small with limited collaboration elements in order to build a functional and effective complex collaboration effort.

Kiernan and Hunt (1.3) point out the nexus between criminality and terrorism. The lessons law enforcement has already learned, as well as the tools applied to defeating social networks of criminals, are also applicable to the military's fight against terrorism. The authors point out two successful collaboration environments – InfraGard and Defense Knowledge Online (DKO).

The last paper in this section is by Hilton (1.4). He starts with a compelling example of the benefits derived from collaboration enabled by technology during the crisis in the Republic of Georgia. Out of the lessons from this effort arose the concept of Teams of Leaders (ToL). ToLs are high-performing leader-teams whose members are from different organizations, cultures, agencies, or backgrounds and who each bring specific knowledge, skills and attitudes to the cross-culture JIIM leader-team. Components of ToL are Information Management, Knowledge Management and Leader Teams. The synergy amongst these three elements results in high performance. A theme that emerges in this paper, and throughout this compendium, is the idea that the least understood element of collaboration is the human element. The struggle for any organization is not information technology or knowledge management capabilities, but the identification and understanding of the human element in order to effectively apply them.

Section two of this compendium provides a scientifically based understanding of collaboration across multiple disciplines. Bienenstock, Troy and Pfautz (2.1) take on the unwieldy task of providing an overview of perspectives on collaboration. What comes out clearly is that there is a wide range of research, stretching across many disciplines in the area, but almost no overlap. Management and Social Sciences research have primarily investigated social structures and incentives that encourage or discourage collaboration. Computer Science research has focused on teamwork through technology. Additionally, computer design researchers have found that individual, dyadic, and group brainstorming should be encouraged, as well as cognitive conflict.

Research in the military and intelligence communities examine specific physical, virtual, and cultural structures that impact collaboration. The authors identify four critical questions for collaboration: 1) What kind of collaboration is required to meet goals; 2) What barriers exist in status quo; 3) What actions must be taken for facilitation; and, 4) what systems will best enable the actions. Bienenstock, Troy and Pfautz echo Hilton's discovery: It is the people element that creates the dilemma for effective collaboration.

Next, Kuznar (2.2) notes the anthropological truism that humans are a social species and are interdependent upon one another for goods, services, security, and emotional support. He describes kin-based sodalities (collaborative societies) and non-kin based sodalities. Another theme emerges, which actually runs through all these papers: non-kin based sodalities are often voluntary associations that people create around some purpose. "The fact that voluntary associations are formed around a common purpose indicates that mechanisms of reciprocity are central to uniting a collaborative society…" Quid pro quo is a very old concept and is actually a reasonable way to organize.

Cronk (2.3) adds to the importance of this theme in his paper addressing an evolutionary perspective of collaboration and cooperation. Concepts such as kin recognition systems, cheater detection mechanisms, cooperator detection mechanisms, sensitivity to audiences, reputational concerns, coalitional awareness and theory of the mind suggest that human cognitive abilities may be the product of Darwinian selection in favor of cooperation.

Bienenstock and Troy (2.4) look at collaboration in terms of two basic dilemmas: social traps and social fences. Research is mature on social dilemmas and some findings echo those discussed throughout their paper. For instance, persistence and repeated interaction lead to emergent understanding of a shared fate and, eventually, trust – which contributes to eliminating both social traps and social fences. Also, network structure affects efficiency and promotes feelings of efficacy and a motivation to collaborate.

In the next paper (2.5), Stouder examines organizational studies. The progression of papers in this compendium illustrates that collaboration is studied from many different perspectives and is called many different things. Terminology aside, there is much science has to offer in guiding how information sharing and collaboration can be maximized. Studies have examined interactions and outcomes based on activity at individual, group, organizational, societal, national, and international levels. While the underlying intent of the studies may be to understand how to get people to work together/collaborate, how the research is implemented can result in findings that cannot, or should not, be compared.

Generalizations concerning collaboration must begin with a norming process on the terminologies and definitions. Just because performance on an assembly-line in Michigan increased when lights were added does not mean that it was the lights that increased production (those social scientists among you will recognize the reference to the Hawthrone studies). The problem of the third variable is very real. Empiricists like to get results based on manipulation of facts. However, there are times when the environment in which the empirical assessment is being made *changes*, and it becomes obvious that what was thought to be causing an outcome was really due to some third variable. Understanding a desired outcome via theory is definitely a more time intensive process, but when the health of entire societies may be on the line, the effort and thought required to test theory is more likely to lead to a consideration involving a rare event such as 9/11.

Stouder's knowledge of the organizational research literature is a key place to start for the Limited-Objective Experiment (LOE) accompanying this compendium (see Article 4.1). Stouder provides a list of research questions that Bienenstock et. al., began; and authors of other papers add to it. For instance, what is the research seeking to understand – the process of collaboration (type, level, frequency, duration, intensity, variety)? Or, should research focus on the drivers or constraints on collaboration (environmental factors, organizational factors, events, etc.)? The quid pro quo theme emerges again. It appears that asking "*What's in it for me?*" is a principle of human behavior as it applies to collaboration.

Heuer, Pherson and Beebe discuss analytic teams, social networks and collaborative behavior in the next paper (2.6). The rising use of Wikis and other collaborative software is building a more transparent and collaborative analytic environment. Hunt (2.7) looks at what can be learned from economics. Economics of engagement indicate that fun, trust and honor are critical components for collaboration success.

The last paper in this section (2.8) presents a Seven-Layer Model for Collaboration. This model is grounded in theory drawn from multiple disciplines. It represents the most comprehensive approach to laying out a means to test concepts of collaboration discovered during our compiling of this paper. Briggs' Seven Layer Model begins with Goals and moves through Deliverables, Activities, Patterns of Collaboration, Collaboration Techniques, Technology and the Script Layer. Later in the compendium (Articles 4.6 & 5.3) a network architecture is described and it should not go unnoticed that this seven-layer theory and the layers of the mission fabric approach together make a good foundation for future theory development and empirical research.

Section three of this compendium addresses *Common Barriers to Collaboration*. Rieger (3.1) calls out imbalanced empowerment and accountability as key barriers. Regulatory and legal concerns play roles in making it hard to collaborate. A basic sense of fear of loss also plays a role. Empowerment is determined by whether someone has enough time to do their work, has the training to do it, has the materials and equipment, has open communications, and management support. If a worker puts any of his or her resources into performance, he/she is going to want to know there will be an acceptable form of reciprocity.

Heuer and Beebe examine Small Groups, Collaborative Pitfalls, and Remedies next (3.2). Small groups have been studied extensively across many domains. There are some basic principles of small group behavior which occur regularly (groupthink, polarization, social loafing, etc.). Heuer and Beebe point out that techniques have been developed which stimulate productive group behavior working with tendencies such as those listed above to improve performance. Palmer and McIntyre (3.3) make observations from the trenches about how to build a collaborative culture. The key challenges in building collaborative culture involve processes, technology, and behaviors. Again, the need for incentives for collaboration is noted.

Section four addresses *What Applied Research has Learned about Collaboration*. Numrich and Chesser (4.1) provide more detail on the Limited Objective Experiment (LOE) mentioned earlier and explain how the effort is embedded in the deeper need to understand and predict rare events. The LOE is designed to enhance existing analytic capability with new collaboration strategies and tools to make the process transparent to strategic decision makers.

The LOE has two parts: a Worldwide Rare Event Network (WREN) experiment and a companion US Air Force Academy (USAFA) experiment. In the WREN experiment a diverse community will attempt to characterize indicators of illicit terrorist activity against the US in a

scenario developed by the FBI. Metrics collected during the experiment will include, but not be limited to, where players seek information, to whom they reach out for collaboration and how often, and what tools they tend to use. The USAFA experiment will involve a range of ages and experience (cadets and students plus law enforcement professionals) and the tools used in the second week will permit more visual interaction to measure whether that interaction enhances collaboration. This second experiment will make use of the mission fabric approach described in later papers (4.6 & 5.3) .

Pherson and McIntyre (4.2) describe the Intelligence Community's (IC) experience with operational collaboration. A great example of where new collaborative technologies are embraced is senior leaders who have started their own blogs. Another theme found across papers is perhaps best described here – there are explicit penalties for sharing information too broadly, including loss of employment, but no comparable penalties for sharing insights and information too narrowly. The idea that new collaboration efforts should start with small problems before they are applied to 'life or death' projects is brought up by Pherson and McIntyre. Key enablers to successful collaboration identified by the authors include consistent policies, technical and administrative infrastructure, engaged leadership, and use of collaboration cells.

Carls, Hunt and Davis (4.3) discuss *Lessons about Collaboration in Army Intelligence*. This is the first time that the importance of physical layouts has been specifically noted. It is also the first time that the trend for humans and computers to share reasoning workloads is noted (an element of the dilemma noted earlier involving the human element). Machines require explicit instructions in order to execute tasks involving collaboration. As such, when humans collaborate with machines, one side of a complex collaboration effort is held constant. This type of man/ machine collaboration may provide a base from which collaborative training for man/ man could begin. Further, broader understanding has often emerged from a leisurely stroll around a library or book store. Computers cannot "do" creativity, but humans have workload issues. Collaboration among humans alleviates some of the workload issue, but how do we move to a multi-faceted collaboration where the best of human groups can be brought out?

Meadows, Wulfeck, and Wetzel-Smith (4.4) next explore complexity, competence and collaboration. Identification of factors and collaboation support system design guidelines related to complexity dovetail with Bienenstock's earlier discussion of the issues involved in researching collaboration. This paper serves as a great means to help merge the Briggs Seven-Layer Model and the framework presented by Pierce for collaboration engineering. The collaboration development process described in the paper is an excellent example of where collaboration started small and how it grew.

Lyons (4.5) provides an excellent review of empirical studies done by the Air Force looking at organizational collaboration and trust in team settings. Four dimensions of collaboration at the organizational level were found using a factor analysis: collaboration culture, technology, enablers (e.g., training), and job characteristics. Other findings relate to structures, processes and reward systems promoting information sharing via IT systems; importance of workspace design (physical layout) in information sharing; importance of individual agreeableness to perception of trust; and, negative communication decreasing performance.

Bergeron and Pierce, in paper 4.6, suggest creation of a means to instantaneously distribute and modulate control of information flow when dealing with security concerns of governmental organizations. Boehm-Davis (4.7) brings a wealth of research from the Human Factors

Engineering (HFE) literature to light. HFE has worked to develop safe and effective performance over the last several decades to understand how man and machine have interacted for decades. Boehm-Davis shows there is a flow of knowledge needed to develop effective collaboration where group processes are understood, and also describes how those processes affect work performance and what the nexus is with technology. For example, studies show that if a procedure is put in place, certain aspects of team dynamics can be improved (e.g., checklists used by medical doctors). Boehm-Davis, taking an approach similar to Briggs Seven-Layer Model, also highlights the need to develop both vertical and horizontal models.

Moreno-Jackson (4.8) approaches issues of collaboration from the pragmatic point of view: sometimes the only way to get good collaboration is to involve a non-biased facilitator. MacMillan (4.9) raises the question of whether there can be too much collaboration. She provides findings from a 13-year study conducted by the Navy on Adaptive Architectures for Command and Control (A2C2). One of the key findings is that there is an optimal level of organizational collaboration and coordination for best mission performance – a level sufficient to ensure that mission tasks are accomplished, but not so great as to generate unnecessary workload. Further, she illustrates that it is possible to optimize organizational structures to achieve superior performance even when the number of times humans collaborate decreases. Boehm-Davis notes that the group dynamics literature has found that greater negotiation amongst group members leads to more adaptive groups over the long run.

There are definitions of collaboration throughout this compendium, but most include a need for *cooperation towards a goal*. The Navy research supports this definition by suggesting that if the goals for collaboration are well-understood and the mission well-specified, only then will there be better mission performance.

Linebarger's paper (4.10) follows-up on the Navy findings by flipping the thought process around and suggesting that task-focused collaboration can be made more effective, especially if group collaboration patterns are recognized and explicitly supported by the surrounding environment and software system. Linebarger notes that collaboration always occurs if there is dialog. His research suggests that collaboration support improves quality and productivity, especially when the group has some control over *how* they are supported. Hall and Buckley (4.11) provide a delineated checklist for successful collaboration that has been used in the intelligence community to evaluate collaboration projects.

Section five of this compendium addresses "*Potential Enablers for Collaboration*." Bronk (5.1) begins by identifying issues in management and sharing using techno-collaboration. He identifies three core principles for IT in collaborative government work: 1) collaboration tools should be easy to use, 2) collaboration tools should be entirely facilitated by the Web browser, and 3) collaboration solutions should be cheap, or even better, free, as far as users are concerned. Bronk suggests that if talented collaborators are cultivated and rewards systems put in place, appropriate technical tools will be found. He also notes that the quid quo pro in government is tied to the appropriation process and constitutional authority, thus explaining why IT adoption is sometimes difficult.

The next two papers address how IT might overcome some 'people' issues. First (5.2), Hunt and Snead discuss "*Collaboration in the Federated Environment: The Nexus Federated Collaboration Environment (NFCE*)." Essentially, the NFCE serves as a virtual social networking place that transcends the center and edges of its member networks yet facilitates

members linking up when they have common specific goals. Interactions among any number of governmental organizations on any number of levels are enabled. The nation must enable people, information and processes to build, explore and exploit a networked federation of diverse organizations so that they can be easily aligned to make timely, transparent and collaborative decisions about adversary goals and behaviors. Again, it is important to put in place mechanisms to reward contributions to collective success.

Pierce (5.3) discusses a multi-dimensionality of collaboration. He describes the interplay between distributed collaboration, security, alignment and provisioning of services. He uses numerous helpful analogies to suggest there should be a paradigm shift in how information is shared and controlled technically. He calls this new approach the *mission fabric*.

Wagner and Muller (5.4) emphasize that trust occurs between two individuals not an organization. They draw from Gallup's research to identify eight elements of collaborative success: complementary strengths, common mission, fairness, trust, acceptance, forgiveness, communication, and unselfishness.

Similar to the need sometimes for facilitators, noted by Moreno-Jackson, Pherson (5.5) suggests the use of Transformation Cells to institutionalize collaboration. This approach agrees with several other authors' observations that there must be a group with skills appropriate for the technologies, processes and behaviors needed, in order to enhance collaboration. Gershon (5.6) examines the scientific research on workspace design and provides blueprints for what might be the most effective designs for collaboration. He also provides illustrations that help the reader understand the key design issues.

Pherson provides another paper (5.7) that illustrates how to develop training courses on collaboration. The approach is comprehensive, noting differences in training requirements dependent upon where a collaborating analyst is in his/her career. He makes a strong argument for joint training because it enables analysts to build teams and networks, develop realistic incentives and metrics, and generate new collection strategies.

Von Lubitz (5.8) discusses the concept and philosophy behind development of Teams of Leaders (ToL) for complex defense and security operations. ToLs were developed because of the need for soldier-leaders who were flexible, adaptable, versatile, and comfortable in operating within the complex setting of Joint Inter-agency, Inter-government, and Multi-national (JIIM) operations.

Finally, Egan and von Lubitz (5.9) discuss the need to include lawyers in groups responding to crises. The Model State Emergency Health Powers Act (MSEHP) helped to organize trans-boundary issues associated with such events as the H1N1 public health emergency, but was more often used to focus on technical challenges. As policymakers worked through crises using MSEHP it became evident that the causes of poor responses were, actually, legal challenges. Three such issues were state sovereignty, definition of response roles, and respect for the federalist process. ToLs, discussed in earlier papers (1.4 and 5.8), which include lawyers, are a means to broaden leadership and to establish a decision-making base that spans the traditional agency and level-of-government boundaries, and generates a collaborative response. The authors emphasize that conflicting laws, jurisdictional domains, and the fear of litigation are present in every decision. As such, it makes sense to add the justice system into all the action already being handled by executive and legislative means.

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As described in the 9/11 Commission Report, effective collaboration is a must if we are to prevent other such tragic events. This compendium takes a significant step toward integrating information from many different disciplines and environments in order to develop a field of research on collaboration. Through a more in-depth, empirically-based understanding of the issues, human collaboration can drive the development of new and/or improved technologies and organizational structures/processes.

What can happen if government information holders collaborate? The events of September 11, 2001 illustrate what can happen if they *don't*.

1. Agency and Operational Perspectives

1.1. A Framework for Thinking about Collaboration within the Intelligence Community and Beyond (Joan McIntyre, Douglas Palmer and Justin Franks - ODNI)

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1.1.A. Introduction

Executives at agencies across the Washington Metropolitan Area and beyond are looking to improve how they collaborate both inside their own organizations and with key partners outside their traditional hierarchies. The President's Memorandum for Heads of Executive Departments and Agencies on Transparency and Open Government, issued 21 January 2009, states "Executive departments and agencies should use innovative tools, methods, and systems to cooperate among themselves, across all levels of Government, and with nonprofit organizations, businesses, and individuals in the private sector."[1] The ***DNI Vision 2015*** states that to meet the demands for greater forethought and strategic agility the Intelligence Community must "evolve into a true Intelligence enterprise established on a collaborative foundation of shared services, mission-centric operations, and integrated mission management, all enabled by the smooth flow of people, ideas, and activities across the boundaries of the Intelligence Community members."[2] Underlying these visions is the goal to create a collaborative and integrated enterprise.

While the desire for greater collaboration and a more integrated community is clear, a common understanding of the associated concepts and vocabulary is lacking and often obscured by a parade of ever changing terms and buzzwords such as teamwork, horizontal integration, Communities of Interest (or practice), jointness, netcentricity, and multi-INT fusion. The emergence of new collaboration capabilities (usually dubbed social software, social media, Web 2.0 or Enterprise 2.0) has generated an additional set of related concepts and behaviors. This essay seeks to provide a framework for those charged with implementing these visions to assist them in thinking about collaboration. While the authors' point of reference is the Intelligence Community, we believe the concepts addressed should be relevant to other government agencies, particularly those dealing with knowledge management.

1.1.B. Defining Collaboration

Webster's defines collaboration as working jointly with others, especially in an intellectual endeavor. Most definitions of collaboration embed and embellish on this concept of joint interaction. Russell Linder argues that "collaboration is about co-labor, about joining effort and ownership" and that "Collaboration occurs when people from different organizations (or units within one organization) produce something together through joint efforts, resources, and decisions making, and share ownership of the final product or service."[3] More simply, Michael M. Beyerlein, Sue Freedman, Craig McGee, and Linda Moran state "Collaboration means working together. Effective collaboration means working together efficiently and effectively."[4] The MITRE Corporation, in a 1999 baseline study of collaboration in the Intelligence

Community defines collaboration more broadly as "the interaction among two or more individuals and can encompass a variety of behaviors, including communications, information sharing, coordination, cooperation, problem solving, and negotiation.[5]"

For the purpose of this essay we will use the definition adopted by the Deputy Director of National Intelligence for Analysis' Collaboration Consulting Team, which defines collaboration as "the interaction among members of the Intelligence Community and their partners—exploiting their diverse expertise and organizational resources to create higher value intelligence than an agency or officer can do individually to achieve the mission of the Intelligence Community." The key points are that collaboration results from co-creation, provides a higher value added output then would have occurred if individuals or organizations had acted alone, and serves as a means of achieving an organization's mission. This definition could easily be adapted to fit other organizations.

1.1.C. Associated Concepts

A number of concepts are often associated with collaboration, and in some cases considered synonymous with it, but which are distinct and should not be confused with collaboration. As stated by the Economist, "The labels themselves are not important, but labeling every initiative as "collaboration" creates a misnomer that robs [organizations] of the ability to deploy resources efficiently and effectively to create the most value."[6] Ignoring many of the buzzwords past and present used by the Intelligence or Defense Community, we focus on a few that are most relevant to understanding the dimensions of collaboration—information sharing, coordination, integration, networks, and collaboration tools.

Information Sharing. Although often used in tandem or interchangeably with collaboration, information sharing is perhaps best thought of as a one-way transfer of available information for others to use. Unlike collaboration no co-creation occurs, and no new knowledge or value added is generated. In the words of 9/11 Commission members LTG Peter Kind (USA, Ret) and Katharine J. Burton, "Access to information does not necessarily lead to effective knowledge sharing and collaboration. When people share knowledge, they are not just sharing information; they are also sharing cultural and social references."[7] Nevertheless, information sharing or, more to the point access to the same body of information, is a necessary precondition for collaboration to occur. In the Intelligence Community lack of access to the same body of information can impede collaboration as potential participants are unsure of what information they can discuss and collaborate on.

Coordination. Frequently confused with collaboration, coordination within the Intelligence Community generally involves sharing a draft report, policy or planning proposal with stakeholders within and outside the initiating organization. Rather than working jointly on a product, the initiators in the coordination process seek comments and/or concurrence from the other stakeholders. In many cases, as groups seek to protect their interests coordination can result in compromises that reduce the richness of the final output. If participants collaborated on an initiative throughout the creation process, then the final coordination phase, if even necessary, can be pro forma, quick, and painless.

Integration. In contrast to the human relationships that drive collaboration, integration--defined as the act or process of incorporating into a larger unit--is an organizational concept describing the relationships within and across organizations. Vertical integration generally describes the Industrial Age command and control structure with communications and interactions flowing up

and down a hierarchal organization. Horizontal integration emphasizes an organizational structure that fosters relationships and interactions that cut across departmental and even organizational boundaries and are much more dependent on collaborative, non-authoritative behaviors. As popularized in books such as Thomas Friedman's *The World is Flat*, the increased complexity of problems and issues that organizations, including the Intelligence Community, face along with emergence of technologies that have greatly expanded the speed and mechanisms for individuals to connect is driving a shift toward more horizontally integrated organizations.[8] In this context, collaboration can provide the mechanism for achieving integration such as envisioned in the DNI's *Vision 2015*.

Networks. Defined by Webster's as an interconnected or interrelated chain, group, or system, networks serve as the underlying fabric that connects organizations and individuals. Networks are common features in biology (neural networks), infrastructure (power grids or communication and transportation systems), and social interactions. To foster collaboration, social networks will allow individuals to leverage their relationships to bring together the right people at the right time to address the problem at hand. In addition, the rapid expansion of communications and computer networks over the last two decades has made it easier for individuals to develop networks that span broad geographic and organizational boundaries, which in turn can enhance the agility of groups to converge and collaborate on rapidly changing issues.

Collaboration Tools. The concept of collaboration is often thought of as synonymous with collaboration tools. As a result, responsibility for developing and implementing a collaboration strategy is frequently given to an organization's office of the Chief Information Officer or Chief Technical Officer. This assumption that the introduction of collaboration tools will solve the organization's collaboration problems ignores the human factors critical to effective collaboration. While collaboration tools can enable collaboration, a collaboration strategy must address the underlying business processes and organizational and cultural drivers that influence participants' willingness to collaborate.

1.1.D. The Collaboration Continuum

Collaboration takes place along a continuum, depending on how well defined and structured the collaboration is. At one end of the spectrum are teams and working groups that have been formally tasked to work together on a well-defined problem or issue. At the other end of the spectrum is an unstructured and indirect form of collaboration termed "emergent" collaboration that occurs when individuals make their thoughts and results of their work available for others to respond to or build on without formally coalescing into a structured team. In between a variety of collaborative activities can occur representing different levels of structure and including ad hoc teams and Communities of Interest.

Team-based collaboration is perhaps the best known and most studied form of collaboration. Teams are generally created to integrate the efforts of known experts against a given and definite problem set. An extensive body of research and literature exists that examines teams from a variety of aspects to understand how to create and sustain effective teams, including:

- Stages of team building: "forming, storming, norming, and performing"[9]
- Roles on teams, including how to effectively lead teams
- Co-located versus geographically dispersed teams, and their different requirements for business processes and tools
- Trust building and other interpersonal aspects of team building[10]

Going under a number of designation including teams, working groups, tiger teams, and committees, some organizational or cross-organizational groups give the appearance of being a team but whose members do not live up to our definition of collaboration. For example, work units, which carry the designation of a team, consist of members who work independently and are not reliant on the other members of the work unit for success in their efforts. Likewise there are committees and other cross-departmental or cross-organizational groups whose participants represent the equities of their organizations and do not work jointly toward a common objective with each member contributing value to an end product. Their functions are generally for information sharing and coordination.

With the emergence of Web 2.0 technologies, such as wikis, blogs, social bookmarking, and micro-blogging, the potential for and realization of unintended or emergent collaboration to occur has grown as users can "bump" into each other as they do their work in an open environment. According to the noted Enterprise 2.0 expert Andrew McAfee, Associate Professor at the Harvard Business School, these technologies are significant "because they can potentially knit together an enterprise and facilitate knowledge work in ways that were simply not possible previously."[11] Clay Shirky argues in *Here Comes Everybody* that the new collaboration capabilities have made it "easier for groups to self-assemble and for individuals to contribute to group effort without requiring formal management,"[12] changing the limits on the size, sophistication, and scope of unsupervised effort. Wikipedia, open source software development, and prediction markets are some of the more well known manifestations of this trend. In essence this form of collaboration allows individual actions to be translated into collective gains as individuals add their information and insights to a collective knowledge base. At its most extreme this collaboration occurs without participants directly interacting with each other.

Between the two ends of this continuum, collaboration can take a number of different forms. Groups can come together voluntarily in ad hoc teams to address a common issue or problem and disperse when the issue or problem ceases to exist. Communities of Interest, or Communities of Practice, are defined by Eggers and Goldsmith as "groups of people linked by technology and informally bound together by a common mission and passion for joint enterprise"[13] and can be created to allow members to share knowledge and expertise. While not jointly producing value-added output, COIs help individuals build their networks and allow them to produce better products or services through the exchange of knowledge, expertise, and information. A well-structured collaboration environment that provides both the technical infrastructure and the incentives for participation can support collaboration that runs across the full continuum and allow participants to move seamlessly between the various forms of collaboration and determine what is best for a given problem set.

1.1.E. Some Final Thoughts on Creating a Collaborative Environment

Translating this framework for collaboration into a strategy that can be effectively implemented within an organization and across organizations such as the Intelligence Community or the Department of Defense presents a multitude of challenges. As many of the articles in this publication point out, collaboration in any form can be difficult to achieve and generally is the exception rather than the rule in organizations. Moreover, there is still a lot to be learned on how emergent collaboration fits into an organizational setting—a setting which differs considerably from the Internet world of self-motivated individuals that originated this form of collaboration.

We would pose some questions to be asked when organizations are thinking about the value of leveraging the different forms of collaboration to include:

- What functions and activities within the organization are more suitable for the more traditional, formal forms of collaboration as opposed to emergent collaboration?
- How can organizations best structure their collaborative environment to ensure that the workforce is able to seamlessly organize into the appropriate type (or types) of collaboration to respond to constantly changing circumstances?
- What business processes, rules of engagement, and organization goals and objectives need to be built into the collaborative environment to ensure that ad hoc or emergent collaboration is aligned with the organizational mission?
- Does the organization's structure—including incentives and training—encourage or hinder collaboration and innovation?
- How can networks be grown and utilized to ensure that collaboration in whatever form benefits from creativity and diversity of perspectives?

Likewise, organizations that make available a variety of collaboration tools within the work environment can support a diversity of collaboration activities. Selection of the best tool, or in many cases the best suite of tools for a specific collaboration effort must be tailored to the mission objectives and desired business processes. While much is yet to be learned on how to leverage such tools most effectively to collaborate, early experience suggests certain possibilities.

- ***Instant messaging, group chat, and persistent chat rooms*** allow for groups to maintain near-real-time communications and facilitate information sharing and coordination of activities particularly in rapidly changing circumstances.
- ***Virtual meeting platforms***, which often include application sharing, virtual whiteboarding, and audio and video conferencing, provide an alternative venue when face-to-face meetings critical to trust building and efficient formal collaboration are not possible.
- ***Discussion threads*** permit participants within a community to pose questions, share information, and discuss ideas and insights on a topic of interest.
- ***Blogs*** provide for an exchange of views similar to threaded discussions but the topics and agenda are driven by the blog owner—either a group or individual. Blogs can be a good way of sharing information and opinions and getting feedback from others.
- ***Wikis*** support dynamic co-creation of content, permitting the consolidation and sharing of the collective knowledge of a group and facilitating the linking together of a large body of related information.
- ***"Live" documents*** such as Google docs permit individuals to jointly produce a document via the web without downloading and re-uploading.
- ***Social Networking Services*** similar to Facebook or Linked-in and embedded in A-Space, the IC analytic work environment launched in September 2008, allow users to identify colleagues with similar or complementary expertise and to develop and maintain their professional networks, enhancing their ability to quickly reach out for needed skills, expertise, or information and to form ad hoc or formal teams to address mission-driven activities.
- ***Social bookmarking*** (tagging or folksonomies) allows users to organize information found in a web environment by "bookmarking" information on the web instead of

individual's browsers and adding tags and comments to be able to easily retrieve and use the information at a later date. Users benefit by seeing how others have tagged the same information and can find additional information tagged by others, both enhancing their ability to find information and identifying other users to add to their networks.

Finally, these collaboration capabilities can be accessed through self-contained collaboration environments with membership limited to defined communities or they can be open to all users on a network. Again, organizations can benefit by having both forms of collaboration capabilities available to users, allowing mission to drive the use of one or the other form. Self-contained communities appear best suited to formal collaboration efforts where the community, objective, and business processes are well-defined, particularly when the activities or information involved is highly sensitive and needs to be kept close hold. However, open collaboration capabilities are imperative to fostering ad hoc and emergent collaboration and permitting networks to develop and groups to form quickly and agilely to meet constantly changing demands on the mission.

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1.2. A Military Perspective on Collaboration: Where the Past Meets the Present (Col Craig Harm - NASIC and Carl Hunt - DTI)

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> ***Collaboration:*** *1: to work jointly with others or together especially in an intellectual endeavor; 2: to cooperate with or willingly assist an enemy of one's country and especially an occupying force; 3: to cooperate with an agency or instrumentality with which one is not immediately connected* [1]

1.2.A. Introduction

The definition of collaboration outlines two distinct and opposing purposes in military operations. Ironically the military use of the term applies to both negative and positive effects for military operations. This article will focus on the first of these purposes which is working together with others to achieve a common goal. The post 9/11 world brings a new perspective to the twentieth century notion of Joint operations. The "others" that must work together has grown beyond just the integration of Service capabilities required in the landmark Goldwater-Nichols Act.[2] Who are these others and how have things changed to drive a more collaborative military?

In the dawn of the twenty-first century, the term "collaboration" has become a buzz-word of sorts. Popularized in business books, it has gained a new momentum in its use to help bureaucrats describe themselves as being progressive. But collaboration in military operations is nothing new. Operations in the twentieth century took the concept to new levels. The introduction of airpower into military operations brought a new domain to warfighting, the first since land and sea. This new domain meant that military effects could be achieved in one area of the battlefield by taking concurrent or sequential actions in a separate area of the battlefield. To achieve these effects, synchronized operations were planned and executed. A new military service was established and eventually even the Air-Land Battle doctrine was developed to better exploit this new domain. The same is now happening in the domains of space and cyberspace.

1.2.B. New Domains – New Opportunities to Collaborate

During World War II, the Germans sought to perfect military integration with the development of their Blitzkrieg doctrine. Detailed planning, to synchronize and deconflict operations, was required between their army and air force units. Timing became a key element and individual units needed more of an understanding of the entire plan. The jungles of Vietnam and the close-in battles in a guerilla war advanced the tactics and doctrine of the Air Force Combat Controllers embedded in ground-based army units. Collaboration was achieved using trained airpower specialists placed as integral members of a ground combat unit.

These airpower specialists used tested and practiced tactics along with radio communications to call in air strikes on an as-needed basis. Air units maintained specifically timed and placed areas of operations; pre-aligned with planned ground operations. Collaborative planning was accomplished through a hierarchical, system then executed directly between engaged troops and airmen. The modern US Air Force took the integration of air power to a new level in the late twentieth century. Desert Storm saw the maturation of the Air Operations Center and a single point of integration for all things related to airpower. This center enabled collaboration amongst

the distinct elements of airpower to actualize the concept of an integrated air campaign, a campaign designed to execute theater-wide effects aligned with the Theater Commander's intent.

Each of these examples shows the impacts and necessity of collaboration for successful military operations, regardless of domain. While each provides its own brand of collaboration; they all were based on a form of hierarchical command system that faces challenges today. Typically, even in the recent past, one service did not talk with another except at the most senior levels of command. Even when subordinate collaboration did occur, it only did so under the authority of DIRLAUTH[3] from the senior commander. In other words, in order to work with someone outside their immediate chain of command, one must first have the expressed permission from a senior commander. In spite of these challenges, however, history has proved the effectiveness of these examples of collaboration and historical evidence substantiates that these methods are relatively sound and worth continuing.

1.2.C. Recent Changes

So why is there such an interest in collaboration and implied discussions that the military does not really collaborate well? Within all levels of the Department of Defense there is an emphasis on the need to collaborate, as indeed this current White Paper indicates. There also appears to be a need to show and highlight collaboration when it is planned or occurs. The implication is the military might not know how to collaborate. But as already discussed, history is replete with examples of intra- and inter-service collaboration. By some accounts it might seem we are rediscovering collaboration in the military. What has changed to bring on the recent emphasis on collaboration? Three key elements have advanced and evolved that are changing the perception of what effective collaboration means: technology, cultural and effective process changes, and people.

1.2.C.1 Technology and Data

The most apparent and prolific change is technological. Modern systems can now connect in ways never before envisioned. Communications can happen not only at instantaneous speeds, but can overcome the obstacles of distance, weather and the elements. Satellite Communications (SATCOM) now allows for direct links to remote areas where previously there was a complete absence of connectivity. High-speed data flows make the transfer of large amounts of information almost instantaneous. Miniaturization and compact battery power allow previously immobile devices and systems that are completely transportable, even to a "pocket" size of mobility.

The maturation of the Internet and the expansion of Web 2.0 technologies make information accessibility universal: culture and processes can now also change. No longer is it only the owner of information who determines who has access to it. Access is now determined by a person's connectivity to the Web. Personal electronic devices have empowered access to endless streams of information at a person's fingertips. A single cell phone now provides the connectivity of voice, data, text, instant messaging, video, audio and the internet. A single personal sized device now provides the full capabilities previously only found in a complete co-located facility.

These new technologies are allowing for increased access to information for people and organizations previously excluded from the information. Blogs, web forums, Internet news sites and knowledge sites like Wikipedia and Intellipedia have created access to volumes of data never

before imagined. More significantly, they provide a means for any single person or organization to publish anything that interests them or they think may interest others. In 2004, U. S. Strategic Command introduced SKIWEB, its own internal command-wide blogosphere. SKIWEB enables any member of the command, regardless of rank or position to post information immediately upon its discovery. This made current information visible to not only their peers and supervisors, but also to all command levels simultaneously. And, it may be posted without the constraints of supervisor oversight. SKIWEB is a true revolution in distribution of information for a traditionally hierarchical organization like the military…it represents whole new domains to collaboratively leverage.

These new technologies are also simultaneously creating a byproduct; excessively large quantities of data. This new volume of information is too large for any one single service or organization to remain as the sole repository. Beyond just the storing and managing of access to the information, the magnitude of its content is becoming too comprehensive for that same service to also ingest. As more and more people and organizations access the same bits of information, they are discovering that each piece of information has different meanings and functions, depending on the perspective of the user. This co-use of data has meant an increased demand for transparency of each other's data and associated context, and is creating synergies through its collaborative use.

1.2.C.2 Cultural and Procedural Changes

While the impacts of technology should not be understated, the more pressing impacts seem to stem from cultural and procedural changes. The collaborative functions these technologies enable have caused a complete readjustment of how, where and who is able to work together. No longer do collaborators have to be physically co-located. Equally important, no longer does data have to reside in a single place. Technology has enabled immediate connectivity between people and data regardless of location or position in an organization. The control of information is no longer at the bequest of a hierarchical system. It is now a free flowing system where anyone with an interest is able to connect with any other person who has a similar interest.

The 9/11 Commission Report provided some very specific recommendations for information sharing and collaboration.[4] It recommended enhancing relationships with other governments, more direct interactions and sharing between intelligence organizations and increased interagency cooperation. Most importantly it provided a legitimate catalyst for an overhaul in attitudes, approaches, policies and laws; but the report was not the only impetus for change.

Concurrently with the publishing of the 9/11 report, Thomas Freidman published his book *The World is Flat*. In his book, Friedman offers "the triple convergence"; three components that acted on the flatteners to create a new, flatter global playing field.[5] Just as the 9/11 Commission Report was widely referenced, Friedman's book also became widely read within military circles. The concept that instead of collaborating vertically (the top-down method of collaboration, where "innovation" comes from the top), businesses needed to begin collaborating horizontally – this began to resonate with some members of the military. They began to develop working relationships outside the traditional chains of command; in some instances, sharing data was institutionalized.[6] These relationships in turn led to more informal direct collaboration which the participants found to be extremely productive in the execution of their missions.

1.2.C.3 Most Importantly, It's Also about the People!

Informal relationships developed between military officers at professional military education schools like the War Colleges have always provided new working relationships. But when these in-person relationships are combined with the new web-based social networking tools, they continue in earnest even after the War College term is over and the officers have moved on to new assignments.

The newest generation of military officers bring with them experience and comfort with the new social networking systems. *MySpace* and *FaceBook* are no longer only social networking for teenagers; in various forms, these social networking environments are now tools for military officers of all ages. Tailored websites like *LinkedIn* have even brought this system of networking to the business professionals. The Army built its own version of a collaboration site, known as Army Knowledge Online, which eventually began to transform into an inter-service environment known as Defense Knowledge Online.

Professional societies that were previously dependent on conferences and seminars for networking now use blogs and websites to keep members connected. Joint duty assignments introduced officers to fellow officers of different services and when merged with social networking technologies have allowed these relationships to continue even after the assignment is over. These relationships build not just between peers of equal rank, they are integrating members of all ranks and services and even nationalities based on any common interests.

Conversely, this "Friedman flattening" has also given very high levels of the military direct access to the warfighter engaged in combat. In the intelligence world, this is gaining new momentum through the concept of National-to-Tactical Integration, NTI. In his remarks to the Marine Corps Intelligence Association,[7] the former Director of National Intelligence, Ambassador John D. Negroponte, commented that the line between national and tactical intelligence is blurring, that in the world of asymmetric warfare, everyone has an intelligence mission. Additionally it means that the technology exists to provide access to intelligence previously available only at a strategic level to those people and organizations at the tactical level. This level of direct horizontal collaboration is changing our perceptions of a hierarchical access system.

Not only did the 9/11 report highlight the need for interagency collaboration, recent military operations also provide practical experience highlighting the need. For the last decade, military colleges have emphasized the DIME (Diplomacy, Information, Military, Economic); the principle that national power is found in four elements, only one of which is directly managed by the military. The others are represented by other agencies within the US Government. This theory of national power and its infusion into the military officer corps has spawned an increased interest in collaboration across the interagency.

Military operations are becoming more intertwined and interdependent with those of other agencies to achieve national level goals. In earlier twentieth century military operations, collaboration and synchronized operations were thought of within the small spectrum of a single service's various branches, or as the complexity of operations evolved, between services. However, in both cases, collaboration was generally confined to within the Department of Defense. Now as we move into the twenty-first century, it is becoming increasingly important that collaboration occur among government agencies of all levels.

1.2.D. But, It's Smart Organizations and Policies that Empower Collaboration

So how is this affecting collaboration for the military? Historical systems and policies existed for efficiency and unity of command. They were hierarchical systems designed to allow for collaboration by process. These systems were used to ensure proper oversight and command of activities and missions. Formal staffing processes and higher headquarters approval are in place to ensure this proper oversight. Now, new technologies, concepts and current events are challenging these historical systems. Systems like Intellipedia and A-Space are designed for the individual experts to immediately and unilaterally expose information and knowledge without a direct approval chain. And while the telephone was always a direct connection to others, it is basically a one-to-one personal connection. Now, electronic communications systems like e-mail, Windows Messenger, Adobe Connect and others are enabling direct multiple peer-to-peer communications for groups of people without the involvement of supervisors.

As smart organizations are empowering their people with the new technologies that enable new areas and methods of collaboration, care must be taken to resist the urge for the tools to drive the future of collaboration. Both history and current operations are showing us where collaboration is most needed. As military operations continue to expand and evolve, it is not just the "where" to collaborate that must be determined. More importantly, looking back to the definition of collaboration, it is the "who" we should collaborate with that must be identified. The "who" must be determined as a function of the desired effects and impact, aligned with the objectives of the organizations that enable collaboration. With the "who" and the "where" determined, new technologies can be examined and tested to better enable effective collaboration.

Even with the best collaboration skills and technologies, all collaboration efforts within the US government must be aligned within national level policies and laws. Military collaboration is conducted under the authorities of the Secretary of Defense. Goldwater-Nichols was put into place to help empower internal collaboration between the services in a Joint environment. Desert Storm and subsequent military operations have proven the effectiveness of this policy decades after its enactment. But the 9/11 report highlighted that much is still needed to enable this same level of collaboration between all government agencies. This is where new law and policy may be required to fully enable the collaboration made possible with modern technologies and concepts.

Technology, policies, culture, and concepts are all shaping the military's concepts of collaboration. The military is well known for its precise planning and strict discipline. These traits are some of the factors that drive the military to practice. The military repeatedly exercises everything it does. But what exercises are designed for the military to specifically practice collaboration in an interagency environment?

JIATF-South is a living example of operations executed leveraging horizontal collaboration. At JIATF-South, representatives from numerous interagency organizations sit side-by-side conducting activities at an operational level. This structure is allowing direct interagency collaboration instantaneously, without many of the burdensome time constraints of a hierarchical approval system. And while this model is confined to a specific mission in a specific location, and all participants are co-located, it still provides insight into what can be accomplished with collaboration-friendly policies and systems.

1.2.E. Conclusions

Collaboration within the military has been present for decades. It is not a new concept. History is full of examples of collaborative military operations. Operation Overlord, the German Blitzkrieg and Desert Storm all proved what can be accomplished when military organizations with aligned objectives collaborate to achieve a common end. But as the dawn of the twenty-first century unfolds, the military is finding that their current concepts of collaboration must expand beyond just within and between the services…the interagency and all of government collaboration are proving their worth and need. New enabling technologies and changes in social culture are putting new perspectives on who we are able to collaborate with and how we do it. New and expanded horizontal collaboration is in place within modern culture and it is forcing the military to revaluate the impacts and implementation within their traditional hierarchical system.

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[1] Merriam-Webster"s Online Dictionary, http://www.merriam-webster.com/dictionary/collaboration, April 1, 2009

[2] The Goldwater-Nichols Department of Defense Reorganization Act of 1986 Pub.L. 99-433 reworked the command structure of the United States military. It increased the powers of the Chairman of the Joint Chiefs of Staff.

[3] Direct Liaison Authorized. "DIRLAUTH is that authority granted by a commander (any level) to a subordinate to directly consult or coordinate an action with a command or agency within or outside of the granting command. DIRLAUTH is more applicable to planning than operations and always carries with it the requirement of keeping the commander granting DIRLAUTH informed. DIRLAUTH is a coordination relationship, not an authority through which command may be exercised." Joint Pub O-2, 10 July 2001

[4] "Final Report of the National Commission on Terrorist Attacks Upon the United States," is the official report of the events leading up to the September 11, 2001 attacks. It was prepared by the National Commission on Terrorist Attacks Upon the United States (informally sometimes known as the "9/11 Commission" or the "Kean/Zelikow Commission") at the request of the President and Congress.

[5] Friedman, T., *The World is Flat*, Farrar, Straus, and Giroux, New York, 2005. The triple convergence Friedman cites are: the convergence of workflow software, information and hardware; horizontal collaboration both within and outside organizations; and a whole new playing field brought on by the World Wide Web and global openness to sharing and collaboration.

[6] Army Knowledge Online and Defense Knowledge Online are two examples, even though all of the military services have tested such collaborative forums.

[7] Remarks by the Director of National Intelligence, Ambassador John D. Negroponte, Marine Corps Intelligence Association, Inc. Denver, Colorado, September 7, 2006

1.3. The Law Enforcement Perspective in US Interagency Collaboration: Leveraging the Whole of Government Approach (Kathleen Kiernan - RRTO/Kiernan Group and Carl Hunt - DTI)

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1.3.A. Introduction.

This paper will examine an opportunity to bridge two communities which although different in mission and scope, have a common requirement for knowledge discovery within the nexus between criminality and terrorism. These mutual requirements directly impact the operational preparation and response capabilities of each. Law enforcement has historically been adept at identifying sophisticated criminal networks and dismantling criminal enterprises which fuel violence and jeopardize the safety of a community with activity which ranges from petty crime to armed conflict. And, as is frequently now the case, the criminal element has superior weaponry than that issued to uniformed police officers and moreover, is neither constrained by rules of engagement nor with any regard for collateral damage, in effect tipping the tactical advantage to the adversary.

The military is confronted with a similar and compelling need to identify and disable the criminal networks which fuel and sustain terrorist and insurgent activity, paralyze a population, and pose a significant threat to US and coalition forces from a perspective of force protection. Unfortunately, the military is generally ill-equipped to leverage the cumulative experience and lessons learned by law enforcement when building operational strategy and training. Fortunately, however, a concept known as Whole of Government, offers means to bring the military and civilian law enforcement closer to synchronization of collaborative methods.

1.3.B. Law Enforcement and the United States Military: Two Sides of At Least a Similar Coin?

Historically, both military and law enforcement organizations exist to counter violent threats against the security of the national entity. The military, at least in the United States, exists to counter external threats to national security and law enforcement serves the same purpose to deal with threats against internal security. However, tactics, techniques and procedures (TTPs) have not always been shared between the two distinctive entities, and both have suffered because of it.

Fortunately, there is an exception: military reservists who are law enforcement officers by profession bring a valuable set of skills to armed conflict and share their skills routinely. The challenge appears to be in how military, law enforcement and indeed the entire interagency complex might learn from each other and even introduce new forms of effective national security that improves both our domestic and international political and security standings. As noted below, there are early attempts to improve interagency collaboration among military and law enforcement through military-sponsored distributed knowledge management environments.

To begin with, we examine the benefits that civilian law enforcement reservists bring to the active military and ultimately, potentially, to the entire interagency. These benefits include the basic skills of search and seizure of people, vehicles, and fixed locations; the recruitment and handling of human intelligence sources; interview/interrogation techniques; and equally

importantly the ability to discern subtle changes in behavior which may signal danger within a populace, small crowd, and/or on an individual basis. Civilian law enforcement professionals practice and refine these skills daily.

These skills and aptitudes are developed from dealing with the churn of street crime over time. This enables an anticipatory awareness, sometimes referred to as "streetcraft"[1] within law enforcement culture or more euphemistically, the JDLR (just doesn't look right) capability. This provides enhanced situational awareness skills predicated on officer safety and which can easily transition to the safety of a warfighter. While military law enforcement organizations do teach and practice these skills for the most part, the differences in operating environments between military and civilian law enforcement is sufficient that these skills do not enhance general military aptitudes (e.g., non-law enforcement) in a significant way.

The two communities need to develop a consistent means in which to partner domestically and internationally to the maximum extent allowed by law in order to optimize the capabilities of each for the benefit of both. Results for the military may be less definitive then those in law enforcement which place a great deal of emphasis on statistical reporting in granular detail not as easily done in a battlefield. The real measure may be more qualitative in nature and more apparent in stability operations. We examine the Whole of Government approach as a potential catalyst for developing new partnerships between the military and law enforcement. In addition, we briefly look at an increasingly operational capability known as Defense Knowledge Online (DKO) as a military-initiated capability to bring the two communities closer together.

1.3.C. The Whole of Government Approach to Interagency Collaboration

Approaches for collaboration within and among government agencies have varied throughout the years, but a recent initiative, entitled Whole of Government (WoG), has caught the attention of the US Defense Department and other US Government agencies in the past year. The WoG concept actually has its roots in several allied countries, including both Australia and Canada, who have been discussing it since at least 2002. As the Australian Public Service (APS) ministry noted in 2004,

> *Whole of government is the public administration of the future. It offers links and connections to the global community of ideas, knowledge and understanding essential for the APS to face the governance challenges of the 21st century. It extols team-based approaches to solving the wicked problems that are endemic to public policy.*[2]

Much more recently, Secretary of Defense Robert Gates and Chairman of the Joint Chiefs Admiral Mike Mullen echoed similar thoughts in terms of operations and budgeting across the US Government related to national security.[3] Admiral Mullen spoke particularly in terms of deployment of "soft power" derived from the interagency partners such as Departments of State, Treasury, Commerce and Justice, with even a little help from the Department of Agriculture![4] The Whole of Government approach, sometimes referred to as "unity of action" in US military doctrine,[5] has caught the eye of those interested in the interagency and joint service approaches the US government has sought since the passage of the National Security Act in 1947 and the Goldwater-Nichols Act of 1986.

Whole of Government is an approach to solidify the interagency effort. By one definition, WoG is a "means to achieve a unity of effort in operations that synchronizes all the elements of national power."[6] While the APS definition above is a bit more global in terms of connecting

ideas, the concept appears to be an effective way to overcome "vertical stovepipe information conduits that exist in current organizations (that) do not lend to the rapid sharing of information."[7] As far as US thinking goes today, the WoG concept can help develop codifications of doctrine to better connect military, governmental and non-governmental agencies. "As this (global financial) crisis really takes hold, there will be places that become unstable that we (the military) haven't anticipated," Admiral Mullen noted. "We need a whole-of-government approach."[8]

Recognition of the need for integrating national and global governmental planning and execution as called for in the WoG approach is different than executing it, however. For example, the construct of a "Whole of Government" approach to information sharing in law enforcement is immediately suspect as the laws which govern the collection and dissemination of information are so multifaceted that even in the aftermath of a recognized systemic failure which directly contributed to the events of 11 September 2001, barriers remain.

A recent article in Newsweek summed it up: "there's no such thing as information sharing, there is only information trading," claimed David Cohen, formerly Director of CIA's Directorate of Operations and currently head of the New York Police Department's Intelligence Division.[9] The rules are complex, far from transparent and interpretation varies widely across organizations. Information has become a commodity with rules which shape its acquisition, regulate its packaging, determine its dissemination, and review its market appeal.

There are calls for more, better and faster dissemination as well as complaints about multiple reporting streams and over-classification of information. The consumer base has grown exponentially and includes a broader base of law enforcement and the private sector, each of which is not only a customer, but also a supplier of information related to the protection of critical infrastructure. The overarching question is a foundational one: "who is in charge?" The answer varies according to the community of interest.

From a uniformed policing perspective prior to 9/11 it seemed so easy to share information. Beat cops sat in roll-call before shifts and the station commander passed along alerts and BOLOs ("be on the lookout"), and the patrolmen would offer any leads they might have on the alerts. Occasionally, an officer might even know what was happening in a jurisdiction outside the beat, and throw that information into the mix. We shared, within our own piece of the world, and we seemed to do reasonably well in protecting the citizens of our community and each other.

What we rarely did, however, was share with other departments or levels of government, outside of regionally organized task force efforts which were specialized in nature and organized for a specific issue or case and then disbanded. The other exception was the requirement which still exists to provide copies of fingerprints of individuals arrested/convicted to the FBI. There were no policies in effect to require in-person interagency collaboration or shared training opportunities. Agencies underwent profound changes since 9/11 and there was an organic need to establish mechanisms to bridge communities of interest regardless of any history of fractious relationships. A great deal of progress has been made, although persistent issues related to classification and reciprocity of exchange still exist, as David Cohen points out above.

Issues became more complicated as domestic terrorism and terrorist attacks on our soil occurred and secondary strikes seemed likely. Laws that had previously protected and compartmented our collection of intelligence through divisions such as foreign and domestic data collection and analysis also stood in the way of sharing across agencies, even when one agency could help the

other. Perhaps technology didn't help as much as we thought, since it was even easier to build walls between each other with separation of systems and databases.

Sharing was driven as much by the philosophy of "what's in it for me?" as it became ever more difficult to bridge the gap between agencies. Tacit compliance with legislative mandates masked organizational reluctance to collaborate and unilateral focus on mission was acceptable given the unprecedented attacks on US soil. While well-intentioned perhaps, the reluctance to share has hampered the WoG approach considerably.

1.3.D. Knowledge Sharing through Collaboration Environments

While this paper could focus on several law enforcement collaboration environments such as the FBI-sponsored Law Enforcement Online, we will focus this paper on a DoD-sponsored effort called Defense Knowledge Online (DKO) and a more specific law enforcement information sharing environment about threats to US infrastructure, known as the FBI's InfraGard program.

InfraGard is a classic example of a public-private partnership which is both efficient and effective. Its roots date to 1996 in the Cleveland Field Office of the FBI as an outreach to the financial sector on an issue regarding the movement of currency. Establishing trust within a closed community (finance) with a large federal law enforcement organization was nothing short of Herculean, but it happened and from there the reach has extended across all 18 elements of the national critical infrastructure.

Today, InfraGard membership exceeds 30,000 volunteers who share their expertise with the FBI and, in fact, have contributed in a substantial way to over 1,400 cases involving homeland and national security during the past year. In return, members have access to sensitive but unclassified information relevant to their sectors from the FBI and in addition have the opportunity to attend specialized training sessions.

Partnerships exist between InfraGard and the Department of Homeland Security; BENs (Business Executives for National Security); the SBA (Small Business Association); the US Bureau of Alcohol, Tobacco and Firearms; The United States Secret Service; the National Sheriff's Association, and other private sector organizations unhampered by reluctance to share information. There is a common purpose and a common mission of security and a shared trust among peers which are the foundation of the organizational success. InfraGard members are linked through a web-based portal and common email system by which they can also securely share information.

The concept for operations for DoD's Defense Knowledge Online was formalized in late 2007. While it was not funded to embrace the entire US government interagency, DKO did include within its proposed end-state the ability to support non-DoD agencies and allies should it be directed to by the Defense Department. Included within this concept of operations was an extension of DoD's network-centric enterprise services (NCES) to all relevant communities of interest, including the intelligence community and other agencies such as law enforcement, based on authorization by the DoD. [10]

Initial pilot testing of DKO included a great variety of organizations that composed the US Combatant Commands, military services and DoD Agencies, as well as organizations within the US Intelligence Community (both DoD and non-DoD, which also includes the FBI and State Department, although these agencies were not specifically tested in the pilots). DKO is designed to accommodate the US interagency community at large.

The capabilities of NCES which DKO is prepared to extend to the broader community include a fully interoperable collaboration suite which includes shared file structure environments for storage of community of interest (COI) knowledge and information, and the ability to tailor these COIs to interoperate under local control of COI leaders.

Also included within DKO's NCES capabilities are video and voice teleconferencing and shared applications through electronic whiteboards. Single point of entry to these capabilities, through what is known as "single sign-on," is also an operational feature of DKO. This means that DKO provides, as a service, access to enterprise-level tools that include web-based email, instant messaging, real-time chat, documents and records management and other enterprise-level access to payroll, travel and medical records.[11]

1.3.E. Conclusions

The important consideration about DKO, InfraGard and other distributed collaboration environments is that these capabilities and tools are designed from the ground up to support information sharing across agencies given that the agencies are authorized to and desire to share. Law enforcement officials tend to share within their own community. Military professionals tend to share within their own community. They engage in sharing for a whole range of reasons, which include collegiality and even organizational and individual survival.

The technologies exist to better share and strengthen the bonds of interagency cooperation. The laws and regulations are pushing towards increased collaboration. Within each of the interested and affected organizations there are individuals and even small groups of professionals who are willing to take risks and share when it can make a difference. The larger question, however, is whether or not efforts such as "Whole of Government" and technologies such as DKO and InfraGard will enable better sharing. Can we bring our cultures closer so that sharing is a routine rather than exception?

The outlook is actually favorable, as evidenced by several of the other papers within this larger White Paper on collaboration. The right people, the right processes and the right technologies are forming around the important questions and sharing and collaboration is becoming more appealing and even evident. The critical interconnection of law enforcement and military professionals are showing us the way.

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[1] Kiernan, K., "Hidden in Plain Sight - Intelligence Against Terrorism: Tradecraft or Streetcraft?" Crime and Justice International July-August, 2006. Streetcraft is the operational art of law enforcement that is neither codified in any SOP nor taught in a police academy. Rather, it is learned on the street through the experience of dealing with the extremes of human behaviour.

[2] Australia Public Service (APS), A Report by the Commonwealth of Australia, Connecting Government: Whole of Government Responses to Australia's Priority Challenges, 2004, http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA485610&Location=U2&doc=GetTRDoc.pdf, accessed 24 March 2009.

[3] Pincus, W., "Pentagon Recommends 'Whole of Government' National Security Plans," Washington Post Online, 2 Feb 2009, http://www.washingtonpost.com/wp-dyn/content/article/2009/02/01/AR2009020101964.html, accessed 24 March 2009.

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[4] Garamone, J., "Mullen Addresses Need for 'Whole of Government' Approach," American Forces Press Service, 6 February 2009, http://www.globalsecurity.org/military/library/news/2009/02/mil-090206-afps05.htm, accessed 24 March 2009.

[5] Hancock, J., MAJ, US Army, "Whole of Government – The Search for a True Joint Interagency Approach to Military Operations," School of Advanced Military Studies, US Army Command and General Staff College, Ft. Leavenworth, KS, 22 May 2008.

[6] Ibid., page 5.

[7] Ibid.

[8] Garamone, op. cit.

[9] Dickey, C., "The Spymaster of New York," Newsweek Magazine, 2/9/2009, http://www.newsweek.com/id/182526, accessed, 2/3/2009.

[10] Department of Defense Information Systems Agency and United States Army, "Defense Knowledge Online (DKO) (NIPRNET and SIPRNET) Strategic Concept of Operations (CONOPS)," 30 October 2007.

[11] Ibid.

1.4. Enabling Collaboration through Teams of Leaders - ToL (LTC Brad Hilton, US Army)

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Headquarters, United States European Command (EUCOM) was responsible for monitoring and coordinating humanitarian support following a Russian invasion and follow-on humanitarian crisis that unfolded in the Republic of Georgia during late summer and early fall of 2008. The dynamic and constantly changing nature of the crisis created a continuous unquenchable demand for accurate and timely knowledge, both horizontally and vertically, within and externally to the Department of Defense. This collaboration needed to occur across three continents ranging from diversified locations like those who had first hand ground truth from within the Republic of Georgia while supporting operations to policy and decision makers in Washington D.C. and various locations around the globe.

In response, and to improve knowledge flow (actionable information), EUCOM initiated a daily collaborative secure Video Teleconference (VTC) inviting a Whole of Government audience located around the world. While the use of VTC technology itself was not new, the approach of using the VTC first in establishing a Whole of Government working group and then later as a means to brief a cross section of decision makers and increase situational awareness was a novel way to improve collaboration.

Furthermore, as a result of the daily VTCs, virtual teams of action officers and staffers formed to share expertise about planning and briefing documents, understanding reports in context, and identifying and connecting with one another much faster within a much broader group. Attendees from the various groups crossed many organizational and hierarchical boundaries, representing various levels and functions within the government, but all with a common interest in assisting the Republic of Georgia. Meetings were also strategically timed to provide updates to those on the east coast early in the morning while they were constructing updates in preparation for morning briefings to their leadership. This in turn allowed for quicker understanding within Washington D.C., resulting in more responsive guidance and decisions from better-informed leaders.

Although initial VTC participation was limited, within days as news and word spread, agencies and departments throughout the United States Government who were all responding to the crisis quickly realized that this was a shared virtual location to obtain current updates. As the audience grew, participation evolved from just learning what was happening to a more interactive environment in which they could address concerns or share insights with a larger group beyond a single department of government. The result after just a few weeks was a reduction in phone calls, emails and requests for information as leaders (including staffers and action officers) were better informed. This increase in actionable understanding provided context and background when traditional reports and communication were received. As situational awareness increased, so did the level of trust and confidence of all those within the various virtual groups and teams.

In addition, while visibly recognizable and effective formal communication was occurring, a second form of informal collaboration was also transpiring among the various staffers and action officers throughout the participating agencies and departments. This informal collaboration

among staffers and action officers formed informal virtual teams enabled with the latest knowledge continuously available from EUCOM's Collaborative Information Environment (CIE), to review situation updates/reports, maps and cables relevant and current to the crisis. If more details were needed the ability to identify and connect with the right expert allowed for agreements, as well as, disagreements to be identified, analysis completed, and concurrence among staffers and action officers achieved prior to the formal VTCs. As described by Major Joshua Green, serving as the Joint Operations Center (JOC) systems officer:

> *...here is where we are posting all the current information we have, here is our view of the world, take a look at it and tell us if it's accurate and they would come back and say that is accurate, but your off on that one and this data is out of date by at least 24 to 48 hours and you need to update it here, so there was a lot of that cross mixing.*

1.4.A. An Emerging Collaborative Environment

There is a dramatic revolution underway changing how the world connects and collaborates as the 21st Century unfolds and technology matures among an emergent Web 2.0 enabled Internet and virtually continuous connectivity. This ability to stay connected is pushing traditional work processes as well as social norms by overcoming physical limitations like time and geography. Today, with the ever-increasing explosion of readily available and more powerful mobile devices, this trend is more likely to grow and extend the reach of connectivity to further dominate our lives. Generation X and Y are well ahead of the Baby Boomers in their acceptance and application of collaborative technologies.

The acceptance of Web 2.0 availability is seen through individuals who will blog to whomever will listen; tweet to stay informed on the move and Facebook one another to stay current and in touch with friends and family. Social networking highlights the change; we continuously collaborate within our personal lives, no longer bound by point-to-point communication through email or over the telephone. We now share among networked groups with similar interests and common experiences. Society embracing these tools has enabled a culture of collaboration that pushes traditional social interaction that is spilling over into our professional lives. Boundaries overlap and stretch the limits of the number of people we can interact with regardless of physical location, time zones, or daily schedules.

Because our work environments are not immune, collaboration is no longer an enabler to achieve success, but a driving force in the need to connect with others to share knowledge and sustain a competitive advantage. The rapid change and breadth of networked technology has expanded the desire for collaborative interaction, changing the way we perceive knowledge. Today, ownership of knowledge is no longer limited by what we know, but also who else shares in understanding that knowledge with us that determines value. This pushes the traditional organization boundaries and demands that effective leaders seek experiences and expertise from a larger, potentially global, Rolodex or contact lists like those leveraged by Major Green during a real world crisis.

The Web 2.0 experience further transforms collaboration within organizations that exist today, with much more emphasis on a framework of formal and informal networks of teams that crisscross traditional hierarchies and bureaucracies. Many of these teams are informal in nature and exist unrecognized by the parent organization and just for a fleeting requirement. Others are long-standing informal connections built over years to share professional knowledge and experiences, maturing as we do within a lifetime. Regardless of the teams' formality or duration,

they are all just as essential to decision making as traditional command and control processes that provide structure to our hierarchical organization. Major Green's informal team lasted only weeks, but was no less effective.

1.4.B. Teams of Leaders

To take advantage of the collaborative potential of formal and informal teams, European Command has employed a concept called Teams of Leaders (ToL) in order to enable high performance as part of a foundation towards building and sustaining a command-sponsored collaborative knowledge environment. As defined conceptually, "Teams of Leaders" is intensive collaboration stimulated to override frequent individual and team reluctance to share information and improve decision-making. Power is sharing—not hoarding—information![1]

As a forward-deployed combatant command headquarters within Europe, the need to collaborate and team with diversified groups and organizations is a routine part of day-to-day life, as the crisis response within the Republic of Georgia clearly demonstrated. EUCOM's definition of Teams of Leaders clearly articulates the need to collaborate well beyond the traditional organizational hierarchy and include other Joint, Interagency, Intergovernmental, and Multinational (JIIM) organizations and partners:

> *The term Teams of Leaders is used to describe a high-performing leader-team whose members are from different organizations, cultures, agencies, or backgrounds and who each bring specific knowledge, skills, and attitudes to the cross culture JIIM leader-team. These leader-team members often represent a parent agency, organization, or country and come with varying backgrounds, skill sets, motivations, and agendas as they interact to accomplish a common mission or objective. Due to the complexity and a less defined hierarchy where European Command (EUCOM) may not be the lead agency, each leader-member of the team may find themselves in a lead role for a project or objective. Rather than a team consisting of clearly defined leaders and subordinates focused on task proficiency, the team is transformed into one of peer leaders or a leader-team, where the relationship among members is the cornerstone to achieving high-performance.*[2]

1.4.C. The Three Components of Teams of Leaders

The three components of ToL are Information Management (IM), Knowledge Management (KM) and Leader Teams. The first two components (IM and KM) are enablers; the third and core component is leader teams. The interaction of the three components could be viewed as a three circle overlapping Venn diagram as depicted in Figure 1.4-1. Each component provides essential support in achieving high performance. However, when they interact, overlap and work in synergy with one another, knowledge is more effectively shared within a secure environment and leader teams transform into high performing leader teams enabled by actionable understanding: "through intensive collaboration - appropriately molded to stimulate shared trust, shared vision, shared competence, and shared confidence - powerful and effective cross-cultural communication is developed"[3]

In order to be effective in supporting ToL, all three must be present. The quantity of each component will depend largely upon the type of team, mission/purpose and the availability of tools. The circles in the Venn diagram should be viewed as very elastic; while IM and KM are important, Leader Teams qualities are the cornerstone element. We could have an effective team with no IM or KM, yet we cannot have an effective team of leaders without the shared leader team qualities enabled by some element of all three.

Figure 1.4-1 Three Components of Teams of Leaders

Although information and knowledge management are normally more mature and better understood, the integration of both towards operational effectiveness is often times systemically difficult or challenging. In many cases this struggle is due to the application of underlying technology first and then driving operators towards solutions with a pre-defined technological box second. However, by aligning information management and knowledge management in support of the informal and formal collaboration requirements of leader teams, the link between operational needs and associated technology requirements is bridged and becomes a catalyst to collaboration, instead of an obstacle.

Therefore, when an organization integrates all three components to work in synergistic combination with one another within a collaborative environment, they generate actionable understanding among participating leaders that empowers the organization. ToL work in a harmonious balance, but the strength lies within high performing leader teams:

> *Teams lead events, not follow; initiating not responding; absolutely success-oriented whether the leader teams are applying hard or soft power as the situation requires. All achieved as action officers range globally, informally, stimulating higher performing leader teams.*[4]

1.4.D. Leader Teams

The third component, leader teams, is the least understood of the three, but by far the most critical. Traditional teams are hierarchical in nature with defined roles and responsibilities among participants. For example, a tank or helicopter crew is a traditional hierarchical team with a clearly recognized leader, defined team positions and responsibilities. However, in a much more networked world, teams are formed and organized to solve specific problems or accomplish specific tasks and are much more likely to be required to extend beyond traditional boundaries of culture, organization, function and level. A ToL forms where the relationship of the participants becomes more critical to success over pre-define roles and positions. The leader team component of ToL within EUCOM is described as follows:

> *Leader-teams are comprised of members from different organizations, cultures, agencies, or backgrounds joined to accomplish a mission or task. These teams exist across government, the military, industry, academia, and in our neighborhoods. Each member brings specific skills, knowledge, and attitudes to the team to help accomplish an objective and each "leader" is part of a greater organization that the leader-team member can reach back to for expertise and support. These teams do not follow a hierarchical organizational model, but rather operate as a network within the hierarchy.*

> *At any time, any member of the team may be placed in a lead role for a project or objective. ToL is a new approach that achieves higher performance faster than traditional teaming practices.*[5]

In the initial example, the formal team extended beyond the military's chain of command and included other government agencies and actors, all interested in understanding accurately what was occurring in the Republic of Georgia. This was a responsive leader team addressing a crisis where each brought unique expertise and capabilities beyond organizational boundaries, all focused on providing timely and effective humanitarian support.

As the United States approaches challenges and crisis in a Whole of Government cross-department or agency approach, nested teams of teams become the coin of the realm and the need to enable those participating leader teams will become increasingly more important to achieve mission success. Lessons learned from Katrina to Operations in Iraq and Afghanistan have all implied the increased need for an effective method to develop nested teams of leaders in order to increase collaboration across the Whole of Government.

1.4.D.1 Skills, Knowledge and Attributes

The level of high performance achieved within leader teams is defined by the relationship that exists among various team members. The stronger the connection, the more likely team members will freely collaborate with one another in an atmosphere of confidence and shared risk. Within ToL these are defined by the teams "shared skills, knowledge, attributes (SKA) of team leadership (shared trust [attribute], shared vision [knowledge] shared competence [skill] and shared confidence [attribute])" which drives high levels leader-team performance and collaboration. [6]

1.4.D.2 Enabling Leader Teams Through The Leader Team Exercise (LTX)

The Leader Team Exercise or LTX "acts as an accelerant by moving a team through its stages of development faster[7] which results in higher performance by developing the shared SKA qualities within the leader team in a deliberate manner. Given enough time, almost half of all teams will achieve high performance, but in a crisis where time is critical, we cannot afford to wait for extended periods of time. Because the LTX is designed to be conducted within the leader team's battle rhythm in the context of the current situation, while the team is "doing," it becomes a powerful tool to generate high performance quickly. It is more of a "thinking tool" that empowers any user to critically approach a situation, mission and solutions. It forces us to go beyond linear sequential thinking and apply a systems approach. It also requires the team members to communicate and collaborate, often uncovering differences and disagreements, then being forced to address those differences to find common ground.

> *To develop such high-performing leader-teams requires an approach that goes beyond traditional "train to task" models. Rather, these exercises develop the "art" of adaptive thinking and learning. This advanced methodology develops clear and shared understanding, critical-thinking and reasoning skills, and promotes adaptive behaviors, not conditioned responses.*[8]

The LTX consists of three steps

1. Determine and understand the team's situation and requirements.
2. Practice by thinking (talking) through the situation.
3. Review your shared actions and decisions.

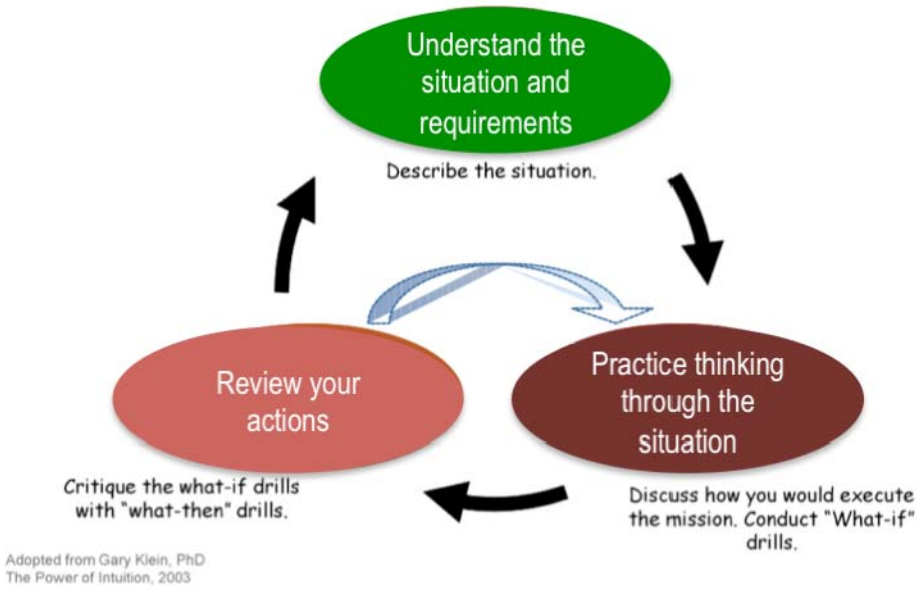

Figure 1.4-2 Leader Team Exercise (LTX) Framework

The application of an LTX can be conducted within a formal or informal setting and done within a few minutes or over time. This may become invaluable if the leader is forming or reacting within a high stress or complicated environment where establishing shared team dynamics needs to develop quickly. Many leaders instinctively apply the LTX as part of day-to-day operations. It is most effective at forcing the team to do an "azimuth check" and calibrate their shared understanding of the situation and the direction in which the team is heading. It is also effective at helping team members with different perspectives and agendas see the other's point of view and look for common agreements.

1.4.D.3 Enabling Leader Teams Through IM and KM

Only people communicate and collaborate. Systems interact and can move data and artifacts but only people can take that information and make it knowledge by applying it to solve a problem. Knowledge only moves through people, it is viral and all our attempts to substitute systems and technology have only added to frustrations. A long-standing principal, which is often forgotten when designing or building collaborative information environments, is that information technology systems or processes enable people to collaborate, but people collaborate with people. Therefore, underlying IM and KM systems should enable teams of leaders, improving their reach and their capacity to store, manage, and share.

However, ToL does not achieve success by subordinating information or knowledge management to leader teams, rather by ensuring they are in equal balance with one another. Most organizations have very effective information technology and knowledge management programs, but struggle with understanding the operational requirements for fully integrating those systems in support of the organization. By recognizing that wiring diagrams explain a formal structure, but that collaboration ranges among formal and informal leader teams not limited by that structure, the identification of information technology requirements becomes much more apparent, aiding in their development and application. Furthermore, by focusing on enabling leader teams, information and knowledge management become instrumental beyond just supporting requirements, but also in the construction of Teams of Leaders.

1.4.E. Conclusion

Whether in our personal or professional lives, the need to connect and sustain relationships in an increasingly more networked world regardless of distance or time becomes an essential ingredient to success. As the crisis within the Republic of Georgia highlighted, the need for organizations to collaborate within formal and informal high performing leader teams crossing traditional boundaries demonstrates the need for the powerful operational multiplier which ToL provides.

Because these leader teams operate within an environment where strong relationships are forged through shared vision or purpose, shared trust, shared confidence, and shared competence enabled by supportive information management and knowledge management, they are responsive to opportunities for overcoming barriers and challenges to collaboration. When a ToL culture flourishes within an organization, actionable understanding flows freely among leader teams becoming high performing teams while leveraging the power of knowledge shared, resulting in more effective, adaptive and flexible organizations.

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2. Scientific Disciplines Studying Collaboration

2.1. Overview of Collaboration in the National Security Arena: A Multidisciplinary Collection of Perspectives (Elisa Jayne Bienenstock, Kevin K. Troy, and Stacy Lovell Pfautz - NSI)

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2.1.A. Introduction

The challenge of fostering collaboration throughout the national security community is undeniably monumental. Ensuring national security will require the repeated coordination of dozens of organizations and agencies, tens of thousands of individuals, and billions of data points; a challenge that may seem intractable. Nonetheless, the need for collaboration (two or more people working together toward a common goal) is compelling. Events like September 11th demonstrate that no one person or organization working alone is capable of revealing and preventing such an attack. This reality is true for hundreds of daily challenges and scenarios that face those charged with ensuring national security. Information foretelling plots of this type are unpredictably distributed across many different agencies and actors. If we are to identify enough signals to observe, comprehend and disrupt the planning and execution of these threats, it will only be through collaborative efforts.

Unfortunately, as the diversity of topics in this issue illustrates, there is no simple solution to this challenge. There is no one area of research, magical reorganization scheme, or collaboration tool that will provide a clear direction for how to encourage collaboration throughout the interagency. Because the overall challenge of national security collaboration in the interagency and beyond is so massive, it is not surprising that a first pass at studying collaboration draws from the disparate bodies of research in the social sciences, management science, computer science (information technology), as well as studies of the military and intelligence communities, with almost no overlap in research. All of these approaches provide insights into how to address one or another aspect of collaboration in the national security context. However, none generalize to provide an overarching framework, nor do any sufficiently address the challenge of coordination in the prevention of rare events. This collection, by presenting so many perspectives in one volume, may be the first important step in grappling with this problem to discover a general solution.

Ironically, current research on collaboration is isolated by discipline, level of analysis, and theoretical tradition, with little cross-fertilization. For example, an analysis of the references used by authors in this collection showed very little overlap; only four citations are shared by two papers, and there are no citations that are shared by three or more papers.[1] Nevertheless, despite the diversity there are clearly synergies and overlaps in many of the ideas presented that provide opportunities to develop a more general approach. What will be required is an effort to bridge these areas.

Within the academic literature, a few researchers have attempted to devise a general theory of collaboration. Wood & Gray[2] reviewed nine research articles to identify various theoretical perspectives for collaborative behaviors. These perspectives included resource dependence; corporate social performance/institutional economics; microeconomics; institutional/negotiated

order; and political science. They also identified several issues that need to be addressed including the meaning of collaboration, the implications of collaboration, and the relationship between different stakeholders in a collaborative alliance. Elliot[3] also presents a theoretical framework for collaboration, focusing on online collaborative environments. His architecture describes underlying mechanisms that may enable mass collaboration and include theories of swarm intelligence, stigmergy, and distributed cognition. But even these attempts at developing a general theory are limited to one or another disciplinary orientation or tradition.

Research on collaboration has emerged independently from myriad fields, including sociology, psychology, economics and management, and computer science. Work generated from the areas of social and management sciences share elements, and even origins, in that they primarily investigate the social structures and incentives that encourage or discourage collaboration. Research in the social dilemma, social capital, and social (communication) network literature have been leveraged to inform the challenges of encouraging collaboration. Kollock[4] describes studies of social dilemmas between individual and collective rationality from a sociology perspective. His research involves two-person or multiple-person social dilemmas where individual behaviors lead to situations that are not ideal for the common good. Bavelas[5] and Bonacich[6] investigate the effect of different network and incentive structures on collaboration outcomes when information is distributed. Other research in sociology examines social networks and virtual communities. Wellman et. al.[7] studied computer supported social networks (CSSNs) and how they foster cooperative work between individuals and organizations that are physically dispersed. They also describe the social implications of CSSNs. Panzarasa et. al.[8] collected network data from an online community to analyze patterns of users' behavior and social interaction. Their research indicates that their system is a "small world", and looks at whether hubs facilitate information flow.

Work from computer science ranges in focus. Much work is focused on algorithmically automating or facilitating collaboration through technology (electronic collaboration / e-collaboration). Research in this area typically is focused on developing tools to enable virtual teams and discover how technology can improve teamwork, topics also discussed by social scientists, although the literatures are distinct. Computer supportive cooperative work (CSCW) research investigates many of the same issues of interest to social scientists including focus on distributed collaboration, however the theoretical underpinnings do not necessarily stem from sociology. Farooq et. al.[9], for example, investigates the design of tools to support creativity in distributed collaboration on group dynamics and creativity literature. They describe three implications for design including integrating support for individual, dyadic, and group brainstorming; leveraging cognitive conflict by preserving and reflecting on minority dissent; and supporting flexibility in granularity of planning. Fedorowicz et. al.[10] also examines how e-collaboration can support creativity. Their research covers the impact of collaboration tools on process, product, and relationship innovation; the impact of e-information, e-communication, and e-workflow on innovation; and design requirements for collaboration tools.

Finally, studies of the military and intelligence communities examine the specific physical, virtual, and cultural structures that impact collaboration in the specific context of the national security mission. Organizational literature informs this as well. Swindler et. al.[11] also studied organizational collaboration (in a command and control setting). They identified barriers to collaboration such as information flow, constant rotation of military personnel, and intense

specialization in a particular job. They also discuss lessons learned from studying collaboration and different data collection methods, metrics, and complexities.

Most of the pieces in this white paper can be identified with one or two of these fields, and all touch on important issues such as the barriers to collaboration, ways to build collaborative communities, and the technologies that can assist those wishing to collaborate. Unfortunately, the disciplinary divide does create barriers and confusion when communicating about collaboration. Nonetheless, there are overlaps and synergies evident in the papers in this volume. Taken together, the papers in this collection begin to sketch answers to four critical questions:

1) *What kind* of collaboration is required to accomplish the mission?
2) *What barriers* to that kind of collaboration exist in the status quo?
3) *What actions* must be taken to facilitate this kind of collaboration?
4) *What systems* will best enable these actions?

2.1.B. Integrating Relevant Literature to Address the Question

By placing some of the papers, and additional sources from each field in the context of the four questions suggested above, we provide a road map for reading these papers as a collective contribution to confronting the social dilemma.

2.1.B.1 What kind of collaboration is required for the mission?

A consensus throughout the papers in this collection is that, more than any other form of collaboration, information sharing is crucial to the national security mission. Informed in large part by reflections on the events leading up to September 11th, this insight is also bolstered by observations such as Kiernan and Hunt's (1.3) who note the similarities between the tasks faced by domestic law enforcement and the U.S. military in Iraq and Afghanistan. Both on an analytical and operational level, knowledge and information must flow more freely. If the sharing of information is the problem, what can we learn from social science that can help us motivate people to share information more freely? Many of the papers in this collection provide solutions that require team building or leadership. While these techniques are useful in many contexts such as crisis intervention, it is unclear how they can apply to less imminent, more dispersed, or less likely dangers. Less prescriptive are the papers of Cronk (2.3), which assures us that as humans we seek collaborative solutions, and Kuznar (2.2) who introduces the concept of sodality into the discussion. Although initially formulated as kin-based groups, the discussion of non-kin based sodalities offers an intriguing model for fostering collaboration between agencies by uniting all participants in the national security arena with a common identity.

One literature not represented in this white paper that may bear on this goal is the literature on social capital. Lin[12] views social capital as the resources embedded in one's social network. In this case, the goal is to have collaborative structures that increase the resources available in the professional networks of those in the national security and intelligence communities.

It is not accidental that the pieces in this white paper point toward a notion of collaboration based on information and available resources, for as McMillan (4.9) points out, too much prescribed collaboration can become a source of inefficiency and conflict. In moving toward more collaboration, it will be important to keep the pendulum from swinging too far.

2.1.B.2 What barriers to this kind of collaboration exist in the status quo?

The models of the prisoner's dilemma and the production of public goods help to identify some of the structural barriers to collaboration in the status quo (see article 2.4 for further discussion). This white paper explicates many more specific barriers. Cronk's contribution to this volume (2.3) is an insightful study of how cooperative behaviors have been, to an extent, naturally selected for in humans. However, examining the mechanisms that evolved to facilitate cooperation (e.g., kin selection, direct reciprocity, and indirect reciprocity) it is clear that these mechanisms are often absent from the national security arena. Rieger (3.1) cites the imbalance of empowerment and accountability within bureaucratic structures as another important barrier to collaboration. Many other papers identify specific elements of the culture of military, national security, or intelligence organizations that inhibit collaboration. But one particularly important barrier is identified by Pherson and McIntyre (4.2): the dominance of the need-to-know as the only reason for sharing information. Although understandably motivated by the desire to protect classified information, a failure to recognize a need-to-share will cripple any attempts to build up collaboration, especially of the nature recognized by the papers in this volume as being so critical. Cumulatively, these papers show the importance of attending to both the structural and specific reasons why collaboration is such a challenge.

2.1.B.3 What actions must be taken to facilitate this kind of collaboration?

Once again, despite the diversity of these papers, there is remarkable consensus about the general nature of actions that must be taken to facilitate collaboration. Just as information sharing was recognized as the key form of collaboration required for the mission, affecting shifts in organizational culture is seen as the crucial action-item in fulfilling that requirement. Harm and Hunt (1.2) recognize that, although technology is important in facilitating collaborative relationships, it will go unused unless the value of such relationships is inculcated into the community. At the macro-level, Pherson and McIntyre (4.2) extol the need to develop a sense of the 'responsibility to provide'. Hunt and Snead (5.2) promote the idea of the 'nexus federated collaboration environment' as an instantiation of a culture valuing this responsibility. At a micro-level, Boehm-Davis (4.7) argues for 'proceduralizing' cooperation in a team setting such that it becomes second nature. Meadows, Wulfeck, and Wetzel-Smith (4.4) emphasize the importance of training if any of these actions are to be effective. Although there is no grand strategy to engender collaboration in the national security arena, the common sense that it will require altering incentive structures and reshaping mindsets is important and valuable.

2.1.B.4 What systems will enable these actions?

Any success in establishing a culture of collaboration will have to be matched by success in developing systems to ensure that collaboration is possible. This white paper provides an excellent guide to some of the possibilities in this domain. From physical enablers (see Gershon's (5.6) contribution about workspace organization), to human enablers (Wagner and Muller (5.4) explain the importance of leadership), to virtual enablers (which Bronk (5.1) discusses), there are many dimensions that must be considered in promoting collaboration. A source of particular excitement is the possibility of information technology as an enabler of collaboration. Both Bergeron and Pierce (4.6) and Pierce (5.3) look into the possibilities of web-based social networking. Heuer, Jr., Pherson, and Beebe (2.6) along with several others propose wikis as potential information-sharing locations. All of these ideas deserve thoughtful study, but in examining them it is important to remember that, as Briggs (2.8) points out, technologies must

be goal-oriented. The enablers for collaboration will be most efficiently and effectively developed once a solid theoretical understanding of what kind of collaboration is needed has been put into place. Fortunately, the comprehensive scope of this white paper ensures that, as the conversation about collaboration progresses, solutions will not be constructed in search of problems.

2.1.C. Conclusion

Attempting to foster collaboration in the national security arena is the ultimate social dilemma. Group sizes, time frames, incentive structures, organizational cultures, and a host of other barriers exist to a collaborative approach to the mission of national security. But ignoring the importance of collaboration because of the complexity of achieving it is not an option. And although the diversity of these papers highlights an ironic lack of extant collaboration in the literature about collaboration, the act of assembling this white paper is an important first step in combating that irony and improving the national security community. The existence of common themes and repeated insights that appear throughout this volume demonstrates that there are some consistent and recurring challenges of collaboration as well as some equally consistent approaches toward meeting the challenge. It is also important to note that there is not only one solution. As collaboration is desired in multiple contexts, the methods for facilitating collaboration will likely differ as well, and what measurable solutions are developed will likely be multifaceted – addressing inherent social and institutional barriers along with developing requisite tools to meet technological needs.

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[1] There are two citations that are completely shared:
- Paper 1.1 (McIntyre, Palmer, and Franks) and Paper 1.2 (Harm and Hunt) both cite The World is Flat by Thomas Friedman;
- Paper 1.1 (McIntyre, Palmer, and Franks) and Paper 5.3 (Pierce) both cite Clay Shirky, Here Comes Everybody: The Power of Organizing Without Organizations, The Penguin Press, New York, 2008.

There are two other instances in which the exact same author (or author set) was cited by two papers, but the citations were of different articles:
- Paper 3.1 (Rieger) cites Rieger, Thomas. White Paper: Balancing Empowerment and Accountability. Gallup Consulting, 2007; Paper 5.7 (Pherson) simply cites Paper 3.1 by Rieger;
- Paper 4.4 (Meadows, Wulfeck, and Wetzel-Smith) cites Cannon-Bowers, J.A., Salas, E., & Converse, S.A. (1990). Cognitive psychology and team training: Training shared mental models and complex systems, Human Factors Society Bulletin, 33, 1-4; Paper 4.9 (MacMillan) cites Cannon-Bowers, J., Salas, E., and Converse, S. (1993). Shared mental models in expert team decision making. In Castellan, Jr., N.J. (Ed.), Individual and Group Decision Making (pp. 221-246). Hillsdale, NJ: Erlbaum.

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2.2. Anthropological Perspectives on Collaboration (Larry Kuznar - NSI)

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2.2.A. Introduction

An anthropological truism is that humans are a social species. Recent reviews stress that human beings are capable of forming huge social collectives involving thousands and even millions of people who, ironically, do not even know one another[1]. Not all social connections are collaborative, but many are; people are truly interdependent upon one another for goods and services, security, and emotional support. As the poet John Donne noted, "No Man is an Island." Much of anthropology is devoted to studying the many forms of collaborative social organization that exist in human societies, how these arrangements are maintained, and the collective purposes around which they are formed. In this article, we review several basic forms of collaborative organization important in human societies, and relate these to modern issues concerning effective collaboration in organizations.

Anthropologists refer to collaborative societies as sodalities, which are either based on kinship or non-kin criteria. While most modern organizations are not strictly kin-based, much of anthropologists' understanding of non-kin-based social organization is in relation to what we know about kinship.

2.2.B. Kin-based Sodalities

Arguably, modern anthropology was born during the 19th Century when anthropologists realized the fundamental importance of kin networks and the evolution of these organizations for understanding human society and its change through time. Kin-based organizations are less important in Western, economically-developed societies and most modern corporations, but kinship continues to be of fundamental importance in much of the rest of the world, especially at local village and tribal levels. The most fundamental kin units in all human societies are nuclear families and lineages.

The nuclear family is the fundamental unit of human kinship, and is composed of married adults and their unwed children. In most cases, nuclear families are monogamous, but many societies permit polygyny (one man married to more than one woman at the same time), and rarely, polyandry (one woman married to more than one man at the same time). These nuclear families form the smallest social units of any human society. Collaboration is intense within a nuclear family, and in many ways defines it; males typically specialize in certain activities, while women specialize in others, and the products of men's and women's labor sustain the family[2]. In agrarian societies, this cooperation often extends to children who provide agricultural labor in family enterprises. The mechanisms of this cooperation include intense emotional bonding, which likely has its roots in evolutionary trends toward helping one's kin (kin selection or nepotism, See Cronk, article 2.3).

Some societies, such as ours, tend toward atomistic, independent family units, but in all societies, there are higher-level aggregations of nuclear families, and in most societies, these aggregations play a fundamental role in a family's life. The next highest aggregation is the lineage, which is a collection of nuclear families who can trace their descent to a common, known, ancestor. In societies that privilege descent through one side of the family (patrilineal societies privilege

descent through males, matrilineal societies privilege descent through females), lineages are traced through that side of the family. In societies where descent is reckoned through both sides of the family, larger bilateral kindreds form to include ancestors in both lines of descent.

In most non-Western societies, lineages form important functions for coordinating collaborative activities among lineage families, and nuclear families are often wholly dependent upon their lineages for access to resources and security. Often, there is a dynamic tension between nuclear family interests and those of the lineage collectively. For instance, a family may benefit from increasing its access to grazing lands at the expense of another lineage family. For this reason, lineages are dynamic and often oscillate between intense collaboration and social fragmentation. A classic study of the Nuer of southern Sudan by E.E. Evans-Pritchard[3] illustrates this very common pattern, called the segmentary lineage system. The Nuer are a patrilineal cattle-herding tribe in southern Sudan. Cattle are the key item of wealth in this society. When the Nuer were not threatened by outsiders (their traditional enemies, the Dinka, especially), there was much competition over cattle, and in many ways, no distinctive tribal organization that one would call Nuer seemed to exist. However, when raids from non-Nuer occurred, Nuer nuclear families formed into their lineages, and these lineages aggregated into larger units that mobilized for a common defense.

In the Nuer case (and many other societies around the world), kin relations are used as a focal point for collaboration that benefits both the group and its constituents. Evans-Pritchard detailed the kin basis for the Arab proverb, "Me and my brother against my cousin, *me, my brother,* and *my cousin against* the other." The mechanisms that sustain kin-based collaboration at the lineage level are not well known, and clearly have limits, since lineages often fragment. For this reason, kin-based forms of solidarity are insufficient to sustain collaboration in very large (thousands), diverse social groups. In larger societies, people create sodalities that crosscut kin lines, and help to glue a larger society together.

2.2.C. Non-Kin Based Sodalities

Non-kin based sodalities are often voluntary associations that people create around some purpose. The fact that voluntary associations are formed around a common purpose indicates that mechanisms of reciprocity (see Cronk, article 2.3) are central to uniting the sodality; members are ostensibly motivated because their coordinated efforts are necessary to achieve a goal to which they all agree. Voluntary associations are important for overcoming the centripetal tendency of kin-based organizations to split when they become too large and the overall relatedness of members decreases.[4] For instance, tribes are typically formed as several lineages ally, but inter-lineage rivalries constantly threaten to pull a tribe apart. Voluntary associations unite individuals from different kin groups, weakening kin allegiances and limiting the likelihood that a tribe will fragment. The classic examples of voluntary associations are the military societies that permeated Native American societies in the plains, such as the Sioux, Kiowa, Apache, Crow and Cheyenne. In these cases, warriors and former warriors formed sodalities where they could keep their warrior traditions alive and enjoy the companionship of fellow warriors[5]. Not only do the collective efforts of warriors in military societies help to achieve collective goals, but the social success of their sodalities also confers prestige upon individual members. Also, loyal membership in a sodality also signals to other members of society, valued traits, such as loyalty and respect (see Cronk, article 2.3).

Voluntary associations can be categorized in many different ways, but three types are relevant for collaboration among organizations. These include: Instituted associations, hierarchy-based sodalities, and ad hoc organizations. Sodalities do serve an integrative role in a society, but the various dimensions along which they form also create internal cleavages that can work against larger social common goals.

2.2.C.1 Instituted Associations

Plains Indian military societies are classic examples of a pre-existing, non-kin based, socially instituted sodality. While membership changes with each generation, the institution persists and is recognized throughout the society. Modern institutionalized associations include the Veterans of Foreign Wars, Knights of Columbus, Rotary Club, the Masons, and the many fraternities and sororities on college campuses. In all cases, these organizations are instituted, have well-defined charters, and often have well-defined offices, ranks and other internal distinctions that provide a hierarchy of decision-making and a division of labor.

2.2.C.2 Hierarchy-based Sodalities

In some cases, sodalities form in hierarchical societies as members within a class realize their common interests and unite to protect them. Unions are an explicit, institutionalized, form of hierarchy-based sodality. The traditional Hindu caste system of India is another form. Modern military organizations make a clear distinction between their officer corps and the ranks of the enlisted, and fraternization across these boundaries is prohibited or discouraged.

Hierarchy-based sodalities can also be less formal. Managers in a firm may not form explicit sodalities of their own, but they may tend to socialize or talk around the coffee pot with one another more than they do with subordinates. Likewise, administrators at a university, while often holding academic positions, nonetheless usually form a social network distinct from that of the faculty. Managers of government programs may have more contact with one another, and share similar professional objectives, and their association at conferences and workshops can create a de facto sodality that facilitates information flow among them.

2.2.C.3 Ad hoc Sodalities

Informal sodalities that form in hierarchies have an ad hoc character, forming as individuals come to realize they have goals and objectives more in common with one another than they do with others. The institutional hierarchy, however, provides some structure to the sodalities. Other sodalities are entirely ad hoc, and draw on individuals from many corners of society, based solely on a common interest.

Based on journalistic accounts, the pirate associations of northern Somalia appear to be examples of ad hoc sodalities. Over the past 10 years, piracy has become a well-organized and lucrative enterprise for thousands of Somalis. Several pirate associations have emerged, with the capacity to coordinate raids, transfer funds, negotiate with corporations and issue communiqués to governments.

Somali pirates are not a motley collection of vagabonds who occasionally venture to sea to raid vessels. At present, at least four pirate groups appear to be operating out of Somalia, each named and with varying degrees of explicit organization. They include the National Volunteer Coast Guard (VNCG), the Marka Group, the Somali Marines, and the Puntland Group[6]. All groups have formed enough organizational structure to allow logistical planning, complicated financial transactions and coordination of their attacks. Ransom payments are made in US dollars, and are

typically routed through banks in Djibouti by Sudanese couriers[7]. This takes coordination and sophisticated electronic communications, which are evident when a vessel is hijacked. Towns come alive, and lawyers and financiers drive to beaches in expensive cars, laptops at the ready to begin business[8].

Somali pirate associations have the classic features of an ad hoc sodality, since they draw on a cross-section of Somali society, and they serve an integrative function, at least locally. A BBC reporter noted that Somali pirates appear to have three basic backgrounds, each with its own capabilities[9]. Ex-fishermen provide knowledge of seafaring, ex-militiamen supply knowledge and use of violence, and technical experts provide expertise in the use of high-tech equipment, such as satellite phones, GPS and more sophisticated weaponry, which has become standard for Somali piracy. This report also noted the attraction piracy has had for young Somali men without other prospects. Somali piracy has been extremely lucrative, yielding $30 million US in 2008 alone, and providing Somali pirates prestige and wealth. Young men use their new found wealth to acquire second and third wives, often from poor nomadic tribes whose women are considered the most beautiful in the region[10].

Somali pirate associations also enliven the economies of the towns from which they operate. The influx of cash sparks economic activity, and specialists benefit, such as legal counsel, negotiators, financiers, and even restaurateurs who cater to captives' palates[11]. Therefore, Somali pirate associations help integrate the communities from which they operate, at least economically. Pirates are not uniformly welcome, as the wealth they inject into a community creates inflation, they clearly compete with other males in the community for access to wives, and age-old pirate bad habits including drug use and alcohol consumption have become bothersome[12].

Somali pirate associations have formed around a clear collective purpose, the support of their predatory raids on international shipping for booty and ransom. Prima facie evidence for this singularity of purpose is the fact that, to date, there has been little violence among the pirates; they have collaborated in the face of greater profits from raids and greater threats from foreign navies now patrolling the coast of Somalia to protect shipping. Another purpose cited in reports indicates that Somali piracy may also be a response to illegal trawling off the Somali coast; piracy is an attempt by some Somali fishermen to regain lost wealth[13]. In summary, Somali pirate associations emerged from a common purpose, crosscut class and possibly kin lines, and provide economic integration for Somali communities. Given the narrowness of their purpose and its vulnerability to rule of law (during the brief rule of the Islamic Courts, piracy was greatly diminished), Somali piracy will probably be a relatively short-lived phenomenon, and therefore Somali pirate associations will probably be relatively ephemeral sodalities. In this way, they represent adaptive social organizations that rise under specific pressures, but likewise dissolve when those pressures and needs dissipate.

2.2.D. Strengths and Weaknesses of Sodalities

This brief cross-cultural review of social organization illustrates the strengths and weaknesses of the different ways people bind their societies together. The choices are limited, people use kinship and voluntary associations based on a common interest to bind a social group together. There are different forms of kin organization, and many types of voluntary associations, so that many different combinations are possible, creating the cultural diversity apparent when one examines different societies. However, these diverse forms are all variations on a few themes, and the themes have basic strengths and weaknesses.

The strength of kinship is that kin ties among those closely related tend to be very strong; the weakness is that these bonds rapidly dissipate as a kin group gets large and kinship is diluted. From a group perspective, a weakness of kinship is that the nepotistic strong ties of close kin can overwhelm collaborative ties throughout a larger society, ergo the laws against nepotism common in modern societies and corporations.

The strength of a voluntary association is that people can unite around a common purpose, providing a focus of effort and presumably members' satisfaction of attaining a goal to maintain membership. It is important also that the collective goals of the association be reinforced by satisfaction of individual desires of its members. For instance, military societies in Native American societies both satisfied the needs for promoting a warrior way of life and individuals' needs for increased social status. The weakness of a voluntary association is the maintenance of common and individual goals, which can conflict, leading to the dissolution of the sodality, or at least its decreased effectiveness. Another weakness of a voluntary association, from the perspective of a larger social need for integration, is that associations too, can become insular and compete with one another.

2.2.E. Dimensionality of Sodalities

In reality, most forms of human social organization combine elements of kin organization and voluntary associations (Figure 2.2-1). For instance, family members may serve as conduits for recruitment into an association, as individuals with union ties help relatives to get jobs and become members of a labor union. Ad hoc sodalities may draw in members of varied kin groups and different social classes, thereby integrating sectors of a society that would not normally collaborate. These sodalities integrate a society vertically, whereas hierarchy-based sodalities integrate a society horizontally. While class and kin elements of a sodality by definition integrate a larger society around a purpose, these elements can also form cliques and fissures within a sodality, ultimately defeating that purpose. Therefore, functioning sodalities are inherently multi-dimensional and dynamic. Maintaining collaboration within or between sodalities requires sustenance of benefits to the various organizations involved, and of rewards to the individuals who ultimately need to perform actions that serve an organizational purpose.

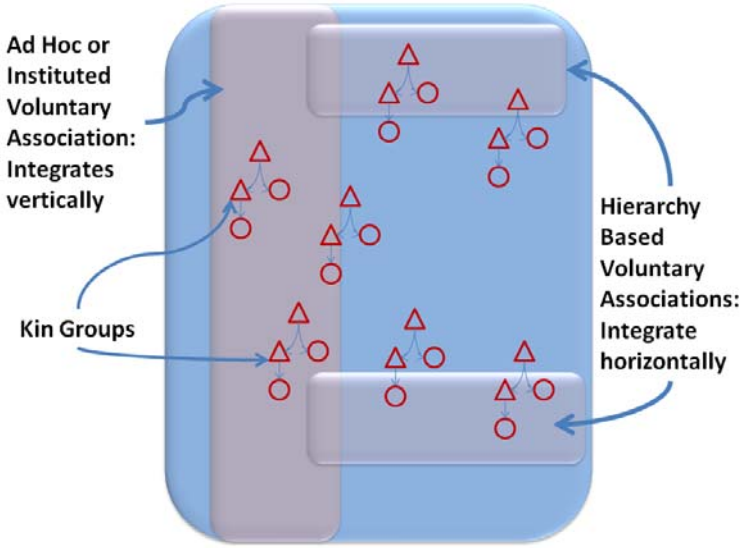

Figure 2.2-1. Social Integration through Kin based and Non-Kin-based Sodalities.

2.2.F. Sodalities and Collaboration in Large Organizations

Large organizations, such as elements of the intelligence community, are good examples of sodalities: they have a purpose (to preserve national security); they have their own internal hierarchies and divisions of labor; and they are relatively insular and separated from one another, each with its own institutional culture, and each with its own incentives for members. In contrast to this picture of separate "cylinders of excellence," there is the national mandate that these communities collaborate in order to satisfy a national need for common defense.

"The IC is a federation of executive branch agencies and organizations that work separately and together to conduct intelligence activities necessary for the conduct of foreign relations and the protection of the national security of the United States."[14]

An anthropological consideration of the dimensions of sodalities provides some lessons learned for how federations of sodalities and their members may be better incentivized to collaborate.

First, modern nation states like the US have long recognized the fragmenting effects of kinship on larger organizational solidarity, and so nepotism laws will prevent the use of kinship as an organizational principle in large organizations.

Hierarchy-based sodalities have benefits and costs for encouraging collaboration. On the one hand, government administrators who develop trusting relationships with one another can facilitate the flow of information across sodality lines, just as operators who forge links with one another can create solutions without bureaucratic interference from managers and commanders. On the other hand, if these hierarchy-based relationships prevent the vertical flow of information, command and control can be lost, and labor / management antagonisms may further fragment the functioning of the organization for its intended purpose. More permanent societies, can create solidarity and a sense of purpose within the society, but can lead to isolation from other societies with which they are supposed to collaborate.

The advent of cyber-enabled communication has probably created a more fertile environment for ad hoc sodalities, more temporarily formed around a specific purpose (see Hunt & Snead, article 5.2). Specific purposes may call for a range of skills (information technology, analytical, managerial, combat), from a variety of fields (commerce, military, engineering, social science). If relevant practitioners from different governmental agencies, private firms, and academia can be assembled, then ad hoc sodalities could provide a flexible answer to rapidly emerging and novel challenges. However, the multiple dimensions of social integration must be recognized and the proper incentives provided to both the individuals on the teams and to the various organizations that would contribute to such ad hoc organizations. These incentives should:

- Provide compensation to individuals commensurate with expertise and effort
- Serve the needs of the various organizations as well as the ad hoc unit
- Absolutely not draw on an organization's resources without compensation
- Provide for reciprocal benefits to participating organizations, especially if these benefits can outlast the ad hoc organization.

Furthermore, these collaborative sodalities should be as short-lived as the specific threats that motivate their formation, providing an adaptive efficiency to modern organization. Institutionalizing an organization to address a threat that has passed is classic "fighting the last war. This adaptiveness is an advantage in the 21st Century where threats rapidly emerge, transform, die, and are replaced by novel challenges.

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[1] Richerson, P. J., & Boyd, R. (2005). *Not by Genes Alone: How Culture Transformed Human Evolution*. Chicago: University of Chicago Press.

[2] Men's contributions may be indirect, as in the sharing of meat after a successful hunt with everyone in a band. However, women are attracted to men with well-established hunting skills, and other high status markers, as husbands. See Hawkes, K. (1993). Why Hunter-Gatherers Work. Current Anthropology 34: 341-361.

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2.3. An Evolutionary Perspective On Collaboration And Cooperation (Lee Cronk - Rutgers)

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2.3.A. Introduction

Because the term "collaboration" is seldom used in the evolutionary biological study of social behavior, I will instead use the term "cooperation." They mean essentially the same thing: Organisms working together[1]. Although competition among organisms is a driving force in evolution, the study of cooperation among organisms has also been an important topic in evolutionary theory for many years. In recent years, cooperation among humans has received a great deal of attention among evolutionary scholars because we tend to cooperate so much more with each other, particularly non-relatives, than do members of other species. In this article I will review the major evolutionary biological models of cooperation and identify some specific psychological adaptations that help our species cooperate.

2.3.B. Evolutionary models of cooperation

2.3.B.1 Kin selection

Several evolutionary models of how cooperation might be favored by selection have become standards of the literature. First among these is W. D. Hamilton's theory of kin selection.[2] The theory of kin selection is designed to solve a basic evolutionary puzzle: If selection acts through the differential survival and reproduction of individuals, why do individuals sometimes do things that harm their own chances of surviving and reproducing while enhancing those of others? Hamilton's answer focused on the fact that individual organisms share genes with genetic relatives. A tendency to behave altruistically towards others will spread in a population if it is coupled with sensitivity to relatedness. The theory of kin selection is thus best suited to explaining cooperation and altruism among relatives. However, it may also be relevant to the study of cooperation among non-relatives. One of the theory's predictions is that we should have mechanisms for identifying kin, and research indicates that we do. But the existence of such mechanisms opens the door to their being exploited, and humans have a long history of doing just that in order to secure cooperation from others. This is often accomplished through the manipulative use of kinship terms. The use of kin terms in political rhetoric (e.g., "brother," "sister," "motherland," "fatherland," and so on) is both common and increases its persuasiveness,[3] and religious organizations that demand celibacy often use fictive kin categories to structure their relationships.[4] Kin recognition mechanisms and associated emotions may be triggered in more subtle ways by the bonding effect of shared struggle, trauma, and triumph, as among initiates in secret societies (e.g., fraternities and sororities), athletic teammates, and soldiers.[5]

2.3.B.2 Direct reciprocity

The next milestone in the evolutionary modeling of cooperation was Trivers' theory of reciprocal altruism, nowadays often referred to as direct reciprocity or simply reciprocity.[6] Trivers pointed out that many emotions, including "friendship, dislike, moralistic aggression, gratitude, sympathy, trust, suspicion, trustworthiness, aspects of guilt, and some forms of dishonesty and

hypocrisy" may have their roots in selection for an ability to engage in reciprocity. Subsequent researchers have focused on how we go about selecting trustworthy partners for reciprocal exchanges. An interest in identifying such people appears early. Preverbal infants will choose to play with a toy that has been depicted as helpful to other toys over one that has been depicted as hindering other toys in their efforts to reach a goal.[7] One good way to associate with more cooperative people is to avoid uncooperative ones. Accordingly, people are better at remembering faces of people who are supposedly untrustworthy or uncooperative than those of people who are supposedly trustworthy and cooperative.[8] People also remember the faces of uncooperative people better than those of cooperative ones even when they have been given no information about the other person's personality or behavior.[9] We also have an ability to identify cheaters, identified as people who gain benefits without paying socially stipulated costs associated with them. This ability has been identified by contrasting people's ability to solve abstract logic problems with their ability to solve problems that are logically identical but that involve social rule violations. People are generally very bad at the abstract problems but quite good at identifying rule violators.[10] Some argue that selection in favor of this ability may have begun with a need to avoid cheaters in reciprocal exchange relationships.

2.3.B.3 Indirect reciprocity

Whereas direct reciprocity involves just two individuals (say, A and B), indirect reciprocity involves a third (C). If C is pleased by what he sees A do for B, he may treat A nicely in the future, perhaps seeking him out for some cooperative venture. If C is displeased by A's behavior toward B, he may avoid A or perhaps even punish him in some way. Either way, he may tell someone else (D) about C's treatment of B.[11] Indirect reciprocity creates selection pressures in favor of paying attention to reputations, both one's own and those of others. Concern about one's reputations leads to concern about one's audience, and several recent studies have shown how very sensitive people are to even the slightest hint of an audience. One of the most interesting was conducted using the simplest materials available: A coffee pot, a donation jar, and photographs of eyes.[12] Like many offices, the Department of Psychology at the University of Newcastle maintains a common coffee pot alongside a donation jar and a sign asking for people to make voluntary contributions to help pay for the cost of the coffee, tea, and milk. Three members of the department set their colleagues up as unknowing experimental subjects by posting two different kinds of images on the wall above the pot. One week, there would be a photograph of flowers. The next week, there would be a photograph of a pair of eyes. This went on for ten weeks. The amount of tea and coffee consumed was estimated by keeping track of the amount of milk used. Every time the picture shifted from flowers to eyes, the amount in the jar at the end of the week increased. Every time the picture shifted from eyes to flowers, the amount decreased. A more controlled study of the same phenomenon found that stylized eyespots on a computer screen were enough to increase donations in a dictator game,[13] and an image of a robot on a computer screen increased donations in a public goods game.[14] Even the specter of a supernatural observer is enough to make people more generous. In an experiment using the dictator game, subjects who were primed with God concepts through a task involving the unscrambling of sentences gave considerably more than unprimed subjects. Interestingly, the effect was seen in both theist and atheist subjects.[15] Of course, actual audiences also have effects on behavior. In a study involving English high school students, average contributions to a public good increased (and, correspondingly, the retention of resources by individuals decreased) when everyone's actions were made known to each other, but not when privacy was maintained.[16] In two experiments where subjects were given a chance to pay to punish others who had committed

moral violations, punishment increased when other subjects were to be told of their choice. Even when only the experimenter was aware of subjects' choices, more subjects punished and spent more to do so than when their choice was completely anonymous.[17]

2.3.B.4 Hard-to-fake signals

It pays to have a reputation for such things as generosity, kindness, trustworthiness, a willingness to follow even arbitrary norms, a willingness to punish those who do not show these characteristics, and a willingness to share accurate information about others' social behaviors. But how can you make sure that people know that you have these characteristics, particularly when they might be skeptical about your claims? This is where signaling theory can play a role in our understanding of human cooperation. Not all signals are equally believable. The ones that are most likely to convince a skeptical receiver are those that are hard-to-fake, i.e., signals that individuals without the qualities being advertised find difficult to pull off. Among humans, such signals often take prosocial forms, such as public generosity[18] and participation in group defense. One reason for this is broadcast efficiency.[19] If you want to get a message out to a lot of people, you need to get their attention. A simple way to do this is to do something that they will appreciate, such as provide a public good. Thus, public generosity may serve as a signal of one's status and ability to control resources[20] or one's cooperative nature.[21]

This leads to the prediction that people will sometimes provide public goods, even in the face of free riders, if they can gain reputational and other benefits in the process. There is considerable evidence to support this prediction. A particularly detailed study of public generosity as a hard-to-fake signal was conducted on Mer (formerly Murray Island), an island in the Torres Strait.[22] Although Mer is administered by Australia, the Meriam are culturally and linguistically closer to the people of New Guinea than to Australia's aborigines. Meriam eat a variety of things, including large green turtles (*Chelonia mydas*), each one of which yields about fifty kilos (more than 100 pounds) of meat. There are two ways to catch turtles. When they are nesting, they can be easily collected off the beaches by just about anybody – men, women, children, and the elderly. Turtle meat obtained that way is mostly shared privately among just a few households. During the non-nesting season, however, the only way to catch a turtle is to head out to sea and capture one in its own element. This is a difficult, risky, and expensive proposition, but some men still do it. Furthermore, when they do it, the meat is never consumed privately but rather widely shared at public ceremonies. Why provide turtle meat – or any other public good - despite the fact that so many free-riders will consume it? Because others notice. On average, more than a third of the island's population attends any one feast, which supports the idea that public generosity is a particularly good way to signal one's quality because of its broadcast efficiency. The attention turtle hunters receive eventually results not only in adulation but also in more mates and children[23].

In addition to letting others know about one's quality as a mate or ally, signals can also give them information about one's commitments. The role of commitments in strategic interactions was explored first by Thomas Schelling,[24] who pointed out that it is often in our own long-term best interests to convince others that we will not act in our own short-term best interests. The question for a signaler is exactly how to make a believable signal of commitment. Receivers sometimes give signalers a helping hand in this regard by specifying what they must do in order for their commitment to be convincing. This is often done by groups that need believable commitments from their members in order to hold together. A common feature of groups is that their members must forego their own short-term best interests either to join or to remain in the

group. This can take mild forms such as membership and initiation fees, but many groups require much more onerous signals of members' commitments. Religious groups can be particularly demanding. The kinds of acts and sacrifices required by religion are familiar to us all: Tithing and other contributions of wealth and labor, forbidden foods, frequent prayer, distinctive clothing, and participation in various rituals, which may involve discomfort if not actual pain. The association between signals of commitment and cooperation within religious groups has recently been documented in a wide range of settings.[25]

2.3.B.5 Biological group selection

Natural selection acts through the differential reproduction of replicating entities. Such entities can exist at different levels, ranging from individual genes to individual organisms to groups of organisms. Kin selection, direct reciprocity, indirect reciprocity, and signaling theory all work from the assumption that selection acts most powerfully at lower levels, i.e., genes and individuals. An alternative theory is that selection is driven by the differential survival and reproduction of groups of organisms. Although this idea was once popular among evolutionary theorists, important problems with it were identified long ago.[26] Specifically, in order for group selection to operate, groups must be distinct, with low levels of migration between them, and the threat of group extinction must be real. In most real world circumstances, these conditions do not apply, and so group selection is usually a weak evolutionary force.

Despite its longstanding theoretical shortcomings, group selection continues to have proponents, particularly among those who study humans.[27] Recent advocates of the idea that human psychology and behavior have been shaped by the forces of group selection point to findings from a large number of studies using experimental economic games of various kinds, which often find that people are more generous than one would predict from traditional rational actor models. This tendency is sometimes called "strong reciprocity." "Strong reciprocators" are "predisposed to cooperate with others and punish non-cooperators, even when this behavior cannot be justified in terms of self-interest, extended kinship, or reciprocal altruism."[28] Because the costs of "strong reciprocity" cannot be recovered by the individual strong reciprocator, the implication is that it must have evolved through group selection. The idea of "strong reciprocity" and the idea that the behaviors it refers to are products of group selection have both been strongly criticized.[29] The most parsimonious explanation for the behaviors it refers to is that they would have been adaptive for our ancestors, who lived in small-scale societies with little privacy or anonymity. In such societies, a willingness to be generous would have benefited individuals through all of the mechanisms previously described in this chapter, making biological group selection unnecessary to explain them.

2.3.B.6 Cultural group selection

Cultural group selection differs from biological group selection in many ways. Most importantly, cultural group selection does not require low rates of intergroup migration or high rates of biological extinction of entire groups. It can occur even when people move from group to group and when nobody dies. What it requires is for groups to remain culturally distinct and for unsuccessful ones to be abandoned. This can occur if people move from group to group and adopt the local culture.[30] Indeed, one way for a cultural group to outcompete another is simply to draw off its people. It is clear that this possibility was understood by Soviet leaders when they authorized extreme and often lethal measures to prevent citizens of Warsaw Pact countries from fleeing to the West.

Cultural group selection differs from biological group selection in one other very important way: Evidence for it is indisputable. Indeed, it happens every day. One clear example of cultural group selection is competition among firms in a market economy. Even if they provide the same product or service, firms differ from one another. Because those differences certainly are not genetic, they must be cultural, i.e., the result of socially transmitted information. Some of the cultural differences between firms may be trivial, but some may have real effects on the bottom line and thus on firm longevity. Although organizational culture is certainly relevant here, the sorts of cultural differences likely to make a difference when firms compete in a market also include manufacturing methods, labor-management relations, and marketing techniques. Firms work hard to refine these aspects of their internal cultures and, when they find something that works for them, they also work hard to keep it out of the hands of competing firms. Such vigilance helps maintain the differences between groups that are necessary for cultural group selection to operate. Although this process drives rapid cultural change in market economies, the individuals involved are still very much individuals, free to move from firm to firm, acquiring new culture traits with each new job. Due to the intensity of competition among firms in a market economy, this may be an extreme case in various ways, including the discreetness of groups and the frequency with which new ones are formed and disbanded. However, it is easy to imagine this same process occurring, though perhaps more slowly and on a larger scale, among competing polities, religious communities, and ethnic groups.

Cultural group selection may have helped shape human psychology. The kinds of psychological adaptations that may be most likely to arise from selection pressures created by cultural group selection are those that enable us to deal with a world in which competition between groups is important, but group memberships are flexible rather than fixed. This puts pressure on people to be team players but to recognize that they are just that – teams. People need to be able to feel loyalty and commitment towards their current teams while also being willing and able to shift from team to team. In short, we should have psychological mechanisms designed to deal with a world of important but flexible coalitions. A reasonable hypothesis is that our evolved coalitional psychology is built upon psychological adaptations originally shaped by direct and indirect reciprocity.[31] Several recent studies provide support for this view. Kurzban et al.[32] explored the idea that people pick up on external cues, even arbitrary ones, to identify people as members of coalitions. Because coalitions are flexible, people should be able to pick up cues that are easily changed, such as clothing and jewelry, as well as those that are more fixed, such as accents and physical resemblances. Their subjects were shown photographs of members of two rival basketball teams and told to form impressions of the individuals on the teams. Each picture was paired with a statement that the person had supposedly made about the teams' rivalry. The actual pairing of sentences with photos was randomized across subjects. Subjects were then given a surprise memory test involving matching statements with photos. Because this was a difficult task, they made a lot of errors, and the patterns in the errors reveal that they used statements associated with faces along with other cues, such as the basketball jersey colors, to identify coalitions. One of this study's most interesting findings is that flexible cues such as the statements people make and the clothes they wear swamp the effects of race as a coalitional cue. This makes sense in light of how our ancestors lived. Given that their mobility was limited by how far they could walk, they were very unlikely to have encountered people as physically different from themselves as we routinely do now, and it would make little sense for us to have an evolved tendency to focus on race when determining coalitions. Kurzban et al.'s encouraging conclusion is that racism may simply be a misfiring of a psychological mechanism designed to

pick up on more flexible coalitional cues. When race is disconnected from actual coalitions, as in their experiment, its importance as a way to sort people into groups is greatly diminished.

2.3.B.7 Coordination

Those who study human cooperation focus most of their attention on how people deal with situations in which they have conflicts of interest with each other. As important as such conflicts may be, another important obstacle to cooperation in many circumstances is simply information: People share common interests, but do not know either that they could work together or how best to do it. This is known as a coordination problem. Thomas Schelling[33] pointed out that coordination problems are often solved by "focal points," i.e., prominent features that are obvious to all parties. The example he gave was that if you ask people in New Haven, Connecticut where they would meet someone in New York City if no specific meeting place had been arranged, they usually say "Grand Central Terminal," because that is where commuter trains from New Haven arrive in Manhattan. But such focal points vary depending on the shared backgrounds of the people involved. If Schelling had asked people from New Jersey or Long Island, they may have said "Penn Station," because that is where their trains arrive in New York. Focal points need not be physical. Often, they are metaphorical. For example, the Maasai of East Africa maintain important gift-giving relationships that they refer to metaphorically as "umbilical cords."[34] The metaphor serves as a common and evocative referent that helps define the qualities of the relationship.

The need to coordinate one's behavior with others may have created selection pressures that helped shape human psychology and perhaps even physiology. Humans are unusual among primates in that our eyes have irises and sclera (the "whites") of contrasting colors.[35] Some have suggested that this evolved to make it easier to figure out where others were looking. An ability to determine the direction of another individual's gaze would have dovetailed nicely with our broader cognitive ability to understand what others are thinking. This "Theory of Mind" is better developed among humans than among members of any other species. Theory of Mind's basis in neurobiology is supported by studies showing that it is not present in very young children or in individuals with some kinds of cognitive deficits.[36] Our Theory of Mind module, as it is often called, enables us to understand and share others' intentions and work with them towards common goals.

2.3.C. Summary

Several important human cognitive abilities may be the products of selection in favor of cooperation. These include kin recognition mechanisms, cheater detection mechanisms, cooperator detection mechanisms, sensitivity to audiences, reputational concerns, coalitional awareness, and theory of mind. Knowledge of their evolutionary underpinnings can provide those who wish to design institutions that support cooperation with an understanding of the circumstances that are likely to trigger them.

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[1] Note, however, that many evolutionary scholars use the term "cooperation" as a synonym for "altruism" (e.g., Nowak, M. 2006. *Evolutionary Dynamics*. Cambridge, MA: Harvard University Press; Henrich, J., and N. Henrich. 2007. *Why Humans Cooperate*. Oxford: Oxford University Press). This has caused considerable confusion.

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2.4. Collaboration in the National Security Arena as a Social Dilemma (Elisa Jayne Bienenstock and Kevin K. Troy – NSI)

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2.4.A. Introduction

The purpose of this article is to introduce the findings and framework of social dilemma[1] research to the community grappling with the challenge of improving collaboration across the interagency. While almost everyone agrees that, in theory, coordination and collaboration across agencies would benefit national security, it has been difficult to bring about real change in the standard operating procedures of organizations. While increased collaboration and cooperation can and does benefit any number of activities or programs within the IC and DoD on a daily basis, the fundamental challenge is motivating people to change their modus operandi and prioritize collaborative endeavors. Despite the fact that the report of the 9-11 commission clearly recognized that collaboration involving many people across many agencies is required to prevent future threats, especially future rare events, a culture of collaboration has been difficult to generate.

Fundamentally, a social dilemma occurs whenever individual and collective incentives are at odds. The social dilemma literature spans multiple disciplines including economics, psychology, sociology, anthropology, evolutionary biology[2] and political science. The reason for this broad interest is that the problem is compelling. It unites a whole host of fascinating social challenges, from motivating people to recycle, stop smoking or contribute to the arts to collaboration. Kollock[3] in his review of the social dilemma literature defined social dilemmas as situations in which "individual rationality leads to collective irrationality."[4]

The advantage of identifying a situation as a social dilemma is that, once identified, it is possible to further classify the problem as a specific type of social dilemma. Because of decades of experimental and field research on the topic, once a social dilemma is properly classified, solution options become apparent.

Social dilemmas can be partitioned into two kinds: social traps and social fences. A social trap is a situation where a person performs an action that acts as a trap for negative consequences; a social fence is a situation where an obstacle prevents a person from performing an action that has positive consequences.[5] In addition, social dilemmas can operate at the individual or small group level, or at the level of a large collective. Another distinction is between dilemmas where the outcome or reward is immediate versus delayed.

2.4.B. Why Mixed Incentives Produce a Dilemma

The classic two-person social dilemma—the prisoner's dilemma—illustrates the applicability of the social dilemma framework. In the prisoner's dilemma, two players choose whether to cooperate with one another or defect, with the payoffs shown in Figure 2.4-1 (player one's payoffs are on the right).

		Player One	
		Cooperate	Defect
Player Two	Cooperate	3,3	0,5
	Defect	5,0	1,1

Figure 2.4-1 Prisoner's Dilemma

The traditional narrative of the prisoner's dilemma involves two prisoners' decisions about whether or not to turn on one another. The payoffs are in terms of jail time. However, this story can easily be changed to fit interagency collaboration in the national security arena. Should two agencies collaborate and produce a joint product, they will each get some of the credit. Should one agency agree to and seek collaboration only to have the other act unilaterally, the trusting agency will be left without recognition while the defector will be viewed as the only engaged actor (generating a higher payoff than collaboration). Should both agencies decide to work independently, neither will receive sole credit, and their dueling outputs will likely divide the attention of the national security community, leaving each with a lower payoff than collaboration. Granted, this is a highly idealized story of interagency functioning, but it illustrates the fundamental paradox of collaboration.

Literature on the evolution of cooperation (pioneered by Axelrod[6]) focuses on strategies for escaping this dilemma, for, as Kuznar and Cronk demonstrated in their papers (2.2 and 2.3 respectively), people often rise above their self interest and cooperate to achieve a common goal. The work by Axelrod demonstrates that although in a one-shot prisoner's dilemma, defection is the dominant strategy (that is, it is always rational to defect), when the game is iterated cooperation can emerge. The development of this literature revealed several factors that encourage emergent cooperation. These include persistence and repeated interaction, which lead to an emergent understanding of a shared fate and, eventually, trust. While this is encouraging, another finding from this line of work is that it is more difficult to establish cooperation when groups of more than two are considered, or when the outcome of the decision, be it reward or punishment, is delayed. The challenge then, when social dilemmas present themselves, becomes determining how to modify the social conditions and the incentive structures to encourage collaboration.

2.4.C. The Problem of Information Sharing

One of the fundamental challenges facing the national security and intelligence community is the challenge of information sharing. While it is recognized that, collectively, the country would benefit from more information sharing, there is often a cost incurred by collaborative individuals. Often individuals are siloed by department, agency and office, and disincentives are levied on work that falls outside the strict responsibilities of the particular office. This creates a social dilemma.

Bonacich[7] studied this type of social dilemma in a series of laboratory experiments in order to discover strategies for encouraging collaboration. The main focus of this work was to investigate whether the structure of the communication network affected collaboration. In this experiment participants were tasked to gather information distributed across a (social) network in order to solve a puzzle (in this case, accumulating letters to fill in a quote). In the Bonacich experiments, players had certain letters and certain information about those letters. They could only interact with a small number of other players, those to whom they were directly connected in the communication network. Once a player assembled enough letters, he or she could place them

together into the quotation, ending the game. The dilemma was introduced by disproportionately rewarding individual puzzle solvers despite the fact puzzle solving is impossible without collaboration and information sharing by everyone. This conflict is often present in collaborative environments and it also captures some features of the process for accumulation of information about possible rare events. Actors distributed across a network have pieces of information that are useless alone and must be combined with information located at other, unknown points on the network. Bonacich's main finding was that network structure affected efficiency, feelings of efficacy among players and motivation to collaborate.

In subsequent experiments, Bonacich and Schneider[8] found that by varying the way incentives were framed (e.g. team-oriented versus individual or isolated group versus a group competing with other similarly situated groups) collaboration could be fostered or discouraged. For instance, one experiment compared collaboration metrics for two networks that had identical communication structures. Figure 2.4-2 illustrates the design. For the "one group" condition subjects were given the standard set of instructions used for the earlier Bonacich experiment. For the two-group condition subjects randomly assigned to the positions represented as squares, were told that they belonged to a different team than others placed in positions represented by filled circles and vice versa. This difference in conditions resulted in less collaboration and reduced efficiency. The mention of the groups was cursory and the groupings had no relevance to any real life affiliation or membership. Nonetheless, it evoked competitiveness, suggesting that in the real world organizational identification and loyalty may undermine collaboration.

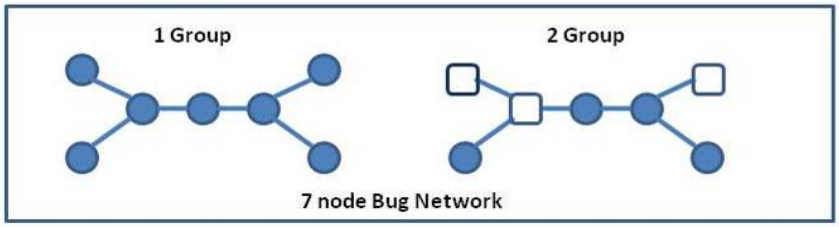

Figure 2.4-2 Network Design

Subsequent related works by others have provided insight into a range of solutions to the dilemma including how to use reputation to encourage collaboration, and how to modify structures to increase each individual's sense of efficacy and investment.

The implication of this line of work for the problem of interagency collaboration is that some types of social network structures and frames obviate the disincentive to collaborate. More structure, more centralized structures, and local recognition all encourage collaboration. The interagency is a fairly decentralized communication network, partially accounting for the difficulty in solving the rare events problems. Exacerbating this further is the fact that identity is often focused on agency rather than more generally. One possible avenue for rectifying the challenge of collaboration is to seriously consider the extant structure of the social and communication network and investigate methods for rewiring in order to create a structure that fosters collaborations.

2.4.D. Beyond Collaboration

The challenge facing the national security community goes beyond facilitating collaboration. Most solutions that are appropriate to remedy a social dilemma at the small group (N<50) level, are not sufficient to address the rare events dilemma. If it were the case that we had the right 20

people in the same room and they didn't know how to work together, then the issue would simply be one of collaboration. Instead, when facing down the task of identifying and disrupting rare events, we face a situation in which there are 20 people out of a community of millions who need to work together, but don't yet know it and don't know each other.

Unfortunately, the rare events situation represents the most intractable type of commons problem.[9] It is a very large N, it is a fence rather than a trap, and there is a delay between action and reward or punishment (if the action makes any difference at all). Each of these factors alone makes it more difficult to achieve cooperation; combined the effect is exacerbated. For each separate factor research has provided strategies to obviate the problem and eliminate the dilemma. In the case of collaborating to detect a rare event, however, eliminating one obstacle to collaboration does little to diminish the problem.

Figure 2.4-3 is an illustration of each of the above factor's effect on collaboration, with the asterisk representing the problem of rare events prevention facing the national security community. The figure is an illustrative, but dire depiction of the difficulty of the rare events dilemma. The root of the social dilemma is the difficulty of forgoing short-term gratification for long-term reward. An example as simple as an individual's decision about whether or not to eat fattening food which will taste good, but will add weight illustrates this problem. Moreover, the farther away the ultimate benefits are, the less likely the optimal decision will be made. The distance between actions designed to prevent rare events and the events (or non-events) themselves accounts for the asterisk's location far along the x-axis.

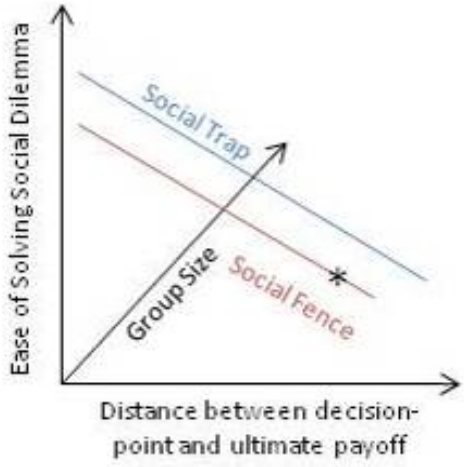

Figure 2.4-3 Effect of Factors on Collaboration (Asterisk represents Rare Events problem)

Social dilemmas in larger groups are harder to solve for many reasons.

1. An individual is less likely to feel closely tied to a larger group
2. An individual's feeling of efficacy within a group is directly related to the proportion of the group he or she comprises, so as group size goes up, individual efficacy goes down
3. Credit is harder to assign in a larger group, making rewards difficult to dispense
4. Anonymity is greater in a larger group, making it easier for individuals to shirk responsibility

Unfortunately, since the community of people involved with national security can be measured in the millions, all of these conditions apply to the rare events dilemma, explaining the asterisk's location on the z-axis.

Finally, since the failure to share information and collaborate across agencies is a social fence situation, the asterisk is positioned lower on the y-axis than it otherwise would be. Sins of commission are easier to recognize and sanction than sins of omission, so it is more difficult to change a norm that requires an action, than a norm that hopes to prohibit a behavior. This is especially true as population size increases, for all the reasons previously discussed.

2.4.E. Conclusion

Viewing the interagency collaboration challenge as a social dilemma provides a framework for distilling and evaluating different aspects of the challenge and candidate solutions. Initially, this characterization may seem discouraging to some, as the discussion in the last section may make the problem seem insurmountable. One of the lessons of the evolution of cooperation literature is that insurmountable problems often do have solutions, as at one time it was thought there was no solution to a prisoner's dilemma, and so cooperation was doomed. Similarly, by recognizing that aspects of the challenge of interagency collaboration resemble social dilemmas, the problems actually become more tractable. Over the years motivated individuals have successfully reframed numerous social dilemmas, establishing new norms and enhancing the public sphere. Examples of revolutionary changes in behavior include the changes in public perceptions and behavior regarding cigarette smoking, a social trap, and recycling, a social fence. Similarly, solutions to the interagency collaboration and rare events dilemma can be orchestrated.

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[1] Known by a host of names including: social dilemmas, commons problems, problems of collective action, social traps, n-person prisoner's dilemma, altruism game, public goods problem, and more.

[2] Article 2.3 (Cronk) also covers this topic

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[4] ibid. page 183.

[5] Cross, J.G. and Guyer, M. J. (1980) *Social Traps*. Ann Arbor. University of Michigan Press.

[6] Axelrod, Robert. (1984) *The Evolution of Cooperation*. Basic Books.

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[8] Bonacich, Phillip, and Schneider, Sherry. (1992) "Communication networks and collective action," in Liebrand, W.B.G., Messick, D.M., and Wilke, H.A.M. (eds.) *Social Dilemmas: Theoretical Issues and Research Findings*. Oxford: Permagon Press. Pp. 225-245

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2.5. Collaboration: A Perspective from Organizational Studies (Michael Stouder - GWU)

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2.5.A. Introduction

In this short essay I suggest that *collaboration*, may be understood and studied using an *organizational* perspective. I will give a brief overview of what I mean by organizational perspective and then link it to the idea of collaboration. I will emphasize the importance of understanding the problems that invoke talk of collaboration, as well as the importance of understanding some of the assumptions embedded in the term as it is currently used. This discussion will hopefully serve to orient potential research strategies and tactics. An organizational perspective is not the only word on collaboration, and the restrictions on length for this white paper strongly limit what I can say in such a brief overview. I encourage the reader to adopt a stance of critical inquiry, scrutiny and common sense towards the term or concept of *collaboration.*

2.5.A.1 Organizations.

The modern world we inhabit is an *organized* world, meaning that the activity of humans now primarily occurs within some sort of organization. This fact of increasingly organized humanity has not gone unnoticed; a voluminous and growing literature and research has emerged over the last 100 years addressing the wide variety of conditions of human organization. Specialized organization and management journals have proliferated and thousands of articles and books have been written. Like other academic fields, the study of organizations has become both highly specialized and ever more interdisciplinary. Theories and findings from other scholarly domains are with more frequency being incorporated into the study and understanding of organizations.

2.5.A.2 Organization Studies.

Those who study organizations[1] are interested in a wide range of phenomena, both within and across organizations. This includes understanding the reasons for organizations, their birth, growth and death, overall change or transformation, their similarities and differences, interdependencies, and their performance over time (this is a brief sampling of topics). Organizational scholars are curious about the ways in which workers (or organizational actors) and work activities are structured, divided, bounded, and linked. They study how decisions are informed and made, and how decision-making is distributed. They are intensely interested in how humans behave in organizations, such as how they perceive and how they are motivated, how and with whom they interact, how they use tools, solve problems, learn, and transfer knowledge, who has power and how it is wielded. They are interested in how goals and strategies are created and implemented, and, importantly, how all the above phenomena are related and measured. Like other academic disciplines, the field has both its theoretical and applied aspects; there are those who seek to provide prescriptive guidance to managers, policymakers, and practitioners (for example through consulting or through MBA and management education) and those who merely wish to study and explain organizational phenomenon. There is much overlap between theoretical and applied perspectives.[2]

2.5.A.3 Collaboration: Definition(s).

What does it mean to collaborate? To *collaborate*, in common terms, simply means to *work together*. That definition is useful and orienting, but managers, technical specialists, or organization researchers may also use the term in quite particular ways that extend and develop this basic definition. Specialized definitions will depend upon the context and domain of interest or the nature of particular problems being addressed. For example (hypothetical) an organizational researcher might wish to understand the ways in which an existing process, such as an automobile assembly line, creates opportunities for sharing technical knowledge among workers. In that case collaboration might be defined as *social interaction in an assembly sub-system that leads to a transfer of knowledge*, perhaps measured by the type and level of worker interaction, and resultant learning. As the example shows, definitions of collaboration will closely depend upon the circumstances or research program in which it is being used.[3]

2.5.A.4 Collaboration: Related Concepts.

The concept of collaboration has many closely related somewhat interchangeable concepts, often used to describe the same or similar phenomena. Some commonly used close substitutes for collaboration include: teamwork, joint operations, cooperation, cooperative systems, joint venturing, alliance creation, and networking. The reader can surely add to this list. Suffice it to say there is no overarching, unifying, or one "best" way to define collaboration, and there are many other similar terms freely and commonly substituted. Still, it is useful to keep in mind that all definitions of collaboration (and its close conceptual proxies) in some sense or another are talking about the act of working together.

2.5.A.5 Collaboration: What it is not.

When clarifying collaboration, as with any concept, it might be helpful to consider the limits of the definition, or what is deemed *not* collaboration. Collaboration may be contrasted with working independently, separately, in isolation, competitively, or in direct opposition. For example a craftsman, writer, judge, scientist, musician, salesman may spend an inordinate amount of work time in solitary effort. An elite military team may operate independently (of the larger organization) for long periods of time. A sports team will compete fiercely with its rivals – hardly a cooperative endeavor. Of course it may be the case that groups or organizations can simultaneously work together and in opposition, such as when two competitor organizations create a joint research venture or when two sports teams agree to play by certain rules. It may also be the case that collaboration may be superficial, nominal and not real. A team may be a team in name only, displaying little evidence of teamwork. The appearance of working together may in fact mask deeper conflict, competition or destructive opposition within or across a work group(s). In that instance one is hard pressed to state that a condition of collaboration pertains.

Many other conceptual limits for the concept of collaboration are possible here, and indeed part of the task of the researcher is to carefully and uniquely delimit the concept, based on the problem or phenomenon to be addressed, and the background framework through which it is viewed. One cannot study everything. For example my preference would be to limit the domain of definitions of collaboration to interactions between humans, based on the problems that beset humans in collaboration, viewed through a theoretical framework of organizational studies. But others, such as computer engineers and scientists, might challenge that limitation. They might point out that it is now commonplace for diverse computer systems, linked within a network, to exchange information and execute decisions or actions with little or no human intervention.

Should we regard that as collaboration? Is it possible for non-humans to work together? Can or should we define collaboration as the *interaction between two or more machines*? This unique usage strikes me as odd, but perhaps not extraordinary, given the current and growing capacity of computer and information technology. Computer scientists see the problems of collaboration differently and bring a unique theoretical framework (for example, the study of machine learning) to bear on the discussion.

2.5.A.6 Collaboration: A buzzword?

Imprecise, careless or habitual use of a concept can distort its meaning, or load it so full of loose or related meanings that it is hard to know exactly what is being denoted by the concept. I suggest here that the term *collaboration* is at risk of becoming just such a concept. It is likely that as a popular or faddish term, it has entered the lexicon of contemporary management jargon. When this occurs it is also possible that the term collaboration will increasingly be used to promote a particular management agenda, policy or ideology, often unaccompanied by any visible rationale. By this I mean that the term is not necessarily used to describe the act or fact of working together. Rather it is used as a prescription for improvement, or as a command; in other words not what *is*, but what *should* be.

In such cases, the imperatival *should* is often emphasized with heightened importance, urgency, or authority. For example: "Team X and Team Y need to be *more* collaborative!" Note that in the example greater collaboration is implicitly preferable to less, despite the presence or absence of understanding, evidence or reasoned debate. Here is an analogous situation: Children are often told by parents to play together nicely (where *play together* is a form of collaboration), a command that is typically not accompanied by reasoning, explanation or empirical research results. In this case, defying the command, or questioning its rationale, will often be accompanied by reprobation and sanctions from the parents. Curiously, the children's ensuing behavior may have the look of joint play, but may critically lack certain essential features of true collaboration. Thus, one pernicious effect of buzzwords in organizational settings is that otherwise intelligent and adaptive humans may become resistant and cynical with respect to those buzzwords, and engage in behavior designed to foster impressions, not supported by underlying motives or intentions.

2.5.B. Collaborative (or joint) production - A main goal and problem of organizations.

The production of any product or service, beyond the most basic, requires a measure of combined human effort. This is true for loading a truck, creating and monitoring a bank loan, producing a Broadway show, fighting a war, or placing a human on the moon. There is no shortage of sophisticated literature in organization studies/theory regarding why organizations exist, what determines their scale, scope and structure, and how cooperative behavior of those who work within them might best be secured. Suffice it to say, getting people to work together, or collaborate to create products or services, is the perennial challenge of those who design and manage organizations. Anyone who has supervised a group or team, presided over a committee, run a household or an entire company, already understands the extent of the difficulties of getting people to work together. Achieving the cooperation and coordination of the members of a large complex organization is monumental task. The point here is that historically, those who study organizations are often implicitly if not explicitly studying the phenomenon of collaboration. Those who insist that collaboration is a wholly new phenomenon are either naïve, misinformed or enamored of their own particular research agendas.

2.5.C. Collaborative (or joint) production – a routine organizational activity.

A cursory consideration of the scale of organized activity, and the inherent challenges of working together, can alert researchers to the potential constraints that *size* places on any group effort; it is one thing to get 5 team members moving in the same direction, to work together, and quite another for an organization of 500, 5,000 or 50,000. Considerations of size or scale raise an important question: How is it that a large complex organization can get any collaborative or joint work done at all? At least part of the answer is that much of the work in organizations is not novel or exceptional. Rather, it is for the most part repetitive and recurring. The human interactive part (or collaborative part) of complex organizational behavior is typically formalized, pre-specified, or standardized, restricted and controlled. The work of organizations, for most members, is therefore of a routine nature. Efficiency considerations, the stewardship of scarce resources, the concomitant necessity for control of organized behavior, are likely to drive most organizations, especially large ones, towards standards and routines.[4] Tasks are divided up, roles are prescribed, rules and policies guide actions, machines or computer software structure actual work tasks.[5] Therefore, most collaboration in organizations is likely to be of an automatic or routine nature, highly structured or pre-specified.

As a result, working together is not unusual or atypical in organizations of all sizes and types. It is largely routine behavior. Collaboration researchers should therefore consider what, from their perspective, is new or exceptional about the phenomenon of collaboration, and what new or specific problems and issues of collaboration they seek to study or understand. They should likewise use caution when creating and studying artificial collaborative scenarios, which are likely to strongly diverge from the way organizational activities (including collaboration) are routinely enacted; artificial settings and findings may not represent, or transfer well, to real work environments.

2.5.D. Collaboration study: Troublesome embedded assumptions.

From an organization studies perspective, I see several potentially troublesome assumptions embedded in contemporary usage of the term collaboration, as well as other research method errors that are likely to be committed. I will discuss some of these, but space constraints necessarily limit the extent of the discussion.

The first common assumption is that collaboration, or working together, is a new phenomenon. That of course is plainly false; humans have worked together for eons. Consider for example that the construction of the great pyramids of Egypt surely was not a solitary effort, either in design or implementation. A sub-assumption is that collaboration is everywhere increasing. Logically, that is probably true overall (numerically more people, more organizations, technological advances in communications, globalization) but collaboration may also be reversing in many cases. For example where technology has reduced the need for labor-intensive processes, then collaboration will often be rendered unnecessary. Consider a few examples such as the use of robotics in an automobile plant, the use of high-tech farming machinery, the computerized crane and storage systems used to load ships with freight, or the systems used to route telephone calls or move data. In all of these cases, specific work systems are devolving from a situation of greater to lesser collaboration.

A second common assumption is that more collaboration is always better than less collaboration. That is less plainly false, but false none-the-less. It should be readily apparent to anyone who has participated in any group or organized endeavor that increasing the increment of collaboration

does not necessarily lead to any sort of recognizable group or organizational improvement. Collaboration will certainly lead to various outcomes, but increased performance may not be one of them. Managers who attribute all sorts of benefits to collaboration may fail to understand the complex set of causal factors that lead to performance. Misdiagnosis of organizational problems is common.

Collaboration may in fact lead to a host of unpleasant or unwanted outcomes, such as information overload, confusion, increased conflict and decreased performance. For example, increasing the collaboration of different military/law enforcement units in the same operational location creates many potential risks and other unintended consequences, such as the risk of critical communication mishaps or the risk of accidentally shooting each other. Collaboration, especially if it is too close or extensive may jeopardize professional objectivity (e.g., see recent accounting and finance scandals), may compromise critical private organizational information (e.g., trade secrets, economic espionage), or may invoke damaging legal or interest group scrutiny (e.g., antitrust violations, anti-globalization movements). One corrective or counter-balancing exercise would be for researchers and practitioners to consider, or seek out, instances where *less* (not more) collaboration might increase performance or lead to more desirable outcomes.

A third common assumption (related to the second) is that the coordination problems inherent in group or collaborative activities will magically solve themselves, and will do so in ways that don't involve the expenditure of resources. However, solutions to problems of organizational coordination are not costless[6] and coordination problems may prove to be complex or impossible to solve in certain cases. More mundanely, humans, in many circumstances, may not work well together. For example, they may simply not like each other, for a variety of reasons. It is also common that some individuals will seek power and dominance rather than cooperation. Anyone who has worked in an organization or served on some sort of committee for even a short period of time should have no trouble understanding these obvious aspects of organized life. Scott Adams, author of the Dilbert cartoon series, is widely appreciated primarily because he humorously portrays the reasons and extent to which humans often do not work well together. Fixing these sorts of organizational problems may involve considerable costs in time and money, and the outcomes are far from certain.

2.5.E. Researching collaboration

2.5.E.1 An approach using an organizational perspective.[7]

A modest approach to understanding organizational collaboration would attempt to define the specific issues or problems regarding working together (collaboration) that are under consideration, as well as the specific contexts within which they occur. ***What specific problems are you trying to understand or solve by invoking the concept or notion of collaboration?*** Is a lack of collaboration the real problem? Collaboration as *working together* is, and has been, a ubiquitous organizational phenomenon. It is not new. Researchers should remain curious as to why issues regarding working together (collaboration) are currently problematic or in vogue, as if they were never problems prior to our current organizational experience or our organizational histories. How have situations changed (e.g., the internal or external operating environment) that necessitate a change in the ways individuals, groups or organizations work together? Is the real problem about *getting people to work together* or is it something else, such as improving the effectiveness of organizational communication?

Using a broad organization studies standpoint, I recommend that organization researchers approach the study and understanding of collaboration by first specifying as clearly as possible the particular research issues, questions, problems, or areas of interest. Particular questions will depend on a given researcher's unique theoretical orientation and areas of interest. An infinite number of research problems, questions and variables are possible, and many diverse issues are likely to be identified, with considerable overlap across issues. If researchers lack a reasonably clear understanding of the problems under consideration, collecting data will become something of a blind enterprise. If little is known ahead of time about the phenomenon then a more open, flexible or qualitative research approach is recommended.[8]

2.5.E.2 Possible research questions, variables and alternative approaches.

Are you (the researcher) seeking to explain or understand the *process* of collaboration (type, level, frequency, duration, intensity, variety)? Are you seeking to explain what drives or *constrains* the process of collaboration (environmental factors, organizational factors, organizational values and beliefs, certain events, incentives, problem sets, structures, rules, policies, leadership)? Are you seeking to understand *attributes* of the collaborators (age, diversity, gender, experience, intelligence, knowledge, skills, abilities, motivation, personality, location, status)? Are you seeking to explain *outcomes* of collaboration (efficiency, effectiveness, learning, creativity, cohesion, satisfaction)? Are you seeking to understand some combination of these variables? (Are women more likely to collaborate then men? What kind of women? Under which circumstances?

These are just examples and many more questions may pertain. Policy-makers and practitioners need not be frightened off by the level of abstractness entailed in the previous paragraph, or the complications inherent in the many variables listed. Research issues can be stated plainly or concretely, and can reflect more limited, practical or immediate concerns. Massive theories and elaborate studies with multiple variables are not always necessary or may prove to be prohibitively time consuming or expensive, and may not, in the end, yield improved understanding of the phenomenon. A great deal may be learned about a phenomenon by merely watching it happen (observation) and reporting on what is seen (description), or by talking to participants (interviews, focus groups) regarding a specific instance (a case), all of which demonstrate a less rigid, though no less rigorous research approach.

For managers and practitioners, analogies and metaphors can be very useful to help describe organizational phenomenon. What actual or metaphorical images does the notion of collaboration create?[9] Using an analogy to bees, collaboration as similar to the activity within a hive of bees evokes many powerful ideas, such as how complex behavior is coordinated, how collaborative roles are divided, and what determines the numerical limits of collaboration, such as the weight of the hive. What about the intensity of collaboration of bees packed tightly together in space, or collaboration between dissimilar bees?[10] Transferring this sort of analogical or metaphorical thinking to organizational cases we might ask similar questions. How might we understand the organizational limits of collaboration? Are we thinking about collaboration in terms of working with those we have not traditionally worked with before? Are we referring to teams, other kinds of groups, organizations or groups of organizations? Are we interested in collaboration *within* groups or *across* groups or both? Do we wish to understand collaboration in co-presence (face-to-face) or in situations where actors are physically scattered in space and time? Does collaboration need to be persistent or merely occasional, depending on the situation? What gains are expected or anticipated from collaboration and what are the costs (the costs of

organizing, monitoring performance, etc.) incurred in doing so? People are more likely to work together when the benefits of that collaboration exceed the costs of doing so. But they may also work together even if it is inefficient or costly to do so, for example because they like each other, because they routinely do so. Like bees, collaboration may be contingent on membership in a particular swarm.

Those who study collaboration should not expect to reach a clear consensus regarding collaboration phenomenon. Definitions of collaboration, and various research agendas about collaboration, are likely to demonstrate levels of vagueness and ambiguity, especially across disciplinary lines. Definitions of collaboration are also likely to be parochial, in the sense that they may only make sense within a specified theoretical or research program. For example, an organizational psychologist, drawing on the personality trait of introversion/extroversion, might use the concept of personality to explain why it is that certain people are drawn to teamwork (collaboration) in the first place, or why some would prefer to work alone. In other words, the concept of personality may be used to explain collaboration. Alternatively, a social psychologist studying group processes might try to understand how group members become more cohesive, where increased collaboration becomes a means towards increasing the cohesion among team members. Here, collaboration might be defined as "communicative interaction" and might be operationally measured by the number of hours spent in face-to-face, phone or email contact with other team members. An organizational theorist might wish to understand the persistence of collaboration of an alliance of two firms involved in joint research and development, as well as the outcome of that collaboration in terms of financial performance. Alternatively, a sociologist might wish to understand the dynamics of trade (or exchange) within a given social network of actors. In this case, collaboration could be defined broadly as "social exchange" and operationally defined (measured) as the quantity and/or quality of goods or services flowing across a network. These kinds of research examples, variables and measures, could be enumerated endlessly.

Therefore, those who seek to understand collaboration more broadly should attempt to understand the constraints on the meaning of the terms used, based on how they are particularly defined in diverse and unique research activities, focused on particular problems of limited scope. There will often be overlap across research programs but it may be difficult or impossible to make meaningful comparisons across these programs. Likewise, there may be no precise standard with which to compare the measurement of collaboration in one research setting versus another, or to deem one definition (or theory) of collaboration superior to another. As with most worthwhile endeavors a certain amount of reasoned judgment will be required.

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[1] This includes, among others, organization theorists, management theorists, business consultants, organizational behavior theorists, industrial-organizational psychologists, operations researchers, decision and information science theorists, public policy scholars, sociologists, anthropologists, and working managers.

[2] For a solid, readable, contemporary introduction to the study of organizations see Hatch, Mary Jo and Cunliffe, Ann L. 2006. Organization Theory (2nd ed) New York, NY: Oxford University Press.

[3] For a relevant research example using a specific definition of the concept of collaboration ("collaborative analysis") see Hackman, Richard J., Kosslyn, Stephen M. and Woolley, Anita W. 2008. "The Design and Leadership of Intelligence Analysis Teams." Technical Report No.11: The Group Brain Project. Harvard University. http://groupbrain.wjh.harvard.edu

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[4] A main criticism of large bureaucratic organizations is that they are mired in these sorts of routines which ultimately render them inefficient and/or ineffective. The degree of standardization of organizational processes may therefore be considered one of many organizational characteristics.

[5] The organization theorist Charles Perrow has referred to the extensive systematic control exerted by large organizations, via processes and structures, as somewhat invisible or "unobtrusive". Perrow, Charles. 1986. Complex Organizations: A Critical Essay (3rd ed.). New York: Random House.

[6] Costs of coordination, either in firms or markets, are in organization studies jargon referred to as "transactions costs". The seminal work regarding transactions costs can be found in Coase, R. H. 1937. "The Nature of the Firm." Economica. 4: 386-405.

[7] The discussion here is meant to be limited and general, focused on the phenomenon of collaboration. There is not sufficient room for an adequate treatment of the many ways in which data can be collected and how data may be analyzed. Data types, collection and analysis methods range from simple to highly elaborate statistical techniques. The reader is directed to more specialized sources regarding research methods in social sciences.

[8] For a basic orientation to types of qualitative research methods used in social science see: Creswell, John W. 1994. Research Design: Qualitative and Quantitative Approaches. Thousand Oaks, CA: Sage Publications, Inc.

[9] For practical and engaging examples of how to use metaphors/analogies in order to illuminate and diagnose organizational problems see: Morgan, Gareth. 1986. Images of Organization. Beverly Hills, CA: Sage.

[10] For a fascinating account of how honey bees cooperate (or collaborate?) and make timely decisions see: Seeley, Thomas D., Visscher, P. Kirk and Passino, Kevin M. 2006. "Group Decision Making in Honey Bee Swarms." American Scientist. 94: 220-229.

2.6. Analytic Teams, Social Networks, and Collaborative Behavior (Richards Heuer, Jr. - consultant and Randy Pherson and Sarah Miller Beebe, Pherson Assoc.)

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2.6.A. Introduction[1]

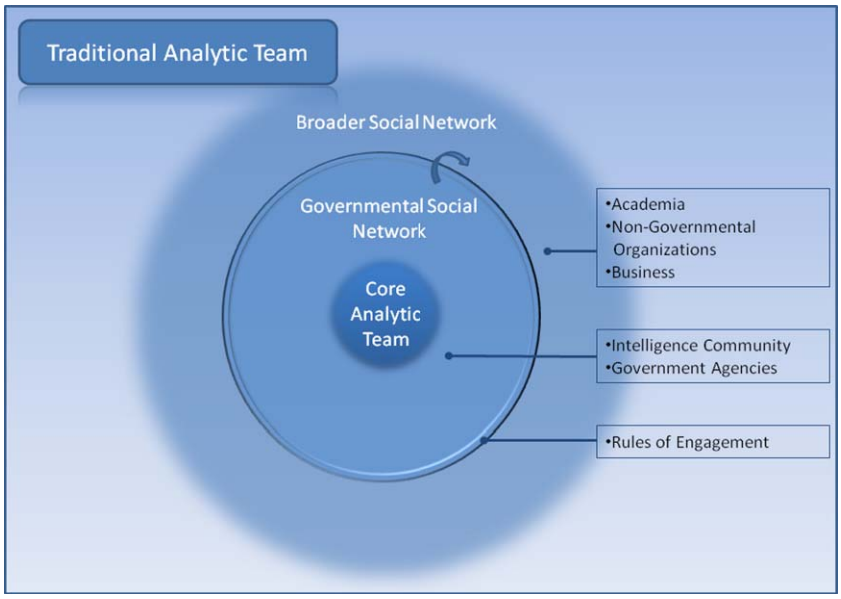
Across most of the US Intelligence Community, analysis appears to be in a transitional stage from a mental activity done predominantly by a sole analyst to a collaborative team or group activity. The driving forces behind this transition are the growing complexity of international issues and consequent requirement for multidisciplinary input to most analytic products; the need to share more information more quickly across organizational boundaries; growing dispersion of expertise, especially as the boundaries between analysts, collectors, and operators become blurred; and the need to identify and evaluate the validity of alternative mental models. The transition is enabled by advances in technology such as Intellipedia, Communities of Interest, A-Space in the Intelligence Community, and the mushrooming growth of social networking practices among the upcoming generation of analysts. Many things change when the analytic thought process is externalized in a transparent manner so that it can be shared, built on, and easily critiqued by others.

The transition to a more collaborative form of analytic activity presents many challenges, particularly when the analysis is being done by small groups. When discussing the US Intelligence Community, it seems most useful to deal with three types of groups or teams: the traditional Analytic Team, the Special Project Team, and Social Networks. The rapid growth of social networks across organizational boundaries and the consequent geographic distribution of their members are changing how analysis is being done. The authors propose that much analysis now should be done in two phases, a divergent analysis phase by a geographically distributed social network and a convergent analysis phase and final report done by a small analytic team. The ultimate challenge is to know how to take advantage of the collaborative environment while preventing or avoiding the many, well-known problems associated with small group processes.

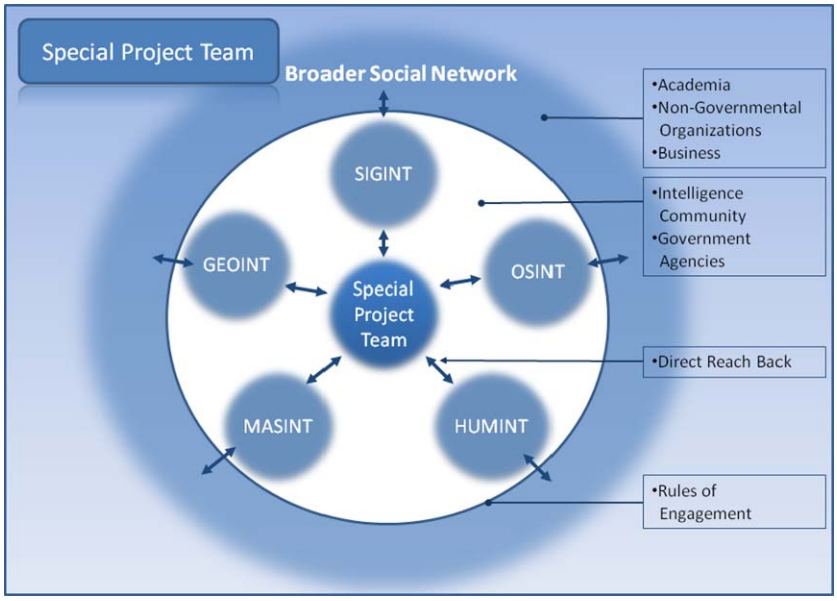
2.6.B. Analytic Teams and Social Networks

Analytic teams and groups can differ in the nature of their leadership, frequency of face-to-face interactions versus virtual meetings, the breadth of the analytic activity, and the amount of time pressure under which they work.[2] Analytic Teams, supported by Social Networks, can operate effectively in both co-located and geographically distributed modes. The Special Project Team is most effective when its members are co-located.

- *Analytic Team:* This is the typical work team assigned to perform a specific task. It has a leader appointed by a manager or chosen by the team. All members of the team usually are collectively accountable for the team's product. The team may work jointly to develop the entire product or each team member may be responsible for a specific section of the work. Historically, many teams were composed of analysts from a single agency, and involvement of other agencies was through coordination during the latter part of the process rather than collaboration from the beginning. That is now changing as a consequence of changes in policy and easier access to secure interagency communications and collaboration software.



- *Special Project Team:* Such a team is usually formed to provide real time analytic support to decision makers during a crisis or ongoing operation. A crisis support task force or field-deployed interagency intelligence team that supports a military operation exemplifies this type of team. Members are either located in the same physical office space or are connected by video communications. There is strong team leadership, often with close personal interaction between team members. Because the team is created to deal with a specific situation, its work has a narrower focus than a social network or regular analytic team and its duration is limited. There is usually intense time pressure and around-the-clock operation may be required.



- *Social Networks:* Experienced analysts have always had their own network of experts in their field or related fields with whom they consult from time to time and whom they may recruit to work with them on a specific analytic project. Social networks are the guts of the analytic business. They do the day-to-day monitoring of events, produce routine products as

needed, and may recommend the formation of a more formal analytic team to handle a specific project. The social network is the form of group activity that is now changing dramatically with the growing ease of cross-agency secure communications and the availability of social networking software. Social networks are expanding exponentially across organization boundaries. The term social network as used here includes all analysts working on a particular country, such as Brazil, or on an issue, such as the development of chemical weapons, anywhere in the world. It can be limited to a small group with special clearances or comprise a broad array of government, non-government, and academic experts.

2.6.C. Challenges Faced by Geographically Distributed Teams

The key problem that arises with social networks is the geographic distribution of its members. Even within the Washington, DC metropolitan area, distance is a factor that limits the frequency of face-to-face meetings. Based on their study of teams in diverse organizations that included teams in the Intelligence Community, Richard Hackman and Anita Woolley concluded:

> *"Distributed teams do relatively well on innovation tasks for which ideas and solutions need to be generated, for example, but generally underperform face-to-face teams on decision-making tasks. Although decision support systems can improve performance slightly, decisions made from afar still tend to take more time, involve less exchange of information, make error detection and correction more difficult, and can result in less participant satisfaction with the outcome than is the case for face-to-face teams…. In sum, distributed teams are appropriate for many, but not all, team tasks. Using them well requires careful attention to team structure, a face-to-face launch when members initially come together, and leadership support throughout the life of the team to keep members engaged and aligned with collective purposes."*[3]

Research on effective collaborative practices has shown that geographically distributed teams are most likely to succeed when they satisfy six key imperatives. Participants must:

- Know and trust each other; this usually requires that they meet face-to-face at least once.
- Feel a personal need to engage the group in order to perform a critical task.
- Derive mutual benefits from working together.
- Connect with each other virtually on demand and easily add new members.
- Perceive incentives for participating in the group, such as saving time or increasing the impact of their contribution.
- Share a common understanding of the problem with agreed lists of common terms and definitions.[4]

2.6.D. Using Wikis to Overcome These Challenges

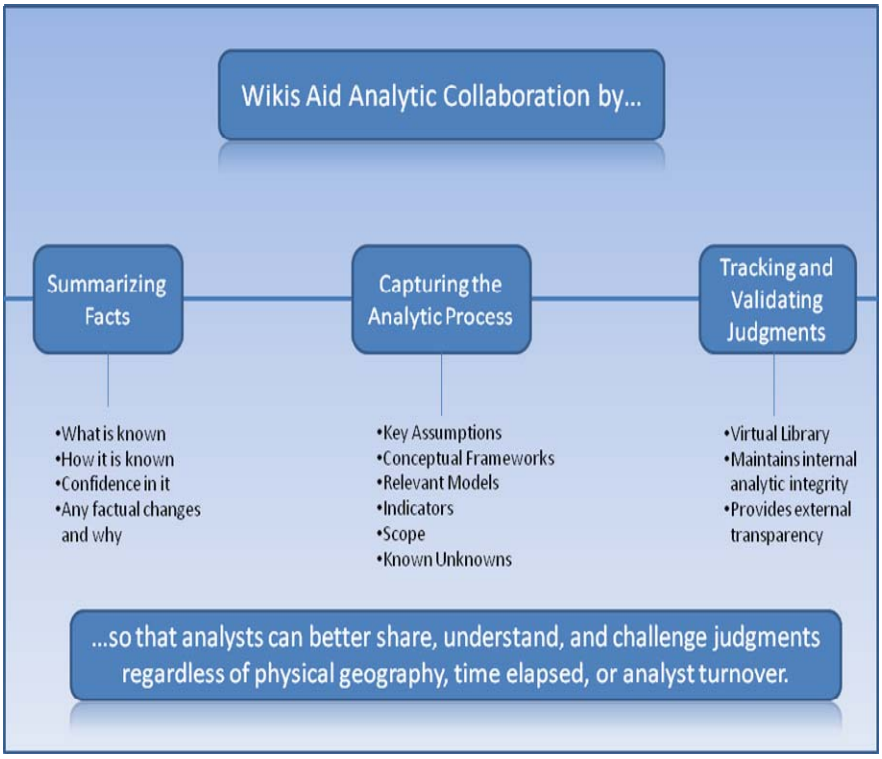
Managing the geographic distribution of the social network can be addressed effectively by dividing the analytic task into two parts – first, exploiting the strengths of the social network for divergent or creative analysis to identify ideas and gather information, and, second, forming a small analytic team that employs convergent analysis to meld these ideas into an analytic product. When the draft is completed, it goes back for review to all members of the social network who contributed during the first phase of the analysis, and then back to the team to edit and produce the final product.

Structured analytic techniques and collaborative software work very well with this two-part approach to analysis. A series of basic techniques used for divergent analysis early in the analytic

process works well for a geographically distributed social network communicating via a wiki. This provides a solid foundation for subsequent convergent analysis by a small analytic team. In other words, each type of group performs the type of task for which it is best qualified. This process is applicable to most analytic projects, and it can work as described below.

A project leader informs a social network of an impending project, provides a tentative project description, target audience, scope, and process to be followed. The leader also gives the name of the wiki to be used and invites interested analysts knowledgeable in that area to participate. Any analyst with access to the secure network also has access to the wiki and is authorized to add information and ideas to it. During the divergent phase of analysis, the project leader can engage the team in a variety of activities designed to:

- Better define the issue.
- Brainstorm lists of driving forces, variables, or players.
- Rank or prioritize these lists.
- Assess the relationship, if any, between various pairs of driving forces, variables, or players associated with the topic.
- List alternative explanations or outcomes (hypotheses) to be considered.
- Develop evidence to be considered when evaluating these hypotheses.
- Review the key assumptions that underlie the analysis. This will be less effective when done on a wiki than in a face-to-face meeting, but it would be beneficial to know the network's thinking about key assumptions.



Most of these steps involve making lists, which can be done quite effectively with a wiki. Making such input via a wiki can be even more productive than a face-to-face meeting, because analysts have more time to think about and generate their input. Moreover, they can take several days to consider their contribution and make additions or changes as new ideas come to them.

The process usually is overseen and guided by a project leader. In addition to providing a sound foundation for further analysis, the process gives the project leader time to seek out analysts with alternative perspectives or with a unique knowledge base or conscientious work ethic that qualifies them for membership in the analytic team that conducts the second phase of the project – making analytic judgments and drafting the report. The project manager should select team members to represent maximum subject expertise, the diversity of opinions and thinking styles, and various stakeholders in the analysis.

The action then moves from the social network to a small, trusted team (preferably no larger than eight analysts) to complete the analysis. Face-to-face meetings should be held as needed. Software used for exchanging ideas and revising text should use a system like Microsoft SharePoint rather than a wiki, as a SharePoint-type system allows for privacy of deliberations, which the wiki does not. The draft report is best done by a single person. That person can work from other team members' inputs, but the report usually reads better if it is crafted in one voice. As noted earlier, the working draft should be reviewed by those members of the social network who participated in the first phase of the analysis.

2.6.E. Conclusion

The benefits of using a wiki or other collaborative software are numerous. An obvious benefit is that it allows the social network and small analytic team to better track the underpinnings of their analysis, such as indicators, brainstorming results, and key assumptions. When used in this manner, a wiki can also facilitate an otherwise cumbersome review and coordination process by allowing analysts to refer to the wiki for information on the analytic processes that were used to arrive at the analytic judgments. Furthermore, after the project is completed, analysts can employ the wiki to help test their analytic framework and judgments as new information or ideas become available. The most compelling benefit of all, however, may be that wiki-enabled analysis helps build a more transparent and collaborative analytic environment.

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[1] This article was drawn largely from a forthcoming book by Richards J. Heuer, Jr. and Randolph H. Pherson, *Structured Analytic Techniques for Intelligence Analysis* (Washington, DC Congressional Quarterly Press).

[2] This article was inspired by and draws on the research done by The Group Brain Project at Harvard University. This project was supported by the National Science Foundation and the CIA Intelligence Technology Innovation Center. See in particular J. Richard Hackman & Anita W. Woolley, "Creating and Leading Analytic Teams" (Technical Report No. 5, February 2007), available at http://groupbrain.wjh.harvard.edu/publications.html.

[3] Ibid, p. 8

[4] These imperatives are discussed in more detail in article 4.2 (Pherson & McIntyre).

2.7. The Engagement Economy: Applying Lessons of Economics in Collaboration – Moving from Attention to Engagement (Carl Hunt - DTI)

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2.7.A. Introduction

When most people think of economics, they often imagine buying and selling, trading, return on investment, and a variety of other concepts they learned in school. Wikipedia's initial definitions in its piece on economics are informative:

> **Economics** is the *social science* that studies the *production*, *distribution*, and *consumption* of *goods* and *services*. The term economics comes from the *Ancient Greek* *ο•κονομία* (oikonomia, "management of a household, administration") from *ο•κος* (oikos, "house") + *νόμος* (nomos, "custom" or "law"), hence "rules of the house(hold)".[1] Current economic models developed out of the broader field of *political economy* in the late 19th century, owing to a desire to use an *empirical* approach more akin to the physical sciences.[2] A definition that captures much of modern economics is that of *Lionel Robbins* in a *1932 essay*: "the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses."[3] *Scarcity* means that available *resources* are insufficient to satisfy all wants and needs.[1]

This paper touches on several of the important economic concepts Wikipedia delineates above, while adding an interesting new twist: this paper also reports on what is known as a new *Economics of Engagement,* an emerging component of successful collaboration. In this new economic theory of collaboration, self-organization, self-defined innovation and "fun" are critical to success. These "new" characteristics of collaborative work may even suggest how group cooperation could unfold in new complex distributed settings, supplementing Western-based group planning and execution with Eastern notions of trust. These approaches may become part of a viable path to collaborative success in an uncertain and often ill-defined future.

2.7.B. The Inspiration of Economics

Before dwelling too much on novel engagement approaches and Eastern influences, however, it is valuable to consider some basics about economics and its effects on collaboration in general. In all environments – government, cultural, business, family, and even non-human organic systems – economics are at play. All living systems engage in forms of trade on both physical and non-physical substrates. As the Wikipedia article above points out, this substrate or trade space accommodates the interactions of production, distribution and consumption of goods and services (typically based on some level of demand). The effectiveness of the trade space emerges from an intersection of the value to the participants and the rules or laws of the environment in which the economic system exists, hence the relationship to the original Greek roots of household management rules, *ο•κονομία*.

Over the centuries, human economics has become as much a social science as a political science. We see the social and cultural aspects of economics even more vividly in the era of globalization

and the economic meeting of the minds of diverse cultures – East and West, for example. Economics is very much a study of behavior as much as it is a study of trade of scarce resources. All living systems trade something for their existence, whether it is in the size and dominance they can achieve in their own environment, or the amount of "wealth" they can store by virtue of their displacement or role in the biological setting. Life itself is the result of many economic trade space interactions. Collaboration, agreement and decisions to act on those agreements are the result of similar trade-space interactions, most of which have some economic corollary, as we shall see in the *Economics of Engagement*.

2.7.C. The Economics of Engagement: Competing for Human Thought Cycles to Put Energy and Fun into Group Work

If economics is a manifestation of trade-space interactions, and the subject of this collection of papers is human organizational collaboration and interactions, then it is useful to understand how people decide to choose endeavor ***A*** to engage in with others (e.g., collaborate) versus endeavor ***B***. In other words, those who design and administer collaboration environments would like to understand why a person participates in one group collaboration rather than another, or why do they prefer investing their time in one group over another?[2] What motivates people to engage in rather than simply attend collaborative sessions? How does the organizational collective ensure a person puts the most he can into the group setting and gets back a reasonable return on his investment? What keeps him engaged?

While these questions may be better left to social scientists to address, there are some insights from which we can draw recent findings in a report entitled "Engagement Economy" that should inform collaboration choices.[3] This report cites other recent research by those following crowdsourcing and "wisdom of crowds" and their relatively undirected methods of gaining group-based insights about ill-defined or highly unstructured problems.[4]

> To effectively harness the wisdom of the crowds, and to successfully leverage the participation of the many, organizations will need to become effective players in an emerging economy of engagement. In the economy of engagement, it is less and less important to compete for attention, and more and more important to compete for things like brain cycles and interactive bandwidth. Crowd-dependent projects must capture the mental energy and the active effort it takes to make individual contributions to a larger whole.[5]

"Brain cycles" and "interactive bandwidth" are ways to think about engagement, an involvement within the collaboration environment that exceeds simply showing up and watching what happens. Collaboration environments that require participation of distributed or even locally collected groups demand "mental energy" and "active effort" to ensure effective discussions and debates over anything but the most simple of problems or planning efforts – a major reason why collaboration environments exist in the first place.

Organizational collaboration, particularly as practiced in highly distributed interagency environments, does in fact seek to "harness the wisdom of the crowds" to a significant degree. While we do not seek to throw hard problems out to an undefined public for solutions, as crowdsourcing theory might suggest, there will be occasions when solutions might emerge from unlikely sources. A distributed collaboration environment must accommodate contributors from diverse sources which might be obscure or not clearly aligned with "mainstream" efforts, although typically from within a vetted community. In other words, collaboration could

conceivably embrace insights from trusted but formerly unforeseen sources. This comes very close to the principles of crowdsourcing, although trust may be at a higher level…more about trust in the next section.

This ultimately defines the challenge of the Engagement Economy: competing not for attention, but for commitment and trust in a diverse setting that offers many competing interests for potential contributions to collaborative efforts. Collaboration tools are important, even necessary, but they are not sufficient to focus commitment. But, as it is more than just tools, it's also more than just commitment. According to the author of the Engagement Economy, the "more" deals with turning mere attention into engagement through fun and self-directed, self-organized teamwork. These are the foundational blocks supporting the "Engagement Economy."

McGonigal cites several categories of "massively participatory projects," as she calls them, projects that capitalize on creating entertaining ways to engage people across distance and multiple organizations, harnessing in many cases the force of self-organization and self-empowerment. These projects run across the spectrum of organizational entities in the US and around the world, including government, corporate, research and not-for-profits:

- Peer2Peer translation networks, such as DotSub, an online platform that enables crowdsourced translation and subtitling for digital videos.
- Social news systems, such as Current TV's online "news game" that invites viewers 24 hours a day, 7 days a week to help create two minutes of each hour of on-air programming.
- Citizen science projects, such as the University of California, Berkeley's stardust@home project, which invites volunteers to search for interstellar dust through virtual microscopes and Foldit!, the University of Washington's collaborative and amateur-friendly protein-folding environment.
- Crowdsourced art, such as Post Secret, a curated collection of anonymous community-contributed postcards describing the sender's most private secrets.
- Open-source search engine development, such as Wikipedia founder Jimmy Wales's Wikia Search and Jason Calacanis's Mahalo start-ups, both of which hope to use social networks and human filtering to improve search results.
- Crowdsourced artificial intelligence (AI) training systems, such as Carnegie Mellon's GWAP ("Games With a Purpose"), a set of four online mini-games designed to improve AI algorithms for things like audio music genre recognition and natural language association.
- Participatory marketing campaigns, which ask consumers to create enthusiastic videos, wikis, and other Web 2.0 content to promote a product to the rest of the world, such as the Dove/YouTube "make your own commercial" campaign and NBC's official wiki for its television series Heroes.
- Crowdsourced political engagement, such as the Center for Media and Democracy's "Congresspedia" and American Public Media's "Preserving the American Dream Idea Generator."[6]

These are among numerous ongoing efforts that seek to leverage the phenomenon of crowdsourcing and self-directed goal setting and attainment (also components of self-organizing systems). But there are also constraints to these new approaches to collaboration. As McGonigal

notes, "with many more possible groups competing for the average individual's time, the speed with which a group can become unglued has also increased." After all, she continues, "there are only so many units of engagement each participant can expend" over time and within the context of existing (and perhaps traditional), non-collaborative work.[7]

Collaboration projects will simply have to compete for resources just like any other type of work, and this condition is exacerbated when individual contributors are pulled between doing work in traditional ways, learning the collaborative work style and segmenting themselves among competing projects. There must be attractors built into collaborative work styles that keep people engaged and returning to the project willingly. One of the strongest contending attractors, according to McGonigal and new research in gaming is simply having *fun*.

The idea of having fun in work, particularly collaborative work, is related to the study of human emotion, or the *economy of feelings*, as McGonigal puts it. In this economy, positive emotions that include "pride, curiosity, love and feeling smart" are meaningful, perhaps "ultimate" rewards for being a productive and engaged part of the collaborative effort.[8]

University of Indiana economist Edward Castronova is a well-known game theorist and virtual environment designer. Castronova is currently engaged in developing virtual environments to use as laboratories for social science experiments. In a recent experiment, he found that the economic principle known as the Law of Demand seems to hold substantially true whether in real world or virtual world environments.[9] The basic economic principles of demand and availability to meet demand (e.g., "supply" in the world of goods and services) also seem to apply to the economy of engagement, based on this research.

Castronova and Claremont Graduate University psychologist Mihaly Csikszentmihalyi, the creator of the concept of *Flow* in psychology,[10] stress the importance of the feeling of "happiness we experience when we are fully engaged in something, when we are marshalling our resources and receiving feedback that we are making progress toward a goal."[11] They posit that any mass collaboration environment that fails to induce and accommodate flow "will fail to achieve maximum possible engagement…anyone who is motivated and engaged enough can break through …and become a star. The whole crowd can be stars."[12]

McGonigal concludes that organizations seeking to leverage interest and demand for large-scale (or even mid- and small-scale) collaboration must be prepared to commit resources to master the art (and science) of "making mass participation fun and sustainable…In the new economy of engagement, whoever captures the most passionate players and participants will have an unquestionable edge on innovation."[13]

Collaboration has always been about maximizing the talents of groups (closely related to some elements of "crowds") to bring about useful and innovative ideas. Once multiple collaboration environments started competing against each other and traditional ways of doing the organization's business, however, it became a matter of parceling out the scarce resources of attention and engagement, as well as incentivizing collaborative behavior. The new economics of engagement address how these resources might be better recruited – this form of economics also embraces trust. The next step to formalizing engagement and incentivizing may be better incorporation of trust within collaborative efforts.

2.7.D. The Economics of Trust in Engagement: "American *Guanxi*"[14]

Collaboration is ultimately about networks of people and the increased value and productivity these networked people can contribute to an organization by leveraging the principles of connectivity. Trust among members of the collaboration community is at the heart of building, sustaining and exploiting the innovative power of collaboration. Trust is also a significant factor in how attention and engagement play out in the collaboration setting. Compounding the challenges of collaboration, these environments may be distributed across great distances and within otherwise unstable, inter-organizational settings.

To address overcoming instability of environments, it may be useful to consider a Chinese concept that has played well over many centuries across the immense social and political world that is China. *Guanxi* is a Chinese concept that deals with the notion of "networks" or "connections" but as viewed by the larger Chinese culture is so much more. In fact, collaboration principles in China may provide important inspirations for collaboration in the US and the West: an American modification of guanxi may be an important ingredient for more effective collaboration.

Honor and respect are core themes of guanxi as practiced in China, with the concept originating hundreds of years ago to help build trust among local and distributed populations in a vast land afflicted by constantly changing political systems. Guanxi became a mechanism to tame the "wide west" of relationships within Chinese culture, society and politics, strengthening and building on the strong expectations that arose when entering within a guanxi relationship. These expectations, based on honor, respect and trust provided a model that has long influenced Chinese relationships both internally and externally. Guanxi made doing business a repeatable and reliable venture in the enormity of China. Honor, respect and a reputation of trustworthiness play strong roles in Western collaborative efforts, as well.

Guanxi is often thought of as a two-way relationship, but new studies in social network analysis reveal that it can also be a multi-person relationship built on trust and responsibility to guanxi partners, distributed or local.[15] Trust, responsibility and consistent interactions are keys to guanxi. Guanxi as practiced in China today generally relates to the idea of networks or connections, and at its heart, guanxi is social science in action. The relationships that exist within guanxi are often built on strong emotional ties that are developed over multiple encounters and often involve becoming indebted to a guanxi partner. These interlocking, mutually indebted relationships are core to successful guanxi. The debts are not always related to financial concerns, either – they could also be related to doing non-financial favors. Could this notion of mutual indebtedness to one another or to common purpose also play a role in American forms of collaboration?

Recent studies have also looked at modern distributed forms of guanxi. Those studying online network building are particularly interested in whether electronic media and global connections empower the development of these sorts of intricate human bonds. "Some people call the Internet and the other communication technologies of the twentieth century *guanxi enablers*… They point out that e-mail address books and speed dial lists make it quicker, easier, and more affordable to make contacts and keep those contacts fresh."[16] Keeping contacts and relationships fresh marks another important element of successful guanxi – partners must exercise their relationships routinely. This principle also certainly applies to American and Western collaboration.

Guanxi may not offer as compelling an inducement for successful collaboration as leveraging the principles of the economy of engagement, but it does reflect on the importance of trust in any distributed relationship. It also points to how important it is to facilitate the growth and nurture of trust and responsibility to partners within the collaboration environment. In that sense, guanxi-like trust enters into the economy of engagement, strengthening the potential for success.

2.7.E. Conclusions

A remarkably successful venture started in the United States, known as *One Laptop Per Child* (OLPC), has set the stage for the beginnings of near-universal collaboration on the global stage. Formally begun in early 2006, the OLPC program has delivered millions of "green" laptops in countries around the world, including Mongolia, Afghanistan and Ghana just to name a few. Already, international reports substantiate the power of collaboration and that distributed cooperative societies are growing, influencing the way people think and learn…and communicate and collaborate. These laptops are mostly in the hands of children, and they are having fun with them.[17] The OLPC project is surely changing the way young people will learn trust and group behaviors, as well. We are seeing a near renaissance in global learning and cooperation in the OLPC effort. The economics of engagement are changing and adapting to an even greater degree than first posed by McGonigal just last year!

The world around us, human and non-human, Western and non-Western, has a great deal to teach us about collaboration and trust. The tools that both allow experimentation and shape the experiments are in our midst, in the hands of people. Virtual world and gaming technologies, and even the OLPC reports substantiate this even more. The economics of engagement are increasingly important and intimately interwoven with the principles of trust and mutual accommodation. The economics of engagement tell us that fun, trust and honor are critical components for collaboration success. It's up to the leaders/ facilitators of these newly formed collaborative environments to learn and exercise these lessons, and make collaboration a reality in every setting. It certainly won't hurt the effort if collaboration also happens to be fun!

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[1] See Wikipedia, "Economics", at http://en.wikipedia.org/wiki/Economics, accessed 3 March 2009.

[2] Another way of asking this question might be: Why do people invest time and effort in establishing and administering their Facebook website rather than a MySpace site? Both are social networking sites that can facilitate collaboration, yet the resources of time and energy can only go so far in attending to one or the other. What are the motivations and incentives to set up and run a useful site in MySpace or Facebook?

[3] McGonigal, J., "Engagement Economy: the future of massively scaled collaboration and participation," Institute for the Future, 2008, referenced at: http://www.iftf.org/node/2306, membership site for the Institute for the Future.

[4] See the Strategic Multilayer Assessment report entitled "Nexus Federated Collaboration Environment" for more information about crowd-sourcing and "wisdom of crowds," available on request from the author of this paper. There are also numerous recent texts on this subject as a quick search through Amazon.com, Borders.com or similar booksellers will reveal.

[5] McGonigal. op cit

[6] Ibid

[7] Ibid.

8 Ibid.

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[9] Castronova, E., "A Test of the Law of Demand in a Virtual World: Exploring the Petri Dish Approach to Social Science," Social Science Research Network, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1173642#, accessed 9 March 2009. The paper also comments on the variety of caveats in making the comparisons cited.

[10] See "Flow (psychology), in http://en.wikipedia.org/wiki/Flow_(psychology). According to the article, "Flow is the mental state of operation in which the person is fully immersed in what he or she is doing by a feeling of energized focus, full involvement, and success in the process of the activity."

[11] McGonigal. op cit

[12] Ibid.

[13] Ibid.

[14] Christensen, K., and Levinson, D., "Guanxi" in the Encyclopedia of Community, Sage, 2004, referenced at: http://guanxi.pbwiki.com/, accessed 5 March 2009.

[15] Wellman, B., "Guanxi as Sociology Network," http://guanxi.pbwiki.com/Guanxi-as-Sociology-Network, accessed 9 March 2009.

[16] Christensen, K., and Levinson, D., "The Guanxi Wiki," http://guanxi.pbwiki.com/, accessed 9 March 2009.

[17] Ravitz, J., "Laptops bring lessons, maybe even peace," CNN.com News Online, http://www.cnn.com/2009/TECH/03/05/one.laptop.per.child/index.html, accessed 7 March 2009.

2.8. A Seven-Layer Model for Collaboration (Robert O. Briggs - UNO)

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2.8.A. Introduction

When working on mission-critical tasks, today's warfighters at the operational echelons must frequently collaborate across departments (G-codes, N-codes, J-codes), across commands, across services and agencies, and even across national boundaries when working with allies. For the purposes of this paper, *collaboration* is defined as joint effort toward a group goal. The word, collaboration, comes from the Latin word, *collaborare*,[1] which means "work with," from the Latin term *com*, meaning, *with*, and *labore*, meaning, *to work.* As used in this paper, the term, collaboration, is not intended to be normative; it does not imply egalitarianism, equal access to information, equal sharing of resources, or democratic process. It implies only that individuals commit to a joint effort toward a mutually agreed goal.

Warfighters and other stakeholders must collaborate because, for many tasks, no single individual has all the expertise, insight, information, influence, or resources to achieve the task alone. Collaboration, however, is a mixed blessing. When many people bring their diverse expertise and resources to bear, they can sometimes achieve remarkable results. However, collaboration brings its own cognitive, interpersonal, political, and technical challenges as depicted in Figure 2.8-1. When working together, warfighters must balance the cognitive load of communication and information access against the need to think and reason creatively and quickly in the face of many potential distractions. When working across chains of command, they must devote further attention to discovering and engaging success-critical stakeholders, and assuring that group processes and group goals are congruent with the interests of the stakeholders. They must devise work practices that will allow them to address these issues as they work together to create high-quality deliverables under conditions of intense time pressure and high risk.

Figure 2.8-1. Examples of Collaboration Challenges

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2.8.A.1 Additional Challenges of Time and Distance.

The challenges of collaboration are exacerbated when warfighters are separated by time and distance. They must use communication channels of reduced richness.[2] Non-verbal communication cues like vocalics, kinesics, eye contact, proxemics, and olfactics are restricted or unavailable.[3] Non-conversational signals of presence, availability, interest, and commitment are likewise restricted or unavailable. Time-zone differences can lead to mismatches of battle rhythms. Warfighters in one area may await input from those in another time zone who are not yet in a position to deliver it.

2.8.A.2 The Complexity of Collaboration.

The complexity of collaborative work grows quickly with the number, variety, and complexity of the products a group must create, the actions they must execute, and the information cues they must exchange.[4] Complexity also grows with the number of components in a group's work product and with variety of ways those components may be interdependent, with the frequency, timing, and intensity of interactions required to coordinate group efforts, and with the degree of change that manifests in the problem space, the solution space, the work products, and the team.[5]

Because of the importance of and complexity of collaboration, researchers have devoted a great deal of effort to discovering, defining, theorizing about, and experimenting with phenomena that manifest in that domain. That research produced a large, interconnected body of concepts, models, methods and approaches that, taken together, constitute the body of scientific knowledge now called Collaboration Science. This body of work is itself large, complex, and growing, making it challenging to find, assimilate, understand, and use. It would, therefore, be useful to have an organizing structure to help make sense of how the elements of collaboration science relate to one another, and how they can be brought to bear to improve collaborative efforts.

2.8.A.3 A Seven-Layer Model of Collaboration.

Toward that end, this paper presents a Seven-Layer Model of Collaboration. The Seven-Layer Model allows for a separation of concerns when addressing collaboration issues. Each layer of the model considers collaboration at a different level of abstraction. Each layer addresses different phenomena, different challenges for collaborators, different design challenges for collaboration engineers and facilitators, different solutions, different ways of modeling, different tools, and different metrics.

The seven layers of the model are labeled as follows:

- Goals
- Deliverables
- Activities
- Patterns of Collaboration
- Collaboration Techniques
- Technologies
- Scripts

The seven layers are linked by verbs that, when combined, can express a wide range of concerns for collaboration across many levels of abstraction as a single sentence: *Scripts contain everything a group must say and do with their technologies to instantiate the techniques they will use to invoke the patterns of collaboration they need to move the group through the activities they must execute to create the deliverables that allow them to achieve their goals* (Figure 2.8-2).

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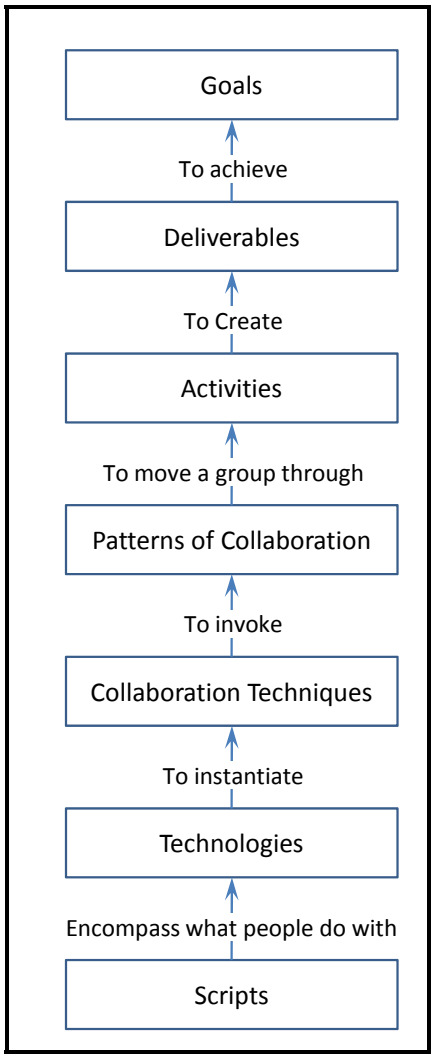

Figure 2.8-2. The Seven Layer Model of Collaboration.
Each layer deals with collaboration at a different level of abstraction, and deals with different concerns. Each has different phenomena of interest, and therefore different methods for modeling and measuring collaboration.

The balance of this paper will define and explain each layer in the Seven-Layer Model. It will discuss the kinds of phenomena that manifest at each layer, the theories surrounding these phenomena, and approaches to measuring them. It will consider the implications of each layer for designing collaborative work practices and modeling conventions used to represent aspects of collaboration at each layer. It will also address issues that manifest at the interfaces between each layer and the layer above it.

2.8.B. The Goals Layer of Collaboration

The Goals Layer of the Seven-Layer Model deals with issues relating to group goals, private goals, and the relationships among them. A *group goal* is a state or outcome toward which group members commit to work. A *private goal* is a state or outcome desired by an individual member of a group. It is important to note that the term, private goals, does not connote selfishness or hedonism. Private goals may be completely altruistic, completely hedonic, or may be synergistic, benefiting self and others.

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2.8.B.1 Concepts and Phenomena at the Goals Layer of Collaboration.

Many phenomena of interest in collaboration manifest at the goals layer. Many of its theoretical foundations are defined in terms of group goals. Collaboration itself, for example, is defined as a joint effort toward a group goal.[6] Definitions of the terms, *group* and *team,* often refer to the collection of people who have committed to work toward a group goal.[7] The effectiveness of a group is defined in terms of the degree to which a group attains the goals toward which it works.[8] Group efficiency is defined in terms of the degree to which a group conserves its resources during the attainment of a group goal.

Other phenomena at the Goals Layer pertain to the private goals of individual group members. The Yield Shift Theory of Satisfaction, for example, posits that satisfaction and dissatisfaction responses are a function of the degree to which individuals perceive changes in the likelihood of attaining their salient private goals, and changes in the utility they ascribe to attaining those goals.[9] Group cohesion is measured in terms of the degree to which an individual group member desires to remain a member of a group.[10]

Still other phenomena at the Goals Layer, such as motivation, commitment, and willingness to change, relate to *goal congruence* – the degree to which individuals perceive that working toward group goals would be instrumental toward attaining salient private goals. Expectancy, Instrumentality, and Reasons theories of motivation posit that motivation to make effort toward group goals will be a function of the degree to which individuals perceive value or benefit in the outcomes of the behaviors the group considers enacting.[11] In a group setting, these perceptions would pertain to the actions an individual contemplates toward helping a group attain its goals. The Instrumentality theory of consensus posits that individuals will only be willing to commit effort and resources toward a proposal for achieving a group goal to the extent that they perceive that outcomes of the effort would be instrumental to their salient private goals.[12] The Value Frequency Model (VFM) for Change of Work Practice posits that an individual's willingness to change to a new way of working (e.g., a new collaborative approach) will be a function of the overall positive or negative value the individual perceives in using the new work practice, and the frequency with which the individual perceives that value will be attained.[13] The theory posits six dimensions of value: economic, political, social, cognitive, affective, and physical. These dimensions pertain directly to the kinds of utility individuals anticipate from the attainment of their salient private goals.

The concepts mentioned here are only examples of the concepts pertinent to the Goals Layer. This layer would pertain to any phenomena that deal with the group goals, the private goals of individual group members, or the relationship between private and group goals.

2.8.B.2 Implications of the Goals Layer for Work Practice Design and Execution.

A collection of people without a defined group goal cannot be productive, since productivity is defined in terms of the degree to which groups attain their goals. Indeed, lacking a goal, it may be difficult to assert the existence of a team, much less to measure its productivity. One of the first tasks for a work practice designer or a group leader must be to establish explicitly the goals the group will strive to attain.

From the theories advanced at the Goals Layer, one may infer that private goals motivate effort toward group goals. The significance of goal congruence to collaboration can be illustrated with a simple thought experiment. Consider a case where an automobile designer who wants

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international recognition for her designs of high-performance sports cars and a machinist who wants financial security agree to join forces with an entrepreneur who wants to build and sell a successful company. They agree to open a car factory and to build cars (the group goal). Notice that none of them wants a car. Indeed, none can achieve their private goals until they get rid of the cars they have agreed to build. Assume that the group established an efficient and effective design/build process, and that there was demand for the cars, so the entrepreneur could sell cars at a profit.

Now consider two minor variations in the details of their arrangement. In the first scenario, the entrepreneur brands the cars with a chrome plaque bearing the name of the designer, and pays the machinist a bonus for every car that came out of the factory. The designer and machinist therefore have high goal congruence because the designer can attain the acclaim she desires, and the machinist can build a nest egg. In the second scenario, the entrepreneur brands the car with the name of the machinist and pays the designer a bonus for every car that came out of the factory. The designer and the machinist therefore have low goal congruence–neither can get what they want from the arrangement. Although the design/build process, the cars, and the operating costs are identical in both scenarios, the enterprise is likely to succeed under Scenario 1, which creates high goal congruence for all group members, and is likely to fail under Scenario 2, which creates low goal congruence for designer and machinist.

The car factory example illustrates that the designers and leaders of work practices cannot focus solely on group goals and enhancing group productivity. They must also get to know the values and goals of the individual group members, and must assure that collaborative work is designed and conducted such that individuals can attain their private goals by working toward group goals.

2.8.C. The Deliverables Layer

In order to achieve their goals, group members typically must create one or more deliverables. A *deliverable* is a tangible or intangible work product, the existence of which signifies that a group goal has been attained. The goal of an internal audit, for example, is to discover risks that have not yet been controlled or mitigated, and to develop controls to cover those risks. Therefore, the deliverable for an internal audit might be a list of risks organized by organizational unit, evaluated for likelihood and impact, elaborated with plans to mitigate each risk, and signed off by an auditor to signify that the controls are in place and functioning properly. The existence of this deliverable would be clear evidence that the group had attained its goals.

2.8.C.1 Concepts and Phenomena at the Deliverables Layer.

While deliverables are typically specific to a task, one can draw insights about what deliverables might be useful by considering a general goal attainment paradigm–understand the problem, develop alternatives, evaluate alternatives, make choices, make plans, take action, review outcomes. Each of these generic phases of problem solving suggests general classes of deliverables that a group could create – e.g., problem statements, lists of possible solutions, lists of evaluated solutions, documentation of decisions and decision rationale, action plans, progress reports, and after-action reviews.

Among the central phenomena of interest at the Deliverables Layer are deliverable quality and deliverable efficacy. The quality of a deliverable may be judged in many ways, depending on its purposes – e.g., correctness, completeness, consistency, clarity, conciseness, and political support. One must define the purpose of the deliverable before one can determine what metrics

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might be useful indicators of its quality. The efficacy of a deliverable is a judgment of the degree to which its existence constitutes having attained a group goal. One must have an explicitly defined group goal before one can derive measures of deliverable efficacy.

2.8.C.2 Phenomena at the Interface of the Deliverables and Goals Layers

Deliverables are only useful to the extent that they are instrumental to the achievement of group goals. Therefore, deliverables must be measured in terms of the degree to which their existence either realizes the group goal or fulfills a prerequisite for goal attainment. Because goals vary from group to group, there are no universal measures of the value of deliverables. Such measures must be derived on a task-by-task basis. It may be possible, however, to derive general measures of the *perceived* value of deliverables, with questions like, "The outcomes of today's efforts will let us achieve our goals."

2.8.C.3 Implications of the Deliverables Layer for Work Practice Design and Execution.

Group members often find it easier to define the deliverables they want than to define the goals that would be served by the deliverable. When designing or leading a collaborative work practice, therefore, one must often begin conversations with practitioners by discussing deliverables rather than goals. Once the group members have clarified precisely what deliverables they wish to create, one can work backward toward the goals by asking questions like, "Why do you want to create this deliverable? What benefit would it bring? Who would derive that benefit? Who would use it? What would they use it for? What value would they get from using it?" The answers to such questions sometimes reveal a startling disconnect between the deliverables and the goals the group wishes to attain. We once worked with a Navy commander who wanted his group to develop a collection of issues for moving their software infrastructure to a service-oriented architecture (SOA) and a set of short-term action items for dealing with those issues. Having clarified and defined that deliverable explicitly we asked, "Why do you want this group to create this list of issues?"

The commander answered, "Because we have some very serious IT governance issues. I'm hoping that if I have my people think about SOA issues, they will notice that we have governance issues, and begin to resolve them." The deliverable, therefore, had only a tangential relationship to the goal. Having discovered the real goal, we suggested that a list of IT governance issues and a set of short term action items for addressing them might move the group toward the goal faster and more directly. The commander concurred. Because group leaders and members often start with only a vague understanding of their goals, it is useful to circle back to the goals level frequently during a work practice design project to verify that the design will actually produce the outcomes the group seeks to attain.

2.8.D. The Activities Layer

The Activities Layer deals with *what* a group must do to create its deliverables without articulating the details of *how* a group must do it. An *activity is a* step the group must take in order to create its deliverables.

2.8.D.1 Concepts and Phenomena of Interest at the Activities Layer.

It is possible to characterize many group activities in terms of the phases in general goal attainment paradigms. Many disciplines offer variations of such a paradigm. In the management literature, for example, it is called *decision making*;[14] in the psychology literature it is called *problem solving*.[15] These process models classify the actions that people take to attain their

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goals. As noted in the Deliverables Layer section above, these models generally include activities for defining the problem or goal, deriving possible solutions, evaluating solutions, making choices, making plans, taking action, and evaluating whether the actions produced the desired outcomes without creating new unacceptable conditions.

Most of the activities in which a group engages can be characterized by one or more of these general classifications. A risk assessment task, for example, may have activities for generating a list of risks, evaluating risks, identifying controls for each risk, and discovering gaps between risks and controls. All of these activities could be characterized as understanding the problem. The group might then consider various approaches for controlling the uncovered risks (generate and evaluate solutions) and decide which of their possible solutions to implement (make choices). They might assign action items for implementing the new controls (make plans) and then proceed with implementation (take action). Later, they might review the new controls to determine whether they have been effective (after action review).

Each activity in a work practice design has an activity goal and an activity deliverable. Many times, the deliverable for one activity becomes input to the next. Phenomena of interest at the Activities Layer could include, for example, actual and perceived effectiveness and efficiency of the activities, the degree to which a given activity produces a timely and useful output, and the degree to which group members find the activities to be an acceptable path to the group goal.

2.8.D.2 Phenomena at the Interface between the Activities Layer and the Deliverables Layer.

The purpose of group activities is to create the deliverables that will let the group achieve its goals. A key phenomenon of interest is the degree to which the deliverables produced by the activities actually realize the group's goals.

2.8.D.3 Implications of the Activities Layer for Work Practice Design and Execution.

The sequence of activities a group must execute and defining the flow of their execution constitutes the highest level of abstraction in the logical design of a collaborative work practice. Before a leader can design a process for creating a deliverable that will achieve the group's goal, the overall goal and deliverable must be clearly defined.

With the overall deliverable defined, the leader can identify the starting state for the group with questions that follow the general goal attainment paradigm, like "Does the group understand its problems? Does it already have possible solutions? Have they been evaluated? " Having identified a starting state, a leader may decompose the work practice into a sequence of steps by which the group can move from its starting state to its deliverable. The final step in the work practice would be the one that produces the final draft of the overall deliverable that achieves the group's goals.

2.8.E. The Patterns of Collaboration Layer

Where the Activities Layer defines *what* a group will do, the Patterns of Collaboration Layer defines *how* a group will move through its activities. Collaboration engineering researchers have identified six patterns of collaboration that characterize how groups move toward their goals.[16] These are:

- Generate - To move from having fewer concepts to having more concepts in the set of ideas shared by the group.

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- Reduce - To move from having many concepts to a focus on fewer ideas deemed worthy of further attention.
- Clarify -To move from less to more shared understanding of the concepts in the set of ideas shared by the group.
- Organize - To move from less to more understanding of the relationships among concepts in the set of ideas shared by the group.
- Evaluate - To move from less to more understanding of the instrumentality of the concepts in the idea set shared by the group toward attaining group and private goals.
- Build Commitment - To move from fewer to more group members who are willing to commit to a proposal for moving the group toward attaining its goal(s).

2.8.E.1 Concepts and Phenomena of Interest at the Patterns of Collaboration Layer.

Most of the behaviors in which a group engages as it moves through an activity can be characterized by these six patterns. In a risk assessment work practice, for example, as a group moves through a risk identification activity, they may *generate* candidate risk statements, *evaluate* the likelihood and impact of each risk, and *reduce* the list to the risks that pose a credible threat to the organization.

There are phenomena of interest relating to each of the six patterns of collaboration. For the *Generate* pattern, for example, one might be concerned with the number of ideas a group produces, their originality, relevance, effectiveness, feasibility, and thoroughness.[17]

For the *Reduce* pattern, one might be interested in reductions not only in the number of ideas in the shared set, but also in the degree to which the reduced idea set includes high-quality ideas and excludes low-quality ideas. One might also find it useful to study the degree to which the reduced idea set also reduces actual and perceived cognitive load for using those ideas in the service of the group goal.

Phenomena relating to the *Clarify* pattern of collaboration could include, for example, reductions in ambiguity in the language used to express ideas, and reductions in the number of words required to convey the meaning of the concept. Reductions of ambiguity would increase the likelihood that participants would hold shared understandings of a concept, and reductions in word counts would reduce cognitive load for assimilating and using ideas.

The primary phenomenon of interest for the *Organize* pattern of collaboration is reduced cognitive load. Human attention resources are limited, allowing one to manipulate about seven concepts in working memory simultaneously.[18] The organizing of ideas helps mitigate the cognitive load of exploring a large concept space.

The *Evaluate* pattern has a variety of phenomena relating to projections of possible consequences of choices, and the degree to which those consequences would be positive or negative for goal attainment.

Issues of commitment arise in many phases of group work, starting with the formation of the group, and continuing through every proposed course of action and every choice group members make as they move through their activities. In the context of this paper, *commitment* means assuming an obligation to expend effort and resources to fulfill the terms of an agreement. Commitment, an individual-level construct, is at the core of the consensus, a group-level construct. A group has consensus when all its members are willing to commit to a proposal. A group lacks consensus if even one of its members is unwilling to commit to a proposal.

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2.8.E.2 Phenomena at the Interface between the Patterns of Collaboration Layer and the Activities Layer.

The purpose of the six patterns of collaboration is to provide a logical understanding of how a group will move through the activities it must complete in order to create its deliverables. Of interest between these layers, therefore, would be the degree to which the sequence of collaboration patterns prescribed for an activity would, in fact, yield outcomes resulting in the production of useful deliverables.

2.8.E.3 Implications of the Patterns of Collaboration Layer for Work Practice Design and Execution.

Having defined a set of activities for a group to execute to create their deliverables, a group leader may analyze each activity in terms of a sequence of patterns a group could go through to create the deliverables for the activity to achieve the activity goal. Consider, for example, a group conducting the first activity of an operational risk assessment: Identify key risks. The goal for this activity would be to identify risks that, if realized, could threaten the wellbeing of the organization. The deliverable for this activity might be a list of significant risks rank ordered by severity. It would be unlikely that a group could generate such a list in a single step. Therefore, the group leader might decompose the activity into a sequence of patterns like this:

1. *Generate* a list of candidate risks.
2. *Reduce* the list to those risks the group deems sufficiently severe that they warrant further attention.
3. *Evaluate* each risk in terms of likelihood (from 0.0 to 1.0) and impact (dollars lost if the risk is realized).
4. *Organize* the list of risks in descending order by severity (likelihood X impact).

The single activity, Identify Key Risks, thus requires the group to move through four patterns of collaboration to create the activity deliverable.

2.8.F. The Collaboration Techniques Layer

One key advantage of analyzing a group activity into its constituent patterns of collaboration is that reliable techniques exist for invoking predictable variations of the six patterns of collaboration. A *collaboration technique* is a named, scripted procedure that invokes known patterns of collaboration among people working together toward a group goal.[19] Osborn's brainstorming method is a well-known example of a collaboration technique that invokes a particular variation of the *Generate* pattern.[20] A variety of other idea generation techniques provide a diversity of other variations on the *generate* pattern. The FreeBrainstorming technique, for example, pushes a group for breadth and variety, while the LeafHopper technique pushes a group for depth and detail on a narrow set of topics.[21] Likewise, techniques exist for invoking variations and combinations of the other five patterns of collaboration.

2.8.F.1 Concepts and Phenomena at the Collaboration Techniques Layer.

A well-tested collection of named collaboration techniques can comprise a pattern language for collaborative work practices. Christopher Alexander, who coined the term, says of design patterns, "*a pattern describes a problem which occurs over and over again and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice*".[22] Collaboration engineering researchers have begun to codify an instance of a design pattern language for collaborative work practices

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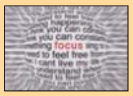
called *ThinkLets*.[23] These researchers seek to distill each technique to its essence, creating the smallest possible units of intellectual capital necessary to recreate known variations on the six patterns of collaboration. ThinkLets provide common language for designers and practitioners of collaborative work practices. Those who know the pattern language can transfer sophisticated and complex work practices to one another with very few words. For example, a requirements engineering work practice that required 170 pages to document in plain language could be communicated in fewer than five pages using ThinkLets notation.[24] ThinkLets and other collaboration techniques enable rapid development of sophisticated, coherent, multi-layered collaboration processes that can improve the productivity and quality of work life for teams.[25]

There are a number of phenomena of interest pertaining to collaboration techniques. Techniques differ widely in the degree of skill a practitioner must have to lead them. Some techniques are so simple they require only the utterance of a single well-framed sentence, and can be mastered in moments. Others require a great deal of experience and mental agility, and may require hours of practice to master. Figure 2.8-3, for example, shows the front and back of a cue card used to train practitioners to lead the FastFocus thinkLet, a technique for extracting a clean, complete, non-redundant list of useful ideas from the output of a brainstorming session. Beginners find it challenging to conduct a FastFocus activity because they must simultaneously listen to and understand contributions from the group, reword the contributions into short, clear statements, while screening out redundancy, irrelevance, lack of clarity, inappropriate levels of abstraction, and criticism.

FastFocus (Reduce, Clarify)



- Choose this thinkLet…
  - To quickly extract a clean, non-redundant list from a brainstorm activity
  - When agreement on the meaning of the resulting list is important
- Do not choose this thinkLet…
  - To reach consensus on the merits of ideas. Consider the StrawPoll thinkLet instead.
- Setup
  - Distribute all brainstorming ideas across multiple pages – at least one page per participant. Give each participant a page of ideas.
  - Create a place where you can create a publicly viewable list of the key ideas they extract from their brainstorming activity

- **Script**
  - Say this:
    "Read through the brainstorming ideas in the screen in front of you and look for <important> <ideas>"
    "I will call on each of you in turn. <Name>, what is the most <important> <idea> on the page in front of you that is not yet on the list?"
  - Do this:
    Write each new idea on the public list
    Screen out inappropriate contribuitons as follows:
    Redundancy: "Is your idea the same or different than <idea X>?"
    Clarity: "I'm not sure what that means. Would you please explain it?"
    Abstraction:
    »Is that an instance of something more general of a more general concept?
    »That is a fairly general concept. Can you suggest some specifics?
    Relevance: We are building a list of <X> . That sounds like a <Y>. Is it?
    Criticism: We'll evaluate these ideas later. Now we are only building the list.
  - Do This:
    - When all participants have had a turn, tell everybody to swap pages; start a second round
    - For the third round, ask the whole group if anyone has an <important> <Idea> that is not yet on the list
    - Repeat until no one wants to add anything new to the list

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Figure 2.8-3 A cue card for the FastFocus thinkLet. Words enclosed in angle brackets (<>) are parameters that must be replaced with task-specific terms when the thinkLet is instantiated.

Techniques also vary in the cognitive load they impose on participants. Participants find some techniques challenging, and others quite simple. Interestingly, the difficulty of leading a technique seems to be independent of the difficulty of participating in it.

2.8.F.2 Phenomena at the Interface between the Techniques Layer and the Patterns of Collaboration Layer

The purpose of collaboration techniques is to invoke patterns of collaboration that will be useful for moving a group through its activities. Of interest at this interface between the layers, therefore, would be the degree to which each technique invokes the requisite patterns.

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2.8.F.3 Implications of Collaboration Techniques Layer for Work Practice Design and Execution.

Every technique requires some sort of input – e.g. a brainstorming question, a list of ideas to be organized, a voting criteria. Every technique has outputs. The outputs of some techniques serve well as inputs to other techniques. The output from a brainstorming activity, for example, is typically an unstructured, redundant collection of ideas of widely varying quality and clarity. The FastFocus technique begins with just such an input and produces a clean, non-redundant, list of ideas deemed to be worthy of further attention.

Designers of collaborative work practices must, therefore, select and sequence techniques such that the output of each technique provides a useful input to a subsequent technique. Sometimes that is simply not possible; there are some mismatches that cannot be avoided. In such cases, the work practice designer must plan a transition between two techniques to transform the output of one thinkLet into a something that can be a useful input to the next technique. It may be, for example, that a brainstorming activity produces a set of ideas distributed across multiple pages. A follow-on polling method, however, might require that all ideas be transferred to a single page before voting can begin.

2.8.G. The Technology Layer

Every collaboration technique requires certain capabilities to support its execution. The FastFocus thinkLet, for example, requires a page of brainstorming ideas for each participant, a page for documenting the reduced and clarified idea set, and a conversation channel between the participants and the moderator. These required capabilities must be afforded to the group via some technology. The pages required for the FastFocus thinkLet could be implemented with a variety of technologies, for example, pieces of writing paper, flip chart pages, yellow stickies posted on a wall, or computer-based collaboration technologies.

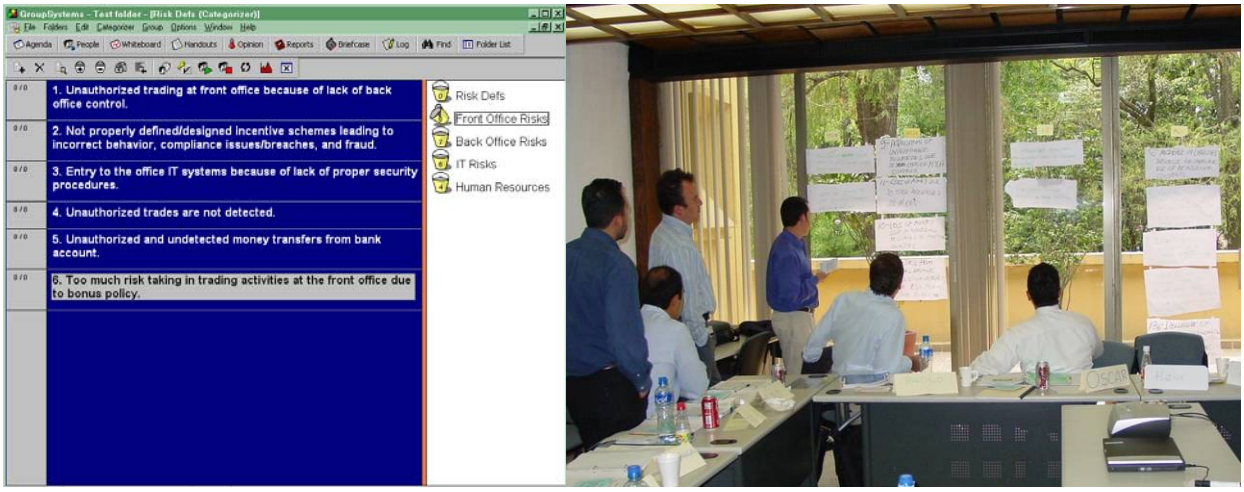

Figure 2.8-4 Two different technologies for the same collaboration technique. On the left, participants click-and-drag ideas into buckets. On the right, participants tape paper slips containing ideas on to windows under category labels written on yellow stickies.

Figure 2.8-4 illustrates two different technical implementations for an idea organizing technique called "PopcornSort". In this technique, group members work in parallel to move ideas from a mutually shared set into one of several specified categories. The left panel shows a computer implementation of the PopcornSort. Here, people click-and-drag ideas from the blue list into a

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digital bucket. The right panel shows the same technique implemented with paper and tape. Team members pick up ideas written on strips of paper and tape them to a window under category headings written on yellow stickies. Despite the differences in technology, both implementations yield the same pattern of collaboration, because both implementations afford the team the capabilities they require to instantiate the technique.

2.8.G.1 Concepts and Phenomena of Interest at the Technology Layer

There are a wide variety of computer-based collaboration technologies that groups may use to support their work. Most of them fall into three general categories: Jointly-authored pages, streaming tools, and information access tools.[26] With jointly-authored pages, the software provides a shared window to which all participants may contribute simultaneously, and all participants may see the contributions of others. Jointly-authored pages may be optimized for a variety of purposes, for example, to support conversations, (e.g., instant messaging, blogs), to create shared documents (e.g., shared text editors, shared spreadsheets) or to create variations of the six patterns of collaboration (e.g., group support systems). Streaming tools depend on a continuous flow of ever-changing data to support the team. Examples of streaming tools include audio and video conferencing, remote presentation, and desktop sharing. Collaboration tools for information access include, among other things, shared document repositories and social tagging systems that allow people to find objects stored by themselves and others based on topic tags applied to the objects by people who store and use them, and, more importantly, to find other people interested in the same topics.

Within and across categories, collaboration technologies can differ along a variety of dimensions, for example:

- Content. Various collaboration tools support different kinds of content. Shared editors may hold, for example, text, graphics, spreadsheets, or polling tools.
- Access Controls. Mechanisms that allow authorized people access to a system will block unauthorized access. Access controls could be, for example, invitations, login names, passwords, and/or smart cards.
- Awareness. Mechanisms that allow participants to know who else is in the system with them, their status, where they are working, and what actions they are taking.
- Actions. Systems vary in the variety of actions users may execute, for example, adding, editing, moving, deleting, or judging the content of a system
- Synchronicity. The lag between the time a participant takes an action and the time s/he can expect that other participants to become aware that the action has been taken. Some collaboration technologies have immediate synchronicity (e.g., audio conferencing, instant messaging), while others may have synchronicity measured in hours or days (e.g., e-mail, blog).
- Identity. Mechanisms for identity control the degree to which participants know who executed which actions in the shared environment. Actions may range from fully anonymous, to identified by pseudonym, to fully identified.
- Persistence. The degree to which shared contributions continue to exist as people enter and exit the shared system. In some systems all contributions are ephemeral, disappearing as soon as a session is closed. In other systems, persistence is optional and configurable; in others, it is mandatory – all contributions are saved and accessible indefinitely.

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As with the Collaboration Techniques Layer, a pattern language named P4CMI (Patterns for Computer-Mediated Interaction) has emerged to support designers and developers of collaboration technologies.[27] This pattern language offers a collection of technical solutions for supporting a community of collaborators, a particular group within a community, and individual members within a group.

Many of the phenomena of interest at the Technology Layer center on many of the same issues that are important to all technologies – reliability, extensibility, maintainability, speed, accuracy, and so on. Also important at this level are the degree to which people find a collaboration technology useful and easy to use,[28] and the degree to which they are willing to continue using it over time.[29]

2.8.G.2 Phenomena at the Interface between the Technology Layer and the Collaboration Techniques Layer.

The purpose of the Technology Layer is to afford the capabilities that a group will need to instantiate the techniques they will use to invoke the patterns of collaboration they need. Of interest at the interface of the Technology and Techniques Layers, then, is the degree to which a given technology affords required capabilities, and the degree to which those capabilities are afforded at a minimum of financial, political, social, cognitive, emotional, and physical cost.

2.8.G.3 Implications of Technology Layer for Work Practice Design and Execution.

Having decided which techniques to use, the designer of a collaborative work practice can analyze what kinds of capabilities will be required to execute those techniques, what technologies are available, and how available technologies can be configured to best instantiate the selected techniques.

Even within a given class of technologies, some technologies may have built-in assumptions that block a group from using them. For example, some collaboration technologies are built on the assumption that a group has only one leader. Some groups, however, have multiple people who assume leadership roles, depending on which part of the task is being executed, or even what time of day it is. Military operations, for example, frequently involve standing watches. When the watch changes, leadership changes, and so the systems that support them must allow leader rights to multiple people. A leader must select tools whose capabilities and configurations support the group's way of working.

2.8.H. The Script Layer

The Script Layer of the Seven Layer Model of Collaboration encompasses everything that leaders and participants must say and do with the technologies they use to instantiate the collaboration techniques they will use. Sometimes the script for a work practice is tacitly embedded in the routine behaviors of the group. Other times, the script may be formalized, written down as procedure and training manuals. Still other times the script for a collaborative work practice may be embodied in a collaborative software application that moves a group step-by-step toward its goals.

2.8.H.1 Concepts and Phenomena of Interest at the Script Layer

A key phenomenon at the Script Layer is the degree to which the script as executed actually invokes the behaviors required of the group to complete the task and achieve its goals. Also of interest are the transferability of the script to new practitioners, the repeatability with which users

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of the script achieve useful outcomes, and the variety of circumstances to which the script can be successfully applied. Scripts that are so specific that they can only be used once create less value than scripts that can be applied to many different instances of a task. Scripts that lead to predictable, repeatable success on a task are more valuable than scripts where the risk of failure is higher.

2.8.H.2 Concepts at the Interface between the Script Layer and the Technology Layer

The clarity and simplicity with which a script guides participants in performing useful behaviors is of particular interest at the interface of the Script and Technology Layers. Scripts that leave participants confused about how to configure and use their technologies are of less value than scripts that reliably lead to clear understandings of the tools and of what users are expected to do with them.

2.8.I. Discussion

2.8.I.1 Downward Independence – Upward Dependence in the Seven-Layer Model.

Each layer in the Seven-Layer Model is independent of those below it. Changes made at a given level of the model do not require changes at the current level of the model, nor in the layers above it. Each layer of the model is, however, dependent on those above it. This means that when changes occur at a given level of the model, changes may also have to be made in all other levels below it.

The verbs that link each layer to the one above it reflect the downward dependence among the layers. The Script Layer, for example, encompasses everything a group must say and do with their technologies in order to instantiate a collaboration technique. If a leader were to decide to implement the technique using a different technology, then the script would have to change to explain how to use the new technology instead of the old technology. Thus, there is downward dependence between the Technology and Script Layers. The leader would not, however, have to choose a different collaboration technique just because s/he has chosen to implement the current technique with a different technology. Thus, there is upward independence between the Technology and Technique Layers. This downward dependence and upward independence holds at every layer of the model.

2.8.I.2 Measurement Issues in the Seven-Layer Model.

Because group-level phenomena like productivity, efficiency, and effectiveness are defined in terms of group goal attainment, there are no universal measures of these phenomena. They can only be measured in terms of the specific goals a group seeks to attain. To measure these phenomena, therefore, one must first explicitly define the group's goals in a way that can be quantified. One may then derive measures of the degree to which those goals have been attained.

Sometimes the constructs we need to measure aspects of collaboration bear ambiguous labels. The term, satisfaction, for example, is sometimes defined as a judgment that needs or constraints have been met – e.g., people may deem themselves satisfied with a collaboration tool because it is sufficiently fast, accurate, and reliable. Satisfaction, however, may also connote an affective response – a positive or negative emotion with respect to private goals that have been advanced or thwarted. When a label like satisfaction has multiple connotations, one must first define explicitly the connotation one intends to measure, and then derive measures directly from that definition. For satisfaction, measures like, "I feel satisfied with…(agree / disagree)" could be appropriate for measuring satisfaction-as-emotion, while measures like "The system is

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sufficiently fast (agree / disagree)" could be appropriate for measuring satisfaction-as-judgment. Measures like, "I am satisfied with… (agree / disagree)," however, would, themselves, be ambiguous because it will not be clear to the respondent whether the question asks about a judgment or an emotion. Some will interpret it one way, some the other. The measure would, therefore, not be reliable. Care must be taken to explicitly define the constructs representing the phenomena of interest before trying to create variables to measure those constructs.

2.8.J. Conclusions

The Seven-Layer Model of Collaboration offered in this paper provides an organizing structure for knowledge about collaboration generated by exploratory, theoretical, experimental, and applied science. It provides a guiding structure for issues of concern to those who design and develop collaboration technologies and those who design and deploy collaborative work practices. By providing ways to think about collaboration at differing levels of abstraction, it allows for a separation of concerns for those engaged in making sense of this complex domain.

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3. Common Barriers to Collaboration

3.1. Barriers to Collaboration: Imbalanced Empowerment and Accountability (Thomas Rieger - Gallup)

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Collaboration has been identified as a critical success factor in increasing the effectiveness of intelligence analysis and identification of courses of action with the operational community. While everyone would agree that collaboration is necessary and desirable, it is not always possible.

Some barriers to collaboration exist because of regulatory and legal concerns. In the face of these constraints, there is little an analyst can do to overcome them. However, in the private sector, where no such legal barriers exist, collaboration within organizations is just as difficult, and just as rare.

Gallup Consulting conducted a comprehensive study of these barriers beginning in 2003, including both the private and public sectors, across several different industries, job types, levels, and functions. Once the barriers to organizational effectiveness that were discovered and studied were categorized, it became apparent that more often than not, these barriers are built not for legal reasons, but out of fear.[1]

Not fear in the literal sense. What managers feared was losing *something*. Resources, control of staff, decision rights, control of information, budget, headcount, or a myriad of other factors can evolve into highly protected assets for one small group, even at the expense of the larger organization. Once a manager felt that they "owned" something, it instantly increased in value… but only to them.

This same phenomenon was found in Kahneman, Knetsch and Thaler's well known "coffee mug" study regarding endowment effects. The findings of that research showed that the value of a mug (or the selling price) was dramatically higher once someone was "endowed" with it, compared to the "buying" price before possession was granted.[2]

The same can be said for information, control over staff, decision rights, and freedom to collaborate. It is very common for managers to place limits on collaboration to protect what they feel is "theirs" so that they will not jeopardize their own ability to meet their goals and objectives.

The research by Gallup identified multiple root causes and manifestations. However, when it came to barriers to collaboration, the culprit was usually an imbalance in empowerment and accountability.[3]

In studying these two factors, Gallup has found that they are not as simple as they may appear on the surface. Both empowerment and accountability have multiple dimensions, which all have to be taken into account when addressing these types of barriers.

3.1.A. Empowerment

Empowerment allows people the freedom, within guidelines, to make decisions and take action to achieve an outcome, or to adapt to changes in the environment. If someone is powerless to do so, then they are powerless to change the outcome. After a while there is no point in even trying.

To avoid this damaging state of affairs, organizations must allow employees to have at least some level of freedom in how they do their work. Otherwise, it becomes extremely difficult to adapt or respond to changing environments or conditions, or be "free to collaborate".

Empowerment at its most basic level is freedom, within guidelines. A customer service representative may need to deviate from a script to handle an unusual customer situation. A salesperson may need to get an exception on pricing or figure out a way to get an emergency shipment. A repair technician may need to get creative to find and troubleshoot a problem. At its heart, empowerment is the ability to change one's normal routine to meet a new demand or need.

But that's not enough. There are other factors that also determine whether or not someone is empowered.

3.1.A.1 Lack of Time

One of the biggest killers of empowerment is time. If someone doesn't have or is not given adequate time to do their job, then every second of the workday is spent doing the bare minimum required to "keep your head above water".

As one hospital employee put it, although she was told to spend as much time as necessary in order to make the patient feel comfortable, the pressure to get all of the department's procedures done in the scheduled 45 minutes forced her to in essence tell the patient to "lay down, sit still, shut up, then get out". Otherwise it would be impossible to get everything done that was scheduled for her shift, even though acting that way went against everything she believed in.

Gallup found that employees that do not have time to think about how to customize or adjust what they are, say that they are not just physically tired, but they are mentally tired as well. Mentally tired people with barely enough time to check off the boxes that they need to check each day will not have the creative energy and ability to take the time to do things differently.

In addressing a threat scenario, if someone does not have time to help a different agency or department (even though they may be very willing to do so), they are not empowered to collaborate.

3.1.A.2 Lack of Training

Another empowerment killer is lack of training. If an employee has the freedom and the time to change their approach or adapt to a new situation, that will do absolutely no good if they don't know how. For example, a customer may have a question about a problem they are having with a product sold by a different division. If an employee has had no training on that product, they will be incapable of helping them. The same is true if they have not had enough training on new products within their area, new initiatives, or press releases.

In some companies, employees indicated that the only way they find out about company news is by reading the newspaper. And yet they are expected to be empowered to address any and all related customer questions and issues.

Or, an analyst may be unfamiliar with how to interpret technical data or a different type of intelligence.

Without providing employees with the knowledge and skills they need to be able to adapt to different situations, then even if they are technically empowered, they will be unable to be effective in addressing different types of situations for which they have not been prepared.

3.1.A.3 Lack of Materials and Equipment

As with training, lack of the needed resources to react to different situations can limit true empowerment. This factor becomes especially important in technical fields, where a particular piece of specialized equipment or material may be needed to fully address an unusual situation.

Materials and equipment can impact all areas of responsibility. For example, if a sales representative does not have a PDA device, he may not get a critical email from a customer in time. Similarly, if a change needs to be made to a set of reports, and the person who is about to present does not have access to the original files, a color high speed printer, or binding equipment, they will be unable to make the changes that are necessary.

If an analyst does not have access to a particular database, they may not be able to help.

Ultimately, it is very difficult to change your approach if you lack the tools that the change requires.

3.1.A.4 Lack of Open Communications

Decisions can rarely be made in a vacuum. Even the most empowered employee will face circumstances where they will need the involvement or approval of others in order to proceed with their idea. For that to happen effectively there must be open channels of communication.

If the employee who had the idea has no means of communicating with other involved personnel, or if they are not taken seriously, then their "official" level of empowerment becomes meaningless. Or, if they are prohibited from sharing information with someone else who could use it, even though there is no legal reason not to, then any collaborative discussions will likely quickly falter. Creating an environment where every employee's opinions count is a critical part of creating empowerment.

3.1.A.5 Lack of Management Support

When a financial services front line employee was asked if she was empowered, after a sarcastic smirk, she replied "I am empowered at my own risk". Even if all of the above conditions are met, and someone is "technically" empowered, if their manager or supervisor does not back them up, or even worse, if they rebuke the employee every time they take initiative, then very quickly the employee will learn that empowerment exists in name only.

An analyst that collaborates and then gets rebuked for doing so may not be so quick to volunteer in the future.

The best managers will define boundaries and then, so long as those limits are respected, take the heat for risks that do not work out. The worst ones will take credit when things work out, but will summarily and publicly blame the employee when things go wrong.

In summary, if an employee is given the freedom, time, training, tools, communications and support to do what they think is best, then and only then can a workforce be considered to be fully empowered.

3.1.B. Accountability

Empowerment, while critical, is only half of the equation. Too much empowerment can be just as damaging as not enough, if there is no clear accountability around those actions.

It is very easy to think of accountability as simply being held to a certain performance standard. However, as is also the case for empowerment, there are many different ways to cloud or limit accountability.

3.1.B.1 Lack of Objective and Relevant Performance Criteria

If the criteria under which success is measured are entirely subjective, they will be subject to the whim of the evaluator. Personal feelings toward the employee, framing effects, or just that manager's mood can have a tremendous impact on how the same level of performance is evaluated. In addition, if performance criteria are not objective, the way that they are interpreted and defined are highly subject to shifts, making it very difficult for the employee to have a consistent view of what is most important.

Performance criteria must not only be objective, but those metrics must also at least to some extent be able to be impacted by the employee. If an employee is held accountable to improve metrics over which they have little or no control, it will be very difficult for that employee to stay motivated over time.

In the context of collaboration, if there is no accountability to achieve an outcome, it will be difficult to measure the effectiveness of the effort.

3.1.B.2 Lack of Feedback on Progress or Performance

Having relevant and objective metrics does little good if the employee has no idea if they are succeeding or failing on meeting their goals. Without regular access to valid performance data, it will be very difficult for any employee to accurately know if their current efforts are working or not. As a result, adjusting to increase or decrease productivity will be a matter of guesswork, and may not be what is needed.

3.1.B.3 Lack of Objective and Appropriate Rewards and Consequences

Performance relative to goals should have both upside and downside consequences for the individual who is being held accountable for achieving a particular level of performance.

If there is no incentive for achieving a goal, it may be less motivating for that individual. Specifically, without any kind of recognition or reward for strong performance, employee engagement is likely to suffer.

Similarly, if there is no downside to missing goals, they will likely get less attention and focus from employees, especially if they need to provide high levels of effort to achieve even a barely adequate level of performance. After all, there are always other tasks to be done.

Finally, the reward or consequence for meeting, exceeding, or falling short of a goal should be in proportion to the importance of that goal to the organization. The size of a reward or the strength

of a punishment provides a very strong indicator of what is valued and important to the organization, especially relative to its values, beliefs, mission, and overall strategy.

3.1.B.4 Lack of Focus by Management

Even if all of the above factors exist within an organization, if a manager or supervisor does not emphasize and follow the set performance guidelines, employees will very quickly learn to just pay lip service to the "official" criteria. Meeting a goal may become simply checking off a box, without necessarily understanding strategy behind it.

In addition, if a manager is constantly pulling employees away from tasks requiring collaboration with others so that they can focus solely on local responsibilities, it will be very hard for employees to feel a sense of ownership over the collaborative tasks for which they are never able to devote adequate time and attention.

3.1.B.5 Lack of "Procedural Justice"

All of the pieces of the puzzle described in this section assume a certain level of fairness. The metrics themselves, as well as how they are reported, rewards, punishments, and degree of focus must have some level of justice in the manner in which they are measured, reported, and acted upon.

Without procedural justice, local goals and accountability systems can very quickly become a focus of disengagement, and lose their intended purpose of aligning the organization around what is important to achieving desired strategies and outcomes. Unfortunately, procedural justice can be influenced highly by relational concerns and goals.[4] If something is perceived to be unfair, it will likely foster an unwillingness to step outside of comfort zones, increased turnover, or disengagement.

3.1.C. Balancing Empowerment and Accountability

Ideally, an employee should have the proper amount of empowerment (within guidelines), balanced with the appropriate accountabilities. The impact of accountability and empowerment was studied by Gallup in a study of 2,634 working American adults, in January 2007.

The research showed that when both of these conditions exist, employees are highly engaged. Those who agree, on average, that both conditions exist are in the 87th percentile of all workers.[5] In other words, empowerment and accountability appear to be pre-requisites for becoming a ***top performer***. However, only one-quarter of the American work force believes that they are both empowered and accountable.

The first type of imbalance occurs when someone is empowered, but without clear accountabilities. These employees are ***loose cannons***. Loose cannons have high levels of empowerment but are not held accountable for the damage done by their actions, particularly elsewhere in the organization. Loose cannons are less engaged than top performers, falling into the 61st percentile of Gallup's database. While this group is relatively small in size, their impact can be felt throughout organizations.

The most damaging conditions, however, are ones with low levels of empowerment. It is not uncommon to find work environments where employees are held to high levels of accountability, but are not empowered, either through lack of freedom to make decisions, lack of time, lack of management support, or any of the other factors described above. This group is comprised of ***broken spirits***, who are relatively disengaged, falling into only the 36th percentile of Gallup's

database. Disengaged employees, Gallup has found, tend to have higher turnover, lower productivity, and more safety incidents when compared to other more engaged employees.

Finally, there are situations where an employee is neither empowered nor have clear accountabilities. This group referred to as ***prisoners***. Prisoners, unfortunately, make up half of the US working population. They are relatively disengaged in their work, falling into only the 8th percentile, ranking them among the most disengaged employees in the US workforce.

The impact on collaboration can be severe. Several issues related to collaboration were included in the study, including ability to apply creative ideas, being able to feed off of the creativity of others, interdepartmental cooperation, and company as well as manager openness to different ideas and opinions.

In each case, as shown in the table below, the differences between the prisoners and the top performers were quite dramatic. For each of these factors, once empowerment and accountability were low, barriers to collaboration were pervasive.

Comparison of Prisoners and Top Performers

Percent "strongly agree" (5 on a 5-point scale)	Prisoners	Top Performers
My current job brings out my most creative ideas	7%	38%
I feed off the creativity of my colleagues	6%	32%
In my company, other departments always cooperate with my dept.	2%	25%
My company treasures diverse opinions and ideas	2%	36%
My supervisor is open to new ideas and suggestions	11%	71%

These categories also do not appear to necessarily relate just to one's position or level within an organization. The Gallup research showed identified some companies where empowerment and accountability are much higher at the front line than among managers, and other companies where the opposite is true. In each case, however, these imbalances served to create and/or preserve significant barriers to success, in essence causing the company to self-impose limits on their own effectiveness.

The good news, however, is that these imbalances can be addressed. By measuring each aspect of empowerment and accountability by work group and position, clear indication can be found as to what interventions would be needed to improve the situation, and thereby remove these self-imposed barriers. It may require strong leadership that is willing to hold no past endowments or practices sacred. But, as these limitations were created by those inside the company, they certainly can be removed by the same means.

Left unchecked, however, imbalances in empowerment and accountability will not only preserve existing barriers to success… these imbalances can in some cases become institutionalized, and over time spread to other parts of the organization, hastening and increasing the damage that they create. Only by unlocking the potential of each employee, and providing the proper guidelines and environment to channel that energy, can an organization remain barrier free and able to collaborate.

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3.2. Small Groups, Collaborative Pitfalls, and Remedies (Richards J. Heuer, Jr. - consultant and Sarah Miller Beebe - Pherson Assoc.)

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3.2.A. Common Pitfalls with Small Groups[1]

As more analysis is done collaboratively, the quality of intelligence products is increasingly influenced by the success or failure of small group processes. The various pathologies that afflict small group processes are well known and have been the subject of considerable research. One might reasonably be concerned that more collaboration will just mean more problems, more interagency battles. However, as explained here, it turns out that the use of structured analytic techniques frequently helps analysts *avoid* many of the common small group process pitfalls.

Some group process problems are obvious to anyone who has participated in trying to arrive at decisions or judgments in a group meeting. Guidelines for how to run meetings effectively are widely available, but most group leaders fail to follow them.[2] Key individuals are absent or late and participants are unprepared. Meetings are too often dominated by strong or senior personalities, while some participants are reluctant to speak up or to express their true beliefs. Discussion tends to get stuck on several salient aspects of a problem, rather than covering all aspects of the subject. Decisions may not be reached, and if they are reached, may wind up not being implemented.

> "If you had to identify, in one word, the reason that the human race has not achieved, and never will achieve, its full potential, that word would be *meetings*."[3]
> Humorist Dave Barry

Other problems that are less obvious but no less significant have been documented extensively by academic researchers. There are pressures toward consensus, so that if some reasonably satisfactory solution is proposed that all members can agree with, this ends the discussion without further search to see if there may be a better answer. Such a decision often falls short of the optimum that might be achieved. A phenomenon known as group "polarization" leads, under certain predictable circumstances, to a group decision that is more extreme than the average group member's view prior to the discussion. "Social loafing" is the phenomenon in which people working in a group will often expend less effort than if they were working to accomplish the same task on their own. In any of these situations, the result is often an inferior product that suffers from a lack of analytic rigor.

Academic studies show that "the order in which people speak has a profound effect on the course of a discussion. Earlier comments are more influential, and they tend to provide a framework within which the discussion occurs."[4] Once that framework is in place, discussion tends to center on that framework to the exclusion of other options.

Much research documents that the desire for consensus is an important cause of poor group decisions. Development of a group consensus is usually perceived as success, but, in reality, is often indicative of failure. Premature consensus is one of the more common causes of suboptimal group performance. It leads to failure to identify or seriously consider alternatives, failure to

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examine the negative aspects of the preferred position, and failure to consider the consequences that might follow if one is wrong.[5] This is what is commonly called groupthink.

3.2.B. Improving Group Performance

Improvement of group performance requires an understanding of these problems and a conscientious effort to avoid or mitigate them. The literature on small group performance is virtually unanimous in emphasizing that groups make better decisions when their members bring to the table a diverse set of ideas, opinions, and perspectives. What premature consensus, groupthink, and polarization all have in common is a failure to adequately identify and consider alternative points of view. Laboratory experiments have shown that even a single dissenting opinion, all by itself, makes a group's decisions more nuanced and its decision-making process more rigorous.[6] "The research also shows that these benefits from dissenting opinions occur regardless of whether or not the dissenter is correct. The dissent stimulates a reappraisal of the situation and identification of options that otherwise would have gone undetected."[7]

The research also shows, however, that dissent must be genuine, not generated artificially as in some applications of the devil's advocacy technique.[8] It should also be reasonable. If the person providing dissenting views is known to the group as a habitual contrarian or maverick, then his or her comments run the risk of being dismissed by the group regardless of merit.

Briefly, this means the route to better analysis is small groups of analysts who speak up and express a wider range of ideas, opinions, and perspectives. This can be achieved by the increased use of structured analytic techniques by these groups, the formation of more heterogeneous groups, and the use of computer-mediated communications when analysts are geographically dispersed.

The desired diversity of opinion is, of course, a double-edged sword, as it can become a source of conflict, which degrades group effectiveness.[9] It is not easy to introduce true collaboration and teamwork into a community with a history of organizational rivalry and mistrust. Analysts must engage in inquiry, not advocacy, and they must be critical of ideas but not critical of people.

3.2.C. The Perils of Advocacy

In a task-oriented team environment, advocacy of a specific position can lead to emotional conflict and reduced team effectiveness. Advocates tend to examine evidence in a biased manner, accepting at face value information that seems to confirm their own point of view and subjecting any contrary evidence to highly critical evaluation. Advocacy is appropriate in a meeting of stakeholders that one attends for the purpose of representing a specific interest. It is also "an effective method for making decisions in a courtroom when both sides are effectively represented, or in an election when the decision is made by a vote of the people." [10] However, it is not an appropriate method of discourse within a team "when power is unequally distributed among the participants, when information is unequally distributed, and when there are no clear rules of engagement – especially about how the final decision will be made."[11] An effective resolution may be found only through the creative synergy of alternative perspectives.

The table below displays the differences between advocacy and the objective inquiry expected from a team member or colleague.[12]

When advocacy leads to emotional conflict, it lowers team effectiveness by provoking hostility, distrust, cynicism, and apathy among team members. On the other hand, objective inquiry, which

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often leads to cognitive conflict, can lead to new and creative solutions to problems, especially when it occurs in an atmosphere of civility, collaboration, and common purpose.

	Advocacy	Inquiry
Concept of decision making	A contest	Collaborative problem solving
Purpose of discussion	Persuasion and lobbying	Testing and evaluation
Participants' role	Spokespeople	Critical thinkers
Pattern of behavior	Strive to persuade others Defend your position Downplay weaknesses	Present balanced arguments Remain open to alternatives Accept constructive criticism
Minority views	Discouraged or dismissed	Cultivated and valued
Outcome	Winners and losers	Collective ownership

Figure 3.2-1 Advocacy versus Inquiry in Small Groups

3.2.D. The Value of Structured Analytic Techniques

A team or group using structured analytic techniques is believed to be less vulnerable to these group process pathologies than a comparable group doing traditional analysis, because the techniques force analysts away from advocacy and toward inquiry.[13] This has not been tested and demonstrated empirically, but the rationale is clear.

Such techniques work best when an analyst is collaborating with a small group of other analysts. In such circumstances, the techniques provide structure to individual thought processes as well as to the interaction of analysts within a small team or group. When structured analytic techniques such as What If? Analysis or Indicators are used this way, each step in the process prompts discussion among the group. This discussion generates and evaluates substantially more divergent information and new information than an analyst working alone or with a team that does not use structured processes. With any heterogeneous group, this reduces the risk of premature consensus, group think, and polarization.

Use of a structured technique also sets a clear step-by-step agenda for any meeting where that technique is used. This makes it easier for a leader to keep a meeting on track to achieve its goal. Some techniques such as Key Assumptions Check and Analysis of Competing Hypotheses (ACH) help analysts gain a clear understanding of how and exactly why they disagree. For example, many CIA and FBI users report that their preferred use of ACH is to gain a better understanding of the differences of opinion with other analysts or between analytic offices. The process of creating an ACH matrix requires identification of the evidence and arguments being used and how these are interpreted as either consistent or inconsistent with the various hypotheses. Review of this matrix provides a systematic basis for identification and discussion of differences between two or more analysts. CIA and FBI analysts also note that reference to the matrix helps to depersonalize the argumentation when there are differences of opinion.[14] In other words, ACH helps analysts learn from their differences rather than fight over them. In fact, structured techniques such as the Delphi Method and Structured Debate are designed to either stimulate or resolve *productive* conflict rather than emotional conflict.

Considerable research on virtual teaming shows that leadership effectiveness is a major factor in the success or failure of a virtual team.[15] Although leadership usually is provided by a group's appointed leader, it can also emerge as a more distributed peer process and is greatly aided by the

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use of a trained facilitator (see Figure 3.2-2). When face-to-face contact is limited, leaders, facilitators, and team members must make up for this by paying more attention than they might otherwise devote to:

- Articulating a clear mission, goals, tasks, and procedures for evaluating results.
- Defining measurable objectives with milestones and time lines for achieving them.
- Identifying clear and complementary roles and responsibilities.
- Building relationships with and between team members and with stakeholders.
- Agreeing on team norms and expected behaviors.
- Defining conflict resolution procedures.
- Developing specific communication protocols and practices.[16]

Although most of these functions fall naturally to the designated team leader, a facilitator or a team member can also initiate a discussion on any of these points.

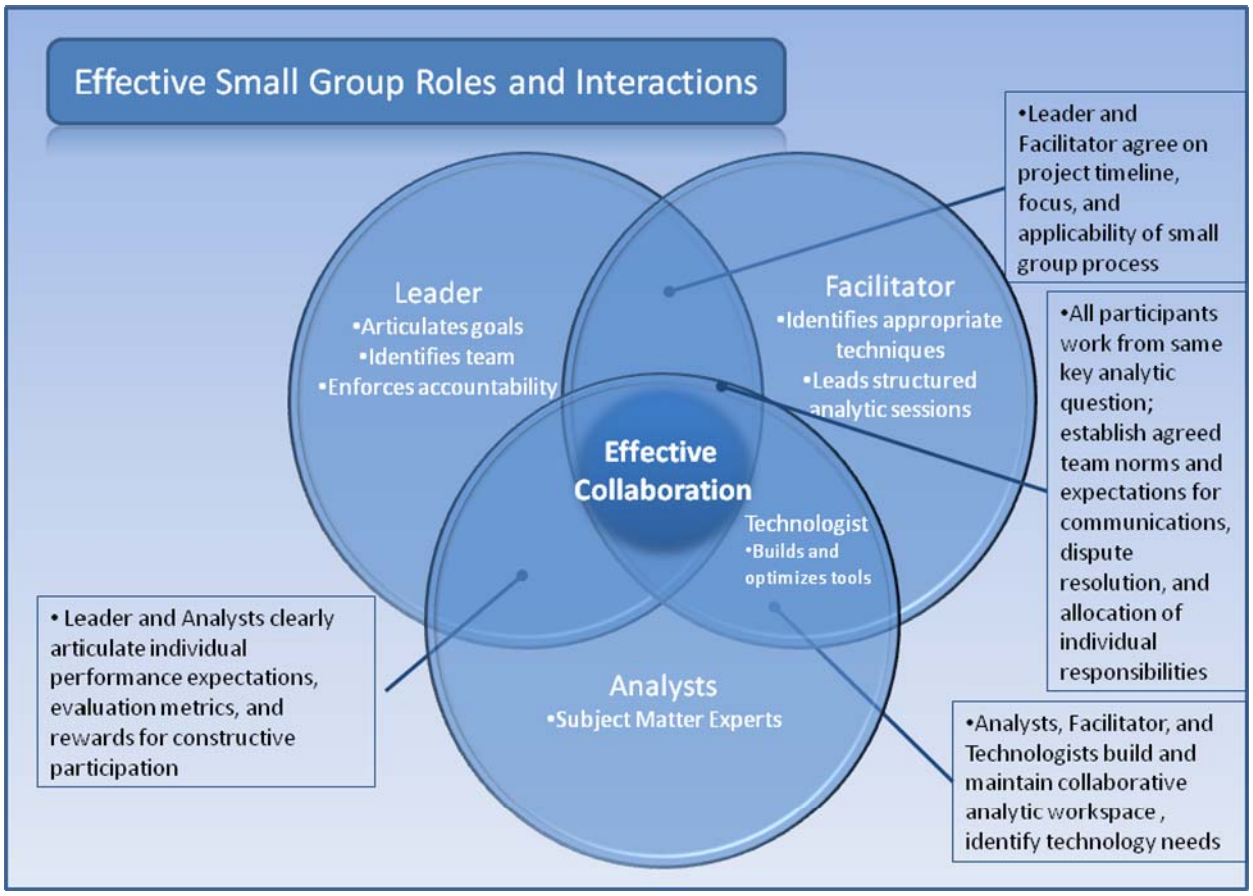

Figure 3.2-2 Effective Small Group Roles and Interactions

As illustrated in Figure 3.2-2, the interactions between the various types of team participants, whether analyst, leader, facilitator, or technologist, are as important as the individual roles played by each. For example, an analyst on a team will be most effective if he or she has subject matter expertise or knowledge that lends a new viewpoint, but also when the rewards for participating are clearly defined by the manager. Likewise, a facilitator's effectiveness is greatly increased when the project goals, time line, and general focus are agreed upon with the leader in advance. When these roles and interactions are explicitly defined and functioning, the group can more easily turn to the more challenging analytic tasks at hand.

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3.2.E. Implications for Training

As greater emphasis is placed on interagency collaboration and more work is done through computer-aided communications, it becomes increasingly important that analysts be trained in the knowledge, skills, and abilities required for facilitation and management of both face-to-face and virtual team or group meetings, including a strong emphasis on the management of conflict during such meetings. Training is more effective when it is available just before the skills and knowledge must be put to use. It is most effective when it is fully integrated into the work process with instructors acting in the role of coaches, mentors, and facilitators.

Training programs that emphasize these concepts would greatly enhance the prospects for interagency collaboration and the efficacy of virtual teams. Whenever a new interagency or virtual team or work group is formed, it would be appropriate to ensure that all members have the same training in the pitfalls of group processes, and are given assistance in the framing of performance expectations, standards of conduct, and conflict resolution procedures. Standardization of this training would accelerate the development of a shared experience and culture and reduce start-up time for any new interagency group.

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[14] Information provided by Randy Pherson and another senior Intelligence Community educator.

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3.3. Building a Culture of Collaboration – Observations from the Trenches (Douglas Palmer and Joan McIntyre - ODNI)

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3.3.A. Introduction

The Director of National Intelligence's (DNI) ***Vision 2015*** deems a globally networked Intelligence Enterprise as essential to meeting the demands for greater forethought and improved strategic agility in an era of constant uncertainty, persistent threats, and a growing array of emerging missions. To meet this challenge the Intelligence Community (IC) must evolve into an integrated enterprise based on a collaborative foundation of shared services, mission centric operations, and integrated mission management.[1] Over the past several years, the DNI has taken steps—the 500 Day Plan, new virtual collaborative capabilities, policy directives, and other initiatives—to lay the foundations for this transformation. Activities and initiatives throughout the Intelligence Community are further fostering a move toward a culture of collaboration and a more integrated Intelligence Enterprise.

This paper examines and characterizes the state of collaboration in the Intelligence Community based on the interactions and experiences of the Collaboration Consulting Team (CCT), a small team of specialists who assist interagency groups with all aspects of their collaboration challenges (i.e., processes, technology, and behaviors). The observations and conclusions documented in this report capture success stories and challenges from the past two years.

For purposes of this study, **collaboration** is defined as the interaction among members of the Intelligence Community and their partners to exploit diverse expertise and organizational resources to create higher value intelligence than an agency or officer could do individually.

Collaboration involves three equally important elements. People must understand and exercise the right **behaviors**. Collaborative teams must have the right **tools** to interact and share information. And finally, organizations must employ policies, metrics, and **business processes** that support a collaborative approach.

3.3.B. Growing Acceptance of New Collaborative Tools

Over the last several years, the Intelligence Community Enterprise Services (ICES), an organization that reports to the DNI's Chief Information Officer, has introduced multiple Web 2.0 "social software" tools. These tools have served to increase the amount of information sharing and collaboration taking place on the Top Secret, Secret, and unclassified networks. Intellipedia, built on the same software as the popular Wikipedia, was an idea from the Central Intelligence Agency (CIA). It was piloted by ICES in 2005 and was deployed to the Intelligence Community in April 2006. Other Web 2.0 tools available to the IC include Microsoft SharePoint portals, blogs, instant messaging, folksonomies (or social bookmarking or tagging), document sharing, and Real Simple Syndication (RSS) feeds. Table 3.3-1provides short descriptions of many of the terms commonly associated with Web 2.0.

Table 3.3-1 Common Terms Associated with Web 2.0

Blog	Short for web log, a blog is a website—personal or group—in the form of an online journal, with new entries appearing in sequence as they are written, especially as dealing with reflections or opinion, and typically incorporating links to other articles.
Community of Interest (COI)	Groups of people linked by technology and informally bound together by a common mission and passion for a joint enterprise.
Instant Messaging	A form of real-time, text-based communication between two or more people and sent computer to computer via network or internet; this service is provided in a variety of forms, including Jabber and Sametime.
Intelink	The secure intranet used by the Intelligence Community.
PKI Certification	Short for a public key infrastructure (PKI), an arrangement that authenticates a user's identity by means of a unique digital certificate.
Real Simple Syndication (RSS)	A format of web feeds that makes it possible for people to keep up with web sites—especially blogs—in an automated manner without checking them manually.
SharePoint	A web-based, Microsoft-created collaboration and document storage platform.
Social Network	Generally speaking, a social structure that comprises nodes (people) and links (relationships); nodes are connected by links for a variety of reasons, including person, financial, and professional reasons.
Folksonomies (a.k.a. Tagging)	Keywords or terms associated with or assigned to a piece of information (a picture, a geographic map, a blog entry, a video clip, etc.), thus describing the item and enabling keyword-based classification and search of information.
Web 2.0	A series of related web or browser-based platforms that facilitate the sharing, publication, and organization of content and information by users.
Wiki	A wiki is software that allows users to create, edit, and link web pages easily. Wikis are often used to create collaborative websites and to power community websites.

A growing number of individuals and teams are successfully changing existing business processes in favor of more collaborative approaches. For example, **Intellipedia** is increasingly being used within the Intelligence Community to collectively consolidate information and analysis on a variety of intelligence topics. Intellipedia usage has grown rapidly over the past three years. One year after Intellipedia's release in April 2006, 13,000 members of the IC were using the tool; by February 2009, there were 55,000 users. The number of Intellipedia articles has increased as well; the total has grown from 20,000 articles in April 2007 to over 65,000 by February 2009. Intellipedia contributors currently make about 4,500 edits per day.

Other tools are seeing a similar level of popularity within the Intelligence Community. The statistics below demonstrate the level of growth on the IC's top secret network.

- Starting in late 2007, Microsoft **SharePoint portals** provided a venue for secure Communities of Interest (COIs).

- By March 2009 the total number of blogs had grown about 50 percent since 2007, with team (vice individual) blogs tripling in that timeframe.
- Items tagged with the social bookmarking tool Tag|Connect more than doubled between February 2008 and February 2009 with number of new items tagged in early 2009 growing at a rate of 2,500 per month.

In September 2008, the Deputy Director of National Intelligence for Analysis (DDNI/A) through its Executive Agent, the Defense Intelligence Agency, launched **A-Space** -- an online analytic work environment on the top secret network open to all Intelligence Community analysts with the proper clearances. A-Space provides analysts with a social networking capability, the ability to create their own communities and workspaces, and access to common data sources and IC collaboration tools mentioned above. Over time additional tools and capabilities supporting all aspects of the analytic work process will become available, allowing analysts to maintain situational awareness, consolidate relevant research and analysis on topics of interest, and share their insights and intuitions in a trusted environment, out of the eye of the customer. Membership has grown rapidly and had reached over 8000 registered users across all the 16 IC organizations and the Combatant Commands by early April 2009.

3.3.C. Adopting More Collaborative Behaviors

Leveraging these tools, Communities of Interest (COIs) have been created to share information and focus IC efforts on many of the critical topics of interest to policymakers and led by senior substantive IC leaders. Members are learning to tailor the tools and their business processes to support their missions, often using several simultaneously. SharePoint and similar portals are predominately used for posting information and providing functions such as group calendars and action tracking systems. Intellipedia helps capture IC knowledge and keeps Community members up to date on emerging events, and A-Space is fostering analytic discussions and building networks of colleagues. All tools foster increased information sharing.

After less than six months, A-Space has repeatedly demonstrated its usefulness in linking analysts together and enhancing analytic assessments with contributions of new information, alternative perspectives, and insights. Following the Mumbai terrorist attacks in November 2008, experts from across the Intelligence Community convened in A-Space—and other collaborative venues—to discuss the evolving situations. Analysts have used A-Space to share and discuss puzzling pictures or other images and leverage collective expertise to come up with answers. In several cases, analysts with expertise in very different areas were able to point others to an approach, which quickly generated new analytic insights.

Intelligence officers throughout the IC have a history of using web-based tools to maintain real-time awareness. Participation in the real-time collaboration venue using instant messaging tools is growing to include new agencies and new streams of collection. For example, the Open Source Center (OSC) began using a chat tool in 2007 to broker open source intelligence to a new and wide audience on a real-time basis. The OSC chat room has become one of the most widely used chat rooms with 50 to 60 users consistently logged on. The effort regularly contributes timely information to other collectors and operators. Participants tracking real time events are also leveraging other capabilities—Intellipedia, A-Space, SharePoint—to further enhance collaboration.

Table 3.3-2 Common Expressed Concerns

"But I won't get credit"	A common argument that surfaces in discussions with analysts from across the IC is that "If I share my unique analytical insights in a collaborative environment, I won't get credit. And if I don't get credit, I won't get promoted."
"That's not 'authoritative' intelligence"	A common concern is that work done in a collaborative space, such as Intellipedia, is often considered to be an unvetted product that has been created by personnel that may not have the necessary experience or analytic background on the subject being written about. The concern is that a decision maker could access the collaborative space and take action without a more formal review of the information being conducted.
"It's not my job"	Many analysts consider "collaboration" an extra duty, not part of their "day job." Many analysts view community projects or task forces as duty above and beyond their normal production workload.
"We already have a process that works"	Many community members voice frustration that collaboration is an inherently disruptive activity that negatively impacts existing processes. For example, several analysts believe that, if the current analysis process is disturbed in any way, national security could be put at risk.
Lack of knowledge, training, and time	Many IC officers have a limited awareness of the collaborative tools and technologies that are available to them. If officers do have an awareness of the tools, they often find it difficult to get formal training due to limited availability. Overloaded personnel frequently do not have the necessary free time to familiarize themselves with the new collaborative tools or to attend training.
"My manager won't let me collaborate"	Many analysts cite lack of management approval as a reason for not participating in the collaborative space. CCT facilitators often hear "my manager won't let me collaborate" accompanied by the belief that the manager views the use of Intellipedia, blogs, or some other collaborative tool as wasted time. Additionally, it appears that managers feel a loss of control over the employee's work and are concerned that information posted publicly may negatively reflect upon the manager.
"These tools are for kids"	Many people associate tools such as blogs and chat with young people and social activities. For those not familiar with such tools, this can lead to a general assumption that these tools are not of value in the work environment. There are also many community members who automatically assume that the technology and learning hurdle is too high and not worth jumping over for tools they perceive to have limited workplace value.
Ready, willing, and … unable	Many motivated officers within the IC are willing to begin to collaborate with their peers yet experience obstacles that keep them from being able to do so. Obstacles include network access issues, non-intuitive collaborative tools, poor search engines that did not allow for easy information discovery, and the lack of a support team or help desk to address basic questions. While any of these obstacles could be singularly overcome, they often hit users in bunches.
Techno-fright	The term "techno-fright" captures the anxiety and overall reluctance experienced by many employees and managers who attempt to use new technology. Another aspect of techno-fright is the realization that collaborative tools allow individuals to "think in public" by sharing their thoughts and ideas openly across the network. What currently is done on a hard drive or in a group's "share" drive could now be wide open to everyone on the network. This major shift in work process brought about by the collaborative technology appears to bring significant discomfort upon first use.

3.3.D. The Challenges of Collaborating

While already having an impact, these activities currently take place on the margins of mainstream Intelligence activity. Collaboration initiatives frequently face difficulty in gaining momentum and generally require strong leadership, charismatic facilitators, and dedicated personnel to be successfully sustained. Over the past two years the CCT has had the opportunity to interact with hundreds of analysts and managers from across the Intelligence Community and Department of Defense and specific issues and concerns began to emerge from these interactions. Table 2 captures many of the common concerns and challenges faced by organizations in promoting and increasing the level of collaboration.

3.3.D.1 Technical Obstacles

Technical obstacles are a constant impediment to new users and existing teams, often overwhelming and frustrating even the most motivated of individuals. These obstacles serve to limit or slow the adoption of new collaborative tools. They range from:

- Network access issues (e.g. need for multiple logons, PKI certificate problems, browser configuration issues, individual agency baseline variations)
- Non-intuitive collaborative tools that often require learning special formatting languages to add links or images, create a table or bullet, and format text
- Tools that are often unstable and not interoperable with other legacy tools and services used on agency networks
- Poor search engines that make it difficult to find existing content on subjects of interest

Tracking down the source of, and fixing, a problem can be quite challenging. Local and agency technical support units are generally unfamiliar with capabilities deployed outside their organization's network and can have trouble identifying where the problem resides. In some cases, the collaborative technology is incompatible with existing browsers or cannot operate through various firewalls. In addition, technology professionals frequently use technical jargon that is both foreign and intimidating to users. Personal networks and informal support groups led by early adopters have helped to overcome some of these obstacles.

Many intelligence officers have only a fleeting awareness of the available collaborative capabilities and a limited understanding as to how such tools can help them do their job. Because these capabilities differ from common tools, such as e-mail, Microsoft Word, Excel, and PowerPoint, time and training are required to become proficient. CIA's Intellipedia Sabbatical, NGA's Web 2.0 training, and various IC Collaboration Courses are teaching these skills; however, the overall availability of such courses is limited. Lack of familiarity with the tools and their potential has fostered the suspicion that they are just a waste of time, particularly by managers who often see these tools as diverting attention from "real" work, rather than a different way to do work.

3.3.D.2 Misaligned Business Processes

Working collaboratively across organizational boundaries and leveraging tools that enable easier interaction require participants to come to a common understanding of group objectives and individual roles and responsibilities. IC officers must engage with each other in ways not required when working individually or with co-located teams that share a common organizational understanding and established work processes. Changing how an organization or team works can be the most difficult element of collaboration in the IC. It often requires time,

creativity, and diplomacy to successfully engage with multiple stakeholders and modify organizational traditions such as business processes and the metrics for gauging success.

One example of the need to modify business processes is today's sequential hierarchical coordination and review process, which is aimed at ensuring that intelligence products are properly vetted and approved prior to release. This traditional process breaks down within a collaborative, dynamic cross-agency environment that Web 2.0 capabilities open up. The Intelligence Community has yet to come to terms with what "authoritative" and "finished" intelligence means in this new environment and what are the best ways to ensure quality while sharing information and analysis in a timely fashion. As a consequence, managers and individual contributors alike often question the quality of work done within Intellipedia and other collaborative venues and are concerned that an operations officer or policy maker may take action on erroneous information. Some will go as far as to express fear that "people will die" because of inaccurate information.

Furthermore, the existing processes, combined with continued security policies that often impede information sharing, have created a mind-set that runs counter to the openness inherent in a collaborative virtual environment. For analysts, the concept of "thinking in public"—sharing their thoughts openly across an IC network open to analysts from all of the IC agencies—is unsettling. What previously had been done on their desktops or on a local work group's "share" drive can now be open to anyone. This is a major shift in the analytic work process. Managers often view this trend as threatening their ability to control analytic output on their topics, and analysts fear that other analysts will "steal" their ideas and publish before they can get it through their internal review process.

3.3.D.3 Organizational Barriers

Collaboration initiatives are further impeded by a wide range of organizational policies and cultural norms that reinforce an organization-centric approach to how the Intelligence Community meets mission demands. How organizations train, evaluate, and reward their personnel undervalue those skills and behaviors most important for collaboration.

Insufficient Incentives for Collaboration The current system of rewards and incentives continues to favor production by individuals of organizational products, often at the expense of cross-agency and mission-focused activity. For example, many analysts noted that they are rewarded for production in the current structure, and spending time inputting, or commenting on information in the virtual space did not help them move forward in their careers. Likewise, managers appear to be at a loss for a means to assess and give credit for participation of their officers in collaborative venues. Pressed to meet demands from existing processes and workflow, many intelligence officers simply do not feel they have the time to collaborate.

Shortfalls in Required Knowledge and Skills To work effectively in an integrated, collaborative, and virtual environment requires a different set of knowledge and skills than has been required within existing organizational structures. Managers and analysts need to be able to participate and at times lead complex and boundary-spanning (cross-agency, multi-INT) projects that require skills in program management, conflict resolution, and motivating people. Successful collaboration efforts have had leaders with such skills, and some projects have benefited from the dedicated support of facilitators who have helped groups structure and implement their initiatives. Groups that expected a specific tool to solve their collaboration problem generally saw only limited results.

Social Networks Underdeveloped Dynamic and adaptive collaborative communities must be built on trusted social networks which are able to easily tap into diverse skills and perspectives in order to respond to changing circumstances. Such networks appear to be relatively underdeveloped within the Intelligence Community for a variety of reasons. For example, at workshops for the North Korean, Cuban, and Somali analysts in late 2006 and early 2007, many of the participants were meeting for the first time and only a handful knew more than half of the other participants.

Another aspect of this problem has to do with a lack of enabling technology. In the past few years, social networking services on the internet have facilitated the creation of large and flexible virtual networks of colleagues and friends. But this kind of technology has only recently been incorporated into the IC with the launch of A-Space. Often referred to in the popular press as "Facebook for Spies", A-Space provides a starting point for analysts to build and maintain social networks across organizational boundaries that are focused on key intelligence issues. Other IC officers – who could also benefit from better collaboration – are still without a similar social networking service on classified networks.

3.3.E. Moving Forward

Improving collaboration depends largely on senior leadership commitment to realign the organizational environment to the needs of a collaborative, integrated community. Senior leaders must oversee changes to policies, regulations, and reward structures to foster information sharing and collaboration to include:

- Managerial engagement in the transformation process
- Incentives and rewards that foster mission-focused collaboration and information sharing
- Community-wide training and facilitation support to ensure that collaboration skills, both behavioral and technical, become embedded in the work environment
- A technology strategy that includes the users in the development process and stresses connected and interoperable tools
- Better metrics and mechanisms for measuring collaboration

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[1] Director of National Intelligence, Vision 2015: A Globally Networked and Integrated Intelligence Network, 22 July 2008, http://www.dni.gov/reports/Vision_2015.pdf

4. What Applied Research Has Learned About Collaboration

4.1. The Strategic Multi-Layer Assessment Limited Objective Experiments (S. K. Numrich - IDA and Nancy Chesser - DTI)

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4.1.A. Introduction

The US military and the Government as a functional whole face challenges from terrorist groups acting adaptively and globally with an agility that confounds our bureaucratic processes and institutions. These non-state actors form relationships with clandestine criminal, financial and logistic networks. Acting on their own, as proxies of nation states or in collaboration with them, terrorist groups seek to procure and deploy weapons of mass destruction or mass effect. To address this highly adaptive and interconnected threat, we must adapt our own networks and processes, increasing collaboration, engaging in information sharing, using new tools and methods to add a greater degree of robustness and transparency to our analytic processes and decision making. The Interagency Limited-Objective Experiment (LOE) is designed to enhance our existing analytic capability with new collaboration strategies and tools and to make that process transparent to strategic decision makers. The experiment will take place in two parts during the summer of 2009. The Worldwide Rare Event Network (WREN) experiment will be a complex multi-environment game that takes place over four weeks. The US Air Force Academy (USAFA) Mission Fabric experiment will be less complex and take place over two weeks.

The Strategic Multilayer Assessment (SMA) group recently completed a multi-agency, collaborative exercise focused on anticipating rare events. SMA brought to this effort access to in-depth social science capability, a unique scenario development process and hypothesis evaluation tools. The assessment of the effort noted the fragility of the projects and suggested taking the process to the next level – a distributed, collaborative environment in which analysts could use their own tools in combination with the new capabilities to enable a richer and more transparent discovery and assessment process. The aim of this new environment is to place an improved analytic product in the hands of decision makers, enabling them to make more accurate and timely decisions across and up their organizational chains of authority. The increased transparency of the process should improve alignment and inform cooperative actions between and among organizations.

4.1.B. Objective of the WREN Experiment

The objective of the experiment is to develop findings and recommendations on facilitating collaboration across Joint Staff, Combatant Commands (COCOMs), Coalition, Interagency, Academia, and Industry in a multi-agency/multi-disciplinary environment, particularly when addressing long-range anticipation of rare events. The methodology to achieve that objective is to conduct an experiment that measures the effects of collaboration and factors that influence collaboration on “puzzle-solving”:

- Evaluate the ability to discover, interpret and effectively share information in the context of a specific scenario
- Measure selected environmental and/or institutional factors

- Execute in an instrumented, controlled, distributed, virtual environment

The distributed members of the virtual WRENet community of interest (COI) will attempt to find and characterize indicators of illicit terrorist activity against the US. The WRENet COI can call on a Social Science Modeling and Analysis COI to provide expertise as needed. The analytic products of the WRENet COI would be aggregated and made transparent to the members of a distributed operational COI whose role would be to share the information across agencies and echelons, determine when it becomes actionable and monitor the ability of decision makers to act on the information. As the process unfolds and metrics are collected, the SMA group would capture tactics, techniques and procedures that would provide the following potential benefits:

- Approach to improving situational awareness across whole of government to support planning for preventive action
- Approach to improving capability to anticipate emerging crises and distinguish real threat streams from false threat streams
- Approach to providing better, more timely inputs to decision makers

4.1.C. Overview of the WREN Experiment

The threat scenario will be global in nature with the continental US as the culminating point. The threat will be perpetrated by non-state actors acting with multiple networks including the involvement of one or more nation states. Transportation will include maritime lines of communication. These features are included in the scenario to force the analysis and decision making to cross typical organizational boundaries within the military and across the various government agencies with different areas of responsibility.

The WRENet COI will be distributed (each member working from his/her own workspace or other chosen location via web portal), operating in a collaborative environment designed to look and feel very much like real-life but enhanced with new technology and the availability of social science expertise. Their task is to discover, define and track a notional threat scenario developed by the FBI with MITRE support and buried in real world data. This modified real world data will be password protected from the real world.

The core analytic capability will be provided by individuals recruited as surrogates for interagency analysts. These individuals will be formed into one or more groups strongly resembling fusion cells. The presence of a core is to guarantee that the exercise will proceed smoothly. The game is open to any interagency individuals who would like to participate in the game for one or two weeks. “Puzzle solvers”, the members of the WRENet COI, are encouraged to enter through the portal into the alternate reality at any time. They may choose to play synchronously with others or collaborate asynchronously by posting their ideas and information. The environment will have familiar information sources -- a faux-intellipedia, faux-databases, faux-google-like search capability, access to Open Source Center documents, game-related announcements and postings. Players will be able to post data to map displays, list their hypotheses, make requests for information and through the use of “tool gurus” make use of new technology. All players will have the ability to seek expert information from criminologists and social scientists capable of profiling terrorist organizations, assessing a propensity for illicit acts, developing social network analyses, and providing a rich understanding of the networks and human decision processes. The players themselves will be profiled and their game identity and skill base will be made available as a means of encouraging collaboration.

The game will be designed to be engaging and challenging for the players. Metrics will be collected during play and will focus on where players seek data, to whom they reach out for collaboration and how often, and what tools they tend to use. Players will be encouraged to post their hypotheses often as a means of sharing situation awareness. Pre- and post-game surveys will attempt to capture the intangibles – satisfaction, frustration, impression of others and of the nature of collaboration they encountered. Adaptation and creative use of tools by the players will also be captured.

The workings and results of the WRENet COI will be made available to the Strategic/Operations COI (decision makers) through a form of watch board. The Strat/Ops COI (also distributed) replicates a virtual Interagency Operations Center Watch Team, with representatives from each of the participating agencies/organizations. Strat/Ops participants will have the ability to collaborate with one another, view the products developed by the WRENet COI and provide feedback on those products. Key findings will be determined by observing how Strat/Ops participants decide that the WRENet COI product(s) have become actionable, identifying whom should be notified in each participating organization and noting differences among the assessments and approaches of representatives from those different organizations. The National Joint Operations Intelligence Center (NJOIC) will participate in the exercise through its' strategic over watch mission, monitoring Combatant Command's daily activities for gaps and seams, and to synchronize global effects for missions with National/Strategic implications.

4.1.D. Unfolding of the WREN Scenario

The FBI, with the assistance of MITRE, has provided a rich, multi-threaded scenario, developed and tested by teams of experts including scientists from multiple cultures, technical experts from an array of generations and industry specialists from shipping, transportation and related fields. The overall experiment will be divided into a sequence of individual games, each game based on a different thread from the scenario. The observable activity in the scenario will begin some months in the past and culminate in the present. The flow of the game will be a “sprint and drift” experience. Each day will be a “drift” through mystery solving and over night the game time will “sprint” forward some months. This allows months of scenario time to be compressed into days of actual play. The information environment to which the players are exposed will consist of “real world” data brought into the game environment and augmented with the scenario injects. Scenario injects can also be provided through responses to “requests for information” from the players. The White Cell will control the flow of the scenario and will have the ability to change the pace depending on the response of the players – putting them back on track if they persist in following false trails or adding noise if the players are solving the mystery too quickly. The nature of the threat scenario will force collaboration across the lines of responsibility that involve multiple military commands and government agencies.

4.1.E. WREN Tools and Enablers

One of the unique features of the experiment is the introduction of new tools for collaboration, for collecting and viewing information, for posting and testing hypotheses and for facilitating collaboration. Because each tool has a learning curve, experts in using the tools will serve as intermediaries for the players, aiding them in handing the tools and thereby reducing the learning curve. The core players in the WRENet COI will have experienced the game environment in a dry run a week or so before the start of the experiment. All these arrangements have been made to lower the cost of entry for players. The utility of the tools will be evaluated by the players and

it is hoped that some of the agencies will find new and useful technology as a result of game play.

Among the most important enablers is access to experts with research understanding, methods and tools not generally available to individual analysts. The value of the open, unclassified, collaborative environment is access to a wide range of expertise not available to individual analysts. Through a collaborative environment analysts from different backgrounds can share their tradecraft as well as their data sources and research methods.

Among the groups collaborating in the exercise are Gallup, the Institute for the Study of Violent Groups (ISVG, University of New Haven), researchers from the Study of Terrorism and Responses to Terrorism (START, University of Maryland), Rice University, Baker Institute, University of Nebraska, Omaha (Center for Collaboration Science) and other government, university and industry experts. This range and depth of talent is not always available within government circles. One of the metrics in the experiment is the manner in which the players reach out for this type of expertise. The nature of play in the experiment should provide players with enhanced awareness of sources of expertise external to their own environments. The designers expect to extract from the play new means to build better collaboration across agencies and different avenues for outreach for tapping external social science expertise.

4.1.F. Overview of the USAFA Mission Fabric Experiment

The USAFA experiment will involve problem-solvers from four distinct groups:

- Military/DoD – cadets from the US Air Force Academy plus participants from USNORTHCOM and USSTRATCOM
- State Law Enforcement - members of the Colorado State Patrol
- County Law Enforcement - detectives from the Douglas County Sherriff's Office
- Academic - students from the University of North Dakota

The two-week experiment will measure collaboration within and between these groups to solve a detailed problem and develop potential responses to the unfolding situation. The USAFA Modeling and Simulation Center has taken the lead in developing the game in which the participants will collaborate. The University of Nebraska - Omaha (Center for Collaboration Science) will develop the design for data collection and perform data analysis.

The first week will feature simple collaboration tools currently in use (email, Voice over IP, etc.) The second week will feature the mission fabric tools described in Articles 4.6 (Bergeron & Pierce) and 5.3 (Pierce). These tools will permit a more visual interaction among the distributed groups and the experiment will measure whether that interaction enhances collaboration. The age differences among the groups will also permit gathering some data on the relative ease with which groups can adapt to and effectively use the enhanced tools.

4.2. The Essence of Collaboration: The IC Experience (Randy Pherson - Pherson Assoc and Joan McIntyre - ODNI)

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4.2.A. Introduction

Since the stand-up of the Office of the Director of National Intelligence in 2005 and with the completion of the ODNI 500 Day Plan in late 2008, the Intelligence Community has laid the foundation for transforming itself into a collaborative, integrated Community that can provide mission-advantage to policymakers, warfighters, and law enforcement to protect the nation's security. Policies and intelligence directives have been promulgated that mandate information sharing and joint assignments, foster common tradecraft standards, and clearly delineate governance structure. The community is increasingly connected through JWICS and SIPRNET and web-based environments such as Intellipedia and A-Space.

As noted in article 1.1 by McIntyre, Palmer & Franks, the Intelligence Community (IC) is increasingly collaborating across organization boundaries to improve the quality of intelligence provided to customers and may be approaching a tipping point in the transition to an integrated, multi-agency collaborative environment. Numerous obstacles remain, however. Managing and empowering this transformation poses major challenges.

This article articulates three core principals, six imperatives, and four critical enablers that the authors believe collectively establish an essential framework for successful collaboration. The assessment is based on the authors' extensive experience working in the Intelligence Community and supporting cross-agency collaboration efforts.

Why Do We Need to Collaborate?

- In today's increasingly complex and interdependent world, no one person or organization has a monopoly on what is needed to get the job done.
- With more than half the community having less than five years of work experience in the IC, the need to connect new officers with more experienced members of the workforce is growing dramatically.
- Expertise is increasingly distributed as the boundaries between analyst, collector, and operator become ever more blurred.
- It is more efficient to engage the full spectrum of key players at the start of a project and generate consensus on how to proceed than to wait until the end of the process and fight over what is right.

4.2.B. Focus on Human Factors

Extensive involvement in the interagency process has led the authors to conclude that the key to establishing a robust collaborative environment lies in focusing attention primarily on the human factors.

- Collaboration is fundamentally about behaviors and interactions among individuals working toward a common objective enabled by IT tools and appropriate organizational policies and underlying cultural norms.

- The correct nexus for collaboration is the human interface with other minds, not the human interface with IT.
- Robust social networks serve as an essential underpinning of collaboration and ensure that communities can come together to put more eyes on the target, promote analytic excellence, and facilitate informed decision-making.
- Achieving a robust collaborative environment requires sustained leadership commitment on the part of senior leaders in every IC and military organization.

Achieving a robust collaborative environment will require far more than just improving IT and enabling information sharing systems. While these actions will help, the obstacles—cultural, structural and managerial—to institutionalizing collaborative practices across a diversity of cultures run much deeper and go to the heart of how the community has traditionally conducted its affairs. Better IT networks alone will be unavailing in the absence of a culture that encourages their use.

While technology is an important multiplier in promoting better collaboration, collaboration is unlikely to become embedded in the operating culture until work processes take advantage of its potential power. Senior leaders need to demonstrate their support for collaboration by "walking the walk" if they "talk the talk." Some senior leaders have established their own blogs, and a growing number are using collaborative platforms to request information and articulate their vision. More important, senior leaders must empower their workforce to integrate such tools into the daily work process, hold subordinates accountable for fostering transformation, and accept or even encourage the risk inherent in change.

Antiquated policies also play a big role in impeding effective collaboration. In all too many cases, risk aversion trumps risk management, and the need-to-know trumps the need-to-share. The Intelligence Community, for example, has explicit penalties for sharing information too broadly—including loss of employment—but imposes no comparable penalties for sharing insights and information too narrowly. Analysts battle over who gets credit as the primary drafter, while those who contributed significantly to the quality of the final product often go unmentioned. Team building and teamwork often are overlooked and sometimes even rejected as criteria for career advancement.

4.2.C. Core Principles

To overcome the obstacles and achieve a truly collaborative and integrated community, a major transformation is needed in how the IC conducts its business. This will require the entire workforce—and particularly senior leaders—to understand and embrace three Core Principles:

4.2.C.1 Responsibility to Provide.

The Intelligence Community must move from a culture and mindset of "need-to-know" to a culture where everyone accepts responsibility to share information with those who need it to perform their mission well. This concept has already been embedded in ICD 501 "*Discovery and Dissemination or Retrieval of Information within the Intelligence Community*," which directs all IC elements to make collected information and analysis discoverable by automated means. Further, it establishes that all authorized IC personnel have the responsibility to discover and to request information believed to be relevant to their assigned mission.[1] In addition ICD 208 "*Writing for Maximum Utility"* calls on the Intelligence Community to maximize support to multiple customers—including non-traditional customers at the federal, state, local and tribal

levels—by tailoring products to best meet customers' requirements at the appropriate classification level.[2] While responsibility to protect sources and methods remains, the expectation is that IC personnel will act in a manner that ensures that getting the right information to the right person is paramount.

Implementation of these directives is critical to ensuring uniform access to all relevant information for intelligence personnel striving to achieve common mission objectives—an essential precondition for effective collaboration. Colleagues will no longer be at the mercy of information "owners" to provide access or even awareness but can proactively seek access for all group members. Information must also be available through common information platforms that allow IC personnel with appropriate clearances to interact with each other and with the information in a transparent fashion. In addition, implementation of *"Writing for Maximum Utility"* will help open the doors to collaboration with nontraditional IC partners. As the workforce takes on more responsibility to share, management must also take on more responsibility for providing clear guidelines and additional training on the characteristics of a good sharing environment and how to properly protect sources and methods.

4.2.C.2 Empowerment to Participate.

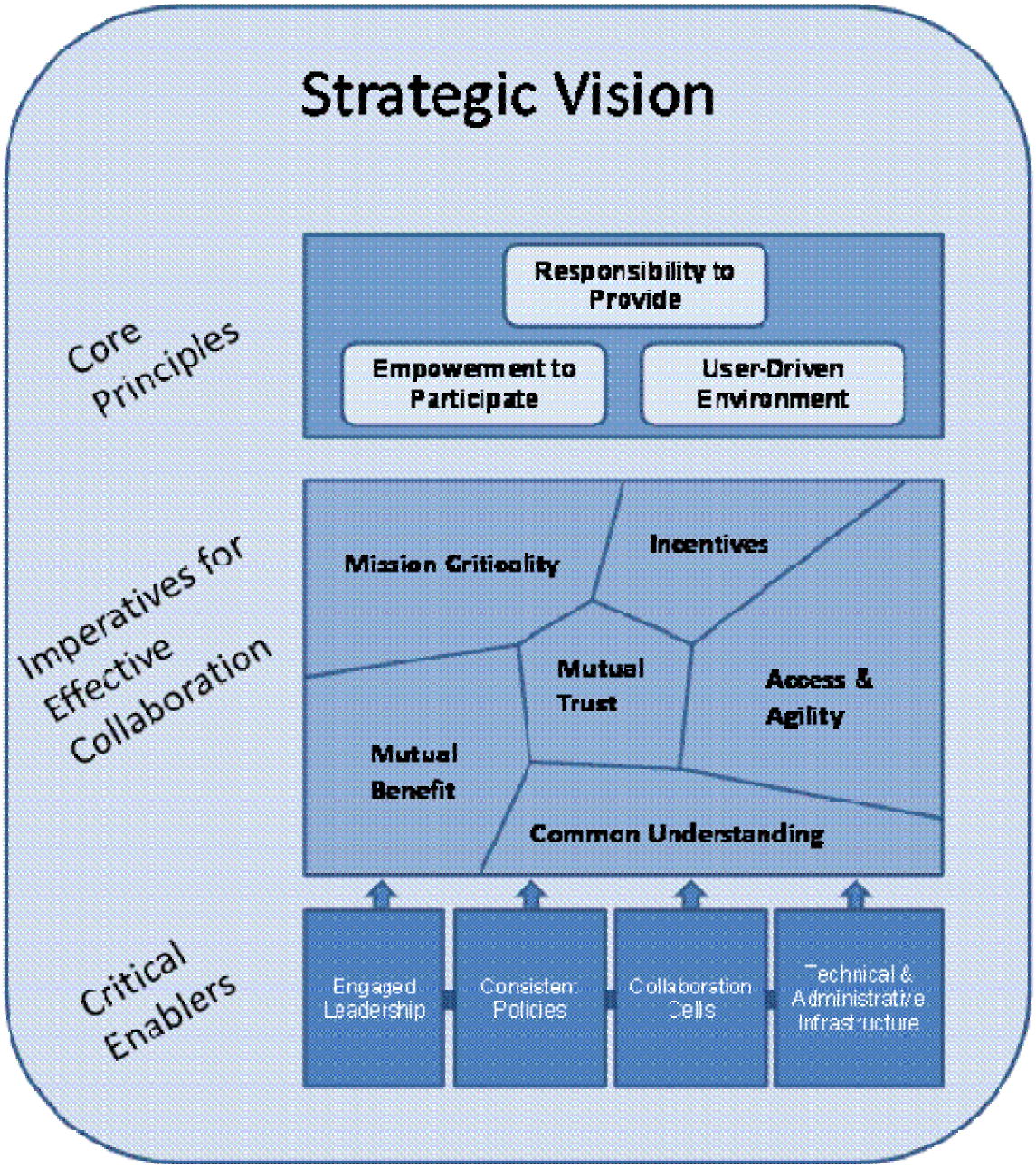
People should be empowered to share their insights, information, and work in progress (within pre-established guidelines) without being required first to seek the permission of their superiors. Empowerment also carries responsibility. Guidelines should to be established that set parameters for what can be shared, how, and with whom. Officers must be provided with explicit "rules of the road" for engaging with others both within and outside their organizations. The function of management is to audit these exchanges. Risk-averse managers may prefer the alternative—to require pre-approval for every interaction—but this will ensure that little collaboration takes place.

The key is to foster an open, sharing environment and accept the risk that on occasion someone might cross the line. From an information-sharing standpoint, it is far better to reel someone in who starts to cross the line than to discourage sharing in order to diminish or eliminate risk. Some mistakes may be made, but the overarching value is that a culture has been created where true collaboration may take place.

4.2.C.3 User-driven Environment.

Collaborative communities should be self-defining, self-creating, agile, and adaptive. The users should effectively own the environment. This principle simply acknowledges the complexity of the world in which we now must function. No longer does the community enjoy the luxury of Cold War targets that are mostly state-based and static. In today's world, targets are increasingly fluid and agile. They are more likely to be networks than states. It usually takes a network to confront a network, putting the onus on IT providers to instill the same degree of agility in the operating work environment if we are to succeed.

The Essence of Collaboration



4.2.D. Six Imperatives for Effective Collaboration

A review of collaborative initiatives suggests that successful sustained collaboration is most likely to occur when members foster a collaborative environment that promotes positive, even enthusiastic participation. The following characteristics, which we have dubbed the Six Imperatives, are key to creating and sustaining such an environment, particularly when participants need to rely on virtual collaboration to sustain their interactions:

4.2.D.1 Mission Criticality.

IC personnel must see participation in collaborative activities as essential to their core activities and not as a "nice-to-have" activity or as a resource to exploit when they have extra time. For virtual collaboration, users should feel a personal need to draw on the network, engage their colleagues, and work in the shared environment as part of their daily routine. If several organizations decide to collaborate in creating a joint database, the data should only reside in the shared space; no one should enter data into their "home system" and then enter it again into a "shared" database.

4.2.D.2 Mutual Benefit.

Participants must derive benefits from each other's knowledge and expertise in ways that help them perform their key missions. Participants should possess a shared sense of mission and articulate a common set of goals and objectives for the "collective good."

4.2.D.3 Mutual Trust.

True collaboration is a personal process that requires the willingness to share partly formed opinions and insights, risk being wrong, and adopt new collaborative business practices. For these reasons, people feel the need to trust those with whom they collaborate. A good way to develop such trust is to organize face-to-face meetings. Such sessions lay the ground work for future interactions in the virtual environment, particularly for the older generation of workers. Increasingly, behaviors and norms are emerging that foster trust among counterparts collaborating solely in virtual environments. As trust develops, participants then become much more willing to engage in collaborative behavior.

4.2.D.4 Access and Agility.

Collaboration requires that users be able to quickly connect with each other and, given the pace of world events, able to coalesce into virtual work groups or add new members to their group within hours, if not minutes. The government must be able to do its work at the same pace of business and with the same agility as its adversaries. Likewise, one size does not fit all. Policies and collaboration tools must enable innovation, "public" thinking, broad dissemination, and the tracking of source and method but also permit compartmented, small group collaborations.

Achieving the necessary degree of agility requires not only common access to the same work environment but pre-established networks and business processes that foster the organic shaping and re-shaping of collaborative communities as demanded by the global events. One innovative approach is to establish "trust bubbles" comprising interlocking cells of six to eight colleagues. It is easier to maintain a high level of trust in such small cells. Individuals who belong to two or three cells are also much more efficient human sharers of information. They know exactly how much information their colleagues can absorb and what is most appropriate to share given that group's culture and work style.

4.2.D.5 Incentives.

Collaborative work practices must save participants time over the long run, increase their impact, and enhance their careers. The most important, and often overlooked, incentive for collaborating is the psychic reward from solving a hard problem, improving the intelligence product, or saving time. Effective collaboration at the start of a project almost always leads to faster coordination at the end. Management needs to reinforce these messages by giving credit for collaboration and teamwork when evaluating their personnel.

4.2.D.6 Common Understanding.

A concerted effort to understand cultural differences across the multitude of agencies and to develop a common lexicon and transparent rules of engagement can reduce misunderstanding and use those differences to improve the quality of intelligence. Given the wide variety of organizational cultures, the chances for miscommunication abound. Anecdotal evidence derived by the authors from a decade of working with interagency teams and task forces suggests that the amount of miscommunication that occurs in such settings is consistently underestimated. Similarly, the need for lists of common terms, acronyms, and definitions cannot be understated. For example, great value can be derived from documenting in one place all the key assumptions that underlie a group's analyses and operational decisions. The simple process of listing the key assumptions usually forces everyone to critically examine and prioritize the list. Differences of opinion can often be traced to the varying definitions team members are using for terms such as collaboration, system, and information sharing. The development of mutually agreed-upon Rules of Engagement for a collaboration initiative or environment can promote a common understanding and build mutual trust.

4.2.E. Critical Enablers

Successful implementation of a robust culture of collaboration requires proactive engagement by the members of the Intelligence Community to ensure that, first, the technical infrastructure is in place and, second, that organizational and community policies and practices are aligned with the vision of an integrated, collaborative IC. The authors assess that four critical areas need to be addressed to enable the transformation.

4.2.E.1 Engaged Leadership.

Virtually every study of successful transformation of a business culture includes a key finding that change must be led from the top. If CEOs do not practice what they preach, then many employees will view pronouncements about the need to collaborate as empty rhetoric or just another fad. More important, engaged leaders send a powerful message to the workforce when they integrate collaborative practices into their daily work practices—and those of their staff. This validates the message that collaboration is not only a preferred mode of conducting business but is the most effective way to do so. Needless to say, the use of web-based tools has created some discomfort within the ranks, especially among mid-level managers. Although some have resisted this more collaborative way of doing business, most will learn quickly how to play by a new set of rules if an appropriate set of incentives are in place.

4.2.E.2 Collaboration Cells.

Collaborative systems are almost certain to fail in large bureaucracies if the participants do not have access to "human enablers" or facilitators who can advise on how to work best collaboratively and assist in tailoring a set of collaborative tools to specific work objectives.

Collaboration Cells provide this essential ingredient in the process, addressing key human factors that have traditionally been overlooked. They help translate the vision of senior leaders and assist both managers and employees in tailoring application of the Core Principles and Six Imperatives to their specific requirements. Collaboration cells can also lead the way in promoting best practices and leveraging lessons learned across the community. (For more details on this concept see article 5.5 on Transformation Cells.)

4.2.E.3 Consistent Policies.

Policies must support collaboration and be adjusted when they do not. Managers should be particularly alert to situations where oft-cited "policies" turn out to be better described as deeply encrusted traditions. In many cases, when collaboration collides with bureaucracy, closer scrutiny will reveal that what was asserted as dogma is no more than common practice that can be fairly easily changed. Policies must also be consistent across all organizations. Requiring people who work in the same spaces to operate under different sets of rules quickly erodes the ability to collaborate.

4.2.E.4 Technical and Administrative Infrastructure.

One of the quickest ways to discourage the instinct to collaborate is to make tools difficult to access, make them too difficult to use, or deny officers much-needed technical support when difficulties arise. Analysts, collectors, and operators are much more inclined to try out and continue to use collaborative systems and software when the tools are intuitive, access is easy, and technical support is available—preferably within hours, or at most days. Administrative practices must also be consistent with an organization's Core Principles and the Six Imperatives of effective collaboration. Personnel appraisals should include collaboration criteria, stressing both the willingness to work in teams and the development of specific collaborative skill sets. Similarly, security policies in each organization should be scrubbed to determine if they unnecessarily impede efforts by the workforce to move across organizational boundaries and personally engage colleagues in other organizations.

4.2.F. Instituting a More Collaborative Work Process

Transforming how the government conducts its daily business is a daunting task. Effective change management requires strong leadership, a well-articulated vision, constant iteration, and persistence. Cultural change demands a long-term strategy and a senior leadership fully committed to change. The good news is that most organizations already have a solid community framework to build on and an increasingly younger workforce that they can empower. A successful collaborative work environment can be achieved within a matter of a few years—not decades—with a modest investment in collaborative tools, training, and staff support accompanied by committed and visionary leaders.

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[1] ICD 501, The Discovery and Dissemination or Retrieval of Information Within the Intelligence Community. 21 January 2009. http://www.dni.gov/electronic_reading_room/ICD_501.pdf.

[2] ICD 208, Writing for Maximum Utility, 17 December 2008, http://www.dni.gov/electronic_reading_room/ICD_208.pdf

4.3. Lessons about Collaboration in Army Intelligence – the Interface of Man, Data and Machine (Joseph Carls - US Army GS-15 ret, Carl Hunt - DTI and Bert Davis - ERDC)

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4.3.A. Introduction

In the early 1960's one could have observed collaboration in intelligence analysis at remote "listening stations" in various locations around the world. As an example, a complete change in the target communications environment (call signs, operating frequencies, transmission schedules, etc.) might periodically occur. Signals analysts would set up small field tables directly behind radio intercept operators and directly exchange information and analytic comments—operator to analyst to operator—as they worked their way through reconstructing the picture of the target communications environment. Operators could often "hear" unique operating characteristics of target communicators and identify a particular operator with his former call sign or similar relationships. This in turn would become a key factor for the analyst in putting the pieces back together to create the picture of the target communications environment. Unfortunately, automation within the communications world has largely carried us far beyond that level of collaboration today. Nonetheless, we have successfully collaborated in military intelligence for at least the past forty five years, but have generally sought to enhance it with technology rather than process to establish the right culture.

4.3.B. Collaboration in the Wild

The idea of collaboration has always held out an attractive promise. The ability to share, and even methods for exploiting that shared information in new and more effective ways, constitutes one of the most intriguing paradoxes we face. The paradox stems from the situation that the more technology enables us to share, the more we question the utility of sharing. We all know intuitively that collaboration and sharing should make us all smarter, but we also know that we dislike being challenged or questioned by others. We also know that information represents power and most find it tough to share power. Fortunately, newer generations of soldiers and government civilians in the intelligence community seem to have become more comfortable living in the world of collaboration. Still, too many of us need help to achieve the greater comfort level we all seek. Technical incompatibility currently represents a great obstacle, yet to some degree the discomfort with sharing rings true in the Army military intelligence community where the friction of power in knowledge and trust in relationships temper the potential for effective collaboration.

So collaboration in the wild, as it were, remains quite different than collaboration we all read about in magazines and books. It's absolutely true that we in the military perform better as teams of people who know how to cooperate and communicate with each other, but even that sometimes falls below the standard of effective collaboration unless worthwhile processes (including technology) become established to reinforce good, sharing behaviors. The next paragraph will examine some of the cultural inhibitions to collaboration that have grown up

almost simultaneously with the reasons and incentives to collaborate. It's been a process of co-evolution of good and bad, one might say.

4.3.B.1 Inhibitions to Collaboration in the Wild (or Anywhere Else)

Collaboration within a single military service appears relatively easy, if that service demonstrates the commitment to establishing the culture and enabling technology in the first place. However, based on direct experiences and observation over the years, difficulties can and do arise in regard to joint operations because of the differing perspectives of the various services. The Air Force tends to view the world from the big blue sky from say 35,000 feet above the ground (in which friendly and enemy aircraft are relatively easily discerned). The Navy view is in the big blue ocean (in which friendly and enemy are still relatively easily discerned) probably five miles (or more) over the nautical horizon.

The Soldier and the Marine ashore view of the world typically occurs at an average of about 5 feet 11 inches above the mud in an environment filled with good guys, bad guys and innocent by-standers jumbled together among buildings, trees, and all sorts of other distracters, perhaps rampant with IEDs and all sorts of other unknown threats. And now we set about collaborating among the services with their very different perspectives of the total battle space. Perhaps it's little wonder "we have a problem, Houston."

Another impediment to collaboration is the varying levels of security classification of information. Overcoming the issue of sharing information and collaborating on its analysis across the classification domains is receiving a great deal of concentrated effort, but it still represents an established impediment that has been frustrating collaboration for many years. The solution is "just around the corner", but that has remained up to now an unrealized promise.

In the lead author's humble opinion, the greatest impediment to collaboration is the lack of trust between and among various intelligence organizations, built upon years of interagency and inter-service rivalries, the causes of which are quite often based on budgets and influence struggles. Consider the following, for example:

1. Special Operations folks tend to mistrust service intelligence organizations and prefer to use their own sources plus information from trusted national intelligence organizations. Why? Because the service intelligence organizations have historically been slow, inaccurate, incomplete or even undependable. The lead author recalls Brigadier General (Ret.) Dick Potter telling him once that he could never get timely, accurate intelligence from the Army during Operation Desert Storm and had actually called friends in a national agency to open a flow of information to support his mission. Special Operations also suffered a real blow in the desert in Iran in the failed attempt to free hostages taken when the US Embassy in Iran was seized by militants – the intelligence for that operation was, at best, incomplete and inaccurate or maybe just plain wrong. Maybe they have a legitimate cause for some reservation here.[1]
2. Organization ***A*** has a data base of information of intelligence value that it has spent great effort in gathering, assessing, organizing, evaluating, etc. ***A*** doesn't want some yoyo from organization ***B*** going into its data base and mucking it up. In addition, organization ***A***, in its infinite wisdom, knows beyond all doubt that only its analysts understand the data. Therefore, it is more than happy to supply a customer with specific reports in response to their specific needs, but no way are they going to share the raw data. Collaboration? Why?

The answer should be plain. Until the intelligence community overcomes its proprietary predispositions and its relative intellectual arrogance, we will continue to talk a good game in regard to collaboration, but real collaboration across the board – maybe not that soon!

3. There is also a mind set in some circles that runs something like "My share of the intelligence budget is dependent on my successes. Why should I share information, let alone actually collaborate with another intelligence organization only to see them get the credit at the expense of my next year's budget. Forget it!" Admittedly, this may be more of an issue between non-Defense agencies, especially those with a law enforcement responsibility. Military Intelligence suffers more so in that it can't get the information or collaborate any easier than any other agency in this budgetary environment "protect my budget" mind set.
4. Finally there is an issue of time. In a research environment where scientific colleagues may work for months or even years on solving a problem, there is plenty of time for collaboration to develop and mature. On the battlefield, our young analyst has hours or at most a few days (12 hours or less in the planning/decision cycle at the lower levels of command and maybe as much as 96 hours at corps or above). In this time, they must learn well enough to collaborate and share in order to solve a life and death problem that may include his or her own life. In such cases, perhaps we are expecting too much in looking for real intellectual collaboration among analysts in the tactical environment.

But all is not lost. The intelligence community, and particularly the military intelligence community, is also home for the greatest of professional analysts and intelligence operations people in history. Increased emphasis on training and education that stresses the value of collaboration and sharing also helps. Perhaps it's more a matter of awakening analysts and their leaders to the value of collaboration and sharing, and in learning to share credit on behalf of a more grateful operator who better understands the challenges that an intelligence analyst must overcome to deliver the right information at the right time and place. Meaningful collaboration processes are truly important here.

4.3.B.2 Mitigating the Inhibitions to Collaboration

As we await the development and implementation of processes needed to make collaboration as routine as other business processes (as discussed below), there are some lessons learned that can help to mitigate the tendency to hoard or compartmentalize information. These examples come from the way in which human analysts interact with their automated counterpart: the computer.[2]

The thought of almost any relatively complex analytic function being performed by a human without computer assistance verges on the absurd. Conversely, the power of a "pure" artificial intelligent (AI) system (where the computer completely replaces the human) typically pales in comparison to a combined human-computer reasoning system; in this superior situation the computer serves as a "cognitive amplifier" to the human's intellectual reasoning. This is a rudimentary form of collaboration in which both of the collaboration partners share information within a commonly understood environment and they depend on each other for accuracy and thoroughness.

Because of this, the evolving trend for powerful reasoning systems is for the human and the computer to share the reasoning workload. In such a configuration the computer provides the repetitive low-level reasoning, and the human provides the common sense and higher-level reasoning; the human also considers "intangibles" or intuition gained from experience. This mix

of reasoning tasks requires a series of "negotiations" between the human and the computer, where the human "explains" to the computer its assigned roles and the computer fulfills those roles within the limits of its programming.

Of course, such current formalisms for sharing reasoning workloads and negotiations between collaboration "partners" exists more by necessity than by "agreement". Humans have the potential to give-and-take to find ways to agree, while humans and computers for the foreseeable future will require strictly-adhered-to rules in order to share and collaborate. Perhaps the first step towards mitigating inhibitions and making human-to-human collaboration more routine then will be in mimicking some of the most relevant rules that enable the man-machine interface. Processes might then evolve from these early rules that make collaboration and sharing between human analysts and operators not only necessary but also desirable.

Fans of science fiction might imagine an environment in which machines learn to practice collaboration and produce value that exceeds the sum of the individual machine contributions. *Star Trek* fans may recognize such collaboration as a Borg-like function, but that also might rob us of the human dimensions of creativity and discovery. Perhaps we can find ways to blend basic machine-based rules with the human qualities of creativity to start building collaboration processes that overcome the inhibitions to sharing and yet avoid rote and excessive rigor. Creativity and sharing must go hand-in-hand.

At the risk of praising the Borg, they did appear to master the art of real-time collaboration and sharing. We were fortunate that Gene Roddenberry conceived a species that had not learned to fuse such a high-level of collaboration with human forms of creativity. Not all the lessons learned must come from actual experiences!

4.3.C. Processes to Overcome Inhibitions to Collaboration

Within a single service, or even within the separate component commands in Joint Operations, there are many current examples of collaboration. The US Army INSCOM Information Dominance Center/Intelligence Operations Center has assigned missions to provide analytic support to tactical forces forward deployed ("Tactical Overwatch"). Support options consist of INSCOM sending analytic results forward based on several factors: potential value to the deployed organizations; responding to specific requests for support from the deployed organizations; or in true interactive collaboration between analysts at INSCOM and those forward deployed. The best methods are not always clear, of course, but there is an element of necessary and relatively effective collaboration through various standing operating procedures, a distinct process if you will.

Use of video teleconferencing is common throughout the DoD but it appears to be most frequently used for management, logistics, and command and control of operations. Technological capabilities such as DISA's Net-Centric Enterprise Services and Army Knowledge Online (AKO)[3] offer simple and secure means to post and share information in community-controlled sharing environments, but we haven't quite developed the processes that encourage and perhaps even eventually require collaboration at that level. The capabilities for true interactive, analyst-to-analyst collaboration are certainly there, and there is no doubt that they can and do work when there is a commitment to sharing and collaboration. The real challenge is thus in developing and implementing the right processes that make it work.

Consider the potential to create meaningful processes enabled by collaboration technologies embedded in an environment such as AKO. AKO is built around a community of interest (COI) approach. This means that users are empowered through the AKO environment to self-organize and establish a "private" workspace to store files and host meetings that can be open but selective at the same time. The managers of the COI control access at an appropriate level, through invitation, but ensure that relevant files and discussions about analytical efforts are maintained in an environment that is accessible to those that contribute to or review the effort. The contributors may be distributed around the globe, and in fact may not even be part of the core discipline of the COI, depending on the needs of the COI. In this case, the rules and processes of the collaboration environment support the ability to collaborate without overly constraining it. Rules support discovery rather than inhibiting it. And, ultimately, the COI may in fact be open to anyone to discover and join, depending on the sensitivity of the information contained within the COI.

Within the last few years, AKO has expanded to embrace all of the DoD and has begun to reach out to other national security organizations in the form of Defense Knowledge Online (DKO).[4] DKO generally offers the same sets of tools in which to build COIs similar to those that can be developed and governed in AKO. DKO and AKO are available to users at both Unclassified (which includes "For Official Use Only") and Secret levels.

Other collaboration environments, often sponsored by the Intelligence Community also offer similar capabilities. One fine example is Intelink, which is hosted in Unclassified, Secret and Sensitive Compartmented Information environments. Each of these three levels allows interagency participation, including appropriately cleared members of the law enforcement and diplomatic communities, as well.[5] *HarmonieWeb* is one particularly interesting application of collaboration tools and processes that operates in a fully unclassified environment yet offers a significant suite of collaboration tools and the ability to develop processes to exploit the need to collaborate.[6]

4.3.D. Conclusions

This piece emphasized the cultural aspect of collaboration from an Army perspective. The biggest obstacle that has been the object of Army efforts, particularly since 2005, remains technical incompatibility. In this same timeframe, cultural impediments have started to dissolve, expressly due to some of the technology enabling collaboration. While some National agencies have been less cooperative than others, Intelligence Community Directive (ICD) 501 makes a substantial move in the direction of breaking down impediments and walls.[7]

One point to remember regarding this: the fidelity and use of data varies by echelon. When a Brigade Combat Team Intelligence Staff Officer (the unit S2) contacts a National agency directly, as regularly happens today, the door opens. The issue has less to do with one of changing data, but using it for a different end. Conversely, the last few years have demonstrated the National agency appetite for tactical data. Again, they have different uses for the data that makes it more important that the data become available in its original form.

While the ideas on collaboration processes and the technology to support it have only begun to fully emerge at this point, these ways of doing business will prove critical to building sustainable and repeatable methods for sharing and collaboration. Only by instituting and training against such processes will we be able to capitalize on the lessons learned from the Army military intelligence experience or indeed the experiences of any intelligence community partner.

"Lessons Learned" have become valuable sources of information for the military community and indeed for many government institutions. The convergence of man and machine, particularly when augmented by the kinds of human-built collaboration environments we find emerging in communities such as AKO, DKO, Intelink and *HarmonieWeb*, offer us accessible and useful ways to share and learn from these lessons of the past. In fact, as we have seen in the case of science fiction such as *Star Trek*, perhaps we don't even need to experience some lessons to learn from them.

A magnificent, though fictional, work on a potential future of collaboration, Vernor Vinge's *Rainbows End*, foretells of a time when it is possible to share almost anything with anyone at any time, both visually and verbally. Lessons learned are instantly accessible and can even be modeled and simulated on the spot to provide access to new, although virtual, experiences. The key to drawing insight from lessons learned, however, is to ask good questions. In one scene, one of the characters describes the value of browsing the stacks of books in a library that he claimed could never be replicated in a fully automated environment. This invokes another lesson we must bear in mind as we move towards instantly available and shareable information…

> *"In all the thousands of times I've gone hunting in the stacks, I've seldom found exactly what I was looking for. You know what I did find? I found the books on close-by topics. I found answers to questions that I never thought to ask. Those answers took me in new directions and were almost always more valuable than whatever I originally had in mind."*[8]

Exploiting the value of collaboration through lessons learned is fundamentally important to improving the way in which we share and build communities of interest to tackle the very hard problems we will face in national security. The convergence of man and machine only aggravates that problem by offering to speed up every process we have ever used to share and learn. It will always be important to ask the right questions of the lessons we learn and ensure we are open to discovery and creative uses of those lessons. That, in the end, is what will keep us from becoming the Borg, no matter how good they were at collaboration. And that might be the best lesson of all.

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[1] Personal recollections from Joe Carls from his years of service with US Army INSCOM, both on active duty and as a senior civilian at INSCOM.

[2] This section concerning the man-machine interface in collaboration is based on an unpublished White Paper by LTC Jerry Schlabach, US Army MI (now retired), formerly of INSCOM, entitled "Cognitive Tools for Intelligence Processing – A White Paper." This paper was written by LTC Schlabach in the late 1990's to address the broad issue of "How can the I&W (Indications and Warnings) community best exploit cognitive tools to support the MI professional of 2010?"

[3] See https://www.us.army.mil/ and the Wikipedia article on AKO at http://en.wikipedia.org/wiki/Army_Knowledge_Online for general orientations on the purpose and function of AKO.

[4] Defense Knowledge Online is accessible through AKO or through other military portals, but is run by the Army on behalf of the Defense community.

[5] See the Wikipedia article on Intelink at http://en.wikipedia.org/wiki/Intelink for a general overview of the collaboration environment and the capabilities it offers within the various classification levels it serves.

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[6] See http://www.harmonieweb.org/Pages/Default.aspx for more information on *HarmonieWeb*. According to the introductory page on the website, "HARMONIEWeb.org is an internet accessible environment for the exchange of information across the civil-government boundary associated with Stability, Security, Transition and Reconstruction Operations or Humanitarian Assistance and Disaster relief."

[7] United Stated Intelligence Community, Intelligence Community Directive, Number 501, Discovery And Dissemination Or Retrieval Of Information Within The Intelligence Community, 21 January 2009, http://www.dni.gov/electronic_reading_room/ICD_501.pdf, accessed 23 April 2009. The primary objective of this directive is to: "Foster an enduring culture of responsible sharing and collaboration within an integrated IC." The authors would also like to acknowledge the assistance of COL James H. Harper, US Army TRADOC Capability Manager, Sensor Processing, Fort Huachuca, AZ in reviewing this document and guiding the conclusions section, particularly the role of ICD 501.

[8] Vinge, V., *Rainbows End*, Tor Books, NY, 2006, pp. 127-128.

4.4. Complexity, Competence, and Collaboration (Brian Meadows, Wallace Wulfeck, and Sandra Wetzel-Smith - SPAWAR)

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4.4.A. Introduction

For collaboration tools to affect analysis, they must support the tasks analysts do, and support the ways they think. First, the kinds of problems analysts are trying to solve (e.g., prediction of rare events, understanding opposer's capabilities and courses of action, making sense of emerging events.) are incredibly complex -- they require years of training, education, study, and experience. To cope with this complexity, analysts also require training and support systems carefully developed to support expert performance. Second, there is a reasonable literature on group problem solving and collaboration. Simply throwing potentially large numbers of people together into some sort of collaborative experience is not necessarily a good way to get superior problem solving or decision making, and adding extra people often increases production time. Third, collaboration is not in devices or networks that support it, but rather distributed over people and systems. Developing the problem solving and collaboration skills necessary to attack hard problems will take systematic coordinated development of training, practice, and collaboration support systems. The US Navy is developing command and control systems designed to promote collaborative planning, operations, and assessment.

It is generally thought that collaboration is good – that several people or organizations working towards a common goal might mean that goals may be met sooner or more elegantly. The social psychology literature includes many studies related to group dynamics and group problem solving. In general, while results are mixed, it appears that small groups outperform individuals or large groups in problem solving. Many technologies have evolved to support collaboration, including idea-generation and knowledge structuring techniques, and knowledge management systems.

The management literature also documents the use of collaborative tools to accomplish significant complex work, for example software development. There is also a growing literature on the use of computer and communications technologies to support collaboration. For example, the Association for Computing Machinery (ACM) has supported a major biennial conference on Computer Supported Collaborative Work since 1986.[1]

The purpose of this paper is to give our perspective on some of this literature, and describe some of our experience with the development of collaborative systems for training complex command and control tasks for Anti-Submarine Warfare (ASW) in the US Navy. Although none of us has a background in intelligence (our training is in Physics, Mathematics, Computer Science, Psychology and Naval Warfare), ASW does involve many analytic tasks: evaluating opposers' vulnerabilities and capabilities, modeling them in tactically interesting environments, making predictions about the effectiveness of sensor systems, generating and evaluating courses of action, and collaborating across dispersed teams.

4.4.B. Complexity

Analysis is often an incredibly complex task, in that it involves extremely complicated judgment, planning, and decision making, and requires extensive expert-level knowledge and skill. In earlier work we have described such "Incredibly Complex Tasks" as requiring years of highly contextualized study and experience.[2] They are tasks that require deep expertise and highly focused practice for successful performance. These are the kinds of tasks that lay people speak of as "rocket science" or "brain surgery."

Complex tasks involve abstractions rather than concrete phenomena. They usually involve multiple interacting causes or sources of variation that affect outcomes. They involve non-linear processes that are dynamic, continuous, and have many simultaneously "moving parts." They are characterized by uncertainty and ambiguity.

Some of the properties of tasks that contribute to complexity are given in Table 4.4-1. Many of these properties were identified in the context of medical decision making[3] or in ASW.[4] Some of the same criteria are identified by Heuer[5] in the context of intelligence analysis.

Table 4.4-1. Factors Affecting Complexity[6]

Property	*Description*
Abstract	Physical phenomena or causation are not readily visible
Multivariate	Many variables underlie outcomes.
Interactive	Changes in one variable may affect several others. Processes are co-dependent.
Continuous	Physical phenomena and their effects are described as values along continua, rather than as discrete properties.
Non-Linear	Relations among variables are not simple straight-line functions
Dynamic	The process of variation is of interest, rather than end-state
Simultaneous	Systemic variation is coincident rather than serial.
Conditional	Outcomes are highly dependent on boundary conditions and context.
Uncertain	Values of underlying variables are imprecise estimates, interpolations, approximations
Ambiguous	The same outcome may arise from different combinations of inputs.

4.4.C. Complexity and Competence

Training for incredibly complex tasks needs to 1) teach principles underlying abstraction, 2) help learners cope with multiple sources of variability in the problem space, 3) provide aids that reduce memory load, 4) provide strategies for dealing with uncertainty and ambiguity, and 5) provide training in problem solving, judgment, and decision making.[7] Some design guidelines for training and performance aiding systems for complex tasks are given in Table 4.4-2.

However, training by itself is not sufficient to develop expertise; there must also be extensive periods of deliberate practice.[8] Moreover, for highly expert performance, intensive practice often continues for at least a decade. Gladwell[9] cites Ericsson et al's "10,000 hour rule": About 10,000 hours of deliberate practice are necessary for development of expertise.[10] Note that this is not merely 10 years of experience with a task, but rather 10 years of deliberately increasing difficulty and complexity so that performance is continuously improved. This means that

performance support tools and processes, including collaboration, communication and decision-aiding tools, need to be built to develop and support expert performance over periods of decades.

Table 4.4-2 Design guidelines for training and performance aiding systems to support complex tasks.[11]

Property	*Design Guideline*
Abstract	Develop visualizations that explain underlying physical phenomena and causation
Multivariate	Develop simulation-based/physics-based problem space in which effects of variation can be explored
Continuous	Provide for continuous variation, not a succession of states.
Non-Linear	Explore the non-linearity: Concentrate on inflection points, minima, maxima, zero-crossings, asymptotes
Dynamic	Task environment must include dynamic complexity – Scenarios must present continuous evolution, not a succession of static states.
Interactive	Systematically hold some variables constant while exploring variation. Use no more than three-way interactions for problem cases.
Simultaneous	Develop mental models for simultaneity as underlying interaction, not serial causation.
Conditional	Provide highly contextualized environment that is capable of supporting practice in high-difficulty real-world environments.
Uncertainty & Ambiguity	Develop methods / procedures for resolving uncertainty / ambiguity. Task environment must properly replicate these effects. Develop test scenarios that exploit uncertainty.

4.4.D. Collaboration

There are several kinds of expert performance that can be supported by collaborative tools. *Situation Awareness* tools help in the conduct and management of operations by providing shared status and process information for decision makers and staffs. An example of such tools began as a "knowledge wall" or "knowledge web" at the Space and Naval Warfare Systems Center Pacific.[12] It is designed to provide a consistently formatted graphical interface to tactical and summary information supporting a Commander's critical information requirements. The concept was later tested with a multiple-aircraft-carrier battle force deployed in the Middle East during the September 11, 2001 time frame. One of the innovations in this work was that knowledge was organized by its use for decision operations rather than by its source, a strategy known as task-centered or user-centered design.[13] Another lesson learned is that users of the system came to drive its contents and organization, because only they had sufficient expertise in the tasks the system supported.[14] The knowledge web concept has since been implemented in other operational command centers and situation rooms throughout the government. Web-based knowledge aggregation tools for portals and "mashups" are now available to make the development of business and/or user data integration services easier, and user-level tools are becoming available which allow end-users to construct their own customizable information-monitoring pages.

A second class of activities which can benefit from collaborative web services is rapid-reaction *problem solving.* An intelligence-community example is *Intellipedia* based on wiki technologies.[15] Calabrese[16] recently described a case where intelligence officers' field requests for information were quickly addressed by experts, without formal inter-agency coordination, through web-based collaboration. The social psychology literature has included work on group dynamics and group problem solving for decades.[17] In general, small groups of problem solvers outperform individuals working alone. For example, Laughlin et al[18] found that groups of three are more efficient and accurate than larger or smaller groups on moderately difficult problems that require the use of logic, verbal, and qualitative reasoning.

A third and perhaps most important class of expert-level activities is *production* of intellectual products, such as operational plans, designs for large systems, large software programs, and assessment or estimates. Here, collaborative tools can provide assistance for many of the stages of production, including plan generation, course of action analysis, modular development, and quality control and verification.

In early plan generation and analysis, fluency of idea generation is crucial, followed by analysis of alternatives. This is often the work of individuals: it is probably not an accident that large creative works such as novels, symphonies, architectural designs, or advertising plans, are begun by individuals or very small teams. Moreover, the work of creation is the work of experts. Idea generation is based on what is already known,[19] so that high prior knowledge is likely to lead to more generation. Further, experts with more abstract approaches to tasks (associated with higher domain knowledge) might develop more original products as a result.[20] However, even here it seems that priming individuals with ideas (e.g. through collaboration) might improve creative problem solving.[21]

One of the bibles for the management of large developmental projects is Fred Brooks' *The Mythical Man Month*[22], which contains a wealth of insights distilled from years of experience in developing really large software systems. Brooks is famous for the aphorism that "adding manpower to a late software project makes it later." He advocates a small surgical-team approach to production management, with a chief architect and sub-pyramids of developmental activity, in order to achieve conceptual integrity coupled with the productivity of additional workers. He also advocates as much communication as possible across this organization, including status and technical briefings, electronic mail, etc.

Brooks also makes two other related points. First, he notes that choice of representation is a large driver of program efficiency; that strategic breakthroughs come from new processes or ways of thinking about problem. This same point is made several times by Heuer,[23] noting that successful analysis depends on ways of perceiving and thinking about problems. Second, Brooks notes that successful project managers spend only a small proportion, say 20 percent, of their time on tasks where they need information from outside their own heads. This is in part a comment about the expertise and extensive knowledge required for complex tasks, and we suspect the same may be true of expert analysts. But he notes that so-called management information systems may not be based on good characterization of expert decision making and production management.

An alternative to this more traditional hierarchical model is the emergence of open-source[24] software development or knowledge production, such as in the *linux* project or in *Wikipedia.* Kittur and Krout[25] address the problems of coordination of contributors in *Wikipedia*. They surveyed over 25,000 articles and noted that to achieve high quality, "our data suggest that it is

important to have a small number of contributors setting the direction, structure, and scope of the article at the beginning of its life cycle, either implicitly by actually doing the writing or by explicitly communicating and coordinating. As the article matures and coordination requirements ease, tasks may be more effectively distributed to a larger group of contributors."[26](pg. 44). Their results clearly demonstrate the "critical importance of coordination in effectively harnessing the 'wisdom of the crowd'", and in many ways reinforce older experience such as Brooks and other studies of production management.

One of the common themes in all this work is what Brooks calls "enforcement of conceptual integrity." Performance of any abstract task requires a "mental model" of the task environment,[27] and collaborative tasks require "shared mental models".[28] Heuer emphasizes this point in the case of intelligence analysis. Thus, it should be clear that situational awareness must be integrated with production, and that the right mental models shared across the appropriate team of collaborators need to inform the design and contents of collaborative tools. Hollan, Hutchins and Kirsch go much farther in their theory of Distributed Cognition: … "in order to understand situated human cognition, it is not enough to know how the mind processes information. It is also necessary to know how the information to be processed is arranged in the material and social world."[29] They view complex cognitive processes as distributed over both groups of people and external structure in the environment, and they advocate design of work environments that are conceptually meaningful and cognitively coordinated with their users.

4.4.E. Building Systems for Collaboration

So far we have recommended that performance support tools and processes, including collaboration, communication and decision-aiding tools, (1) address abstract complex tasks at expert levels of performance, (2) be built to develop and support expert performance over periods of decades, and (3) support distributed cognition among collaborators and the tools of production.

Well, all this is much easier said than done. For one thing, it requires an evolutionary approach to the development of collaboration systems. For the last 18 years we have been involved in developing training for operational users of ASW sensor systems.[30] Our effort, called Interactive Multisensor Analysis Training (IMAT), has focused on training at all levels from initial individual training ashore through team, platform, and collective training at-sea, at all skill levels from apprentice sensor operators to senior tactical commanders. These include:

- Instructor or student-controlled visualization tools for classroom learning
- Deployable systems for operational training
- Collaborative systems for collective training in multi-ship ASW operations
- Command-level training and performance support systems for senior level staff.

Early in our development we recognized that operators and tacticians at all levels need a deep and scientifically accurate, but not necessarily formal, understanding of the physical principles that underlie tactical employment of their sensors. Our training built model-based scientific visualizations of the underlying physical phenomena, including three-dimensional graphics and animations, to illustrate complex abstractions in mission-relevant contexts. These systems provided interactive virtual laboratories in which the principles underlying sensor employment and tactical decision making can be explored.

After several years it became clear that these systems had operational value in addition to their utility for training. This led to two different developments. First, the visualization systems for

sensor performance prediction became on-board tactical planning aids for use by sensor and command teams during at-sea operations. Second, real-time versions became full-scale simulations for combat systems team training, including multi-operator collaboration training.

The next major development was focused on ASW by multiple ships operating in battle groups, and on using network connectivity to achieve multi-ship collaborative ASW. This included multi-platform ASW planning and tactical execution aids that support network-enabled collaboration. These were supported by task and mission analyses for ASW operations and tactics, training curricula, new-technology network-based training systems, planning tools, tactical decision aids, and assessment/reconstruction tools. The development approach was to prototype performance support systems, provide training to fleet users, and then progressively refine them through heavy interaction with operational users and rapid test and revision.

These tools were then incorporated into a larger developmental system for collaborative command and control called Composeable FORCEnet (CFn). FORCEnet is the Navy's overall program for network-enabled command and control systems for fleet operations. The term "Composeable" refers to the capability of the system to add or adapt web-services-based information sources or processes, including various forms of collaboration, as needed for particular tactical or warfighting contexts. Elements of the CFn concept were developed and installed at key intelligence and command and control nodes in the Pacific Theater, enabling substantially improved operational management of anti-submarine warfare forces and tactical ASW. CFn provides "the means to achieve shared awareness through an intuitive, map-based operational picture where information from any source may be geo-referenced, and where all users can participate in collaborative sessions".[31]

Most recently, these systems have been extended and continuously improved at the Theater level, particularly in the Seventh Fleet area of operations, for theater-wide ASW which is the most critical warfighting priority for the Pacific Fleet. Collaboration is now much more than simply sharing an operational picture. In particular, the underlying collaboration and simulation tools can be used interactively across multiple organizations for integrating intelligence information, providing situation awareness, conducting "what-if" analyses to develop alternative courses of action, monitoring current operations including "drill-down" capability to investigate critical detail, and for post-event analysis.

In summary, this overall approach involved several of the main points described in this paper:

1. Developing a deep understanding of the tasks involved
2. Characterizing and representing incredibly complex tasks through development of high-fidelity quantitative or qualitative models and simulations of the phenomena of interest.
3. Focusing on higher-level collaborative decision making
4. Integrating the development of both training and operational collaborative decision aiding systems, so that systems are conceptually meaningful and cognitively coordinated with their users
5. Continuing evolutionary system building, testing, and refinement for long enough periods for expertise to develop.

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4.5. Air Force Studies (Joseph Lyons - AFRL/RHXS)

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4.5.A. Introduction

The topic of collaboration has burgeoned in recent years due to an influx of demand for rapid information sharing across the distributed problem space. The combined need for agility and quality in organizations has driven the topic of collaboration to the forefront of most executive mission statements with an alacrity that might suggest that this is the quintessential component of modern work. This has been substantiated by large-scale events that have pinpointed significant breakdowns in communication as a major inhibitor to accomplishing mission objectives within the military and the government in general.[1] Furthermore, both the commercial sector and the military rely heavily on virtual work whether connecting business professionals in different countries or jointly planning/executing reconnaissance missions from half-way across the globe. Yet despite good intent and enthusiasm, there is still a great deal to learn about the topic of collaboration. Early work in the area focused predominately on the development of technology tools to support the collaborative work of knowledge workers (individuals whose activities involve the use, transmission, or modification of information). However, it didn't take long for engineers and researchers alike to come to the conclusion that there was more to collaborative work than meets the eye. More recently, researchers have begun to acknowledge the impact of social, organizational, and other context influences on collaboration. The current paper will discuss the concepts of organizational collaboration and trust in team settings.

4.5.B. Organizational Collaboration

Collaboration has been defined in previous research as involving information sharing between two or more entities toward a common goal.[2] Despite this cogent definition, researchers remain perplexed when trying to apply this definition to organizations. There are a variety of factors within an organization that could contribute to an individual's collaborative behavior. Individuals within organizations may not be motivated to share information, their reward systems and organizational structures may inhibit information sharing, they may not have the capabilities, training, or appropriate technology to share information or there may be policies or processes that preclude the necessary collaborative activities. Along these lines, we piloted a metric to gauge collaborative readiness within a sample of military knowledge workers. Factor analytic techniques were employed following an assessment of knowledge workers in an Air Force organization. Results from the study demonstrated that collaboration could be characterized at the organizational level based on 4 dimensions: collaboration culture, technology, enablers (e.g., training), and job characteristics.[3] Interestingly, the most salient dimension outlined in that study was one of organizational culture (i.e., the shared attitudes and behaviors of the personnel) rather than technology. Thus, the study demonstrated that collaborative activities in the workplace are multifaceted and complex. The complexity of the modern information age may be addressed, in part, through organizational design.

4.5.B.1 Organizational Design

The structure and processes of an organization will drive how information flows and how decisions are made within an organization. Additionally, the culture and reward system that is

embedded within the organization will solidify the behaviors of the personnel residing within the organization. Finally, organizations may attract, train, and retain certain individuals that may or may not be well-suited for collaborative work. Dominant models of organizational effectiveness consider these five elements of organization effectiveness (structure, process, rewards, human resource practices, and culture) and explore the degree to which they are aligned or misaligned to the strategy and goals of the organization.[4] When there is alignment, the organization is likely going to benefit from high organizational effectiveness. An example of good alignment would be an organization that seeks to provide world class customer service. To meet this goal, the organization has structured itself based on its various customer locations, its processes and products are modified based on customer needs, it rewards employees based on customer reviews, it provides training to employees which emphasize how to provide the best customer support, and it attracts, selects, and retains only those employees who enjoy a service-oriented environment. All of the aforementioned characteristics could be reinforced by leadership through communication plans and supervisor behaviors, and should in turn, foster a culture that values customer service above all else. These inherent internal organizational capabilities are often understated and neglected. For instance, organizations may profess that agility and speed are paramount to their operations, while at the same time employees must fight through layer after layer of bureaucracy for decisions. This is a mismatch between the goals of the organization and its structure. Another common mismatch is when organizations reward behaviors that contradict their objectives. For example, individuals may be given performance rewards when team performance is desired by management, this may stifle team collaboration because of the sense of competition it often engenders.

We explored the impact of strategic alignment in a large command and control organization. A series of knowledge workers was asked about their perceptions of strategic alignment in structure, process, and rewards. In this particular organization one of the primary goals of leadership was to promote information sharing among the personnel. Employees were given a series of scales to assess the extent to which the culture, structure, processes, and rewards promoted information sharing within the organization. Additionally, individuals also reported their daily interactions with others in their organization using a variety of methods (e.g., on the phone, email, organized meetings, Information Technology (IT) systems, at a work station, and outside of a workstation). Higher scores for interactions represented more frequent interactions on a daily basis. As shown in the Table below, perceived alignment in structure, process, and rewards were related to more interactions using IT systems. Additionally, all four dimensions (including culture) were related to higher frequency of interactions outside of one's workstation. This suggests that structures, processes, and reward systems that promote information sharing actually do result in greater information sharing via IT systems. Similarly, organizations characterized by an information sharing culture, and those that have structures, processes, and reward systems that promote information sharing, may benefit from employees who are more likely to get together with colleagues outside of their workstations. This is compelling given that knowledge may reside primarily in informal networks. These networks may be more likely to originate in organizations that are strategically aligned to promote information sharing. While only a cursory view of collaboration, this study demonstrated the potential impact that strategic alignment can have on organizations, particularly organizations that are comprised primarily of knowledge workers.

Figure 4.5-1 Correlations Between Culture, Structure, Process, and Rewards with Daily Interactions

(N = 48)	Culture	Structure	Process	Rewards
Interaction Type				
Phone	.07	.27	.23	.28
Email	.12	.23	.17	.29
Organized Meetings	-.07	.09	-.03	-.08
IT Systems	.18	**.38***	**.33***	**.33***
Face to face at a Workstation	-.13	.08	.15	-.07
Face to face Outside of a Workstation	**.35***	**.43***	**.37***	**.33***

Note. * $p < .05$.

4.5.B.2 Workspace design

In addition to design factors at the structural and process levels, collaboration within an organization is also driven by the workspace design of the organization. Many high-quality interactions at work are the result of opportunistic interaction rather than planned meetings. As a result, the physical layout of an organization can be either beneficial or a hindrance to information sharing. In fact, some studies suggest that a mere 30 feet of separation has the same impact on information sharing as being in completely different buildings.[5] Thus in organizations that deal with highly dynamic mission requirements and personnel who are constantly rotating in and out (i.e., a C2 organization) work design may be critical to shaping the critical mass of information that drives mission effectiveness. The effects of workspace design traverse the realm of C2 organizations and are relevant in any organization where groups of people must work together toward organizational goals. Research shows that team-oriented workspaces that have open designs (i.e., low cubicles, team bullpens and pods) are better at facilitating more frequent and shorter interactions relative to high-cube and closed office designs.[6] Brief and frequent interactions are likely key aspects for enabling collaboration among groups of people. This collaboration can be halted by the cube farms and closed office mentality of many organizational leaders. There are limitations to open space designs however. Open spaces may have higher noise and may create an environment where concentration is difficult. Therefore, open space designs should be accompanied with shared private spaces for personnel to conduct private work as needed.

4.5.C. Team Trust

Various challenges exist when exploring collaboration at the organizational level. However, collaboration at a group or team level is just as nefarious. Teams require effective information sharing in order to be most productive. And a critical component of information sharing is trust.[7] We are interested in how to promote trust in team settings, particularly team settings characterized by high degrees of physical dispersion (i.e., virtual teams or computer-mediated teams). Increased globalization and advances in Information Technology have required many team arrangements to be geographically dispersed and thus require personnel to interact using computer-mediated mechanisms.[8] These “virtual team” arrangements are often positive for organizations because they promote flexibility and agility on the part of the organization because they allow employees to cross temporal and national boundaries. However, these team

arrangements have inherent limitations such as experiencing difficulties in establishing and maintaining trust.[9] We conducted a series of studies exploring the concept of trust in virtual teams culminating in a research symposium that was held in 2009.[10] The symposium reported research relating to dispositional, process, and technology influences on trust and performance in virtual teams.

4.5.C.1 Dispositional Influences

Past research has distinguished the concept of *trust* from the concepts of *trustworthiness* and *trust propensity.* Trustworthiness is characterized by one's ability, benevolence, and integrity; and trust propensity represents an individual's dispositional tendency to trust others.[11] Thus, dispositions impact how individuals form trust perceptions. Military personnel are often asked to join or leave teams very rapidly and at times with little to no familiarity with the other personnel on the team. During these situations, personnel have little reference to guide perceptions of trustworthiness and dispositions may carry a greater role in understanding the development of trust perceptions. Research has found that dispositional trust elements are related to early trust perceptions whereas ongoing interactions play a greater role during the latter parts of the trust relationship.[12] In addition, the influence of dispositions on trust may influence interpersonal interactions in a global sense, and as such, may have implications for enhancing overall distributed team effectiveness.

We conducted a series of studies using a logistics team-based research platform where we asked participants to work together in processing aircraft, cargo, and passengers through a simulated airport scenario. Participants were given a chat system to communicate, thus creating an inherently computer-mediated context. Each participant was given a particular role within the scenario and team performance was dependent on contributions from everyone. Additionally, participants were required to follow a particular order of events during the scenario. However, no one participant had visibility over another's activities. Instead, participants had to rely on communication to know when their activity was required and when other tasks were completed. This created a situation where participants could either trust that their teammates would provide them with the appropriate information or they could engage in activities at the wrong time. We were interested in the extent to which intelligence and personality influenced how people trusted others in this experiment. We found that intelligence and agreeableness (one dimension of personality) were related to higher trust perceptions.[13] This suggests that our dispositions do impact how we develop trust of others and this effect is evident even in very brief interactions such as in our experimental settings. Personnel who have very low intelligence and who are not agreeable may not work well on teams that have been brought together rapidly where team members are not familiar with each other.

4.5.C.2 Process

Classic models of team performance consider the role of input factors (e.g., team composition) that are believed to influence team processes (e.g., communication, cohesion), which in turn effect team outcomes such as team performance. Effective teams tend to practice high-quality information exchanges and are able to identify problems within the team and correct them before they deteriorate the cohesiveness of the team.[14] Communication is essential for all teams, however computer-mediated teams have only communication on which to base their interactions and trust judgments. Communication represents a fundamental element of collaboration, yet communication alone is not sufficient to understanding the complexity of collaboration.

Collaboration can only occur when effective communication is combined with trust to solidify individuals toward team-related goals. Using the same logistics scenario as described above, we explored how various elements of team communication influence team performance. We found that negative communication (evidence by low cohesion, and low self and collective efficacy) was related to worse performance in the logistics scenario.[15] This shows the important role of team processes in predicting team performance. Also in the scenario, we explored the relationship between trust and cohesion, another relevant team process variable. The two constructs were found to be highly related thus demonstrating the importance of trust in promoting effective team processes.

4.5.C.3 Technology

Past researchers have discussed 3 elements of collaboration: technology, social culture, and knowledge.[16] The majority of this paper thus far has focused on social and organizational factors that may influence collaboration. Technology is one enabler that can either support or hinder collaborative processes. Media richness is often used to explain the potential benefits of different collaborative tools, yet there is little empirical evidence that substantiates such claims. It is often speculated that collaborative tools that convey facial expressions and body gestures may be more effective than simple text-based features. As a result, we conducted a small experiment to explore whether or not different collaborative tool features influence trust in a decision making scenario. Four collaborative tool feature conditions were created (text only, audio only, audio-video with high emotion, and audio-video with low emotion) and participants were asked to engage in a route planning scenario. They were asked to select an optimal convoy route based on map characteristics, historical and current enemy positions, and suggestions from a local intelligence officer. The information from the intelligence officer was presented in one of the four collaborative tool conditions. Surprisingly, collaborative tool conditions had no influence on users trust in the intelligence officer, thus suggesting that different collaborative tool features do not influence trust in decision making scenarios.[17] However, this was a very preliminary look at these effects and they must be followed up with a larger study. We did find however, that participants were much more likely to base their decisions on the map information which displayed information about historical and current enemy location when that information and that of the intelligence officer conflicted. Thus, under conditions of high vulnerability, people tended to trust an automated system more than they trusted an unfamiliar person despite the clear linkage of the intelligence officer with the domain at hand.

4.5.D. Summary

In summary, collaboration represents the sharing of information between one or more entities toward some shared goal. The current paper presented the case that the factors that influence this sharing of information are multifaceted and range from organizational culture to technology-related interface features. It is the view of the author that collaboration can be impacted by a variety of organizational factors including organizational design factors, workspace design, and the organizational culture within which individuals reside. Additionally, when collaboration is considered at the group level, trust is a critical factor in understanding when and how individuals share information within groups. Trust can be influenced by a gamut of factors including one's dispositions, team processes, and technology features, just to name a few. While the current paper discussed a few possible areas for collaboration researchers to consider, it by no means provided a comprehensive consideration of all the possible influences on collaboration. Collaboration represents a complex phenomenon with a variety of factors that impact effective

collaboration within organizations. When these factors converge to form a strategically aligned organization and or group, collaboration in its truest form is possible.

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4.6. Air Force Studies (Keith Bergeron - USAFA and Terry Pierce - DHS & USAFA)

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4.6.A. Introduction

Social networking innovations in consumer spaces are generating the possibility for the Department of Defense (DoD) and U.S. Department of Homeland Security (DHS) sectors to execute Distributed Operations, Self-Organizing Edge Groups, and Joint Distributed Mission Planning and Execution.[1] The means for achieving these tactics and joint planning operations is Flexible Distributed Control.

Key Question – How do DoD and DHS harness the virtues of consumer social networks, which virtually eliminate group coordinating costs and encourage self-organization, but operate in a non-secure environment and are difficult to command and control?[2]

Answer – Create an instantaneous means to distribute and modulate control of the pervasive flow of information in the digital network – *Flexible Distributed Control.* Put simply, Flexible Distributed Control is the ability to focus and align social networks in secure and non-secure environments.

4.6.B. Flexible Distributed Control

Flexible Distributed Control is a networked process for *how* we distribute control, share human connections, extend understanding of the situation, and self-organize and disperse to create a decisive warfighting advantage. In practice, Flexible Distributed Control is particularly useful in generating collective action in distributed operations where edge units and individuals are often widely dispersed, even to the point of isolation.[3] Flexible Distributed Control thereby is an effort to increase tempo by widening the span of control without increasing coordinating costs, which means increasing the number of distributed subordinates that can self-organize. To be successful, distributed operations require a flatter organization on the periphery where layers of command have been reduced. Consequently, the organization becomes faster and more responsive.[4]

How do we do widen the span of control? Our plan is to field test social networking tools within a command and control mission fabric for reducing the coordinating cost of conducting distributed operations. Admittedly, the current vertical command and control hierarchy is quite proficient in executing a primary and secondary focus of effort. And this hierarchy should remain in place. With that said, we would like to be able to align third through sixth degree edge efforts with the intent of creating positive cascading effects that contribute to the primary and secondary focus of efforts.

4.6.C. USAFA Center of Innovation and Flexible Distributed Control

The US Air Force Academy (USAFA) Center of Innovation is prototyping a novel computer network called the mission fabric – a meshed digital network – for the DHS and DoD Rare Event Experiment, summer 2009 (see article 4.1 by Numrich & Chesser). The mission fabric is the engine for executing Flexible Distributed Coordination. Flexible Distributed Coordination is a

disruptive process weaving the virtues of social networking innovations into a distributed group-action Mission Fabric. It is the ability to focus and align social and ad-hoc networks in secure and non-secure environments. The ability to align distributed social networks enables the rise of new ways of coordinating action, all outside the framework of traditional institutions and among first responders who have typically not been able to collaborate.

4.6.C.1 Attributes

Flexible Distributed Control creates an instantaneous means to distribute and modulate coordination of the pervasive flow of information in the digital network; share human connections; extend understanding of the situation; and self-organize and disperse to create a decisive first responder advantage.

4.6.C.2 USAFA Cadets

One of the reasons for prototyping the mission fabric at USAFA is to enable the Cadets to use it in playing the Rare Event Experiment. It is generally recognized that the Millennium generation is quite adept at using Web 2.0 social networking tools. In fact, they use these tools to communicate in a much different way than the Baby Boom generation, which typically still relies primarily on the telephone, email, and in-person visits to communicate. Our hope in having Cadets participate in the Rare Event Experiment is that they will show us novel ways of collaborating in a distributed environment.

4.6.C.3 After the Rare Event Game

In the Fall 2009, the USAFA Center of Innovation plans on connecting the mission fabric network to the US Military Academy (West Point), US Naval Academy, and US Coast Guard Academy. Our intent is to collaborate with existing academy gaming efforts to conduct distributed collaborative gaming among the academies. The research we would like to conduct is to use the mission fabric network as an engine for executing Flexible Distributed Coordination – an emerging disruptive process innovation. What we are interested in learning is if we can align the efforts of distributed game players to achieve a desired effect.

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[1] See Office of Naval Research, NRAC, Distributed Operations, July, 2006, http://www.onr.navy.mil/nrac/docs/2007_rpt_distributed_operations_report.pdf; also see Distributed Operations brief, 23 June 2006, http://www.onr.navy.mil/nrac/docs/2006_brief_distributed_operations.pdf.

[2] These ideas emerged from a discussion with Major Nick Hague, USAFA, and Terry Pierce on 15 July 2008. Pierce holds the private documents from this meeting in his personal collection.

[3] USMC, Command and Control, MCDP 6, October 1996, p. 52

[4] ibid, p. 92

4.7. Human Factors (Deborah Boehm-Davis - GMU)

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4.7.A. Introduction

Human factors is an interdisciplinary field that leverages information from domains such as psychology and engineering to understand and improve systems performance. Specifically, human factors attempts to improve safety and/or effectiveness of performance by designing systems that take human capabilities and limitations into account.

4.7.B. Understanding System Performance

To understand how safety and effectiveness can be improved, one needs to understand the context within which people work with systems and each other to collaborate. Systems can be conceptualized as a specific instance of the Gray and Altmann[1] *triad*, wherein a user accomplishes specific tasks by using specific products. Further, users perform these tasks within some physical environment. In addition, they may perform their work in conjunction with another user (see Figure 4.7-1). For example, a pilot (user) may use a flight management system (product) in order to land an aircraft (task) on the correct runway (environment); a military officer (user) may interact with another military officer (user) to make a decision about where to move military assets on the ground (environment) with the help of a situational display that provides information about the location of known friendly and enemy assets (product).

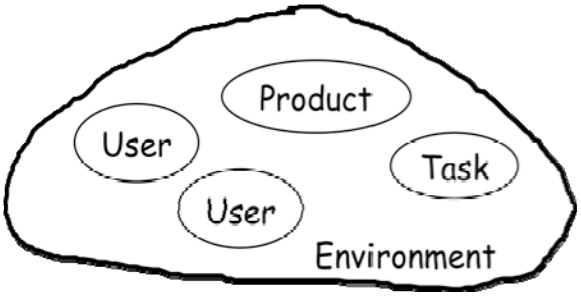

Figure 4.7-1 Work context, which includes users who are using a product to accomplish some task within a specified environment[2].

The overall system suggests that in order to understand how to develop and evaluate safe and effective performance, research needs to focus on these three characteristics, both singly and in combination. Traditional psychological research has tended to study individuals either in isolation or as they interact within specific environments (the user-task connection). That is, psychologists study users completing tasks in order to understand and predict future behavior. Traditional psychological research has also studied users as they interact with one another (user-user connection). As a result, psychological research rarely considers the product that is used to accomplish the task to be relevant to the theory being developed to explain behavior. Traditional engineering tends to be focused on designing products to perform tasks without any consideration of the specific characteristics of the individual who will be using the product. Traditional human factors research has been focused more on the characteristics of people using products. However, in many of these evaluations the user performs a single task, even though users may actually use a system for a number of different types of tasks. Of course, many

researchers do bridge these three components and existing research examining each of these components, either in isolation or in combination, has provided some basic insights into what makes specific systems safe or effective to use.

4.7.C. Understanding Collaboration

Collaboration is one critical component of job performance. As a result, much attention has been devoted to the need for development of resource management training programs that define good collaborative skills in a number of domains. Resource management is particularly important in domains involving complex and dynamic tasks with high costs for errors. Examples of teams in such domains are hospital surgery teams, teams operating automated oil and gas pipeline control centers, and aviation crews[3].

In the aviation domain, crew resource management (CRM) has focused particularly on issues surrounding crew coordination and communication[4]. This work has assumed that better use of the crew's coordination and communication skills will result in improved performance. In fact, some evidence suggests that this is the case[5]. This line of research often focuses on measuring and changing basic attitudes toward aspects of CRM.

Salas and his colleagues[6] have approached this problem from another angle, focusing on developing methods for team training to improve performance. They have developed better measurement methods for identifying important teamwork behaviors, and developed training for how and when to perform such skills or behaviors. Their work has also demonstrated the relationship of improved team coordination and communication to performance[7].

4.7.D. Example of Improving Collaboration (in the Aviation Domain)

Neither of the approaches described has changed the operating context for the task itself. An alternative approach may be to combine pilot training and motivation with a congruent structural change in the operational context. This approach was taken in a demonstration project conducted over a four-year period with a regional airline[8].

In this project, specific procedures were developed which were designed to facilitate CRM based on carefully identified carrier needs. These new procedures required changes in training, motivation, and operational context. This was provided by the carrier agreeing to require these new procedures as standard operating procedures (SOP), and motivating pilots by failing them should they not demonstrate these procedures in both simulations (during training) and line (operational) performance.

In conducting the study, one difficulty arose on the assessment side. Because CRM principles had previously not been specified in a sufficiently concrete fashion, and because specific observable actions were not trained, evaluators felt that they could not fail pilots on the CRM aspects of performance even when they felt it was inadequate. As a result, individual observable actions were specified that would be required in the execution of specific activities at designated points in normal flight operations, and during abnormal or emergency conditions. There were a number of advantages associated with such an approach. The specificity of the behaviors meant that the behaviors should be more easily trained, and that the evaluation criteria for the performance could be more explicit and less subjective.

On the other hand, there were potential pitfalls associated with taking this approach. Foremost among these was the possibility that pilots would learn to execute these new procedures in a rote fashion, with little thought given to their intended meaning and with no generalization to

situations beyond those in which the behaviors were trained. Further, there was a concern that the specific procedures would be overly rigid or constraining to pilots. Thus, this study set out to examine the extent to which a proceduralized version of CRM would improve crew performance in real flight operations.

Data collected over a four year period with a regional air carrier suggested that these concerns were not justified. The combination of specific CRM procedures that were both trained and incorporated into fleet standard operating procedure (SOP) was effective in producing specific changes in crew performance. In addition, different lines of evidence support the conclusion that the effects of CRM training and SOP also generalized to other normal and abnormal conditions. Further, pilots who were promoted and moved to a fleet that was not using these procedures felt they were so useful that they implemented them in their new fleets.

4.7.D.1 Practical implications.

There are several practical implications of these results. First, proceduralizing specific aspects of crew teamwork can improve crew performance both in the simulator and during actual flight operations. Appropriately designed and trained procedures can enhance the crew's ability to communicate effectively, plan, manage their workload, and solve problems during flight operations.

This does not, however, mean that proceduralizing is a panacea for crew performance problems. Procedures must be carefully designed and implemented to fit the operational context, the types of pilots employed by the carrier, and the corporate culture. Alternatives to proceduralizing, such as training interventions or technical fixes, must also be considered. Further, the appropriate design and implementation of procedures must consider possible increases in workload or task distractions as undesirable byproducts of additional procedures.

4.7.D.2 Theoretical implications.

The fundamental implication of these results is that certain aspects of team dynamics can be improved by proceduralizing them. The procedure provides a broad sequence or loose script for communication among team members and coordination of required activity. To the extent that the procedure is correctly designed, the typical team dynamics when using the procedure result in superior outcomes. These superior outcomes can be reflected in the quality, quantity, timeliness, or other aspects of team performance. Therefore, correctly proceduralizing specific aspects of team dynamics is one way to reduce the process losses or produce process gains, both of which would increase performance. Several different theoretical views provide reasons that proceduralizing may provide more efficient group interaction.

One relevant social theory is the effects of status on structuring and limiting communication within a group or team. In the current study proceduralizing CRM may have empowered the lower-status members in the team (the First Officers) to initiate interaction more frequently. This was specifically mentioned on some of the pilot surveys. Increasing participation of the low-status member would reduce the typical predominance of high-status to low-status directional communication that would otherwise be observed in such a context. More equal participation rates could have increased the likelihood of correct or optimal solutions being discussed and adopted by the team, increased the satisfaction with the group interaction, and consequently increased the morale and motivation of the team members. From this view, the increased performance of the team is mainly due to better team interaction, morale and motivation.

From a different social point of view, the more efficient communication of the group can directly reduce process losses[9]. Useless or misleading communications are minimized, and necessary communications are more likely to be performed precisely when and where it is appropriate to do so. From this view, the increased performance of the team is mainly due to better communication during the problem-solving process. However, more efficient communication may have had important cognitive effects that mediate the observed superior team performance.

From a cognitive view, the standardized communication and coordination frameworks may have lowered the cognitive workload involved in understanding communications and actions of the other team member. In part, the workload would decrease because the communications and actions of the other person would be more predictable in both content and timing, and thus more easily comprehended. Decreased workload would have in turn increased the time and cognitive resources available for problem diagnosis, situation assessment, planning, and monitoring. The Instructor/Evaluator surveys directly implicated the factors of more efficient communication, workload management, and planning in the performance differences of the trained and untrained crews. If we arrange these rated effects in a causal model, we would hypothesize that the more efficient communication precedes and facilitates the workload management that in turn frees cognitive resources for more effective planning.

Another direct cognitive consequence of more effective communication would be the development of improved joint situational awareness of the problem and solution. Joint team situational awareness of the physical task, team member functions, and other knowledge has been directly tied to improved team performance[10]. To the extent that the more effective communication increased joint situational awareness, this cognitive factor could have created some of the observed increases in performance.

Thus, the results imply that specific team interaction patterns can be scripted for interaction structure and process, but not for specific content, and significantly increase the effectiveness of the team interaction.

4.7.E. Measuring Collaboration

The project described was useful in understanding crew-level collaboration and its impact on performance. However, fully measuring collaboration requires going beyond an understanding at a single level of analysis. Rather, it is important to understand multiple levels of analysis that are relevant in understanding the behavior of complex human/machine systems (see Figure 4.7-2). In this specific instance, most measures of performance were taken at the “crew” level. However, to fully understand performance, we might want to move vertically, “down” to the individual pilot level, or “up” to the team level that includes other players in the safety of the National Air Space (NAS). That is, integrating measures of performance vertically across different levels of analysis can give important connections that integrate the theoretical views abstracted from different domains into a coherent whole.

Further, the vertical integration may point to key variables at a different level that are more critical to performance assessment and prediction than the original set. Knowing the vertical connections of key variables can also illuminate methods for potentially changing the variables. If high performance teams need high levels of interpersonal trust, for example, the organizational or cultural variables that impact trust are potential foci for change. Conversely, the vertical embedding of key variables may help explain why these variables are resistant to simple change efforts such as training. The horizontally and vertically integrated theory should form a useful

initial basis for the performance measurement and prediction. However, this theoretical basis must also be successively refined and improved as relevant data are collected and evaluated.

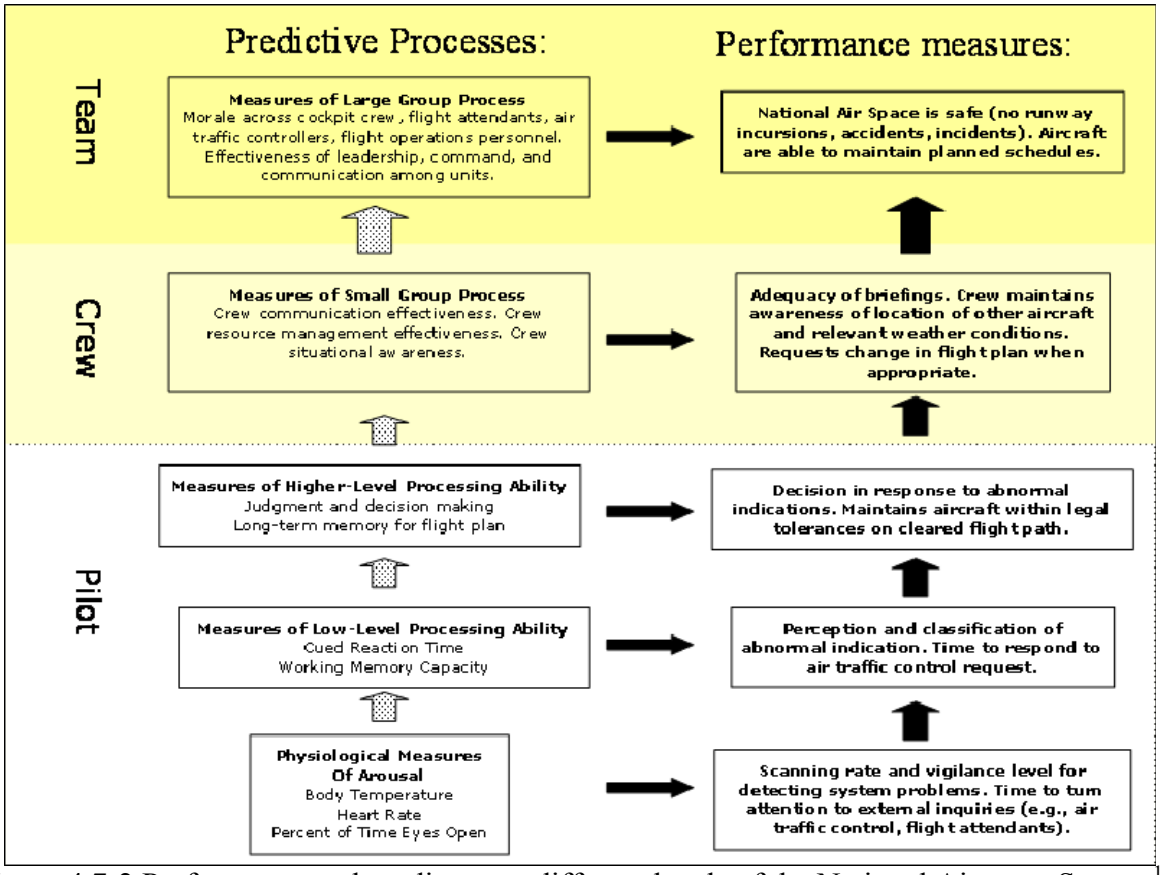

Figure 4.7-2 Performance and predictors at different levels of the National Airspace System[11].

Take, for example, a situation where your goal is to evaluate the effectiveness of collaboration in ensuring the safety of the NAS (Figure 4.7-2). Overall NAS performance will depend on performance of individual cockpit crews and the individuals who comprise the crews (assuming that we are evaluating pilots collaborating with others in the NAS). Starting at the individual level, we might be concerned with the effect of fatigue on each pilot's ability to rapidly and repeatedly scan his or her flight instrument panel and detect possible anomalous readings. At the individual level, we could collect physiological measures of arousal such as body temperature, heart rate, and percent of time the eyes are fully open as indicators of how sleepy or tired the pilot is. A sleepy pilot is likely to perform more poorly on indicators of information processing ability such as vigilance during scanning and simple reaction time to target detection. Decreased vigilance would make individual pilots more likely to miss abnormalities that appear on their displays or take more time to identify an aircraft that has been reported close to their current position. This level uses theory from basic cognition and human factors research.

Since pilots need to coordinate with their co-pilots to ensure the safety of the flight, they need to communicate relevant information to each other. Degradation in higher level language processing would cause lower communication performance among crew members (e.g. fewer messages being passed between them). Similarly, social factors influencing communication patterns (e.g., military experience which encourages a hierarchical relationship between the captain and the first officer) may create effective or ineffective communication among the crew

members. For example, crew members who are not informed about the existence and potential threat value of a short, wet runway will be unable to plan a safe take-off, so the fatigue level of an individual pilot should have an upstream impact on crew performance as well as social processes due to previous cockpit experiences (e.g., in the military). Finally, overall system safety will be affected by the ability of the crew to effectively communicate with others in the airspace system. If, for example, a crew is flying overseas, there may be difficulties in communicating clearly with air traffic control. In addition, there may be cultural factors at play in the willingness of a crew to request alternative routing from flight operations personnel. Thus, a full understanding of collaboration will require understanding performance at all of these levels.

4.7.F. Summary

Human factors provides a mechanism for understanding human performance when humans are involved in a complex human-machine system. Understanding performance, such as collaboration, requires an understanding of how users perform individually and as a team, and how their performance is affected by the systems they use and the environment in which those systems are used. Research has demonstrated methods by which performance can be improved, particularly when looking at performance at the crew level. Additional work is needed to understand how collaborative performance at the team level affects performance of the larger system in which that performance is embedded.

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4.8. Using a Third-Party, Neutral Facilitator to Enhance Team Collaboration (Victoria Moreno-Jackson, National Association for Community Mediation)

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4.8.A. Introduction

Conflict resolution theory identifies five different conflict management and interpersonal dynamic styles: competition, compromise, accommodation, avoidance, and collaboration.[1] Of these, collaboration is becoming increasingly valuable for its ability to take advantage of the various skills and areas of expertise of different individuals within an agency or organization and apply them to the situation at hand. Of course, along with those different skills and areas of expertise, different individuals and groups also bring different methods of communication, different priorities, and different cultures. In a best case scenario, the collaboration will benefit from these differences, but these differences can also pose some significant challenges, putting the entire collaboration at risk.

In their book, *Conflict Coaching: Conflict Management Strategies and Skills for the Individual*, Tricia S. Jones and Ross Brinkert state that four elements must be present in order for a collaboration to be productive:

- Time
- Trust
- Insight—the ability to distinguish between your own personal concerns and the concerns of other individuals at the table
- Diplomacy—the ability to confront issues directly without threatening other members of the collaboration[2]

Even when there is no explicit conflict, trust between parties and the ability to collaborate based on the different concerns and interests of all parties at the table are crucial elements of a productive collaboration.

4.8.B. A trained facilitator can create the atmosphere of trust crucial to a productive collaboration

In the absence of a neutral, third-party facilitator for the collaboration, the collaboration relies on its members to moderate their own behavior, keep the collaboration productive, and stay on task, both subject- and time-wise. Often, these groups will ask one of the parties involved in the collaboration to facilitate the meeting. This approach can pose some significant challenges. Because that facilitator has to simultaneously represent his or her own interests in the collaboration, he or she may be perceived by other participants as leading the process to his or her own advantage or as treating other participants unfairly. Alternatively, the facilitator's own interests as a participant in the collaboration may be compromised because the facilitator is forced to divide his or her attention between being a participant and keeping the meeting in order. Either circumstance—the breakdown in trust in the facilitator that occurs in the first case or the compromise the facilitator is forced to make in the second case—can cause the collaboration to suffer.

Using a third-party, neutral facilitator allows participants to focus their undivided attention on their own role in the collaboration. All team members can have confidence that the facilitator's one and only role is to ensure that the collaboration works as productively as possible towards the group's defined goal in the time allotted. A skilled facilitator can use that confidence to begin building the trust that is so essential to a successful collaboration. Within that atmosphere of trust, each participant is able to advocate for the role and strategies most beneficial to them personally, as well as for the collaboration. Additionally, a third-party facilitator may be able to draw out underlying concerns and resources of the parties in a more neutral fashion. Recognizing these underlying concerns (and hidden resources) in a non-threatening manner can create a collaboration that is more thoughtful and comprehensive than might otherwise be the case.

4.8.C. A trained facilitator provides a neutral framework for collaborative discussions

Every team member walks into a collaboration with preconceived notions, some well-informed and some not, about what they can offer the collaboration. A third-party, neutral facilitator has no affiliation to the members of the collaboration and, therefore, makes no assumptions about individual abilities or limitations. Instead, the facilitator simply provides a structured process for individuals and groups working together to achieve the team members' goals. Because the only agenda of a neutral facilitator is to move the meeting along, collaborators are able to support the facilitator in his or her goal of achieving a productive collaboration without worrying about compromising their own positions.

4.8.D. Putting principles into practice: Moving groups toward a common goal

Every collaboration begins with its participants presenting their initial position. These initial positions are based on an individual's assessment of that group's risks and benefits. Although that position may be the result of previous participation in a collaboration, it is more likely based on a limited amount of information and the assumptions that the individual has drawn based on that information. The facilitator's role is to move the collaborators beyond their initial positions toward a common goal by gathering additional information, looking for common interests, encouraging brainstorming, breaking through stalemates, and highlighting areas of agreement.

During this process, a trained facilitator uses interest-based negotiation[3] to move participants from their initial positions closer to the group's common goal. Interest-based negotiation is an alternative to more traditional negotiations. In traditional negotiations, collaborators bargain from an initial position and work toward some sort of eventual compromise. Each individual or group comes to the table having made a calculation of how much he or she is willing to give away (lose) in order to reach that compromise. Traditional negotiations are known as fixed-resources negotiation, because every participant views available resources as a finite set of assets that must be divided.

In contrast, when a facilitator leads an interest-based negotiation, he or she encourages the team members to see resources as infinite and promotes the concept of added value. To do this, the facilitator probes the collaborators as to why they have come to their initial positions in an effort to uncover what is actual knowledge and what is assumption, and to help the team members understand why they are offering their particular position. Understanding the underlying interests of the collaborators allows all members to participate to the most productive and beneficial extent possible.

During the negotiation, the facilitator's job is to create an atmosphere where the goal is to discover creative options that generate greater resources rather than a competition between team members to divide limited resources. Often during these negotiations, inquiries from the facilitator or the collaborators themselves will reveal resources that the team members had not previously considered. Perhaps one of the participants can address a need through a method other than what is being asked for. Another participant may have a helpful resource that no one knew about or asked for. As a result, it is not at all unusual for collaborators to leave an interest-based negotiation with more than they were expecting.

4.8.E. The facilitator's role before the collaboration: Preparing the collaborators

Stakeholder interviews are the initial team member contact with the facilitator in a facilitated collaboration. During these interviews, the facilitator learns an individual or group's interests in participating in the collaboration; concerns about participation; goals for the collaboration; strategies for accomplishing those goals; and requests for structuring the collaborative process.

These interviews allow the facilitator to create an agenda with input from all team members. Participating in the creation of a group agenda creates a positive dynamic for group collaboration where parties feel more confident about working together and commit more enthusiastically to the process before the collaboration has even begun.

Although the purpose of these meetings is to allow the facilitator to create a group agenda; stakeholder interviews also give collaborators a more private setting in which to express concerns or share important information with the facilitator that they might not be comfortable sharing with others at this early stage of the collaboration. For facilitators, these interviews are an opportunity to obtain information from members privately that might sabotage the collaborative process if expressed in a more public setting. Stakeholder interviews also allow the facilitator to build rapport and trust with collaborators before the collaboration begins. The facilitator can do this by sharing information about how the facilitated collaboration process works and providing private one-on-one feedback on a participant's plans for the collaboration.

After the stakeholder interviews have been completed, the facilitator produces a group summary. Because the summary document will serve as the master plan for the collaboration, it is critical to give team members an opportunity to respond to this document to ensure that it accurately reflects the group's collective understanding and goals. The summary document also serves as a baseline document to keep the collaboration focused and on point. If participants or the facilitator become concerned that the collaboration is no longer productive or moving towards the collaborators' goals, the facilitator or the collaborators can use the group summary to refocus the conversation onto the group's stated goals.

4.8.F. The facilitator's role during the collaboration: Keeping the discussion on point

During the collaboration process, the facilitator's job is to guide the process without participating or appearing to be invested in a particular outcome. The facilitator works with the team members to create an agreement about the collaborative process, including procedural rules and behavioral norms for the collaboration. The facilitator ensures that all members agree on the goals of the collaboration, and the structure to be used to achieve those goals. The facilitator then starts the group meeting based on the teams' agenda.

As the collaboration is in progress, the facilitator promotes constructive communication among the participants. One aspect of the participants' interaction for which a facilitator is looking is a

communication loop. In a successful communication loop, a speaker's intended message is understood by the listener.[4] Although this sounds ridiculously simple, this is actually a complex process. A speaker's message is affected by the speaker's knowledge and culture just as a listener's understanding is affected by theirs. Additionally, a listener is not only working on simply understanding the speaker's message; the listener is also formulating their own message in response to the speaker.

The facilitator assists both the listener and the speaker in this communication process. The facilitator acts as another listener, verifying when necessary, that the listener understands the speaker and assisting the speaker to present his position in a way that is understandable to, or more likely to be understood by, the listener.[5] To do this the facilitator selectively summarizes statements to ensure that all participants understand the input of the other participants, and that the message being conveyed by a speaker is in fact the speaker's intended message. In his book, *The Dynamics of Conflict Resolution: A Practitioner's Guide,* Bernard Mayer calls this process "reframing." [6] The facilitator may also incorporate the other participants in summarizing or reframing, always checking back with the speaker that the message that was heard was the message intended.

The facilitator also is responsible for time management in collaboration. The facilitator monitors the team members' progress through the agenda with one eye on the clock. The facilitator can remind participants of progress already made—or not, when the conversation has wandered off track. The facilitator's own awareness of time can be a powerful tool for bringing meandering participants back on track.

When the allotted time is coming to an end, the facilitator summarizes the progress and accomplishments of the team during that session and any prior sessions. The facilitator then reminds the participants of the next steps in the collaboration. Establishing an action plan for after the collaboration or for the next group meeting ensures that progress made during the meeting does not dissolve following the collaboration. Making the follow-up plans explicit among the participants prevents productivity from being lost due to lack of clarity or misunderstanding of the plan of action created through the collaboration.

4.8.G. Dealing with problems in the process

It is not uncommon for collaborations to stall due to an impasse, power imbalance, or communication barriers caused by cultural differences. Trained facilitators come prepared to deal with these common challenges.

When participants in the collaboration reach an impasse, the facilitator reminds the team members of their interests and goals in the collaboration. This reminder may reinvigorate a brainstorming process to create additional options for the participants, or it may reveal interests that have not yet been addressed. Attempts to meet new participant interests also may move a process along which seems to have lost productivity.

Power imbalances are a frequent, dynamic occurrence during team collaborations. Some participants take on a more powerful role due to personalities involved, some because of resources that the team members bring to the collaborative process, and others because of status. The facilitator's role is to encourage and support participants in a manner consistent with the goals established in the stakeholder interview process. Providing a balanced process does not mean that the facilitator will treat all members equally, rather it is likely that the facilitator will

use different strategies in dealing with different participants. Some participants may be supported more, while others may need to be challenged more in order to have balanced participation in the collaboration process.

Any collaboration brings together a group that contains different cultures. Mayer defines culture as "the enduring norms, values, customs, and behavioral patterns common to a particular group of people."[7] An organization or group's culture comes from their values, beliefs, and mission. Because of these deep-seated factors that are brought to a collaboration, clashes of culture or misunderstandings based on cultural differences can cause a collaboration to come to a halt, or even break down irreparably. The collaboration must either work as a multi-cultural effort or create an implicit or explicit working agreement based on a new, joint culture. As a non-invested participant, the facilitator is in a unique position to provide perspective where team members seem to be encountering barriers or confusion as a result of cultural differences.

4.8.H. Choosing a facilitator

A facilitator does not need expertise in the subject matter of the facilitation, although participants may desire it. A facilitator also does not act as a decision maker for the participants. The necessary familiarity with the subject matter of the collaboration comes from the stakeholder interviews. During these interviews, the participants provide the facilitator with any contextual information necessary to understand the matters involved in the collaboration. The advantage of having a trained facilitator is that the facilitator can bring to attention assumptions that team members are working under. These assumptions may be potential opportunities for misunderstanding or confusion because participants inaccurately believe that they understand one another or are in agreement.

4.8.I. Conclusion

Although facilitation is seen as a tool in the conflict resolution spectrum, conflict is not necessary for a group to benefit from using a facilitator. A collaboration of different individuals or groups has the potential to create a valuable product; however, this same collaboration faces communication challenges that can defeat the purpose of bringing the group together. Using a third-party, neutral facilitator allows team members to focus on the goals of the collaboration and ensure that communication problems and cultural differences amongst the members do not sabotage the process.

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[1] Tricia S. Jones and Ross Brinkert, *Conflict Coaching: Conflict Management Strategies and Skills for the Individual* (Thousand Oaks, CA: Sage Publications, Inc., 2008), 190.

[2] Ibid. at 194-195.

[3] Bernard Mayer, *The Dynamics of Conflict Resolution: A Practitioner's Guide* (San Francisco, CA: Josey-Bass, 2000), 155-157.

[4] Ibid., 122-127.

[5] Ibid., 123.

[6] Ibid., 132.

[7] Ibid., 72.

4.9. Can There Be *Too Much* Collaboration? Lessons from Applied Research (Jean MacMillan - Aptima)

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Much of the research on collaboration within and across organizations has focused on the benefits of collaboration, the barriers that prevent collaboration, and possible methods for removing these barriers. There is another perspective on collaboration, however, that looks at how much collaborative activity an organization *needs* in order to accomplish its mission. This research recognizes that collaboration and coordination, while often essential for mission success, comes at a cost. Both collaboration and coordination require communication among individuals and organizational units, and this communication requires time and effort, increasing the workload—and potentially decreasing the performance — of the coordinating units.[1]

For the last 13 years, the Office of Naval Research has sponsored a research program on Adaptive Architectures for Command and Control (A2C2). Using a combination of mathematical and computational models and empirical experiments with Navy officers, the A2C2 program has investigated the effectiveness of the alternative innovative organizational structures that are being enabled by the explosion in network connectivity. One of the key findings of this research is that there is an *optimal* level of organizational collaboration and coordination for the best mission performance – a level that is sufficient to ensure that mission tasks are accomplished but not so great as to generate unnecessary workload.

4.9.A. The Relationship between Communication and Performance in Organizations

Coordinated action lies at the heart of effective organizational performance[2] and a variety of approaches have been taken to understand the nature of that coordination and the role that communication plays in effective coordination. For example, distinction is often made between the theoretical constructs of *implicit* and *explicit coordination.*[3] Explicit coordination requires that members of an organization communicate to articulate their plans, actions, responsibilities, etc., while implicit coordination describes the ability of those members to act "in concert" without the need for overt communication.

In order for implicit coordination to be successful, members of the organization must have a shared understanding of the situation and an accurate understanding of each other's tasks and responsibilities. The term "shared mental model" is often used to describe this shared awareness.[4]

It is well understood that the advantages and disadvantages of implicit and explicit coordination (and, hence, the need for a shared mental model among team members) depends on the nature of the task and the task environment.[5] In aviation environments, for example, the failure to communicate explicitly has been linked to failures and accidents.[6] On the other hand, the ability to coordinate implicitly can provide an advantage during periods of intense task load by reducing the "communication overhead" needed for coordinated action.[7] Explicit coordination always carries a cost in terms of the time, effort, and attention spent communicating (and therefore not spent doing other things). To the extent that the needed coordination can be achieved without this effort it may boost the team's performance.

Implicit coordination is associated with effective performance if, and only if, members of an organization (or multiple organizations) have an *accurate* understanding of each other's needs, responsibilities, and expected actions, however; and communication may be necessary to build that understanding.

4.9.B. Collaboration and Coordination in Optimized Organizational Structures

A major contribution of the A2C2 program has been the development of methods for designing organizational structures that are optimally suited to the organization's mission.[8] This research has provided findings on how an organization's structure affects the need to coordinate for effective performance, and how the need for coordination affects the need to communicate. "Organizational structure" refers not just to the lines of authority in the organization (who reports to whom), but also to how the organization divides its tasks and responsibilities and controls its resources (including information) in order to perform its mission.

Results from experiments conducted in the A2C2 program illustrate the close relationship between the nature of the mission to be performed, the structure of the organization performing the mission, the collaboration, coordination, and communication that is required for that organization to perform that mission, and the organization's success in performing the mission.[9]

One experiment developed an organizational structure for a Joint Task Force (JTF) that was optimized for accomplishing a mission that involved an air- and sea-based operation to regain control of an allied country that had been taken over in a hostile invasion by a neighboring country. Many of the tasks were sequentially interdependent, i.e., one had to be completed before another could be started, and most required the simultaneous use of several different types of resources (e.g., sensor and weapon platforms) for successful completion. The optimized organizational structure was based primarily on two optimization objectives—simultaneously minimizing the coordination required to accomplish the mission and balancing workload across the organization. These multiple objectives act to constrain each other, since the workload-balancing objective prevents the assignment of all tasks to only a few members in order to minimize the coordination requirements.

Coordination is defined here by the need for members of the organization to combine the resources under their control in order to successfully accomplish each task. Because almost all tasks in the mission required the use of multiple types of resources, reducing the need for coordination resulted in an organizational structure in which each member of the organization controlled most, if not all, of the resources needed to accomplish a specific task. Members were therefore able to act independently to accomplish many tasks because all of the resources needed for the task were under their direct control. In the experiment, this optimized organizational structure was compared to a more "traditional" JTF organizational structure in which similar resources were controlled by the same node without explicit consideration of the need to coordinate their use in the mission.

The optimized team structure in this experiment allocated the organization's resources so that team members could act more independently, thus reducing the need for coordination. One might argue that, at the extreme, such a design approach would result in a collection of independent individuals that was no longer an organization in the usual sense of the word. The constraints of the mission were such that this was not a possibility, however. Many of the tasks could not be done independently by any one member of the organization because of the workload associated with them. Even under the optimized design, there was considerable need for collaboration,

coordination, and communication—it was simply less under the optimized structure than under the traditional design.

4.9.C. Performance Differences under the Two Organizational Structures

The two organizational structures, manned by Navy officers, were "played out' in a simulation-based experiment. The mission performance of the organization using the structure that had been optimized for the mission was significantly superior to the performance of the organization using the more traditional structure.[10]

The optimized structure was designed to achieve its results by minimizing the need for coordination (defined as the need for members of the organization to work together to accomplish a task because each one controlled different resources needed for the task), and the results show that it was successful in this goal. Organizations using the optimized structure achieved superior performance while taking significantly fewer coordination actions during the mission, as measured by the coordination rate.

The optimized team structure also seems to have resulted in more efficient communication as measured by the anticipation ratio. This measure is based on a classification of verbal communications by the team members into information requests and information transfers (as distinguished from other categories), computing a count of each type, and calculating the ratio of the latter to the former. Under the optimized structure, members of the organization communicated less overall, and relatively more of those communications were information transfers rather than requests for information.

Associated with the higher anticipation ratio, members in the optimized structure had a more accurate awareness of the tasks being performed by other members of the organization. The accuracy of the team's mutual organizational awareness was calculated based on the results of a questionnaire administered to participants after each experiment session.

Task interdependence was defined by the mission and was quite high in this experiment. Almost all of the tasks required multiple types of resources for completion and many could not be accomplished until others were completed. The organizational structure either was designed to minimize the amount of coordination needed to accomplish the mission (optimized structure) or was a traditional JTF structure. Task interdependence and team structure jointly determined the need for coordination within the team, defined as the need to simultaneously use resources controlled by multiple individuals in order to accomplish a task. The need for communication follows from the need to coordinate. Coordination activities and communication rates were lower under the optimized design, as was subjective workload, suggesting that the optimized organizational design had reduced the "communication overhead" required for effective organizational performance.

Although the experiment demonstrated quite clearly that an organizational structure that reduced the need for coordination and communication resulted in better performance and lower workload, there may be longer term negative effects from the reduction in required communication levels. Multi-agent computational models developed using Dynamic Network Analysis techniques suggested that organizations in which individuals had a greater need to negotiate with each other were *more adaptive* over the long run.[11] Thus there may be a tradeoff between the efficiency of an organization (characterized by lower communication rates and

higher performance) in the short term and the ability of the organization to adapt in the long term.

4.9.D. Changing the Level of Collaboration Required in an Organization

Experiment results showed that organizations perform best when their collaboration and coordination is at the *right* level—adequate to support the mission but not so much as to generate an unnecessary communication workload. Additional experimentation addressed the extent to which organizations were able to move between structures that required high levels of collaboration and coordination and those that did not.

Research has shown that no one type of organizational structure is best for all missions and all individuals in the organization. For example, functional structures in which the sub-units of the organization are specialized and must coordinate closely to accomplish their mission perform best in predictable task environments, whereas divisional structures, which support greater autonomy, perform best in unpredictable environments.[12] But does it matter what path the organization takes to change its structure, and are certain types or directions of change more or less difficult than others?

A series of experimental studies demonstrated that the *direction* of organizational change affects the levels of performance that can be achieved after a change occurs.[13] If organizational adaptation were a surface, it would not be flat—it is easier for organizations to change their structure in some directions than in others. Specifically, experiments found that it is easier for an organization to move from functional (high collaboration) organizational structure (in which individuals (or units) are specialists and control only one type of resources, and must coordinate for almost all tasks) to a divisional (low collaboration) structure (in which individuals are not specialists and control multiple types of resources) than it is for them to go in the opposite direction.

Moving from a functional to divisional structure meant that individuals needed to learn to collaborate and coordinate *less*. Moving in the opposite direction meant that they had to learn to collaborate and coordinate *more*, which turned out to be the more difficult change to make. Once individuals were used to being able to act independently they found it difficult to learn to coordinate their actions. Experiments also showed an asymmetry in structural change in moving between a centralized and a decentralized organizational structure.[14] Groups found it easier to move from a centralized structure (in which leaders direct and/or approve actions) to a decentralized structure (in which individuals can act more autonomously) than to move in the opposite direction. Apparently, once one has experienced independence, it is hard to move to a structure where there is more centralized control.

4.9.E. Implications of the Research

The results of the A2C2 research program suggest that effort to increase collaboration and coordination within and among government agencies will result in better mission performance if, and only if, the goals for collaboration are driven by well understood and well specified mission requirements. It is very difficult for an organization to become more collaborative (moving in the opposite direction is much easier). Becoming more collaborative is likely, at least in the short term, to increase the organization's workload and reduce its efficiency and performance.

Quantitative analysis using mathematical and computational models, such as that performed for Joint Task Forces in the A2C2 program, can produce organizational structures in which the level

of collaboration and coordination is optimized for the mission to be performed, taking into account the interdependency of the tasks to be accomplished, the resources that are controlled by each member of the organization, and the workload in each part of the organization. Such an approach asks where collaboration is most critical for accomplishing the mission. This rigorous, targeted, principled approach is likely to result in much better overall mission performance than an untargeted across-the-board push to increase all types of collaboration at all levels of the organization.

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4.10. Group Collaboration Patterns (John M. Linebarger - Sandia)

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4.10.A. Introduction[1]

"To pattern is human" could serve as a corollary to the more familiar maxim that it echoes; after all, even errors fall into patterns. Human beings are remarkably efficient pattern makers and pattern detectors, though much pattern-making occurs by default rather than by design, through the forces of habit and inertia. Group collaboration falls into patterns as well, patterns of interaction as well as patterns of content and patterns of tasks. The thesis of this piece is that task-focused collaboration can be made more effective if group collaboration patterns are recognized and explicitly supported by the surrounding environment or software system.

4.10.B. Group Collaboration Patterns

Gottesdiener defines patterns as descriptions of a known solution to a specific type of problem, and group collaboration patterns as techniques, behaviors, and activities for people who share a common goal of working together in a group.[2] Social scientists have investigated the concept of patterns of collaboration for years, often using the language of "modes," "models," or "types" of collaboration. Researchers continue to observe group interaction and to identify patterns of group collaboration. These patterns tend to be domain-specific,[3] although attempts have been made to characterize group interaction based on the nature of the task, not the domain.[4]

4.10.B.1 Patterns of Interaction

In the area of the creative arts, Vera John-Steiner has described four patterns of collaboration.[5] These patterns characterize the way "thought communities" work together to transform the prevailing paradigm of their domain. The *integrative* pattern denotes an intense, sustained, egalitarian partnership that forms the crucible for the creation of something entirely new, the way that painters Picasso and Braque gave birth to Cubism in the visual arts. The most common pattern is *complementary collaboration*, people working together on separate aspects of the problem based on a natural division of labor. *Distributed collaboration* is also marked by a division of labor, but each contributor works alone; an example of this pattern is the creation of an edited book where each chapter is written by a different author located in a different country. The *family pattern* is characterized by a hierarchical division of labor, but the roles are flexible and often shift over time as expertise is acquired.

Architectural design gives rise to other kinds of group collaboration patterns. Cicognani and Maher describe three "types" of collaboration that were observed during a study of computer mediated architectural design.[6] *Mutual* collaboration involves designers working together equally on the same aspect of the task; *exclusive* collaboration characterizes designers working apart on separate aspects of the same problem with occasional periods of consultation; and *dictatorial* collaboration denotes the emergence (or appointment) of a "designer in charge" who makes all the design decisions.

Wasson and Mørch document a different kind of taxonomy of group collaboration patterns in the domain of Internet-based telelearning.[7] Four patterns emerged during their testing, to which they assigned somewhat unusual monikers:

- *Adaptation* reflects the process not only of getting used to the tools provided, but to the way other team members use the tools.
- *Coordinated desynchronization* occurs when teams get comfortable enough with each other to divide and conquer, and begin to work on separate portions of the shared task independently.
- *Constructive commenting* emerges when the team discovers that neutral or negative comments do not achieve the intended results in a timely fashion, and
- *Informal language* characterizes the communication of the team over time as it sheds the formal modes of address used at the outset.

In their summary of results, Wasson and Mørch recommended that software tools for Internet-based telelearning should be designed to support the collaboration patterns observed.

The domain of software requirements definition provides the context for a fairly extensive list of collaboration patterns.[8] Gottesdiener has delineated eight such patterns, and described them in terms of the context, problem, solution, consequences, exit criteria, and uses of the pattern. One of the patterns, named *divide, conquer, correct, collect*, corresponds well with the complementary subgrouping and regrouping pattern that will be introduced below. Another, *decide how to decide*, can almost be described as a metapattern. In this pattern, the group chooses their decision making pattern, which can range from consensus to majority vote to leader choice to random choice.

Identifying a particular collaboration pattern in effect is complicated by the fact that multiple collaboration contexts are often operative at the same time. The collaboration pattern in effect is specific to a particular collaboration context. Some of these contexts are hierarchically organized. For example, in a hotel ballroom filled with diners eating at round tables, at least three such contexts can be identified—the context of the entire room, which is addressable by a speaker at a microphone at one end of the room; the context of a particular table; and the context of a diner's immediate neighbors. (These contexts are more properly thought of as communication contexts, but since collaboration requires communication, collaboration always occurs within a communication context.) Non-nested contexts can also be operative, which are often defined by role. To use the same example of a hotel ballroom with people sitting at round tables (in this case conference attendees instead of diners), someone typing on a laptop might be reading email from work or sending an instant message to a colleague, in their role as a company employee instead of a conference attendee. User interface metaphors have been proposed to represent all operative collaboration contexts and seamlessly switch among them.[9]

4.10.B.2 Patterns of Content

The collaboration patterns described above can be characterized as patterns of *interaction*. Patterns of *content* have also been observed. For example, in a month-long study of a distributed team of simulation analysts, several patterns of collaboration content (as measured by text chat and the exchange of multimedia information, such as screen images and annotations) were noticed.[10] First, the collaboration content was episodic, in that it progressed not linearly but in chunks of related interactions that can be called "chapters" or "scenes." Several kinds of chapter delimiters were observed during the study. These delimiters can be categorized as either natural (arising from the content of the collaboration itself) or synthetic (artificially induced transitions in the collaboration due to exogenous factors). Natural chapter transitions occurred for several reasons—a shift in chat topic or the content of an exchanged screen image, a time gap in the

collaboration conversations, or the introduction of what became recognized as a stereotypical topic. Such topics included an opening or closing summary to an experiment, or an interlude taken to design some software code for the simulation. Synthetic chapter breaks occurred either by vote of the team, by the decision of the *de facto* team leader, or when the time allocated to the current agenda item expired. A second content pattern observed was the fact that these collaborative chapters or episodes roughly tracked an agenda, either explicit or implied. The default or implied agenda (which was the one most frequently used) was a four-step iterative process that corresponded to the four primary activities of the distributed team—modeling, simulation, analysis, and software development.

4.10.B.3 Patterns of Tasks

Another take on collaboration patterns is provided by Schmeil and Eppler, who identify eight collaboration patterns observed in the Second Life collaborative virtual environment.[11] These patterns, such as *Virtual Design Studio*, *Learning Trail*, and *Knowledge Map Co-Construction*, apply to task categories performed in a 3D collaborative virtual environment. Schmeil and Eppler position each pattern on a two-dimensional grid, with 3D Added Value along one axis and Design Scope along another. One pattern, *2D Document Manipulation*, was deemed high in design scope (*i.e.*, difficult to arrange) but low in added value, so it was labeled a pseudo pattern.

4.10.C. Explicit Support for Group Collaboration Patterns

Explicit support for group collaboration patterns begins by recognizing the patterns that are operative in a given domain. (Note that it is an open research question whether truly domain-independent collaboration patterns exist.) Recognizing group collaboration patterns is generally accomplished by controlled observation of numerous examples of collaboration in a particular domain. The following case study presents a composite example in the domain of collaborative product design, which was first observed among groups of high school students.

4.10.C.1 Case Study of Collaborative Product Design

Jane picked up the strut and examined it closely, putting it down with a sniff. "I think what we need to do is to make the car as light as possible." "Whatever," Bill said dismissively. Undaunted, Jane collected the pieces that would form the first version of the team's car. Four wheels, axles and chassis, struts for the overbody superstructure, rubber band for the propulsion. First the front wheels, then the rear wheels, then the chassis that bound them together, and finally a fanciful roof and overbody assembly that marked the team's creation as a "funny car." "Wait!" said Bill. "Can we take a look at the wheels?"

"Sure!" said Jane. She separated the upper part of the car from the lower part and handed the chassis to the two boys. "We'll finish off the top." The two girls shifted a bit onto an empty spot of carpet and examined their section of the car more closely. On their own spot of carpet, the two boys floated design options in low but urgent tones. Breaking apart the original design, they added a horizontal strut on the back of the car that extended the range of the rubber band propulsion mechanism. Looking over to the girls, they noticed a much more elaborate roof structure all ready to go. "Cool!" murmured Ahmed. "Let's put it together and test it out."

Unfortunately, when tested on the makeshift track in the hall, the back wheels spun out furiously, finally catching and sending the car on a sharp bank to the right. It hit the wall well short of the end of the hall. "Shoot!" said Taniqua, "What happened?" "It's ***too*** *light," Bill replied. "We gotta weigh it down so that the wheels don't spin out."*

They moved back into the conference room and resumed their spot on the carpet. "I think we should make it higher," Jane announced. "No way!" replied Bill. "That would just increase wind resistance." "Well, do you guys have a better idea?" retorted Jane. Bill looked at Ahmed and replied, "We might." "OK, do it yourself then," said Jane, and handed the car to Taniqua. Bill fumed, but picked through the parts pile for enough struts and wheels to construct a competing car design.

Working busily, each on their own patch of carpet, the dueling designs took shape. The boys crafted a car that shifted the weight to the back wheels while keeping the profile slim and low. In contrast, the girls' design brought the weight forward by fabricating an overhang that flew high and proud. When each subteam had finished, they reconvened in the hall to put their creations to the test. Again the observer worked the stopwatch and again the wheels spun. When the dust had settled, the girls' car was declared the victor, though by a fairly small margin. The boys reluctantly conceded defeat and scrapped their contribution in favor of the girls' design. In the final race, the team of Jane, Taniqua, Bill, and Ahmed placed second in distance, third in speed, and fifth in cost. Not bad for two hours' work.

4.10.C.2 Group Collaboration Patterns Observed in the Case Study

Several observations can be made about the collaboration described in the case study above. The most important is that subgroups were fluidly formed and dissolved twice in the accomplishment of the overall task, which was to design a car according to three performance criteria—fastest over a fixed interval, longest distance traveled, and least expensive. Closely related is the insight that the subgroup formation process reflected in some sense the structure of the object being created, and could have been continued recursively. For example, it was not accidental that the car was divided into upper and lower sections instead of left and right sections. More generally, the design team exhibited patterns of interaction that constitute patterns of task-focused collaboration. Their collaboration—perhaps even the very nature of collaboration itself—consisted of fluid transitions from one pattern to another in pursuit of a common goal. Table 1 below proposes four patterns of collaboration that are relevant to the activity of product design; these patterns describe the collaborative functioning of the group as a whole, not the individuals that comprise the group. The categorization was influenced by several sources, primarily John-Steiner[12] and Cicognani and Maher,[13] as well as empirical observations of the activities of several product design teams. Note that these patterns may well be domain-independent.

Name	**Description**
Peer-to-Peer	Each group member contributes equally
Leader-Follower	One or two group members contribute far more than the rest of the group
Complementary	Formation of a subgroup for the purpose of dividing a portion of the design task into mutually exclusive subsets, the results of which will be rejoined later at a higher level
Competitive	Formation of a subgroup for the purpose of duplicating a portion of the design task and competing with other subgroups for acceptance

Table 4.10-1: Task-Focused Group Collaboration Patterns Relevant to Product Design

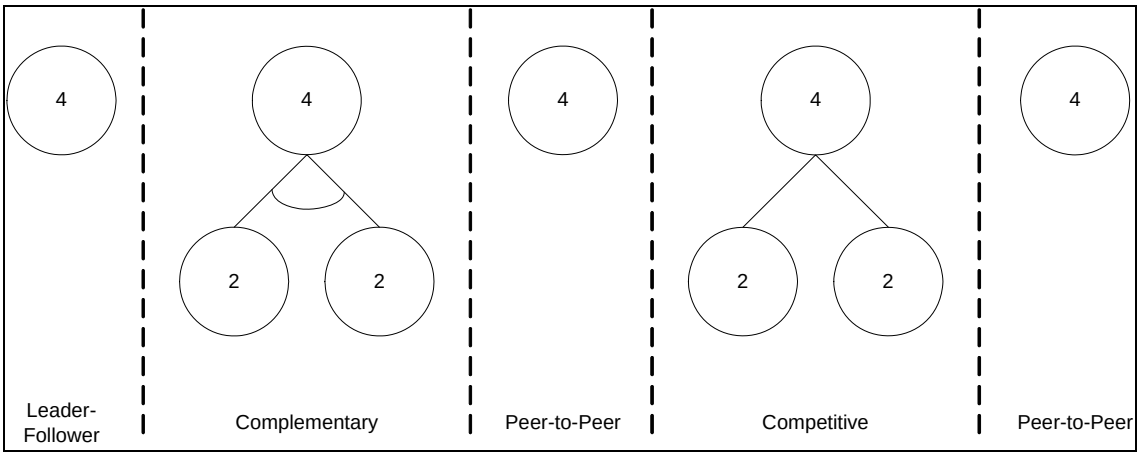

Figure 4.10-1 Stages of Collaboration in the Case Study

The stages in the collaboration process described in the case study are depicted in Figure 4.10-1 using a representation known as a collaboration tree. A collaboration tree is an "and/or" tree that provides a graphical portrayal of the subgroup structure of the group at an instant in time. The "and" branches indicate complementary subgroups, and are denoted by arcs between them; the "or" branches indicate competitive subgroups, and lack such an arc. The number of subgroup members in that branch of the collaboration tree is displayed inside each node.

4.10.C.3 Experimental Results of Explicit Support for Group Collaboration Patterns

After observing that almost none of the collaboration software available provided explicit support for group collaboration patterns, in the Fall of 2003 the present author conducted an experiment at Lehigh University to assess the benefits of such support. The operating hypothesis was that explicit support for group collaboration patterns would improve the group collaboration in some way, whether in time, quality, or productivity. Three factor levels were present in the experiment—no support for group collaboration patterns; manual support for the group collaboration patterns listed in Table 1; and automatic support for those collaboration patterns. The task was the collaborative design and assembly of a roller coaster in a 3D virtual environment. Eighteen teams of six people participated in the experiment, which was divided into two halves. The first half was a quality and productivity test, in which the goal was to design and build a connected roller coaster that consisted of as many track pieces, and as many quality features (such as hills and loops) as possible within 25 minutes. The second half was a time test, in which the goal was to achieve the fastest time in creating a connected roller coaster with at least 25 track pieces, a loop-the-loop, and a hill.

No significant differences were found between factor levels in the time test, primarily because the goal of the fastest time caused very few of the collaborative features of the software to be used. However, significant differences between factor levels were found in the quality and productivity test. The best scores by far were encountered using manual collaboration pattern support; in fact, none of the teams with no collaboration support, and only one of the teams with automatic collaboration pattern support, even completed the task of connecting their roller coaster within the time limit. Post hoc analysis suggested that the explicit support for group collaboration patterns provided cognitive as well as mechanical benefits, and that the observed differences between manual and automatic collaboration support were probably due to inappropriate parameter settings and the lack of direct user control of parameter settings.

4.10.D. Conclusions

Several conclusions can be drawn from the discussion above.

- Several researchers have observed and categorized group collaboration patterns, whether patterns of interaction, patterns of content, or patterns of tasks;
- Group collaboration patterns are generally domain-specific;
- Since individuals often participate in multiple collaboration contexts simultaneously, a collaboration pattern is specific to a particular collaboration context;
- Task-focused collaboration often consists of fluid transitions between group collaboration patterns in the pursuit of task accomplishment; and
- Experiments have demonstrated that explicit computational support for task-oriented group collaboration patterns can improve the performance of the group task.

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[1] This piece is an adapted excerpt from John M. Linebarger, Christopher D. Janneck, & G. Drew Kessler, "Leaving the World Behind: Supporting Group Collaboration Patterns in a Shared Virtual Environment for Product Design," *Presence: Teleoperators and Virtual Environments* 14.6 (December 2005), 697-719. It also contains materials from John M. Linebarger, Andrew J. Scholand, Mark A. Ehlen, & Michael J. Procopio, "Benefits of Synchronous Collaboration Support for an Application-Centered Analysis Team Working on Complex Problems: A Case Study," *Proceedings of the 2005 International ACM SIGGROUP Conference on Supporting Group Work (Group'05)*, Sanibel Island, FL, USA, 6-9 November 2005, 51-60, and John M. Linebarger, Andrew J. Scholand, & Mark A. Ehlen, "Representations and Metaphors for the Structure of Synchronous Multimedia Collaboration within Task-Oriented, Time-Constrained Distributed Teams," *Proceedings of the 39th Hawaii International Conference on System Sciences (HICSS 39)*, 4-7 January 2006, Kauai, HI, USA.

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4.11. Checklist for Successful Collaboration (Tamra Hall and Kerry Buckley - The MITRE Corporation)

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The checklist that follows was used to evaluate collaboration programs in the intelligence community.

Define goals

- ❑ Define specific collaboration goals.
  - – Document anticipated value-added of collaboration.
  - – Define hierarchy of supporting goals, e.g., community, organization, team.
  - – Ensure alignment of goals with organizational culture.
- ❑ Obtain buy-in to goals from all participants.
  - – Document commitment to goals in mission statement or MOA/MOU.
- ❑ Define metrics to gage progress toward goals.
  - – Define schedule to collect and analyze metrics.
- ❑ Define schedule or ongoing mechanism to realign goals based on system evolution.

Define collaboration process and workflow

- ❑ Define who needs to be online to achieve collaboration goals.
- ❑ Specify criteria for system access, including need for restricted access areas.
- ❑ Define types and classification levels of data to be on the system.
- ❑ Define required integration with existing systems and data flow.
- ❑ Define and document roles and responsibilities for organizations and individuals.
- ❑ Designate responsibility and process for content management.
- ❑ Define and document role of facilitators within the system.
- ❑ Define process to support evolving needs of users and organizations.

Establish trusting working relationships

- ❑ Identify barriers to trust among participants.
  - – Obtain input representative of all users' perspectives.
- ❑ Define mechanisms to establish/reinforce personal working relationships.
  - – Aim for initial and periodic face-to-face meetings.
  - – Investigate options for online activities to encourage personal exchanges.

Define rules of engagement

- ❑ Define process for initiating and sustaining collaboration to meet goals.
- ❑ Outline user protocols for logging in, checking e-mail, responding to requests, etc.
- ❑ Establish guidelines for data/product ownership and attribution.
- ❑ Define security and risk mitigation procedures.
- ❑ Ensure user guidelines allow flexibility to evolve system use.

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Ensure mutual benefit

- ❑ Identify perceived inequities in effort versus benefit in system participation.
- ❑ Define strategies to eliminate/minimize discrepancies in effort/benefit.
- ❑ Define strategies for rewarding those who contribute extra work.
- ❑ Define process for monitoring inequities that emerge after deployment.

Obtain management support

- ❑ Ensure management buy-in to collaboration goals.
- ❑ Obtain management commitment to personnel and financial resources.
  - – Include resources to support development, process issues, deployment, training, and operational support.
- ❑ Communicate management commitment to all levels of the organization.
- ❑ Ensure management's knowledge and recognition of collaboration successes.

Align reward structures with collaboration goals

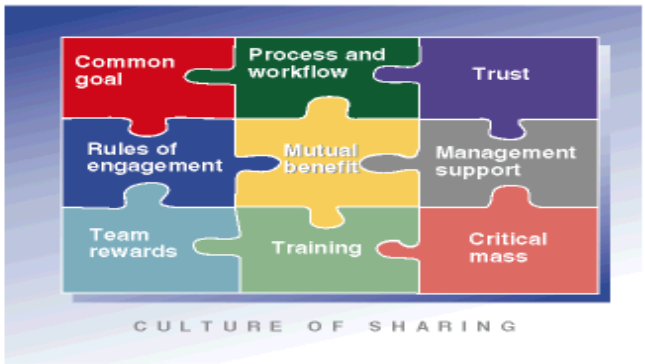
- ❑ Examine evaluation and reward systems to identify conflicts with collaboration goals.
- ❑ Revise/establish reward systems that reinforce collaboration.
- ❑ Establish process to distribute rewards concurrent with accomplishments.

Develop comprehensive training program

- ❑ Begin training by outlining specific collaboration goals.
- ❑ Provide users basic instructions in effective team skills.
- ❑ Address system functionality within context of realistic scenarios.
- ❑ Conduct training as a team.
- ❑ Define need and strategy for training remote users.
- ❑ Define strategy for supporting users' exploration of system after deployment.
- ❑ Allocate separate area in system for training activities.
- ❑ Consider training a requirement for system access.
- ❑ Closely time training with account activation.

Ensure critical mass usage

- ❑ Ensure defined community of users have system access.
- ❑ Define strategy for ensuring system use (e.g., management mandate, rewards).
- ❑ Define process for monitoring system use.



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5. Potential Enablers for Collaboration

5.1. Techno-Collaboration: Issues in Management and Sharing (Chris Bronk - Rice University)

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5.1.A. Introduction

> "It is only because individual human beings are limited in knowledge, foresight, skill, and time that organizations are useful instruments for the achievement of human purpose." — Herbert Simon[1]

Information Technology (IT) has significantly altered the manner in which the US Defense Department and Intelligence Community conducts its business—streamlining some processes, while transforming others. There is potential for powerful change, but Web transactions with and within government have largely been limited to the traditional hierarchical system of control found in bureaucracy. Today, it is becoming evident that new technology may permit more individuals to contribute in collaborative work, and new tools, from "mash-ups" to blogs, will change the way those workers digest, process, refine and visualize data.

This paper investigates the possible paths for government's employment of IT and the connection between technology and organizational culture. How might IT enable new methods for intellectual collaboration in the business of foreign affairs and defense policy and what organizational changes might occur because of that collaboration? What role might IT have in eventually transforming the capacity to allocate human talent to meet pressing issues?

Discussed here is the role of collaborative work as it might impact the traditional *modus operandi* of bureaucracy that has characterized the US defense and intelligence communities, and the process by which deliberative content might become official policy in the national security area. This paper explores how technology might allow large numbers of government workers: soldiers, diplomats, analysts, and others, to electronically publish, share and locate information and knowledge resources with minimal effort—and how that may impact the management, hierarchy, and function of their agencies.

In examining how US agencies create, process and produce information, the useful model is usually one of the hierarchical pyramid, in which large numbers of information collectors and producers at the bottom of the organization create raw data. With each additional step up the pyramid, the data are refined to information and then knowledge.[2] Large organizations, both public and private, have largely recognized that there is value in reorienting labor to meet different needs by forming groups, often formed in an ad-hoc manner to accomplish specific tasks in problem solving and innovation. To describe this manner of collaborative work, this paper uses the term *thinkering*[3] but also useful is Ciborra's concept of *bricolage*[4] (these terms are further discussed in section 5.1.C). The idea, writ simple, is one of collaborative, creative work—the generation of ideas or concepts by groups of individuals—designed to solve problems or answer questions. Contemporary examples of such behavior include the Open Source Software (OSS) movement that has fostered the creation by volunteers of Linux, a variation on

the Unix operating system and Wikipedia, an online encyclopedia "written collaboratively by volunteers from all around the world."[5]

Linux's development turns on its ear the idea that complicated, large-scale software projects require markets or managerial hierarchy to organize production.[6] Linux and other pieces of open source software (OSS)[7] are, indeed, complex technologies and their very existence lends credibility to the idea that "Peer production provides a framework within which individuals who have the best information available about their own fit for a task can self-identify for the task." Key to this concept, however, is the need for the organization to develop a "mechanism to filter mistaken judgments that agents make about themselves."[8] But does this process apply to other forms of knowledge generation, and, if so, how can such an effort be managed? Can the OSS production method apply to intelligence analysis or policy formulation?

5.1.B. The Organization Process Paradigm in the Digital Age

Drawing on Allison, whose work on the bureaucratic response to the Cuban Missile Crisis remains salient,[9] it is also worth asking how the bidirectional Web 2.0 IT might impact organizational process and decision-making. We seek answers as to how disparate reports and rich data combine to become the refined knowledge[10] of use at the highest levels of government, in this case, in the foreign policy arena. Building on concepts of bounded rationality and the resultant bureaucratic behavior,[11] of interest is a re-visit of Allison's Organizational Process Paradigm for contemporary, networked government.[12] More than 35 years after its publication, much contained within rings very true, but how do technologies developed since the release of "The Essence of Decision" interact with the hierarchy of information production and refining impact the model posited? Certainly mass content creation by many will change the boundaries of problem-directed search, organizational learning and change, and central coordination and control. Useful, then, is to track recent government IT activity cohering with each of these themes.

Problem-directed search, which might be labeled enterprise search, is conducted by stand-alone search computers, referred to as appliances, that are each able to search 3 million documents while taking 25 search queries per second.[13] In the past several years, such appliances have been pointed at internal data repositories much like Google points its technology at the open Web. Regarding the forged "Italian Letter," which was used to considerable effect in arguing a connection between Saddam Hussein and uranium from Niger, the Washington Post argued that the document would have been properly identified as specious and jettisoned had a Google full text search been conducted against CIA information holdings.[14] But such an adoption of full-text search had likely not yet occurred for the space in which the letter resided. The expectation that the CIA could employ best of breed search, in hindsight illuminates the problem that the speed of development for Web technologies has outpaced government and probably will continue to do so.[15]

Speaking to search, but applicable to issues far beyond that topic alone, Burton's reflection addresses a core theme of Open Source Software projects. It is the idea that he or she who holds the best solution should win the argument. Pathways to achievement in this area in the construction of analytical products, however, are largely blocked by problems of organizational structure. The collision of digital technology with organizational culture and rules at the FBI (a member of the IC) and the resulting muddle would appear to conflict with Allison's suggestion that, "Dramatic change occurs usually in response to major disasters."[16]

With dramatic failure might come a chorus of calls for change; however, this is by no means a guarantee of effective change, particularly with regard to the implementation of IT. The IC has struggled mightily with the issue of overhauling its IT infrastructure and services to keep pace with an accelerating pace of activity requiring greater sharing and interconnectedness. With September 11 as catalyst, those agencies perceived as failing to "connect the dots" now face the formidable task of adapting to new process and policy heavily fortified with computing and information technologies. Despite the considerable degree of importance of this activity, organization-changing government IT projects fail with regularity.

One such example, the FBI's Virtual Case File (VCF) system, failed because of a closed development environment in which software engineers did not understand the organizational culture their software would serve. Bureau leadership fell into one of the great traps of software development—that a system must be built from the ground up or it would be deficient or substandard. In developing the IT solution for the enterprise, fundamental is the question, "Do you change the software to fit the business function, or the function to fit the software?"[17] Every alteration of existing software code to satisfy the first clause comes at a cost—not only of the fee for crafting that code, but also the inherent errors, or "bugs," that crop up. Sometimes it might just be more productive to make do with what already exists.

Such belief embodies the thinking behind Army Knowledge Online (AKO). Designed to meet the problem, "If we don't mirror the insurgency with our social networking and rapid transfer of knowledge, then soldiers' lives are put at even greater risk," AKO exemplifies technical simplicity.[18] Its mandate is clear: Deliver knowledge where it is needed, when it is needed. While the Army seeks a God's eye view of the battlefield, so that commanders, who might be thousands of miles away, can dispatch forces to scout and, if desirable, attack targets, AKO was built to facilitate horizontal knowledge transfer on a far more basic and organic level. Its designers accepted that the idea of commanders at the highest level managing the conduct of conflict was possible, but there were inherent problems with such a vision. Lyndon Johnson's marathon sessions of target selection at the White House were a prima facie example of managerial overstretch;[19] however, the capacity to do so remains. Leadership can pull together a powerful set of images in directing operations. But how does this remote connectivity aid the foot soldier, or tactical commander engaging in the day-to-day slog of counterinsurgency? This grows problematic considering the hierarchical nature of the service.

The architects of AKO realized that a useful tool resided in the activity of milbloggers. Milblogging, or military blogging, is a phenomenon produced by the first generation of soldiers who brought their laptop computers with them to war.[20] The military's need for distributed digital connectivity and Internet connections in even the most remote locations has allowed soldiers to use their downtime to log in. After some initial opposition, the Army recognized the value of milblogging and eventually incorporated it into AKO. By effectively institutionalizing blogging, the Army chose to accept that the informal horizontal communications and tacit passage of knowledge among its officer corps and other ranks would increasingly take place in digital form. For an organization embracing official reporting and paperwork, this unofficial reporting was deemed valuable and worth protecting. Formal mechanisms of rank and command continue, but the Army recognized utility in not just tapping experience for institutional documents and doctrinal guidance, but also in passing information horizontally without official review. This has likely improved performance in the field and perhaps even saved lives. But another problem exists, that of information overload.

5.1.C. Proliferating Sources and Laws of Collaboration

For any effort designed to share knowledge and understanding, as opposed to data transfer, the question remains as to ultimate digestion or fusion. For the Director of National Intelligence (DNI), the problem is often one of knowing not just what to look for, but also where to look. The DNI and others must cope with an Information Tsunami,[21] a phenomenon produced by the capacity of its analysts and executives to monitor an overwhelming number of sources on a myriad of topics adding new content each day. The computer has allowed collection of information to surpass analytical capabilities and the perceived overload problem has the potential to stymie the government decision maker. The IC's knowledge workers[22] are often awash in a sea of primary and secondary sources, including copious quantities of e-mail and media in multiple formats.

What is desired is the best available information to solve the issue at hand and the ability to develop the practical steps necessary for implementation of Ciborra's *bricolage* or Seeley Brown's *thinkering*. Finding daylight between the two terms is useful for the purposes of this paper. *Bricolage* may be seen as institutional creative tinkering. Under an organizational *bricolage* regime, individuals at all levels of the organization are encouraged to engage in activity which may alter the function of the institution's Strategic Information System (SIS).[23] Seeley-Brown's *thinkering* also embodies this tinkering activity, but in a strict group context. He makes the case that the strongest students study in groups and by extension the best innovators or problems solvers will thrive in organizations that embrace small group models to define issues and craft solutions.

Forwarded is a belief that putting the heads together is important and those who work together should have the freedom to tinker, trying different approaches and tools until they can locate a better mousetrap for doing the job. Unfortunately, the mechanics of making this recognition reality are stymied by organizational boundaries and all manner of controls that have grown up in government regarding information dissemination.

For the knowledge worker, answers to problems in processing data and creating policy are not likely to be found in sophisticated, task-specific computer systems. All but the most exotic roles, as found in aerospace and military applications, are increasingly handled with commercial-off-the-shelf (COTS) hardware and software. The US government is Microsoft's single largest customer. The days when government contracted with the private sector to build specialized computing systems have all but passed. Accepting then, that wider collaboration will not rely upon a new form of computer or highly specific software, what then are the core principles for IT in collaborative government work?

First, collaboration tools should be easy to use. However, in a federal workforce in the throes of massive turnover and reorganization, usability is very much a moving target. For some, editing wiki pages might be simple, for others it is an effort requiring considerable training and support. Nonetheless, usability should trump technical wizardry wherever possible. Simplicity is key.

Second, collaboration should be entirely facilitated by the Web browser. There should be no special software that requires installation, administration or upkeep beyond the browser itself. The data of importance should not reside on individual personal computers, but rather on managed application servers running the collaboration software or in a government-only computing "cloud."

Third, collaboration solutions should be cheap, or even better, free, as far as users are concerned. Although the US Federal Government allocates plenty of money for IT (somewhere in the neighborhood of $65 billion is requested for Fiscal Year 2008[24]), that funding is not always easily steered to information-sharing or collaboration projects at the operational level. Low- or no-cost collaboration—priced somewhere under $2,500, the single transaction discretionary limit for a Federal purchasing credit card—would allow useful services to be accessed by many in an agile manner.

5.1.D. New Way of Work?

IT has spurred tremendous change in how we believe government should function. Ideally, all of the information necessary for solid decision-making should be instantaneously available and easily digested. Management science was convinced in the 1980s of the utility of "flattening" the organization and replacing middle managers with networked computers and other IT. Secretaries became an endangered species, the steno pool evaporated and large numbers of white-collar workers left positions in which they processed and analyzed information rising from the lower echelons of the organization and disseminated messages from above. In the wake of business process re-engineering and reorganization, collaboration has gained value, but the dynamics of how to collaborate remain largely to be defined by the circumstances each time it is undertaken.

One concept of some duration in the management literature has been that of Knowledge Management (KM). An emerging discipline, KM is cogently broken into four parts by Alavi and Leidner, as the creation, sharing, transfer and application of knowledge.[25] Previously mentioned herein with the Army Knowledge Online example, KM has been described in various forms and flavors[26] but boils down to a function in which knowledge gets to where it is needed, when it is needed. All too often the term KM is thought to equate to investment in IT. This is an incomplete statement. Yes, the two terms are, it would appear, inextricably linked, but there is something more.

One consultant's thoughts on KM squarely address this missing element, the human management side of all this moving of ideas. Suggested is the need for a corporate "KM support infrastructure" composed of editorial staff, researchers, brokers, librarians and domain owner/ knowledge managers.[27] This support infrastructure, described as architecture for knowledge management beyond technology, would be one template for middle management in the knowledge organization. While it might not be voguish to speak of hiring new managers, equipped with a different skill set, it might be exactly the prescription for handling the Information Tsunami and facilitating meaningful collaboration.

Building a notional organic work team designed to collaborate as its core value requires a new mode of management. But what examples are there to serve as guides? In academia, collaboration is of fundamental importance, largely because the isolated, monastic thinker pondering his or her research topic in isolation appears to be a waning demographic. Especially in the sciences and engineering, but increasingly in the social sciences as well, novel research is to be found by bringing experts from different areas to work together. Keeping the research focused, supported, and moving forward requires a support infrastructure, not least a research facilitator.

Often executive staff charged with running interdisciplinary research centers will pull together faculty from multiple departments to work on a single focus area. An example of this activity at the author's institution, Rice University, is in the area of nanotechnology. To build

nanotechnology applications typically requires the input of chemists, biologists, computer scientists, and mechanical and electrical engineers, among others. Their effort must be directed, and that is effectively done by a scientific generalist, with leadership and organizational management capacity and training. The IT component is actually fairly easy, as documents, data and other research materials are supported by computing resources and an organizational culture that above all else values the open flourishing of knowledge. Harder is sorting out the interdisciplinary conflicts and research culture biases. Likely the same could be said of inter-agency and inter-service collaboration in the US national security enterprise.

Pulling together all of the desired intelligence products for delivery to policymakers through some sort of a fusion process is the role of management. Office directors or section chiefs distill the content they receive and pass it up the chain of command. Perhaps there is room for a collaboration expert in each analytical cell or even in each organic functional unit, whose job it is to make sure that his or her cell or unit is engaged in the horizontal sharing that better informs the entire enterprise. AKO is an example of an informal activity in this space, but what if every unit had a specialist tasked with making sharing work?

5.1.E. Final Thoughts

Crucial for the Department of Defense and Intelligence Community is meeting a pressing need to get desired information where it is needed, when it is needed. Re-examining Allison's points on directed search, managing change and central coordination and control offer some guidance on the varied experiences of how IT has served, or failed to serve, the national security mission. Generally, the concept of Knowledge Management has come to be viewed as valuable, but an important lesson remains largely unlearned. Much technology has been delivered, but the form and shape of the bureaucracy remain largely the same. There is guidance from economists to be considered in addressing the holistic view of knowledge-enabled government. Brynjolfsson and Hitt argue that, "organizational complements such as new business processes, new skills and new organizational and industry structures [serve] as a major driver of the contribution of information technology."[28]

This coheres with a belief that the evolution from Industrial Age to Information Age necessitates organizational re-tooling for the Department of Defense and Intelligence Community and perhaps federal government at large. Alberts and Hayes describe the fusion of technologies and fundamental process shift at work in the wiki style of information creation and retrieval:

> With the widespread adoption of IP (Internet Protocols), browser technology, and the creation of Web pages and portals, we can finally move away from a push approach to information dissemination to a post and smart pull approach. Moving from a push to a post and smart pull approach shifts the problem from the owner of information having to identify a large number of potentially interested parties to the problem of having the individual who needs information identifying potential sources of that information. The second problem is a far more tractable one. This is because it is much easier for the individual who has a need for information to determine its utility than for the producer to make this judgment.[29]

This idea, in which producers of knowledge share with those who truly might have the need to know without control of that wider sharing, is both appealing and frightening for a bureaucracy concerned with controlled dissemination and originator control, foremost in the classified domain,[30] but increasingly in the sensitive-but-unclassified (SBU) area as well. There is

considerable push to make government "Netcentric,"[31] but friction exists between new models of organization and deeply entrenched institutional norms and practices. Hill and Lynn see a government in which transformation and radical departure from the hierarchical structure are unlikely. There is an information economics issue in government tied to the appropriation process that, in tandem with constitutional authority, will impact how IT adoption influences government process and function with regard to hierarchy.[32]

The magnitude of organizational overhaul that will occur in the federal government as IT and process converge remains to be seen. How the US government, in the transforming global environment in which technologies of computing and telecommunication dramatically alter the conduct of national security affairs, is able to deliver services, provide analysis and solve problems largely on the basis of processing information and transferring knowledge should heed the advice that "hierarchical organization is a lossy medium."[33] Engineering digital information flows that will address concerns for vetting and review, yet provide the speed required of the security domain likely will remain a work in progress for some time to come. Helpful may be a process in which the enterprise begins cultivating talented collaborators, natural networkers able to share information among colleagues and around the organization. If the rewards system of incentives is created to build a career path in this area, the right technical tools will likely be found.

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[2] See Webster, Frank, Theories of the Information Society (London: Routledge, 2006).

[3] Brown, John Seeley, "Reflections on Inflection Points in the 21st Century - scholarship, science, learning literacy and play all in transition," address to the DeLange VI Conference – Emerging Libraries, Rice University, Houston, TX, March 5, 2007.

[4] Ciborra, Claudio, The Labyrinths of Information: Challenging the Wisdom of Systems (Oxford: Oxford University Press, 2004).

[5] Wikipedia, http://en.wikipedia.org/wiki/Wikipedia:About

[6] Ibid.

[7] Including the Mozilla Firefox web browser and Thunderbird email client and Apache, a web server application, are examples of widely used open source applications.

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[9] Allison, Graham T., The Essence of Decision, Explaining the Cuban Missile Crisis (Boston: Little, Brown & Co., 1971).

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[12] Allison, op cit

[13] Google, http://www.google.com/enterprise/gsa/product_models.html

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[16] Allison, p. 85.

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[24] Budget of the United States Government, Fiscal Year 2008, US Government and Printing Office, Washington, D.C., July 11, 2007.

[25] Alavi, M. and D. E. Leidner, "Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues," Management Information Systems Quarterly, Vol. 25, No. 1, 2001.

[26] See Bray, David, "Literature Review – Knowledge Management Research at the Organizational Level," Social Science Research Network

[27] Capozzi, Marla M., Knowledge Management Architectures Beyond Technology, First Monday, June 2007, http://www.firstmonday.org/issues/issue12_6/capozzi/index.html.

[28] Brynjolfsson, Erik and Lorin M. Hitt, "Beyond Computation: Information Technology, Organizational Transformation and Business Performance," Journal of Economic Perspectives, Vol. 14, No. 4, Fall 2000, p.45.

[29] Alberts, David S. and Richard E. Hayes, Power to the Edge: Command…Control…in the Information Age (Washington D.C.: Command Control Research Program, US Department of Defense, 2005, p. 82).

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5.2. Collaboration in the Federated Environment: The Nexus Federated Collaboration Environment (Carl Hunt - DTI and Ned Snead - IDA)

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5.2.A. Introduction

People, processes and technology, along with their critical linking fabric, information, compose the heart of the modern organization. None of them, including the organization itself, stands alone: interconnected and interdependent, people and organizations interact in order to thrive. To succeed in this new massively interconnected environment, we as a nation must know how to enable people, information and processes to build, explore and exploit a networked federation of diverse organizations to better make timely decisions regarding adversary goals and behaviors. In addition, we must understand and apply relevant sciences and technologies to mitigate US and allied organizational impediments to improve decisions and actions overloading an already stressed analytical and operational force. Moreover, we must accomplish all of this while ensuring even complex decisions are responsive to the often time-sensitive nature of global threats. Finally, we must incentivize the members of this federation in ways that recognize and encourage the continued development of transparent collaborative work and institutionalize incentives that reward contributions to the community.

This paper highlights the major challenges addressed in a recent Strategic Multilayer Assessment (SMA) report on designing, building and federating an interagency collaborative environment. We originally chose the term Nexus as a placeholder term to describe this environment. The term Nexus became increasingly useful in large part because it is a sufficiently descriptive term to define what such an environment would do: serve as a virtual place that transcends the center and the edges of its member organizations yet facilitating the linkages of the members in common alignment to specific goals. But the term Nexus was not quite useful enough. The environment we seek to define must span multiple organizations and political-economic worlds both in and out of government: it has to federate. This environment must enable sharing, mutual cooperation and common goal setting and execution: it has to empower collaboration. Finally, it must transcend traditional boundaries and organizational equities: it must be an environment rather than a place or simple collective of organizations; it must be capable of thriving in a virtual, potentially highly distributed setting enabling the multidisciplinary talents of many government and non-government organizations to interact and succeed in ways that exceed the sum of their constituent parts. It must facilitate the emergence of an interagency culture. For these reasons, the Nexus evolved into the Nexus Federated Collaboration Environment, or NFCE: this paper is a brief summary of the research that composed the original report.[1]

5.2.B. Strategically Important Issues about Federated Collaboration

There are several critical questions that drove the direction of the SMA work in researching and designing the NFCE. How do we enable people, organizations, information and processes to join, explore and exploit a networked federation of diverse organizations in order to better make timely, transparent and collaborative decisions about adversary goals and behaviors? In addition, how do we apply relevant sciences and technologies to mitigate US and allied organizational impediments and make certain we improve decisions and actions, without overloading an already

stressed analytical and operational force? How do we marshal our nation's distributed knowledge, talent, and power to most effectively address and prevent the potential consequences of adversary activities? Moreover, how do we accomplish all of this while ensuring leaders and staffs can respond to even highly complex requirements for decisions that are responsive in a timely manner? Finally, how do we incentivize this federation to remain actively engaged in transparent collaborative work as a matter of routine rather than simply on an ad-hoc basis or when convenient?

These questions and other supporting inquiry focused the research that led to the description of the NFCE. The report proposed how we might design, test, instantiate, and sustain a collaborative environment to support US and Allied operators and intelligence analysts in the inhibition, discovery and mitigation of WMD in the hands of terrorists (also referred to as getting "left of boom"). However, the NFCE is not meant to be a purely intelligence-interagency collaboration environment – it would transcend all levels of government and public-private sector boundaries. The NFCE is the supporting and underlying federation of highly diverse organizations, and the beginnings of the organizational design, processes and information technology infrastructure that would make it possible for people to work together to defeat adversary behaviors.

In its full instantiation, the NFCE would enable interaction among any number of governmental organizations on any number of levels. We simply can't look back on a high consequence event and ask why we didn't include agency X, Y, or Z; or why an organization with very specialized expertise did not have access to a relevant data set; or question what if only one agency of government had run another agency's data through their model. The demand for coordination, collaboration, transparency, and continuous improvement is tangible and it is within this NFCE operating environment that leaders can help each player do their part to make the whole so much more that the sum of its individual parts.

5.2.C. The Environment for the NFCE

A new generation of Americans knowing only today's environment of interconnected information is now emerging to lead both society and government.[2] Their impact on the nature of professional and social engagements is clear. This cohort has experienced sharing and collaborating in a world of more open classrooms where research and presentations are developed using tools that require multiple perspectives and multi-disciplinary assessments of both goals and outcomes. The teens and 20-somethings of this newer generation have been collaborating with each other, perhaps having never met face-to-face, in virtual venues such as *World of Warcraft* and *Second Life*, learning to build teams and accomplish objectives while exploiting a constantly adapting set of tools, techniques and interfaces. The new generation, known also as Gen Y[3], has grown up in a new networked world that is integrating applications, data and at least some form of security from the ground up.[4] Their approaches to developing new information technology capabilities harness emergence and co-evolution. While their notions of security may not align with what some today might consider conventional network security, the Gen Y approach may be better optimized for collaboration and more seamless passing of data between what we consider to be separate levels of security.[5] Their approach is instructive if not yet mature.

While these young people may not have yet learned to build new forms of government or economic systems using these demanding collaboration environments, they have learned the

utility of sharing and working in more transparent, goal-oriented worlds and to balance collaboration and sharing.[6] This generation is changing the world of information and knowledge sharing, as well as economics and politics before our very eyes. As generations before them, they are teaching the world a better (or at least different) way, a way forward that addresses the complexities and demands of a new world and creates opportunities. The question is: will we listen?

We are just beginning to harness the power of these novel ways of thinking and interacting. These methods are bridging complex environments, enabling new levels of collaboration among business, academia, and the public sector, and influencing the whole of government more every day. The basic purpose of this report is to articulate and demonstrate the feasibility of sustained federation and collaboration between interagency partners where relationships are mutually supporting within a widely scalable and adaptive manner, leveraging the power of interconnection and networking. "Residents" of these new connected worlds experience relationships and outcomes that are more transparent and targeted towards maximum objectivity in the use of knowledge and meaningful inquiry than ever before.

People, processes and technology, along with their critical linking fabric, information, compose the heart of the modern organization. None of them, including the organization itself, stands alone: interconnected and interdependent, people and organizations interact in order to thrive. As in three legs of a stool, these elements stand in balance providing stability and function to the organization. Failing to address one leg and not another, or placing too much emphasis on one leg over the other, creates imbalance and the organization suffers.

The NFCE research recognizes that no action within one segment of this model can act alone. Technology must enable business requirements and human capital; processes must operate efficiently, enabling the activities of people and systems; and policies must enable resourceful and effective operations in synergistic ways that contribute to enhanced national security. These relationships are bidirectional, enabling each to both shape and respond to the activities of the other. We must expect and challenge these elements to remain responsive to a changing environment. In this space, we face our most vexing challenge. The temptation is often to buy "solutions" to problems that are actually capabilities that optimal employment requires understanding of the environment and its challenges. Accurate measurement of relevant performance measures and open minded consideration of new approaches to business challenges enable required continuous improvement that is essential to remaining relevant.

To succeed in this critically important objective, we as a nation must understand our strengths and enable people, information and processes to build, explore and exploit a networked federation of diverse organizations aligned to make timely, transparent and collaborative decisions about adversary goals and behaviors. The application of this capability is as relevant to daily interactions as it is to addressing complex challenges such as countering the accumulation and/or use of weapons of mass destruction. In addition, we need to know how to apply relevant sciences and technologies to mitigate US and allied organizational impediments and make certain we improve decisions and actions, without overloading an already stressed analytical and operational force. Moreover, we must accomplish all of this while ensuring even complex decisions are responsive to the time-sensitive nature of challenging problems. Finally, we must incentivize individuals and organizations of this federation to routinely engage in transparent collaborative work.

5.2.D. The Nexus Federated Collaboration Environment – Characteristics and Attributes

As noted above, the notion of a nexus describes an environment where interaction is facilitated rather than denied.[7] It is an open "space" for blending need with innovation that produces an environment for better decision-making, backed up by realistic courses-of-action decision tools. This nexus-like environment harnesses the local and global network infrastructures that are possible through the characteristics described in more detail below. A convergence of important contemporary organizational and information management capabilities, augmented by recent discoveries in social science of what are known as "weak ties", suggest an approach to improving timely collaboration and decision-making.[8]

The NFCE demands the application of the individual talent, organizational capabilities and collective wisdom of the whole of government. The dispersion of this national talent and information, combined with diversity of organizational cultures and management systems, challenges the timely exchange of information, association of goals and objectives, and critical timeliness of decision-making processes. The response to these requirements lies in proper alignment of people, process, and technology. Fortunately, commercial demands to operate more efficiently in increasingly global markets drive rapid advances and evolution in some of the very capabilities envisioned for the NFCE.

Another way to think about a nexus is as the center of something. An additional definition speaks to a "connected series or group," while yet another definition has to do with a "means of connection; a link or tie."[9] The NFCE refers not to a center or group but as an environment in which to make connections or links that support transparent, collaborative decision-making and action within and between groups. *It is a virtual place that transcends the center and the edges of its member organizations facilitating the linkages of the members through both the strong and weak ties concepts of network science discussed above.* This NFCE, in synergizing a social networking framework with information technology network applications, offers the following:

1. Dynamic alignment of people, process, policy, and technology, marked by usually continuous and productive activity or change.
2. Transparency of data and process, maximally exposed through the collaborative nature of the network infrastructure that supports it (e.g., both weak and strong ties) and making previously implicit activities and rules now explicit.
3. Continuous improvement that is informed by performance metrics that may be pre-defined, but accommodating of emergent metrics developed from the bottom up.[10]
4. Adaptive behaviors that reflect not only a single organization but all of the organizations linked through the NFCE, and facilitate the rapid and efficient growth of established Communities of Interest and Practice.
5. Continuous learning within an evolutionary environment that is sustained through shared vision of both the organization's membership and those linked through the NFCE…a belief in and exercise of the power of combined and synergized net-enabled organizations.
6. Flexibility to identify and deal with problems within a collaborative interagency environment less restrained by the barriers of traditional organizational areas of responsibility.

7. Seamless transition from production to consumption, recognizing all members as prosumers,[11] producer-consumers working in a sharing-based environment that transcends prescribed organizational boundaries and roles.

Such an enriched networked collaborative environment, federated across the collection of agencies within the whole of government community, results in a visible resource management environment characterized by the following key attributes:

1. Inclusive of all relevant stakeholders
2. Possesses built-in transparency, with maximum visibility of trade-offs and risk
3. Adaptively structured, but collaboratively consensus-building in orientation
4. Works on a multi-layer / multi-disciplinary decision-making platform
5. Evolutionary in design orientation and execution
6. Highlights / mitigates biases through visibility of objective processes
7. Accommodates incentives for resolving competing objectives
8. Informs and enables continuous improvement and alignment of people, process, and technology

The two lists above specify the ideal parameters of the Nexus Federated Collaboration Environment. As noted earlier, the team's research did not find any organizations that were synergizing all of these capabilities into a federated, interagency/intra-agency domain. These characteristics should comprise the internal working components (the DNA) of what might be called the "operating system" of a distributed collaboration environment, the ways in which components and mechanisms of the environment would interface and interact.[12] The SMA Collaboration Experiment in June 2009 will test several of these characteristics and attributes.

5.2.E. Summary

The Nexus concept describes a federated collaboration environment. The NFCE, as discussed throughout this paper, proposes a framework that ties together many social and business concepts that have contributed to greater effectiveness and efficiency in other organizations. The synergies these processes, rules and technologies offer (when integrated through people- and data-centric approaches) promise significant improvements to the way in which we might establish and execute the distributed collaboration. Connection and synergistic interactions are the critical enablers for the NFCE.

It is more than reasonable for a commander/director or a staff member to posit a challenge to the premises of the NFCE and ask "Why should I change…what's in it for me and the agency I represent? Why should I care about what some other agency or group is doing that will only water down the visibility of the contribution my own team can make? I get paid for what my team or I deliver, not for what my so-called mission partners deliver…why should I change?"

Through NFCE-centric networked team building, we can produce imaginative but well-grounded techniques to deal with adversary threats or unforeseen disasters. We can tap and connect members of the federation in ways that produce non-linear effects that increase performance. In other words, routine use of the proposed capabilities can help us locate and better leverage the "left of boom" point in time to our own advantage, as well as assisting in defusing the challenges all along the spectrum of danger to US and allied interests – networked, federated teams give us that potential more than any other inter-organizational form working today.

The NFCE is about harnessing complexity and the richness of internetworked people and their organizations so that we best leverage the power of the individual…but, we tap these individual contributions as part of teams in ways that combine and synergize to create effects that transcend the individual. This is "what's in it for me," as the director or commander might ask…individual people and organizations, networked within and operating collaboratively as part of a transparent effort, aligned to common purpose and mission, and incentivized to win. This is the NFCE. Few would reject being more efficient, responsive, or effective: well-designed and managed teams enhance the likelihood of success. Reducing a focus on self and rewarding and recognizing contributions to collective success is critical.[13] We must align communities to shared objectives rather than revert to the comparison of differences between existing methodologies.

Although the fully synergized, integrated Nexus Federated Collaboration Environment described in this paper is more of a framework than a reality to transform the way we leverage people, process and technologies through networks and information, this federated approach captures the essence of the ways in which life itself has been successful over billions of years and applies it to real-world problem-solving challenges. The NFCE can empower at least a modest part of that success on behalf of our nation and allies' senior decision-makers.

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[1] Hunt, C., Snead., E., Zych, J., "The Nexus Federated Collaboration Environment Report: A Final Report in Support of the WMD-T Joint Intelligence Preparation of the Operational Environment Strategic Multilayer Assessment Project", Office of the Secretary of Defense Director of Defense Research and Engineering Office, Strategic Multilayer Assessment Office, Arlington, VA, Oct., 2008.

[2] The leader of these younger generations, in both name and position, is our Blackberry-empowered President of the United States!

[3] Members of "Gen Y" are generally considered to be born during the period 1979-1995. See: http://en.wikipedia.org/wiki/Generation_Y for general perspectives. This label is sometimes confused with a similar generational category known as "Millennials" who are reputed to be born during the period of 1982-2001.

[4] For example: Facebook, MySpace and similar social networking websites. These are examples of features and capabilities co-evolving together in ways that produce value that transcends the sum of their individual contributions. The kind of federated, collaborative team work this report suggests is another example of this sort of co-evolution. The conventional linear, additive approach to building capability, reflective of the ways in which traditional applications were developed, fails to harness this form of co-evolutionary growth. Note also, however, that security is still a minor concern in these environments, and subject to the strengths or weaknesses of the parent operating environment's security status.

[5] To be sure, this younger generation is only now facing the challenges of securing information consistent with the existing rules of national security, and is complying as part of the terms of employment. It appears, however, that they still question why we must do business with so many levels of security (e.g., JWICS, SIPRNET, C-WAN, NIPRNET, etc.). They also wonder how systems grew into discrete lanes of applications, data, and security and are challenging why new systems would be built in ways that accommodate continued segregation of these potential components of synergy – there is hope for us all!

[6] See the Second Life section on community standards and governance as described by the directors of the environment, (http://secondlife.com/corporate/cs.php). Second Life experiments indicate that the so-called residents of this virtual world may indeed be on the verge of creating new, unique forms of government and economy that can be sustained and even ported back into the real world; in fact, importation back to the physical world is important for many financial transactions as noted below. Obviously, residents of all ages and backgrounds are contributing to the emergence and governance of

this virtual world, but in Second Life, it's easier for the young to be as influential as the old. Interestingly, Second Life is now enjoying a "Second Life." After apparently getting it wrong in terms of support to markets and corporate enterprises, the relatively popular global venue (some 14 million members of which 66,000 are present at any given time) has empowered its corporate users to experience a renaissance of sorts where people and commerce mix more effectively (see: Cohen, A., "The Second Life of Second Life," FastCompany.com, October, 2008, at: http://www.fastcompany.com/magazine/129/the-second-life-of-second-life.html, accessed 22 Sep 2008)

[7] The NFCE conceptually describes a synergy of formal, structured networks (as found in traditional organizations) and less formal small-world networks that leverage the strengths of strong ties with the power of weak ties, as described in this chapter. Mark Buchanan's book, Nexus, is an easily accessible description of how the two forms of networks synergize and extend the power of formal and informal organization. An effective social network, Buchanan notes, blends "a peculiar mingling of order and randomness in one network." Buchanan also posits that these recent discoveries about networks, self-organization and self-synchronization are components of a broader concept known as "complexity theory," a study of the emergence of often rich and complex behaviors from simple interactions. The emergence of these behaviors is typically facilitated by a web or multi-dimensional network of some sort. The Nexus Federated Collaboration Environment proposes to form such a web or network to facilitate rich but efficient interaction and emergence in support of the operator and analyst. See: Buchanan, M., Nexus: Small Worlds and the Groundbreaking Theory of Networks, Norton, New York, 2002.

[8] The ideas on "weak ties" are based on Mark Granovetter's groundbreaking paper, "The Strength of Weak Ties," American Journal of Sociology, Vol. 78, Issue 6, May 1973. See also Barabasi, A.-L. Linked: How Everything Is Connected to Everything Else and What It Means for Business, Science, and Everyday Life. New York: Plume, 2003; and Watts, D. J. Six Degrees: The Science of a Connected Age. New York, W.W. Norton, 2003. For other points about the perceived utility of social networking and weak ties included in A-Space, the Intelligence Community's collaboration and social networking capability see: http://en.wikipedia.org/wiki/US_intelligence_community_A-Space. A-Space was formally implemented on 22 Sep 2008 on the Joint Worldwide Intelligence Communications System (JWICS).

[9] See The American Heritage Dictionary definitions at "Answers.com," (http://www.answers.com/nexus&r=67), accessed 26 Mar 2008.

[10] Another feature of continuous process improvement is that it can be poised to identify and expose impediments to efficiency, particularly within a transparent business environment.

[11] Tapscott, D., and Williams, A., Wikinomics: How Mass Collaboration Changes Everything, Penguin Group, NY, 2006. A prosumer, according to Tapscott, is "a new generation of producer consumers (who) considers the 'right to hack' its birthright." Hacking in this sense finds its roots in the early days of mass communications and the Internet, where hackers constantly tinkered with "the rules" and the technologies to put them together in new ways that could potentially improve processes and productivity. A prosumer in the Tapscott sense is one who simultaneously consumes and produces in the hopes of improving the good or service. A prosumer, in Tapscott's word is "good news." As Tapscott notes, Alvin Toffler originally coined the term prosumer in The Third Wave, Bantam, NY, 1984.

[12] Another way to think about these lists is the way in which a client might approach a service provider or consultant with the criteria for an information technology or organizational design problem. These criteria comprise what the objective organization might look like.

[13] The NFCE Report, cited in Endnote 1, elaborates on notions of incentivizing these collaborative behaviors.

5.3. Collaboration Engineering (Terry Pierce - DHS & USAFA)

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5.3.A. Introduction

The Internet has revolutionized society by giving anyone an instant and unfiltered outlet for organizing without organizations.[1] Historically, group efforts have been managed by institutions because of the difficult task of coordinating groups. As a result, group formation has been limited by institutions because of the cost of managing groups. Although public agencies and military organizations may have desired more groups, they can only have as many as they can afford.[2] Social networking tools have caused most of the barriers for group-forming to collapse, however. Without these barriers, we are seeing the convergence of social and technological networks that is enabling new ways of connecting without formal supervision to form groups and improve our ability to share, cooperate, and act together.[3]

DHS and DoD recognize that distributed collaboration is important among partners if they can operate as part of a continuously adapting fabric of social interaction – a mission fabric. This means that we must have the ability to align mobile ad-hoc nodes or edge elements of the mission fabric for any purpose. We must also have the ability to deliver services to these ad-hoc nodes and edge elements. Finally, we must create a mission fabric network that enables key elements of cyber-defense. The interplay between distributed collaboration, security, alignment, and provisioning of services represents a true inflection point.

5.3.A.1 Ongoing Innovation Efforts

The Department of Homeland Security Science &Technology Directorate (DHS S&T) funded Center of Innovation at the United States Air Force Academy is prototyping a novel computer network, a system of systems, which is designed to enhance distributed collaboration and ad hoc group action. DHS S&T and OSD have funded nearly $1 million to prototype this novel network for the Interagency Limited Objective Experiment (IA LOE) in summer 2009. This unique computer network, the mission fabric, is an initial phase of technology insertion and is modeled after social network structures, with the underlying information flow patterns that enable new kinds of group-forming. In its ultimate instantiation, the mission fabric is saturated with intelligent processes, services, and knowledge that provide us with embedded secure collaboration and reporting capabilities. It is capable of sensing, storing, and supporting the evaluation of elaborate patterns of information and transforming data into actionable information and services. Put simply, the mission fabric alters the old limits of today's networks and provides us the means for executing Flexible Distributed Coordination. Flexible Distributed Coordination is a disruptive process that enables the rise of new ways of coordinating action, all outside the framework of traditional institutions and among first responders who have typically not been able to collaborate. (Flexible Distributed Control is discussed in article 4.6 by Bergeron & Pierce)

5.3.A.2 Disruptive Product Innovation

Traditional computer networks are largely based on host-client and server computers – and their associated software applications. These servers are the brains of the internetwork and they are connected by data transport links – the network backbones, which are essentially unintelligent pipes. These transport links consist of physical and virtual mediums and intermediate nodes, which are networking devices such as routers, switches, and various gateways. The mission fabric disruptive innovation transforms these ordinary links into relatively "smart" connections. This is achieved in multiple ways technologically speaking, but the key innovations are achieved through the insertion of software applications and computational capabilities into the intermediate (network) nodes. In addition, there are major advances in the ability to manipulate networked data in real time to support distinct capabilities. The result is a mission fabric – a meshed digital network – that functions as a single complex adaptive system. The mission fabric's core competency is that all applications are presented as network services and are provisioned or provided at every intermediate node and every user has access to all intermediate nodes. This means that any user can access any service from any intermediate node, including mobile ad hoc nodes, without having to first determine where the service is located.

5.3.A.3 What is the Mission Fabric Network Disrupting?

The mission fabric network is disrupting legacy computer networks, which use unintelligent transport pipes to connect hosts and servers.[4] These legacy networks have been the backbone of the client-server architecture, which started to die almost ten years ago – legacy systems notwithstanding.[5] The constraints of the client-server model still remain, however. In its ultimate instantiation, users will not require specific knowledge of where applications reside in the network – applications will be presented to users as available services based on a user-authentication profile. Specific knowledge of the network and application location is no longer required.

The mission fabric does not use the client-server network model that currently supports Twitter (and other Web 2.0 social networking tools). The paramount reason is security. The problem with the client-server model for many of these popular web applications is that many of the servers are not located in the US -- most are in India and China, which means that data is transitioning highly uncontrolled sites.

What we need now is a new network that enables the mimicking of how humans socially network; and most importantly stores data in highly controlled sites. To mimic how humans socially collaborate, the new network infuses new intelligence into the transport pipes where all compute and network node applications are providing services.

The Mission Fabric will provide the ultimate in collaborative capability, all through unified connectivity. This includes voice, video, file sharing, instant messaging, whiteboarding, collaborative meetings, streaming media, quality of service tuned to the specifics of the application, cyber-defense features, unified communications, unified computing, network attached storage, and a host of other features and capabilities. This initial instantiation of the Mission Fabric innovation is a multi-year process to mimic these human social network characteristics within the network. Areas which require further development include heuristics to determine the Quality of Information (am I interested in the information someone has), Quality of Trust (do I have a social trust level with the node I am exchanging information and how did I derive that trust), Source of Trust (where did I receive that trust – derived, know someone, etc.),

and Resource Trust (will I allow any node to use my memory, CPU, battery, RF bandwidth to traverse me to another destination). These are just a few key areas; however, one can see that to achieve true social networking, distributed capability will take some time and development of areas not currently thought of when looking at data transport across various network "pipes".

5.3.A.4 The Aims of the Mission Fabric

The aim of the mission fabric is to enable the sharing of information in a secure, distributed environment. Through the sharing, we achieve a force multiplier effect where multiple sources are looking at the information and bringing new information bits to the collaboration to support such things as event correlations, creative ideas, deductive and inductive reasoning, ultimately leading to more rapid results than what could be achieved by a single entity or single mission focused group. The mission fabric innovation weaves stove-piped information systems, which have developed their own policies, rules, and architectures, into an information-sharing mission fabric. By eliminating the many gaps and seams existing in the sharing of information, DHS and DoD can develop national solutions for sharing information in a manner consistent with national security and legal standards. The mission fabric is designed to provide dynamic real-time processing and virtualizing of information across diverse, distributed jurisdictional boundaries. Most importantly, the mission fabric enables forces to perform a real time information push to the edge of the network where the information is actionable (e.g. ad hoc and wireless platforms: automobiles, ships, aircraft, rail, and on foot). Put simply, all nodes – mobile or non-mobile – are linked continuously in the mission fabric, which is seamlessly connected to all data storage, data collection, and intelligence interfaces.[6]

Ultimately, the mission fabric is also designed to provide Identity as a service. The mission fabric Identity service enhances the security of DHS and DoD information sharing environments by providing a unified framework for managing identities and rights for persons and hardware and software devices used within and external to an organization's networks. Moreover, the mission fabric establishes an interoperability service with multiple external identity adjudication support systems to enable timely, complete evaluation of an individual's status and eligibility for access.

The mission fabric is designed to minimize the impact of compromises or potential compromises of data, networks, and systems, or that enable them to prevent, detect, resist, or respond to attacks. Additionally, a core function of the mission fabric is its Internet Route Monitoring capability that, in turn, will provide secure ad-hoc grid assembly. Specifically, the mission fabric will be capable of providing the information to support geographic and topological mapping of Internet hosts and routers; as well as identifies infrastructure components in greatest need of protection.

Finally, the mission fabric is designed to handle multiple, overlapping events that may severely stress and damage the Nation's critical infrastructure and economy. Because the mission fabric is a complex adaptive system, it is a unique tool for providing public and private sectors the ability to understand the consequences and react to a disruption or rare event, such as 9/11, Katrina, or other catastrophic events (e.g. wildfire). It also provides the Critical Infrastructure sector a shared process for integrating strategies for the application of resources.

5.3.B. Analogy

In describing this network innovation, we begin with an analogy between the mission fabric and transportation systems – railroads and airplanes. In doing so, we can illustrate the advantages of the services provided by an intelligent mission fabric over the services supported by unintelligent transport networks.

The origins of the first computer networks grew out of Department of Defense experiments in the 1960s to link distributed computers over a dedicated link. In 1969, the ARPANET link consisted of four nodes between University of Utah, Stanford, and two other west coast universities. This network used a link, which enabled multiple senders to transmit data over one medium. Unlike telephone communications that establishes a dedicated path across a sequence of nodes and then allows the caller to send a complete message to the receiving party, networking divides data into small packets and routers choose the best path over which to send the packets so they eventually reach the correct destination and are reassembled. Put simply, intermediate nodes (routers) send discrete blocks of data to each other, and gather information from other routers about what "paths" or "networks" they know.

The four-node ARPANET net is akin to the transcontinental railroad of November 1869 that, for example, linked Omaha with Oakland. Similar to the way we transmit packets of information across a shared medium, rail cars travel from a source to a destination across a shared medium (in this case, the rails themselves). With the advent of smaller railroad spur lines, such as the Santa Fe railroad, connecting to the transcontinental railroad, we see the emergence of the railroad network system. This phenomenon is similar to the growth of computer networks into Local Area Networks (LANs) and Wide Area Networks (WANs) connecting to the long haul very high speed Backbone Network Services. Today, we have the ability to intelligently manage these shared resources in such a way that we can move multiple trains across the same rail medium, something that was a guessing game in the 1880s. This intelligence is representative of routers in networks today, including the client server model that has served us well for decades. Despite the growth of networks, the original client server remains.

Naturally, computer and networks today are vastly more sophisticated than the ARPANET, incorporating such technologies as mobility, multicast, and Quality of Service. Yet, modern computer networks – like the 1869 transcontinental railroad – were not designed and do not have the ability to mimic social network structures. This is a critical network deficiency for enabling the full potential of semantic and Web 2.0 distributed collaboration.

Visualizing people as data that travel in packets, such as trains and airplanes, we can make the case that early management of ARPANET was similar to the managerial methods in running the transcontinental railroad. The principal problem in running the transcontinental railroad was to ensure Eastbound and Westbound trains could share the same track. The railroad developed a service to assure rail switching so several trains could simultaneously use the same tracks. To avoid train collisions, David McCallum, a railroad superintendent for the New York & Erie Railroad, created the first recorded organization chart to ensure the safe flow of trains. Essentially, he created managers for sections of the railroad.

These section managers are an example of routers for the internet, which ensure packets are delivered. Most importantly, the key capabilities of the 1869 Omaha and Oakland transcontinental railroad remain unchanged in today's network rail backbone, much as the key

capabilities of ARPANET, remain unchanged for the Internet Service Providers like Verizon and Sprint that provide high speed backbone for today's Internet.

The mission fabric is designed to mimic social networks. It is anticipated the mission fabric innovation will add a quantum leap in effectiveness over current networks, which essentially are used as unintelligent transport pipes – the transcontinental railroad. It builds upon current networking technology, adding intelligence into the movement of packets of information, much the same way as Rail Systems today have added automation to assure the smooth flow of rail cars. By adding this intelligence, we can now build upon that intelligence and tie together applications that deliver collaborative capabilities into the network intelligence.

In addition, we can begin to transform the network from siloed computing systems, which are found in the client-server model, into computing platforms. Also, keep in mind that these silos are constructs of how we manage and administer our networks, including the policies we put in place. The Mission Fabric construct allows us to transcend these silos without the need to necessarily change administrative policies. In essence, by forcing applications into the network nodes (routers), we can now access and deliver services ubiquitously across the entire network. Put simply, we are taking applications and making them services in the network. For this, there is no analogy to the Transcontinental Railroad because at this point, we start to mimic social structures within a networking environment.

In the context of the Network, a service is defined as a process or set of processes, where users request that service in an ambiguous way, resulting in that process providing the desired result, independent of where that service comes from. For example, when we access our phone to call someone, we pick up the handset and we expect to hear a dial tone. We do not care where that service is provided – the central office, a local router, or an application server – it does not truly matter. We want the confidence, however, that the service is delivered when we pick that handset up.

In the client-server model we have to know where the applications reside to be able to use them. These applications are not part of the network itself; thus users can access these applications only if they receive advanced knowledge of their specific location. In a fully developed mission fabric, user knowledge of the location of applications is unnecessary since they are fundamentally a part of the network itself and are presented to the user as a service. This is a key distinction over current computing technology approaches. This is also referred to as Unified Computing where the computing and storage capacity is resident in the network itself, and the state of the applications is maintained in the network. The result is that the user can request application service from the network and, as defined previously, the network delivers that service to the user without the user needing to know where the computing is actually performed or the storage is physically contained. (Unified Computing is discussed in detail later in this article.)

Using our analogy, we can describe the power of providing services at all network nodes. A major problem facing the 1869 Omaha to Oakland bound train was changing weather conditions. The weather services were provided by the Omaha and Oakland train stations, the two central service providers. As trains reached intermediate stations like Salt Lake City, the train engineer would ask about weather conditions that lay ahead. The Salt Lake City station manager did not have these weather services available onsite, however. The information could be obtained by telegraphing Oakland. If the telegraph line was not working, the Salt Lake City manager would not be able to provide the weather services. Without knowing the weather conditions over the

Sierra Mountains, the train engineer would not have the information available to decide whether or not to stay on the intended route, or use an alternate spur route that avoided the heavy snow.

The mission fabric innovation is adding airplane services to the existing train networks. Using the same Omaha to Oakland route, we can think of an aircraft as a packet of data. As the aircraft flies toward its destination, it is controlled and routed by a series of sector air traffic controllers (routers). What is different from the transcontinental railroad network example is that real-time world-wide weather services are available at every sector control tower – or every router – upon request. This means the network pipes – now a complex adaptive system, can dynamically reroute aircraft to avoid weather.

An example of an intelligent network service is the Dynamic Host Configuration Protocol (DHCP). When we need an IP address, we make a service call to the network and the network knows where to obtain the information. In some cases, the networking physical resources actually have the DHCP service running on them. Most importantly, the user receives the service, but does not know where the DHCP service is delivered from, nor do they care. The service request is delivered back to the user in the form of a completed service request. The future of application processing is the ability to make service calls to the network.

5.3.C. Disruptive Advanced Technologies – Novel Linkages of Layers[7]

To create a mission fabric that supports Flexible Distributed Coordination, collaboration must be a distributed process where information and decision making occur throughout the network—not just at specific aggregation points. Flexible Distributed Coordination achieves this by connecting *all* nodes on the network—data, machines, objects, and people. The means for connecting all the nodes are advanced routers, which links the layers in a novel way.

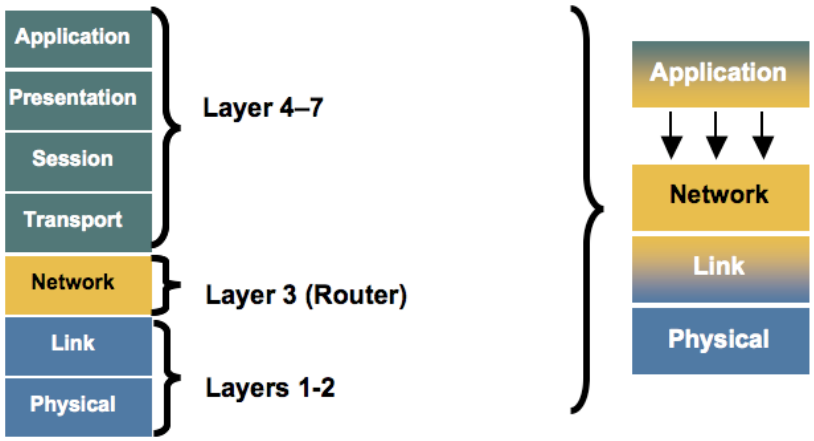

Figure 5.3-1 Blending the Technical Layers of the Network Model to Utilize Each Other

Typically, routers function in the *network* and *transport layers* in which they are calculating paths to destinations, reading addresses on incoming packets, and then forwarding the packet toward its final destination. By design the *network* and *transport layers*, like all the seven layers of the OSI model shown in Figure 5.3-1, are self contained so that the tasks assigned to each layer can be implemented independently. This enables the solutions offered by one layer to be updated without adversely affecting the other layers. The *Upper Layers 5-7* deal with logic, process, and application issues and generally are implemented only in software. The *Lower Layers 1-4* handle data transport issues and are implemented in hardware and software.

Advanced routers, however, now have the capability to move some of the capabilities in the *Upper Layers* into the *Lower Layers* and utilize information from the *Lower Layers* to enhance the *Upper Layers.* Stated differently, advanced routers can move the processing power of *Layers 5-7* into the *Network and Data Link Layers 2-3*. The disruptive innovation is that the advanced routers can blend all *7 Layers* that, in turn, can distribute services within the mission fabric via virtual connections.

Mission fabrics are multilayer problems that demand the technical communication layers work together and be aware of one another. Communications networks will need to be self-configuring, -managing, and –healing. They will mimic social networks rather than technical boundaries. The technology will mold to fit policy and the interaction of people, rather than people molding to fit the technological constraints.

Deep Packet Inspection – In addition to being able to read the address on the IP packets and move them about in a geographic space, another part of the Mission Fabric will be Deep Packet Inspection (DPI). Advanced routers will read ***all*** the information contained in each packet and make decisions based on the information and social heuristics enabled within the network. Since we can bypass applications but we can never bypass routers, we now can create a mission fabric where the advanced routers are able to distribute many of the control and application functions throughout the mission fabric.

5.3.D. UNDER THE HOOD -- Unified Computing[8]

Flexible Distributed Control is a disruptive process innovation for aligning distributed social network groups to achieve a desired effect. The engine for achieving Flexible Distributed Control is the mission fabric, a novel network that mimics how humans achieve distributed social networking. A key ingredient of the mission fabric is Unified Computing – a Cisco innovation.

Unified Computing blends application computing (data centers, etc.) with the network. This blended capability transforms the network into a transmission mechanism for all computing communications (network, storage, and resources). From the network perspective, the computing assets communicate via Open Standard Ethernet and IP networking protocols. From a Storage perspective, the computing assets communicate to the network attached storage devices using Fiber Channel (FC); however, the FC is encapsulated in Ethernet and transmitted using IP protocols. Computing resources are shared among other computing resources utilizing a novel (and yet to be standardized) protocol, which is transmitted using IP protocols.

In order to transform the network into a transmission mechanism for all computing communications we need a novel routing capability that can coordinate the various messages to and from computing, storage, and resources. Achieving this routing capability will enable us to effectively distribute computing resources throughout the network. With Unified Computing, the networking capability needs a unique front end router that not only speaks to the computational assets, but also does the encapsulation and maintains the “state” of the computers such that user requests for resources are made to the network, not directly to the computer itself.

What this effectively does is to simplify the user’s request for computational power by requesting the application from the network vice working directly on the computer itself. Stated differently, the user requests an application service from the network and the network delivers that service, without specific knowledge of where or how that service is delivered. The fact that

the application is running on one or many computational assets is never presented to the user since the network itself is maintaining "state" – that is, it knows what applications are running; where they are running; the operating system status; and how much CPU and memory resources are required to service the user's request.

This network blending of the storage, resources, and computation is a unique capability that is provided by the Cisco Nexus series of switches. In particular, the Nexus 1000V provides the specific interface between the computational world and the networking world, which maintains the computational state. In addition, the Nexus 1000V also provides the ability to "virtualize" the computational environment through the use of "Hypervisor" and VMWare software. The benefit of the VMWare software gives you the ability to create your own computational environment while you are actually sharing the resources of the computer with other users. In essence, VMWare is a force multiplier providing each user the ability to have their own unique environment that is separated from all others and stays active for as long as the VMWare session stays active.

The end result of achieving unified computing is to render the client-server model obsolete. In contrast to the client-server model, the Mission Fabric uses a novel network approach where services are provided from the network. The Mission Fabric is designed to provide the ultimate in social networking capabilities using the following tools: WebEx; IPICS (connecting radio systems to traditional IP networks); Unified Communications (telephone voice mail is integrated with email); Jabber (instant messaging); Streaming Video; Digital Media Service (feedback control from end user to video source); and Telepresence. In using these Mission Fabric social networking tools, we avoid the privacy and security problems that currently exist for those that use Twitter etc. in the client-server network.

We plan on conducting field tests to provide Twitter-like capabilities in the Mission Fabric, but these social networking tools will take a different format than what is commonly used on the internet today. And with good reason: Security!

In today's data center environment, we are still stuck on the client-server model, which requires significant manual intervention to balance CPU, memory, and User-to-asset ratios. Admittedly, the advances of "blade switching" in server chassis in the data center provide network access to the resources. This innovation was a big improvement over a separate device chassis and significantly improved the data center footprint. The constraints of the client-server model still remained, however. Routing by itself is not the answer to the problem. Neither is FC Network Interface Cards (NICs). Even virtualization – VMWare – by itself is not the answer to the problem, but is a significant step in the right direction. The Nexus 1000 V, combined with the Unified Computing approach, truly transforms the network into a computing platform with very significant benefits:

- Nearly infinite computational scalability. Since the state of the computers is maintained in the network, we can add physical computational resources at will. The resources are then reallocated by the Nexus 1000V based on the users computational demands dynamically.
- Nearly infinite data storage scalability. In a similar way to the computational scalability, storage can also be scaled.
- Dynamic resource reallocation. CPU and Memory can be dynamically reallocated between computational assets. The result is that computationally bound applications receive the computing power they need on demand as well as memory bound applications

receiving the memory needed. No longer are we concerned if a computer has enough CPU or memory to run an application. The network takes care of that function for us.

- Users no longer need to know where the computing assets are and what applications run on them. Applications are now presented to the users as a service and they no longer require specific knowledge of where the computing takes place. This greatly simplifies the users interface and makes the management and service of those applications to the user population easier.
- Inherent disaster recovery capability. Since the network maintains the "state" of the computer and the applications, we can now disperse computational assets and storage assets throughout a wide area. With the old client-server model, all of the assets are maintained in one area and damage to those physical assets could result in data being lost. There would also be significant down time to bring up another computing site. With Unified computing, one part of a physical facility may receive damage, but services are not diminished because the network is maintaining computational state and the computing is merely delivered to another part of the network, without disruption. In addition, we can also stripe storage assets such that the data is available in multiple locations. In essence, you would have to take out the entire network (very difficult to do) in order to shut things down completely.

For the Mission Fabric Network, this makes the applications look like they are available everywhere. Cisco announced this capability in April 2009.

Nexus Switches: The Nexus series of switches are a family of switches that combine network routing/switching functions, as well as storage switching functions (specifically, FC switching). The next switch in the series is the Nexus 5000. The primary difference is that the Nexus 5000 does not have the computational interfaces and application state knowledge compared to the Nexus 1000V. The final switch in the Nexus series is the Nexus 9000 that provides terabit class routing/switching for IP and FC.

5.3.E. Summary

USAFA Center of Innovation is prototyping a mission fabric – a meshed digital network – for the DHS and OSD Interagency Limited Objective Experiment in summer 2009. The mission fabric is a new situational awareness architecture enabling collaboration and decision-making in a distributed environment. The mission fabric is the engine for executing Flexible Distributed Coordination. Flexible Distributed Coordination is a disruptive process weaving the virtues of social networking innovations into a distributed group-action mission fabric. Flexible Distributed Coordination is the ability to focus and align social networks for first responders in a non-secure and secure environment. Flexible Distributed Control creates an instantaneous means to distribute and modulate coordination of the pervasive flow of information in the digital network; share human connections; extend understanding of the situation; and self-organize and disperse to create a decisive first responder advantage. The means for achieving Flexible Distributed Coordination is the mission fabric.

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[1] See Clay Shirky, Here Comes Everybody: The Power of Organizing Without Organizations, The Penguin Press, New York, 2008

[2] ibid, p. 21

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[3] ibid, p. 304

[4] The mission fabric network actually disrupts any legacy network, not just computer - for instance, radio networks, tactical data networks, etc. Conversation between Pat Ryan, Cisco Director of Defense Initiatives and Terry Pierce 18 March 2009

[5] Mr. Keith Uebele, Principal Strategist Intel Corporation, email to Dr. Terry Pierce, 23 December 2008, and Mr. Steve Kapp, Senior Architectural Network Engineer, Cisco, discussion with Dr. Terry Pierce November 2008

[6] The mission fabric enables distributed collaboration, but it does not solve the organization issues; the data sharing between organizations; or the policy issues that may prevent distributed collaboration.

[7] Mr. Mike Tibodeau, Cisco Network Engineer, contributed to this section.

[8] Unified Computing is a Cisco Innovation. Cisco senior architectural engineer, Mr. Steve Kapp, contributed to this section.

5.4. Power of 2: Gallup's Discoveries about Successful Collaboration (Rodd Wagner and Gale Muller - Gallup)

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5.4.A. A House Divided[1]

Mergers. Acquisitions. Joint marketing agreements. Strategic alliances. Collaborative ventures. Organizational integration - there are dozens of terms for the strategy of bringing together – sometimes forcing together – two entities on the assumption that when united they can accomplish what neither enterprise could do alone.

The print and online components of *USA Today* were merged in 2005, with instructions to go "beyond arm's-length collaboration."[2] *The New York Times* and NYTimes.com are under similar orders.[3] Exxon merged with Mobil. Sirius Satellite Radio acquired XM Satellite Radio. Wells Fargo is merging with Wachovia. Delta Airlines is merging with Northwest.

The 9/11 Commission found, among other issues, a serious lack of collaboration among the various US intelligence agencies. Today, those agencies are charged with finding better ways of working together. "In the past, the Intelligence Community was siloed into discrete disciplines and functions. These silos often led to competition and duplication," states an unclassified strategy outline from the Office of the Director of National Intelligence. "We must transcend the current agency-based linear model . . . and develop a more mission-based model that is fluid, synchronizes collection, collaborates on analytic issues in real time, and broadens our partnership strategy."[4]

Executives overseeing an integration in private industry routinely tell Wall Street the new, bigger firm will give unrivalled service to its customers, new opportunities to employees, and higher returns to shareholders. They're usually wrong.

More than half of mergers and acquisitions fail. A study of nearly 5,000 of them found that the target companies not only suffer the perhaps "natural and acceptable" loss of many executives shortly after the combination, but "leadership continuity is permanently altered once the firm is acquired. Target companies can expect to lose 21 percent or more of their executives each year – more than double that experienced in non-merged firms – for at least ten years after the acquisition!"

More often than not, the two firms fail to integrate, fail to realize the promised "synergy," lose momentum on key projects the companies were implementing before the merger, lose executives with years of experience and knowledge about the firms, and ignore "negative effects of the merger on target employees that eventually erode productivity."[5]

"We may not perform as well financially as we expected following the merger," US Airways warned investors after its 2005 merger with America West. The process, it said once the reality was clear, "will be costly, complex, and time-consuming, and management will have to devote substantial efforts to such integration that could otherwise be spent on operational matters or other strategic opportunities."[6]

Government agencies struggle with similar issues. “The problem is nearly intractable because of the way the government is currently structured,” concluded the 9/11 Commission. “It is hard to ‘break down stovepipes’ when there are so many stoves that are legally and politically entitled to have cast-iron pipes of their own.”

Everyone talks about collaboration between organizations; few know how to do it.

In most cases, leaders fail to realize the complexity into which they are getting themselves. The clean combination of Organization A and Organization B exists only on paper. In practice, it is the interaction of thousands of employees from A each working with one, two, or 10 people from B, and vice versa. Collaboration between organizations is simply the sum of those individual partnerships.

An alliance between organizations is like a zipper. To work, both sides must be firmly fastened together from top to bottom. Individual partnerships between counterparts from each entity are like the interlocking teeth of the zipper that hold it together at a given point. Where the teeth are separated or missing, it threatens the entire bond between the two sides.

5.4.B. Gallup’s Five-Year Research Initiative

One of the most neglected areas in the study of human productivity is an understanding of what happens when two people team up to accomplish a task. Many books have been published to help readers understand themselves. Many more have been written about what makes a high-performing team or a great manager. But little has been done to guide two collaborators through their journey to reach a common goal.

People typically think of partnerships as formal arrangements, such as the legal agreements between attorneys or entrepreneurs. But a partnership – good or bad – exists whenever two people double up to accomplish an objective. Two students working on a term paper are partners until it is written. Two coaches of a youth lacrosse team are partners until the season ends. Every pair of employees from sister agencies who team up on a particular project are partners until their goal is reached.

Over the past five years, the authors led a research initiative to identify and analyze the aspects of a working relationship crucial to its success. A representative sample of more than 1,000 Americans in the Gallup Panel were asked to identify one top-of-mind partnership that was particularly successful, and one that failed. The respondents were asked parallel series of questions about both working relationships. Their responses were then analyzed to determine which statements best discriminated between success and failure.

Twenty-three statements emerged as being most predictive of a powerful partnership. They range from the straightforward (“We trust each other”) to the more involved (“We do not have to keep track of who does what and who gets credit for what"). Based on these responses, Gallup separates partnerships into five categories, from exceptional and good, through borderline, to poor and very poor. In most cases, partnerships that fall in the lower three categories yield no gain from collaboration, and often create problems that make working together less effective than working separately.

In addition to the repeated waves of proprietary research, the authors made an in-depth review and synthesis of secondary research in selected aspects of behavioral game theory, egocentric biases, neuroscience, biological symbiosis, and even primatology. Gallup also analyzed first-person narratives of successful collaborations, both famous and obscure.

The patterns that emerged from these three lines of attack revealed remarkably consistent patterns of human nature. What Gallup Panel respondents said about communication in their best partnerships matched what James Watson and Francis Crick wrote about their joint discovery of the structure of DNA. The latest discoveries about "strong reciprocity" and trust match what two police officers say about how they protect each other.

The causes of collaborative success sorted cleanly into eight elements, described briefly on the following pages.

5.4.B.1 Complementary Strengths

There's no reason to combine if each organization does not bring to the table something the other lacks. In private industry, sometimes one company excels at sales while the other excels at service. Or one group may be known for its creativity while the other can put great ideas into operation. Partnerships, whether between individuals or between entities, are based on the premise that neither can succeed without the other.

Yet all too often the reasons behind the collaboration are forgotten when the work itself begins. Instead of integrating the best aspects of each approach, the two sides argue over whose way of doing things is better. The strategic discussions about what each contributes turn into grumbling about what each fails to add to the mix. Leaders must constantly emphasize the strengths of each organization if they expect their subordinates to do the same.

5.4.B.2 A Common Mission

As the Union Army made plans in late 1862 to take Vicksburg, Mississippi, President Abraham Lincoln gave General John McClernand, a man with presidential aspirations himself, secret orders to organize troops under his command. But General Ulysses S. Grant was already pursuing the same goal.

"Vicksburg was 250 miles away, and as (Grant) saw it the town belonged to the man who got there first," wrote historian Shelby Foote. At one point when Grant would normally have waited for reinforcements, he hurried south. "I feared that delay might bring McClernand," the general wrote later. The Union subsequently lost the Battle of Chickasaw Bayou, the first contest in what became a six-month campaign. Grant was "fighting two wars simultaneously: one against the Confederacy . . . and the other against a man who, like himself wore blue," wrote Foote.[7]

One of the most common hazards in alliances is that the two sides lack a collaborative mission, a goal premised on an agreement that both camps will succeed together. In their eagerness for results, leaders frequently allow or even encourage internal competition. They say they want salespeople to work together, but what they really want first-and-foremost is the sale, and if elbows fly in the process, so be it. Companies give lip service to partnerships, then create financial incentives that pay most for beating the other guy. Army wants to beat Navy, and vice versa. The result is often a defeat for the organization caused by two generals spending as much time outmaneuvering each other as they do pursuing the objective.

5.4.B.3 Fairness

Issues of how to divide work, rewards, and power confuse organizations as much as they do individuals. When Daimler AG merged with Chrysler in 1998, Daimler-Benz Chairman Jürgen Schrempp and Chrysler Chairman Robert Eaton appeared at an hour-long announcement event in neutral London heralding a "perfect fit of two leaders in their respective markets." They said it

was a "merger of equals" and that the two of them would be "co-chairmen."[8] But the combination became more an acquisition of Chrysler than a merger and, despite some early victories, it didn't live up to its collaborative or financial billing.

"So far, DaimlerChrysler is a trans-Atlantic partnership mostly in name," observed the *International Herald Tribune* one year later. "DaimlerChrysler is pretty much run by Daimler executives. From the ubiquitous chief executive officer Jurgen Schrempp on down, the big decisions are made in Stuttgart. Chrysler managers complain they are lame ducks."[9] Eaton left less than two years after the "merger of equals" press conference.

Nine years after the firms came together, Daimler left Chrysler by the side of the road for one-fifth of its original purchase price. "Chrysler was bought and was subsequently treated like a stepchild, not a partner," wrote one industry publication.[10]

While it is tempting to paper over real issues of parity with euphemisms, such rifts inevitably surface as the two halves start working together. It is far better to hammer out agreements about the division of responsibilities beforehand and then live up to those commitments if the joint effort is to succeed.

5.4.B.4 Trust

Any time two groups are brought together, both must juggle competing loyalties, distinct cultures, and lack of rapport at the same time the workload increases because of the integration. "When I think back on January 1999, my most vivid memory is exhaustion," recalled editor Mark Kennedy of the period when the *Chattanooga Times* merged with its competitor, the *Chattanooga Free Press*. "Thankfully, though, the culture clash that people expected when the newsroom staffs were combined never really materialized. . . . There was a good deal of honest heartache in 1999 about friends who lost their livelihoods in the merger."

"We weren't thrown into a newsroom with our competitors; we were thrown together with other survivors," agreed fellow editor Chris Vass. "I think the 'us vs. them' mentality vanished immediately."[11]

Trust does not exist between two organizations; it occurs between two people. That trust can only be established through experience, when both people take pains to ensure they deliver what the other expects. Leaders who don't give their employees the time and conditions where trust can flourish should not be surprised when much of their post-merger work is in separating warring factions.

5.4.B.5 Acceptance

In a partnership between two people, both must accept the uniqueness of the other and the differences from themselves. A parallel concept applies to collaborating organizations, which usually have different traditions, strategies, or perspectives. In much of the research on mergers, the issue of acceptance is categorized as "integration" or the imperative to combine "cultures."

"It was obvious from the start that (our) sister company had a completely different culture than we did," reported one technology manager. "As software distributors, we shared many of the same product lines and dealt with many of the same technologies. We both did the same thing – sold tech products to computer retailers across the country and around the world. The merger failed miserably. We simply could not get along. There were too many egos and too many superstars. Eventually our West Coast outfit was closed in favor of the East Coast company."[12]

If either side of the alliance cannot comprehend that their way of doing business is not the only way, and appreciate the approach of their counterparts, the resulting friction will doom the combination.

5.4.B.6 Forgiveness

In the majority of the most successful combinations, both sides work intensely to fulfill their end of the deal. Both are careful to avoid a breach of trust that would require apologies and forgiveness. But just as between two people, rifts open between organizations.

Neither entity fully understands what it's getting itself into. Rarely does the collaboration play out exactly as it was envisioned when the papers were drawn up. There will be mistakes. Whether those errors are greeted with recriminations or flexibility could determine whether the agreement succeeds or dissolves.

5.4.B.7 Communication

When former US President Theodore Roosevelt joined an expedition down Brazil's River of Doubt in 1912, his group was visited one morning by three Nhambiquara Indians. "They left their weapons behind them before they appeared, and shouted loudly while they were still hid by the forest," wrote Roosevelt, "and it was only after repeated answering calls of welcome that they approached. Always in the wilderness friends proclaim their presence; a silent advance marks a foe."[13]

The same concept applies to communication between two groups working together. Signaling cooperative intentions is crucial to understanding the other side's perceptions, avoiding hostile assumptions, and making the early agreements that become the foundation for trust. In nearly every study of failed mergers or alliances, miscommunication or lack of communication is one of the primary culprits.

5.4.B.8 Unselfishness

Leaders working to unify their organizations often have their public relations staffs craft slogans aspiring to make their company "one." "One Company. One Team. One Passion," touts Coca-Cola. "One Company. One Team. One Goal," proclaims LexisNexis. "One Team, One Mission," states a US Department of Homeland Security strategy document.

The slogans are fine – the right thing to say, a fitting metaphor for the alignment of efforts that makes an enterprise effective. But real unity is elusive.

At the leadership level, unselfishness means doing what's best for the country, regardless of the consequences for a particular department, agency, or unit. Sometimes a pet project should be terminated, or resources controlled by one organization should be transferred to a division that can use them more effectively. While these kinds of moves are best for the larger "one," in many cases intramural contests and the unit's incentives make people protect their turf against the greater interest.

5.4.C. The Need for Collaborative Leadership

One of the richest ironies in many mergers is that the executive urging partnerships on the managers and employees is someone who recently ousted his or her counterpart from the weaker of the two companies to take control of the combined enterprise. This spawns cascading

Darwinian battles through Operations, Finance, Sales, Marketing, and every department where the stronger side can make a case that its weaker opposite is "redundant."

These same kinds of power struggles also hinder collaboration in government. Most conspicuous is the history of the partnerships between presidents and vice presidents, which is littered with examples of acrimony and distrust, and the rare exception.[14] Whether in private industry or in any level of government, leaders who are poor partners themselves do nothing to inspire collaboration in their organizations.

Without powerful examples at the top, collaborations that began as a "merger of equals" or a "building of strength upon strength" degenerate into a series of cage matches that distract both camps from the business at hand. As with a partnership between two people, an organizational alliance that lacks the key elements is worse than no alliance at all.

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[1] This article is adapted from the forthcoming book Power of 2: How to Make the Most of Your Partnerships at Work and in Life. The book will be published by Gallup Press in the fall of 2009.Copyright 2009, Gallup, Inc., Washington, D.C.

[2] http://www.usatoday.com/media_kit/pressroom/releases/usat121205.htm

[3] http://poynter.org/forum/view_post.asp?id=10027

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[6] Dan Fitzpatrick. "Soaring Stock Prices Suggest Better Days Are Ahead for Airlines" *Pittsburgh Post-Gazette*. December 8, 2005.

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[12] http://blogs.techrepublic.com.com/techofalltrades/?p=132

[13] Theodore Roosevelt. *Through the Brazilian Wilderness* (1914).

[14] Rodd Wagner and Gale Muller. "Who Needs a Biden or a Palin" Gallup Management Journal. October 8, 2008. http://gmj.gallup.com/content/110998/Who-Needs-Palin-Biden.aspx

5.5. Transformation Cells: An Innovative Way To Institutionalize Collaboration (Randy Pherson - Pherson Assoc)

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5.5.A. Introduction

Instituting a robust culture of collaboration across multiple organizational boundaries is a daunting task requiring far more than merely improving information technology and enabling information sharing systems. While these will help, the challenge runs much deeper. Fundamental cultural, structural, and managerial changes are required that go to the heart of how the military and civilian communities have traditionally conducted their affairs. The government imposes explicit penalties for sharing information too broadly — including the loss of employment — but imposes no comparable penalties for sharing information and insights too narrowly. If analysts, collectors, and operators will be expected to engage in more collaborative behavior, they will need help both in establishing collaborative mechanisms that are most appropriate to their work environment and in interpreting the rules of the road.

Such help must have a human face to be effective. The success or failure of efforts to promote cultural change usually depends on how effectively the transforming vision is articulated to lower level managers and the workforce at large. This is best accomplished by forming a small group of interpreters and facilitators who can function as a "help desk" for managers and officers by providing tailored guidance on how to implement collaborative practices within their work environment in the most effective and efficient manner possible. Such Transformation Cells can provide the human infrastructure needed to interpret the leader's vision (his or her Command Intent) and help officers apply it effectively in their workspace.

5.5.B. Origins of the Concept

In the wake of 9/11 and the faulty analysis on the Iraq WMD programs, the CIA's Directorate of Intelligence launched a major effort to instill more imagination and rigor into the analytic process. A major training program familiarized both analysts and managers with an array of Structured Analytic Techniques that could be used to improve the quality of analysis. As more analysts, and then managers, became exposed to the variety of techniques, it soon became apparent that a human infrastructure was needed to facilitate the use of these techniques. Many of the offices in the Directorate formed small Analytic Tradecraft Cells of three to five analysts to work hand-in-hand with line analysts. Their job was to help the line analyst define his or her problem, decide which techniques were most appropriate for the issue at hand, and facilitate the use of the technique or techniques. Over time, the creation of these support cells proved highly effective, instilling structured analytic techniques into the analyst's daily routine. Analysts now had someone to turn to who understood the analytic process, had developed special expertise on the utility of various analytic techniques, and was sitting nearby ready to assist as the need arose.

The CIA's use of tradecraft cells is only one example of the use of internal consultants to propagate collaborative work practices across the government.

- The DDNI for Analysis/AT&T established the ODNI's Collaboration Consulting Team (CCT) as a community service to enhance and integrate collaboration efforts across the community. The CCT generates technical and business process solutions tailored to the

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specific needs of a group, helps people and organizations exchange best practices, and gathers feedback from users and customers to evolve a more effective community collaboration strategy.

- The Analytic Collaboration Exercise course (ACE), supported by DoD, FBI, DHS, and the ODNI, is designed to improve the effectiveness of interagency teams while helping integrate scientific and technical knowledge into their analysis.
- The Global Futures Forum, now sponsored by State/INR, has brought collaboration to the world stage with foreign governments and non-governmental bodies to reconceptualize the profession of intelligence as a globalizing phenomenon. In recent years, it has facilitated collaborative behavior across well-entrenched organizational boundaries involving about a dozen countries.

The increasing number of requests for help and assistance coming to these units indicates the growing enthusiasm for collaboration and pent-up demand for such consulting services. The CCT, for example, started as a small team of two, quickly doubled in size, and was increased to 10 members within 18 months of startup to provide a broader support portfolio and handle a steady volume of requests. A Collaborators' Caucus, hosted by the CCT in June 2007 to share best practices in collaboration, was quickly oversubscribed, reflecting growing interest in fostering collaboration within the Intelligence Community.

5.5.C. Functions of a Transformation Cell

Organizations establishing Transformation Cells would tailor the structure and functions of the cells to leverage the skills and expertise of its members while also supporting internal mission needs and fostering collaboration with the rest of the Intelligence Community. Each cell would be unique—but would be based on the principle of collaborative work processes. It would encompass one or more of the following support functions:

- *Collaboration*. Cell members can provide advice on which collaboration tools (e.g., Intellipedia, SharePoint, A-Space, blogs, etc.) are most appropriate for a group's business needs, help them design an effective collaborative architecture, and provide timely training. A key element of this support is that officers, and particularly those not comfortable with using new collaborative software, can get immediate assistance virtually "on demand" to help them connect and interact most efficiently to other members of their collaborative network.
- *Structured Analytic Techniques.* Cell members can help analysts and managers define the intelligence question, decide which techniques are most appropriate for the issue or problem, and facilitate the use of the technique. For most analysts, just having someone "look over their shoulder" as they get started is sufficient to overcome the challenge of using a new technique. Cell members can also support the collaborative use of structured techniques by small groups. All structured analytic techniques work better when done in small groups, and such groups often span several organizational boundaries. Having a Transformation Cell member available to assist both in the use of the tool and in creating a small collaborative group or interagency team would bring far more synergy to the process.
- *Advanced Computer Applications.* Cell members can also be used as a resource should help be needed in applying more sophisticated computer applications, such as link analysis or geospatial and other data visualizations tools. As with structured analytic techniques, cell members would work with analysts to understand the problem and then

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use their specialized skills to deriver new insights from the available information. They would work as adjunct team members collaborating on challenging problems.

- *Information Brokers.* Cell members would be responsible for monitoring ongoing activities relevant to the organization's mission and stepping in to quickly pass information to both internal and external customers, tipping and cueing across organizational boundaries to facilitate effective mission activities. As part of these functions, members would solicit and draw out information and insights from colleagues.

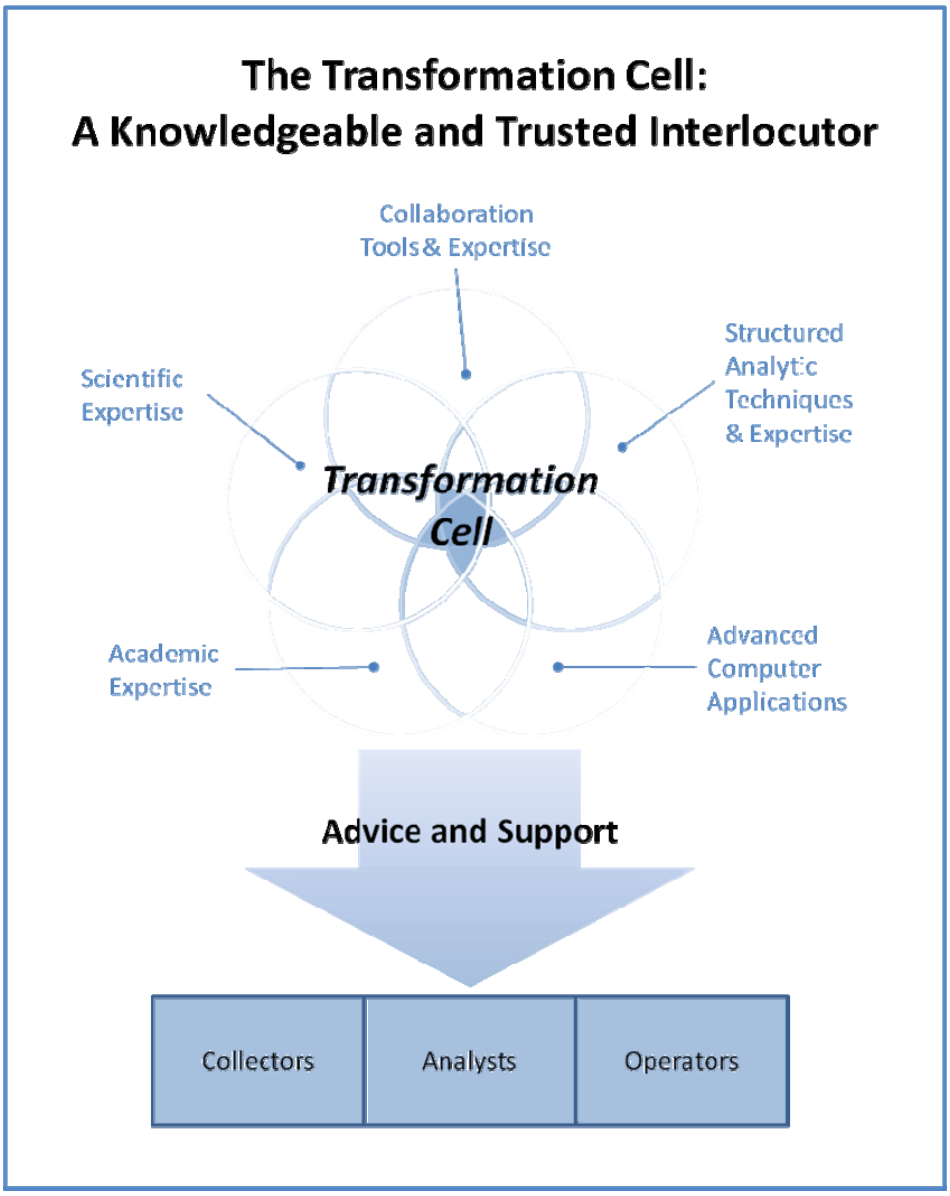

Figure 5.5-1 The Transformation Cell

- *Networks and Outreach.* In addition to building networks within the IC, the cell could facilitate contacts with specialized experts on a broad range of topics. Often, officers are not sure of their agencies' "rules of engagement" with outside experts and thus refrain from engaging them. A longstanding frustration has been the problem of connecting analysts, collectors, and operators with their counterparts in the scientific and academic community. Each bureaucracy has its own regulations for how such contacts should be

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made and for many the task quickly becomes "too hard" to perform. Cell members can help mitigate this problem by learning the relevant rules of engagement and then appropriately building networks of "approved" external contacts.

5.5.D. Creating the Right Incentives

The military services, and more recently the ODNI, require joint service for advancement in the ranks. Traditionally, joint service consists of a tour in another agency or time spent in a joint service billet outside one's home agency. Such a system has proven highly effective in exposing officers to other cultures and helping them build networks that can be leveraged upon returning to their home agency or office. A downside is that home agencies lose the services of promising officers while they are on rotation elsewhere and generally seek to limit the number of such rotations.

One approach that would make service in a Transformation Cell attractive would be to give employees "points" for joint service in a Transformation Cell or if they worked on an interagency project sponsored by the Transformation Cell. Each Cell would have a "budget" for outreach and networking functions; that budget would include "service points" as well as fiscal resources. Service in a Transformation Cell would actually offer more opportunities for networking than an assignment with a single agency. Moreover, the home office would benefit directly from assigning an officer to the Transformation Cell because he or she would be building collaborative networks both inside and outside the home organization.

5.5.E. Implementation Strategies

The challenge is to establish a sufficient number of Transformation Cells to ensure an adequate and responsive **human** support infrastructure that would be viewed as an essential organizational element. One approach that would jumpstart this process would be for the senior leaders to allocate a small number of billets to each of their subsidiary organizations on the condition that each organization match their contribution with the same number of billets. For example, the ODNI would provide four or more billets to each of the 16 IC agencies to use in establishing Transformation Cells with the stipulation that each agency must identify an equal number of internal billets to help populate the cells. Each agency could decide how to allocate the billets most efficiently within their organization, for example, as a fairly large centralized "help desk" unit or by creating small teams within each major organizational unit. Transformation Cells should be linked together in a network, allowing cells to collaborate with and leverage the expertise of counterpart groups across the Intelligence Community.

5.5.F. Conclusion

Transformation Cells can serve as engines of change, empowering the workforce to instill collaborative practices into its daily routines. Managers can use the cells to better connect analysts, collectors, and operators with state-of-the-art collaborative tools and techniques. The cells can also help improve the rigor and quality of analysis, and assist officers in reaching out to experts outside their offices. In building such a human infrastructure, senior management must also establish appropriate incentives to join a Transformation Cell and ensure that working in a cell will enhance careers.

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5.6. Blueprints for Designing Effective Collaborative Workspace, (Nahum Gershon - The MITRE Corporation)

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We shape our buildings,
and afterwards our buildings shape us.[1]
–Winston Churchill

5.6.A. Introduction

A well-designed office environment can significantly increase the potential for effective collaborative practices. An optimal design provides a balance between low distraction workspace and a place where colleagues can meet and interact informally. Past experience and scholarly research have suggested that the design of effective collaborative workspace should satisfy the following criteria:

- Public spaces should be located close to the privates spaces, including:
  - Conference and team rooms as well as communal work spaces with technology that allows multiplayer work.
  - Places where professionals can gather spontaneously (a library) or eat lunch together with wall space to hang and store charts, maps, etc.
  - A "Main Street" that enables individuals to meet each other spontaneously.
  - Public areas to meet with visitors.
- When most professional work is focused on work in independent projects, provide:
  - Enclosed private work spaces large enough to accommodate an extra chair.
  - Work areas that accommodate at least two people sitting in front of the computer screen.
- When most professional work involves group activity, provide space for both small and medium-sized group activity.

One of the consequences of a rapidly expanding workforce and declining budgets has been the tendency to squeeze more people into available space. It is hard to collaborate if there is no room in your cubicle for a visitor's chair. One could expect that compressed workspace almost inevitably leads to a reduction in productivity, product quality, and collaboration. Most managers accept this as a hidden cost of doing work. This paper argues that it should be a conscious decision. Senior managers should make a concerted effort to think strategically about how their physical workspace is designed, especially prior to fitting out new buildings or newly-leased space. One of the more viable approaches is to provide enclosed work spaces that encircle more public common areas; this increases the potential for random encounters and interactions both within and across teams.

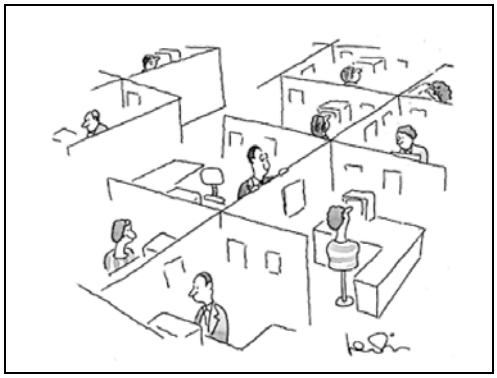
5.6.B. Building Effective Collaboration Space

Human beings are herd creatures and they like to stick together. This is true for life as it is for office environments. When spending time together, people not only satisfy their need for closeness, but also share information, interests, and the like. In office environments, much of the learning takes place when people meet informally.

Collaboration White Paper June 2009

A good office design that supports a more collaborative work environment can have a major impact on worker productivity, creativity, and the quality of the final product. If workspace design makes collaboration among people physically difficult, people will not collaborate much. Even worse, their innate tendency to socialize and collaborate might be significantly diminished.

In the last 30 years or so, the tendency of office space planning has been to "open" office environments and have people work either in half-open cubicles or in open space. A typical cubicle environment is depicted in the following New Yorker cartoon[2]:



As in the cartoon, many existing office cubicle arrays posses the following characteristics:

- ***Rigidity.*** The cubicle arrangement is rigid; there is only one way to arrange the furniture in the cubicle. There is only one option for access and egress.
- ***Clutter.*** There is not enough space in the cubicle to house all of the materials a person needs to do his or her work. The clutter can become unbearable and unsafe.
- ***Lack of Social Space.*** There is no place for socializing or meeting visitors.

The quality of the work environment is also affected by such factors as lighting, acoustics, ventilation, and temperature control. A series of studies over the years show that office design improvements that address these issues frequently generate a 15 to 20 percent increase in worker productivity.[3]

- Seventy percent of employees believe their productivity would increase with the implementation of appropriate noise reduction strategies.
- A 1995 Harvard-sponsored study of 40 buildings and 3,000 employees showed that increased ventilation reduced sick days by an average of 1.5 days per employee.
- The same study determined that employee-controlled lighting improves workers' perception of their environment by nearly 20 percent and decreases costs by 16 percent.

Significant improvements in the quality of work product, creativity, and productivity could be achieved with better designed workspace. Unfortunately, the trend has been in the opposite direction in recent years; with the major influx of new workers, agencies have been forced to house more people in less space. The costs of compressing workspace in this way should not be underestimated.

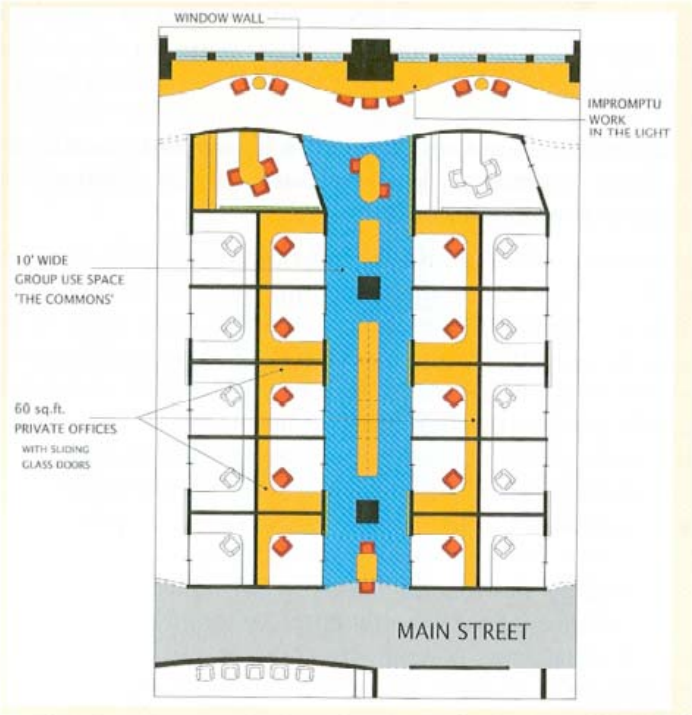
Examples of how to design better workspace abound in the outside world, where the quality of the workspace is seen as having a major impact both in improving quality and defining the mission and culture of the organization. Given the high value placed on establishing a culture of collaboration, there is a parallel requirement to build workspace wherein collaboration can best

take place. The following discussion provides some layouts illustrating how better work space design can enhance interaction and communications.

5.6.C. Most Professionals Work by Themselves

Most professionals are required to spend a considerable time engaged in careful thinking. This includes both individual and team/group work. In *Disproving Widespread Myths About Workplace Design*,[4] Brill et al. report their findings based on interviewing and surveying the work conditions of many thousands of office workers. They found out that "both quiet work and verbal interactions happen largely in individuals' workspaces." At the same time, impromptu meetings in public spaces are important to stimulate the exchange of ideas and for creativity. The key is to strike a balance between the need for a distraction-free workplace and the value of meeting and interacting informally with people in unplanned ways. The solution they propose is to design enclosed workspaces (enclosed offices or enclosed groups of a small number of small open workspaces), each in close proximity to public spaces that "increase the frequency of random encounters and interactions for individuals, within and across teams."

Workspace Array with Public Space. One design that fosters collaboration is an array of enclosed workspaces surrounding a public space that allows people to meet and interact. A schematic design of such a space is given in the figure below.



A design of a cluster of individual workspaces with public space
GSA Public Building, San Francisco, CA[5]

To reach an individual workspace, one must walk through the public space, which provides ample opportunities for people to interact without much planning. These public areas could include drinks and some food (a social magnet). It is important that the enclosed workspaces have doors that can be closed at will in order to preserve privacy when needed. The professionals

should also be allowed to plan the furniture arrangement in their space (to promote diversity including diversity in thinking).

From their research, Brill et al. concluded that areas of enclosed workspaces support informal interactions and impromptu meetings more effectively than open space offices. This conclusion seems counterintuitive: open space offices do not foster more open communication. Open communication is better achieved by removing unnecessary and restrictive hierarchical boundaries and "other barriers that limit the flow of ideas and collaboration," and by using "ways to increase the frequency and utility of work-useful informal interactions and group work."

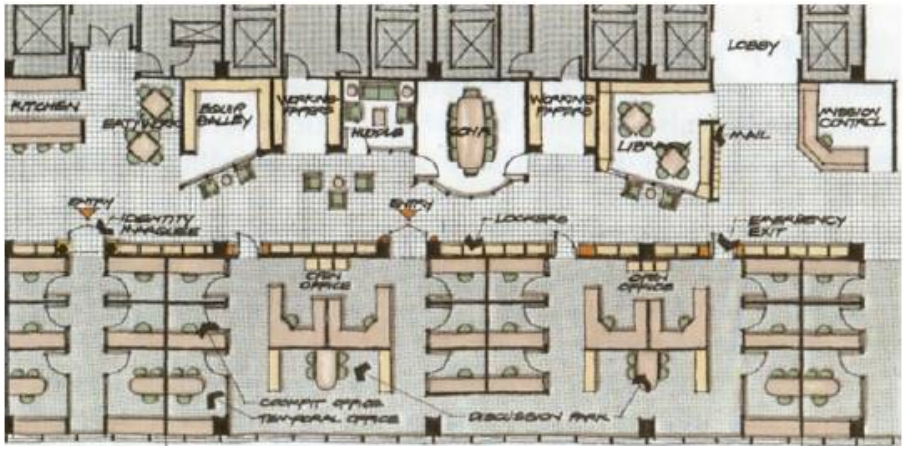
Cross-Group Public Spaces. In addition to the public spaces within a group of enclosed small workspaces, consideration should be given to creating cross-team and cross-functional work space such as:

- "Main Street." A hallway with services, support spaces, and meeting places.
- An enclosed workspace between Main Street and the personal office spaces that prevents noise from reaching the individual work spaces.
- Public spaces interlaced with arrays of personal workspaces, or workspaces interlaced by public spaces.

A Main Street, Perspective[6]

One of the necessary steps in providing workspace for IC professionals that will enhance their work rather than impede it, is to consider:

- How close group interaction space should be to individual workspace.
- Whether interaction spaces should be dedicated to a group or be available to everyone.

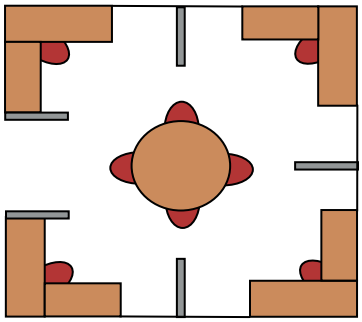


A Main Street Plan, including a full-height wall between
Main Street & individual workspaces

5.6.D. Most Professionals Focus on Work in Groups

In some offices, people work together in groups most of the time. We describe here two possibilities (among many) for increasing efficiency and work quality by creating **an open array.**

Small Group Open Array Workspace. One possibility is to place a small number of professionals in a room divided into individual work areas and a public space in the middle. The following figure illustrates a configuration for a group of four professionals that provides both privacy and the ability to interact. Short partitions divide the space into individual workspaces that keep colleagues outside one's normal field of vision when working at the computer or at one's desk. However, by slightly moving his or her chair back from the desk, the employee can easily engage others in the workspace visually. This is suitable for people working on related issues.



A Four-Desk Array with Center Public Table

A more radical approach has been developed by the architectural firm Meridian Design that divides the work space into open group areas with no cubicles.[6] First, the floor is divided into a number of team areas. The work area is then arranged not with the familiar 90-degree cubicles, but rather with a number of encompassing open workspaces where the prevalent angle is 120 degrees. Each workspace is designed for a few people.

The flowing workspace uses 120-degree corners. Note the communal table
in the center of the workspace (on the left).

The encompassing nature of this design helps to define the boundary of the individual workspace and focuses attention toward a central communal horizontal surface (large and usually non-rectangular table) used for both work and other group activities such as eating, discussing, or floating ideas and sharing insights (some of these activities are also done from the desk surface in a good team flow). The space underneath the communal horizontal surface could be used for extra storage.

As seen in the photo, each computer is placed in a corner of a table with a 120-degree angle. This allows more than one person to work in front of the computer (see picture below), which is much better than placing a computer in the 90-degree enclosure so common in small cubicles.

Two persons sharing a screen in a 120-degree corner.

The open arrangement using 120-degree angles has proven more efficient for Meridian Design than the typical cubicle array they used to have. An individual sitting in front of his or her computer screen, placed in a 120-degree corner, is visually isolated from people who sit in other 120-degree corners. To open a space for passage or activities in a traditional 90-degree cubicle structure, one needs to eliminate cubicles.

Using Wall Space to Share and Collaborate. Areas facing a wall could post drawings, charts, and other materials on the upper half of the wall (see photo below). The lower half is used for storing accumulated large pieces of paper or charts not essential for the work done at a particular time. This communal display also accommodates the collaborative work of two or more people.

The wall is used for collaborative work and storage.

Sound Proofing. Based on their study interviewing thousands of office workers, BOSTI Associates[3] notes that "noise is both necessary for business (because it is integral to verbal transactions, informal learning, and collaboration) and also distracting to neighbors trying to concentrate." They found out that "both quiet work and verbal interactions happen largely in individuals' workspaces."

In open environments, such as cubicle or non-cubicle arrays, noise could be a disturbing factor (raised sound level and/or a distraction). The technology to isolate sound to the immediate surroundings of the analyst exists today and could be implemented. Use of such white noise systems has been actively embraced in the commercial world, expecting that the price of this feature would be easily compensated by the increase in productivity.

Acknowledgements:
The author is grateful to Sue Weidemann for her constructive comments and for granting permission to use some of the drawings produced by the research done by BOSTI Associates. The author is thankful to Randy Pherson for his helpful and useful comments.

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[1] Winston Churchill, 28 October 1943, to the House of Commons (meeting in the House of Lords).

[2] Captionless (Man looking over cubicle wall at mannequin standing in for co-worker). Published in The New Yorker May 10, 2004. Printed by permission. Copyright restrictions prohibit copying and distributing this figure.

[3] Kristan J. Wheaton, "Office Upgrades Likely to Increase Productivity," Intelligence Report, Institute for Intelligence Studies, Mercyhurst College.

[4] M. Brill, S. Weidemann, and the BOSTI Associates, *Disproving Widespread Myths About Workplace Design*, published and distributed by Kimball International. This publication summarizes the rigorous, client-based research done with 10,000 workers in 100 organizations. It showed that workplace design affects productivity and job satisfaction. See http://www.bosti.com/public.htm. An earlier in-depth publication is BOSTI's 1985 two-volume work *Using Office Design to Increase Productivity*.

[5] From M. Brill, S. Weidemann, and the BOSTI Associates, *Disproving Widespread Myths About Workplace Design*, published and distributed by Kimball International. Permission granted.

[6] Meridian Design, New York City, NY. The photos were taken at their offices.

5.7. Breaking the Mold in Developing Training Courses on Collaboration (Randy Pherson - Pherson Assoc.)

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5.7.A. Introduction

Although major progress has been made in recent years to inculcate more collaborative work practices into the daily routines of analysts, collectors, and operators, a common complaint has been the lack of robust community-wide training programs. Several organizations in the Intelligence Community and the military have developed and are teaching courses on collaboration, but the demand far exceeds supply. Efforts to develop effective training programs focusing on collaboration, however, face several unique challenges:

- Most training courses are developed and taught by established school houses and tailored to the needs of their particular organization. This stove-pipe approach to training, however, runs directly counter to the ideal that any course on collaboration include officers from a broad range of agencies and commands. Some agencies invite officers from other organizations to attend their courses, but this is not the same as creating a truly community-based course. School house principals would also have difficulty justifying a course in which most students come from outside the home organizations.
- The press of daily business makes it difficult for managers to release their analysts, operators, and collectors for several days to take a course on collaboration. A key assumption is that critical work is not being done at the office when officers are busy taking courses. Analysts are disincentivized because they know the longer the course, the harder it will be for them to catch up when they return to work.
- Generic courses on collaboration run the risk of trying to be "all things for all people." As a result, specific student needs are not well addressed. Recent hires, for example, have much different needs than established analysts and senior executives face different challenges than first line supervisors. Putting all in the same course simply increases everyone's level of frustration.

This paper attempts to address these challenges by proposing a different approach to collaboration training that is based on a simple concept: "Train as you should work." For example, officers should not just hear about the value of establishing interagency networks, they should be building them as part of the course. Instead of talking about the need for metrics, class time should be focused on developing a set of metrics that works for their particular problem. And class exercises should be based on issues students are currently working on, not on historical case studies.

5.7.B. Collaboration Training as a Joint Experience

Training on collaboration should focus less on explaining the values of collaboration and more on helping officers build collaborative teams and utilize collaboration tools more effectively. Workshops should be populated by *teams* of analysts from different agencies who work the same issue and need to share their insights and pool their data. Officers would be encouraged to nominate themselves *as a team* to attend a workshop and to bring a specific issue or problem to the course that they would like to work on together.

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Train as Teams on Current Issues. The first principle of developing an effective training program is to populate the course with officers who share the same challenge. Students who want to reach across organizational boundaries and collaborate on a given project should identify their "interagency team." The team should agree to take the training together. Engaging the whole team in the training process generates several benefits:

- Students can leverage the training opportunity to build a team that has met face-to-face, knows each other's strengths and weaknesses, and has developed mutual trust.
- By focusing on a particular issue of common concern, students are no longer "away at training" but doing real work.
- Joint training also gives participants valuable time together to discover if they share the same assumptions, use the same definitions, and are working from the same evidence. Even more important, the team will be operating in an environment where they can quickly identify points of disagreement and explore the reasons why.

Build a Common Framework. In a joint training environment, students can develop a common understanding of what constitutes effective collaboration and apply this new-found knowledge to their particular problem. The workshop would draw on many of the concepts and ideas outlined in other articles in this White Paper. The workshop needs to engage students in short exercises that help establish:

- A common lexicon for talking about collaboration.[1]
- The rationale behind several core principles including the responsibility to share, the concept of empowerment, and the requirement that users—not the IT provider—own the environment.
- The critical need to ensure that all collaborative networks are built on a foundation characterized by mutual trust, mutual benefit, mission criticality, proper incentives, established metrics, easy access, and agile systems.[2]

Tailor the Message. Collaboration training should be keyed to at least four distinct audiences: New hires, officers with at least three years on the job, first-line supervisors, and senior executives.

- For new officers, training would focus on developing the necessary skills to exploit existing (or soon to be created) collaborative tools and environments. For example, intelligence officers would be taught how to add themselves to various registries (such as the Intelligence Community's Analytic Resources Catalogue (ARC); access and exploit Intelink, Intellipedia, and A-Space; create wikis and blogs; and use social discovery tools.
- For journeyman officers, the focus would shift to developing strategies to break down cultural and organizational barriers to collaboration. Analysts would learn more about collection and collection systems; collectors would gain a better understanding of how analysis is produced for disparate consumers (in hard copy and virtually) and how analysts can help them identify targets and establish collection priorities; and operators would become more aware of the constraints under which analysts and collectors function.
- First-line supervisors need direct exposure to their counterparts across the community, the challenges their colleagues face, and the tools that would work best to facilitate collaboration. Their training would devote more time to cross-cultural awareness and how to leverage expertise that resides outside their work units.

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- Senior executives need opportunities to pool their experiences as they explore how to create joint databases and build more robust bridges across the community. Most important, attention would focus on how to transform a culture where managers control what their units produce to a much different culture where the primary function of managers is to orchestrate and facilitate high quality, joint production.

5.7.C. Advantages of the Joint Training Approach

Adopting a joint workshop approach to collaboration training will generate some major benefits both within the traditional stovepipes and across the entire community.

Building Teams. The first step in most collaborative projects is organizing a face-to-face meeting that allows the team members to interact personally and build trusting relationships across organizations. This can be accomplished most efficiently by having a new team sign up for the same workshop and take the same course together. Not only does this provide the opportunity for several days of personal interaction, but the team members can actually leverage the experience to get started on their new project. If there are no classification or confidentiality issues with the project, class exercises can be organized in a way that the team members use their project as a case study during the course.

Building Networks. The classroom environment offers a superb opportunity for all participants to make new contacts and significantly expand their networks into several other organizations. Even if the student does not have professional reasons to interact with classmates who are not working on his or her particular topic, that classmate can help the student connect with the appropriate person in their organization after both return to work. Some courses organize special alumni events involving all the students who have taken a particular class in a given year. Such events give the students a chance not only to catch up with their classmates but also to connect with students who had taken the same class at a different time, further expanding their network.

Developing Realistic Incentives and Metrics. Courses can be used as test beds for developing realistic systems of incentives. For example, students could be tasked in a workshop exercise to answer the question: What incentives would best motivate you to work collaboratively to complete this task? A list of effective incentives could be developed that harvested the best ideas that emerge each time the course is taught.[3] A similar approach could be taken for developing metrics of successful collaboration. Each team in the workshop would be asked to come up with a set of metrics that could be used to measure their future success in bringing their project to completion. Again, lists could be made of the most creative and useful ideas. These lists could then be shared with staff officers who are charged with developing metrics and incentive structures for collaborative behavior.

Generating Collection Strategies. The presence of students from multiple agencies—and most likely several key collection agencies—in the same workshop provides an unparalleled opportunity for students to brainstorm multi-INT collection strategies. Collectors can share insights on the strengths and weaknesses of their collection systems and apply that knowledge to the various projects teams are working on in the class. As the days in class unfold and students become familiar with each other's projects, the opportunities for conceptualizing more innovative and more synergistic collection strategies would increase.

Improving Product Quality. Another benefit of adopting a workshop approach with teams of officers representing multiple agencies is that such expertise can be tapped to improve the overall

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quality of the final product. Engaging such expertise at the beginning of a project is almost always more productive than asking them to comment on a finished product. The mindset shifts from a coordination perspective that seeks to protect other organization's equities to a collaborative approach that focuses on how the issue is framed and what are the most productive lines of enquiry.

Establishing a Common Lexicon. Last but not least, the workshop approach provides an ideal setting for establishing common definitions and a common lexicon across all organizations. Differences in how various organizations define terms can be surfaced and differences in how they set priorities can be explained. Teams can also help each other explore key assumptions that underlie a team's analysis and its proposed strategies for moving forward.

5.7.D. Designing Course Curricula

All collaboration courses and workshops should include exercises that reinforce the importance of:

- Framing the issue correctly and defining the intelligence question precisely.
- Core principles that guide the behavior of all members of the community including establishing the responsibility to provide, empowering all officers to participate, and ensuring a user-driven environment.
- The six imperatives that must be present for a collaborative effort to succeed: Mutual trust, mutual benefit, mission criticality, effective incentives, access and agility, and a common understanding of the rules of the road.
- Anticipating which obstacles are most likely to be encountered and discussing strategies to overcome them.
- Incentive structures that further empower and institutionalize the collaborative effort.
- Metrics to monitor progress and document success.
- A wrap-up session that focuses on how the students will apply what they have learned when they return to their offices.

In addition to the core precepts listed above, workshops for newly hired employees should include segments that:

- Sensitize students to the wide range of cultures manifested across all organizations and how this can benefit or impede community collaboration.
- Help analysts assess whether they are natural collaborators, by applying established personality profile tests, if available.
- Provide an overview of the collaborative tools and techniques available in their work areas and where to go for help in using these tools and techniques.
- Assist new officers in getting connected and building their personal social networks.

Workshops for established officers with at least three years' experience on the job should include segments that:

- Spur students to compare and contrast their organizational cultures and how these differences can enable or impede effective collaboration.
- Force a critical appraisal of what traps the students have encountered that make it hard to work collaboratively.
- Allow students to share best practices that demonstrate a higher quality final product as a result of collaboration.

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Courses designed for first-line supervisors who face unique challenges should emphasize problem-solving. Key segments to include are:

- Exercises that illustrate the high potential for miscommunication when interacting in virtual environments.
- The role of organizational cultures and how different cultures can view a problem differently.
- Where to find help.
- How to build effective incentive systems.
- How to adjust their personal management styles to encourage more effective collaboration within their units and better connect their officers to colleagues in other organizations.

Senior executives usually can devote little time to training. This makes it all the more important to focus on several key themes:

- The core principles and six imperatives for effective collaboration.
- The most common obstacles to collaboration and strategies to overcome them.
- The importance of establishing effective incentives—and even consider disincentives if subordinate managers are acting more to impede than support collaboration.
- How to adjust personal management styles to encourage greater collaboration within their organizations and leverage cross-organizational networks.

5.7.E. Begin at the Top

While, over time, training in collaborative practices should be taking place at all levels, private industry has learned that when new training programs are needed to change an organization's work culture, the best strategy is to begin at the top and work down through the organization.

A top-down strategy has two major benefits. First, by beginning at the top, a strong signal goes out to the workforce that this training is important. If your boss is taking the course, it is hard to complain when it becomes your turn. More important, by starting at the top, senior executives have an opportunity to mold the content of the training and identify which areas require the most emphasis. In so doing, the senior executives are much more likely to "own" the message; they will also be in a much stronger position to reinforce the core concepts and help promote cultural change. Senior executives might even consider sponsoring a workshop on a theme contained in their organization's research plan or on an emerging area of concern that would benefit from a collaborative approach.

Another advantage of beginning the training at the senior executive level is that senior managers will have already established a network of contacts with colleagues in other agencies that might come in handy as their subordinates begin to reach out to those organizations. Senior managers may also turn out to be one of the harder audiences to educate. Most senior executives are unfamiliar with, and disinclined to use, social networking and other collaborative tools and uncertain—if not openly critical—of their benefits. One creative idea for dealing with this problem is to assign senior officers with "reverse mentors." A "reverse mentor" is a younger officer who grew up in the world of wikis, blogs, RSS feeds, Twitter, and Facebook and can help a more senior officer to integrate such tools into his or her personal workspace, while explaining how such tools can enhance mission performance.

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5.7.F. Meeting the Challenge

As the world shifts from a linear, hierarchical, and output-oriented mentality to a more dynamic, complex, flatter, and increasingly interdependent "ecosystem," the need to find connectiveness through social networking systems and use collaborative systems smartly is a growing imperative. The way we structure our work processes is increasingly diverging from the world we live in. The danger is that if we don't adopt a more organic, connected, and collaborative work style, we will be increasingly surprised by emerging trends and daily events. Transforming how our day-to-day business is conducted will require our leaders to articulate a compelling story explaining why change is necessary, institute consistent policies across organizational boundaries, and provide the necessary human and technical support to get the job done.

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[1] See Joan McIntyre's article, "A Framework for Thinking about Collaboration within the Intelligence Community" for a richer discussion of this topic (section 1.1).

[2] The three core principles and six imperatives for effective collaboration are discussed in more detail in Randy Pherson and Joan McIntyre's article, "The Essence of Collaboration: The IC Experience" (section 4.2). Thomas Rieger's article, "Barriers to Collaboration: Imbalanced Empowerment and Accountability" (section 3.1) helps make the case for empowerment.

[3] A good place to start is with Kerry Buckley's "Checklist for Successful Collaboration" (section 4.11).

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5.8. Teams of Leaders Concept in Complex Defense and Security Operations (Dag von Lubitz, MedSMART, Inc.)

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E pluribus unum ("Out of Many, One," - The motto of the United States of America)

5.8.A. Government and Bureaucracy

From the most ancient times, the efficiency of national government was closely dependent on the efficiency of the administrative system of governance it created. For ancient China, Egypt, and Rome, their expansion and domination over other nations were contingent on the flawless execution of policies set forth by the governing bodies (autocratic rulers or councils such as the Roman Senate). The structure and regulations allowing implementation of these policies – bureaucracy – permitted application of standardized procedures governing subsequent execution of essentially all processes within the nation.[1] Inherent and fundamental to this process was also bureaucratic division of powers, hierarchy, and relationships. Unsurprisingly, charged with both the interpretation and execution of national policies, the bureaucratic structure acquired a very considerable and near-autonomous power through its informal influence on the conduct of governmental business.[2]

The most common adverse effect of conscientious exercise of bureaucratic powers resulted in initiative-stifling emphasis on procedure and process.[3] In the world of totalitarian systems, bureaucracy served a more ominous role providing, together with organs of internal security, the primary instrument of social and often political oppression.[4] Yet, even fully democratic societies are not entirely free from the negative and often retarding effects of excessively enforced and practiced bureaucratic procedure.[5]

Criticism and satire of Kafka and Hašek notwithstanding, there is no doubt that bureaucracy is needed.[6] Modern governments face a widening range of national problems, and also issues that involve international and multinational cooperation and collaboration. The national worlds of politics, governance, administration, and power projection transform rapidly into "whole of government" interactions, and the latter transit into JIIM – Joint Interagency, International, Multinational activities of escalating scope and significance.[7] Bureaucracy provides the needed uniform framework of process that provides structure and stabilization in such operations, and assures their adherence to appropriate policies and laws.[8] Despite its faults, bureaucracy performs a vital role in the highly complex modern society by providing order to its political, social, economic, and even cultural functions. The "operational limits" of modern bureaucracy are, therefore, not blindness and unimaginative adherence to sanctioned norms but rather increasing specialization of individual arms of government which, devoted to specific areas of national pursuits, assume progressively more self-contained character. Consequently, while the unity of purpose within the government may be preserved, the unity and uniformity of action is often badly affected by individual rules and regulations governing individual agencies and departments. Successful attempts at reconciliation of such differences within the pre-existing and codified patterns of organizational behaviors are not impossible. In practice, however, they entitle to breaking the codified "rules of engagement" in the absence of which a gridlock ensues;

often vital programs become retarded, their original purpose badly distorted or entirely abandoned.[9]

In modern society, governmental or private sector actions and activities that influence either or both of the two sectors are performed in the increasingly "hyper-rich" and "hyper-turbulent" environments characterized by the simultaneous presence of many subordinate, yet often entirely incompatible local, national and international actors.[10] The latter are most commonly either associated with or even defined by disparate goals, and, even if operating within the same national government, by frequently conflicting rules, procedures, and organizational cultures. Such disparities pose a natural barrier to cooperation.[11] The cooperation difficulties are greatly magnified when activities must be executed at the crossroads of national, inter- and/or multinational levels.[12] In the end, despite the best intentions, inconsistencies among involved institutional bureaucracies are so great that the notion of governmental unity and efficiency turns into an exception rather than the rule: four years after Hurricane Katrina, people of New Orleans are still subject to significant privations not because of ill intentions of all concerned, but because of the bureaucratic conflicts among those expected to provide the necessary assistance.[13] The unintentional negative side effect of bureaucratic governance is clearly recognized both by students and practitioners of government, politics, and public administration, and continuous efforts to reduce adverse influences through "reinventing government" are made with unceasing legislative and administrative vigor.[14]

5.8.B. The Impact of Technology on Operations: Actionable Knowledge

The trinity of "technology, processes, and people" has been the cornerstone of modern thought in business and public administration, military and national security for quite a long time.[15] Processes – the domain of bureaucracy – have frequently failed because of their vastly too inflexible or inappropriate application.[16] People and their leadership are the subject of a furious and ongoing debate in which a multitude of theories is proposed, and, depending on the prevalent mood, rejected.[17] Many have therefore hoped that rapidly developing information technology may provide a solution to the increasing range of acute dilemmas facing politicians, administrators, soldiers, and businessmen throughout the world.[18]

Yet, in the complex world of multi-agency governmental and private sector operations, even the most advanced technologies and processes appear to be wanting: *actionable knowledge*[19] that these technologies provide appears to be consistently insufficient and inadequate as the basis for the often desperately sought solutions to the mounting problems.[20] Among the principal reasons for this inadequacy is the fact that actionable knowledge is highly specific: it is extracted from the general body of *pertinent knowledge*[21] by specific agencies, for a specific purpose, and to be applied within (typically) a specific context.[22] In the end, therefore, what may be relevant to a firefighter is less so to a National Guardsman, and potentially completely irrelevant to a national intelligence specialist. By the same token, the same element of information or knowledge may be subject to entirely different interpretation by different agencies or their representatives. In the end, despite identical foundations, development and utilization of *actionable knowledge* may lead to misunderstandings and operational chaos rather than unity of purpose and action.[23]

In view of the problems resulting from agency-specific implementation of knowledge management and the uncritical application of the results to "whole of government" activities, there is the evident need, possibly even a desperate one, for an ingredient surpassing actionable knowledge: the need for *actionable understanding*.[24] It is the latter that allows untangling the

Gordian knot of simultaneous and conflicting demands and priorities that lead to governmental gridlocks and national and international crises. Although greatly facilitated by technology, development of the state of actionable understanding is the sole *domain of people* rather than technology.[25] Hence, any prospect for meaningful and effective solutions to the current and forthcoming national and international dilemmas of security, economy, healthcare, etc., can be attained only through the closest cooperative effort of the involved *people* rather than through the application of even the most impressive technological *tour de force*.

In 2006 Frans Johansson published "The Medici Effect," in which he described the inspiring effect created by the confluence of several outwardly independent developments – the point of intersection of ideas – from which new, often path-breaking concepts emerge and cause dramatic changes both in our perception of the surrounding world, and the manner we interact with it.[26] The concept of *Teams of Leaders* (ToL)[27] is the result of such confluence and *mutagenesis* of several existing concepts into a completely new, revolutionary approach to cooperation and collaboration across cultural, institutional, governmental, and national boundaries and differences.

5.8.C. ToL as The Consequence of New Needs

The origins of ToL can be traced to the entirely new demands faced by the US Army following the end of the Cold War. The expanded range and character of missions enforced not only the introduction of a completely new readiness model emphasizing flexibility and deployment readiness, but also the realization that within the enlarged mission spectrum the performance of an individual soldier could lead to strategic consequences; decisions made by the "man on the spot" had the potential to influence national interests.

To fulfill such unprecedented demands a new breed of soldier-leaders who were flexible, adaptable, versatile, and comfortable in operating within the complex setting of Joint Interagency, Inter-government, Multinational (JIIM) operations was critically needed.[28] In many ways, problems affecting the US Army were similar to the difficulties affecting large-scale governmental operations today: organizational complexity, wide mission spectrum, the need for mission-centered cooperation of numerous local, national, and international agencies, and the need to change operational approaches in order to meet and address an increasingly larger host of rapidly diversifying challenges, while continuing simultaneous engagement in routine activities that are now clearly seen as insufficient to maintain even the minimum of a *status quo*.

5.8.D. The Structure of ToL

Conceptually, ToL is deceptively simple and centered on the active fusion of three elements consisting of advanced IM, KM and High Performing Leader Teams (HPLT). However, it *must not* be mistaken for merely a specialized social network serving a group of select professionals. The cardinal difference between such a network and ToL, and one that also constitutes the prerequisite for the development of HPLT, is the shared foundation of *skills, knowledge, and attitudes* (SKA) based, in turn, on previously acquired appropriate and universally high-quality professional preparation of individual team members. Such preparation can be obtained only through intensive training to *task, condition, and standard* (TCS) resulting in the ability of individual team members to demonstrate practical performance mastery of the required skills. Note, however, that practice of ToL is not contingent on such rigorous interpretation; shared SKAs develop across very diverse leader teams and across the wide variety of boundaries. Wherever one finds a high order of sharing of values combined with common training to TCS,

high performance comes faster and easier. This is the ideal path: one that is far more practical is the employment of Leader Team Exercises (LTXs) as a powerful tool in the development of the required shared SKAs. The advantage of the latter method is its independence of both the composition and location of the participating Leader Teams.[29]

In the case of the US Army, the training and performance proficiency requirements are developed and set by the Army's Training and Doctrine Command (TRADOC). In the civilian world, similar standards are developed by the leading schools of public administration, law, medicine, engineering, and business. These are, in turn, subject to stringent accreditation requirements, peer reviews, and adherence to national and international standards of service.[30]

Rigorous training that satisfies a defined set of metrics-based performance standards assures general uniformity of outcomes and of professional capability of the participants. It also assures the development of *shared confidence and trust* in mutual professionalism and the ability to act appropriately under a very wide range of conditions both as individuals and teams of individuals.

Training alone is not sufficient; it must have roots in active learning that, in the context of leader team development, requires collaborative rather than individual learning. Several studies[31] support such an approach and show that team learning has a significantly greater effect on critical thinking and task performance than the more traditional individual learning process.

To assure the required task performance to a predetermined task/condition/standard, the learning process is experiential rather than didactic, and involves routine exposure to sudden changes ("confounders") that assists in the development of the required flexibility and adaptability both by individuals within the team, and by the entire team.[32] The process has been pioneered and traditionally used as one of the cornerstones of professional education in medicine, nursing, etc.,[33] and its cumulative outcome is the mastery of essential skills, knowledge, and the related mental and physical attributes not only under the most routine circumstances, but also in the environments of maximum stress, uncertainty, and speed of events.

Performance assessment under rigorous and highly demanding conditions constitutes the essential part of High Performing Leader Team development. Consequently, training turns into self-evaluation and evaluation promotes further training; the teams attain pitch efficiency. Due to the standardized approach used in HPLT development, they can be inserted as "modular elements" whenever and wherever required. The "value added" component of such an approach is the resulting "quality assurance"; organizations, whether real or virtual, which co-opt HPLTs as part of their operational profile will have full confidence and trust in their capabilities – an element of possibly the greatest significance in the development of unit efficiency and cohesion that, in turn, provides the efficiency lubricant in multi-organizational efforts. It has been demonstrated on several occasions[34] that absence of such trust and acceptance are among the primary reasons for several failures during complex nation building, humanitarian relief, and peace-keeping operations.[35]

Current applications of network-centric concepts promote top-to-bottom distribution of knowledge (but see von Lubitz et al.[36]) and the reverse direction of information flow. While acceptable in hierarchically organized systems (e.g., the military), the approach may impede development of new, actionable knowledge and may lead to inadvertent "stove-piping." The ToL concept circumvents this problem by the wide-ranging employment of "horizontal spread" through platform-independent peer-to-peer exchanges, social and professional networks, text-

and visual blogs, avatars, etc., all of which are supported and expanded by the rapid maturation of Web 2.0.[37]

Combined with the enterprise-wide access to the primary information and knowledge sources, the resulting pervasive, system-wide use of IT promotes generation of *ad hoc* collaborative entities (teams) capable of addressing common problems, development of "just-in-time" solutions, and fostering creation of new knowledge and best practices. It is important to note that the use of IT as the vehicle for creativity not only dissolves the previous constraints of time, space, organizational/inter-organizational cultures, but also (and most importantly) the barriers of status and rank. Most importantly from the practical point of view, ToL has been employed with great success by the US European Command (EUCOM) as described in the article by LTC Hilton (1.4);[38] the approach proposed above is, therefore, based on the already well proven methods and techniques implemented by an organization of great complexity, involved in a wide range of missions (of which active combat constitutes only a comparatively small part), and interacting with other, equally complex organizations at nationally, international, and global, multi-national levels (e.g., EU, UN, OAS, PAHO; WHO)

The extensive use of IT, IM, and KM as the means of sharing information and knowledge has proven to be a powerful promoter of rapid development of shared vision, competence, confidence, and trust.[39] Attainment of these attributes by members of the collaborating leader teams transforms those into High Performing Leader Teams. It is the activity of the latter that converts the previously top-down structure into a bottom-up/lateral knowledge and "best practices" generator. In the process of that conversion, the pervasive nature of the generated exchanges demolishes organizational barriers, promotes socialization, and fosters mutual confidence and trust among members of leader teams, and, as the cumulative result, Teams of Leaders emerge; the previously physically and/or organizationally isolated individuals and groups convert into "swarms" able to converge accordingly to the requirements of task and mission at hand. Such swarms are essential for addressing problems affecting performance at the level of "domain of domains." Homeland security and defense, healthcare, low intensity conflicts, or global business operations are among the typical examples of such complex fields of action.

Throughout the course of transition from HPLT to ToL a less tangible but critical advantage emerges; people who previously had no knowledge of each other, who might have been separated by distance, institutional or specialty barriers begin to rapidly form a network of close social relationships. Consequently, the development of collaborative spirit that often characterizes interactions between the local ambulance company and the emergency department of a county hospital can now emerge between, for example, members of a special operations team deployed to assist a local Afghan community and emergency physicians and rescue personnel in the US or anywhere else. As can be clearly seen, domain specific actionable knowledge generated through network-centric activities that might have been shared between the two isolated groups[40] transforms through ToL-based interaction into "*actionable understanding*"[41]. The latter constitutes the most essential prerogative for operational efficiency in the environments of uncertainty and rapid, unpredictable change seen, for example, during responses to major disasters or rapidly escalating healthcare threats presented by pandemics or bioterrorism-related events.[42] Also, circumstantial evidence indicates solid reasons to contend that the lack of such understanding was among the chief sources of errors in the response of national healthcare systems to such catastrophic events as the European heat wave of 2003,

Hurricane Katrina in 2005, the conflict in Bosnia or the initial US actions following Operation Iraqi Freedom.[43]

As indicated above, the essential conceptual and structural elements such as the basic IT infrastructure, and information and knowledge bases required for the development of ToL already exist Others, such as the addition of robust, damage-resilient IT elements needed to accommodate both open and secure communications among individual infrastructural subcomponents, are under intensive development.[44] However, the widely dispersed nature of the existing knowledge repositories ancillary to narrowly defined arena of particular interest (e.g., sociology, economics, security, military affairs) will require development of a consistent, "user friendly" format that is both standardized and integrated into the overall pool consistent with what is currently understood as "theater of operations-relevant knowledge base." The new format will also need to allow for the intensive employment of decision support systems (DSS) and executive decision support (EDS) tools required for unhindered fusion of ancillary disciplines with the strictly domain-related ones.[45]

It would be exceedingly naïve to expect ToL to offer a dilemma-solving panacea. Nonetheless, its rapid and consequent implementation within the broadest realm of healthcare may provide the launch pad for such remedy. ToL is endowed with a number of distinct and unique advantages. First of all, the essential physical constituents already exist, several of which have been discussed in this paper Furthermore, the ToL concept is already implemented with a significant success and on a large scale by EUCOM as part of its extensive interaction with the civilian authorities of several European countries. Hence, the "lessons learned" can be readily adopted into the civilian environment. Most importantly, however, ToL unifies the currently disconnected entities and fields of governmental operations and fosters rapid development of actionable understanding rather than actionable knowledge. As argued in the preceding sections, the actionable understanding rather than actionable knowledge serves both as the prerequisite and the *essential* prelude to creating a solid foundation for the development of the very badly needed collaboration and cooperation among all involved national and international actors. Without such understanding, all efforts to relieve the mounting pressures of conflicting demands, inequities, and deficiencies will ultimately fail. The signs of the approaching collapse are clearly visible already, and the currently favored erratic application of ever-larger amounts of money to avert the inevitable is, equally clearly, utterly inadequate.

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5.9. Transboundary Crises, Transboundary Thinking, and The Teams Of Leaders (ToL) Approach: The H1N1 Case (M. Jude Egan, LSU and Dag von Lubitz, MedSMART, Inc.)

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5.9.A. Introduction

A recent *New York Times* editorial declares that all disasters are local and indeed most are.[1] The Incident Command Structure (ICS), a network of concentric circles of local, state and federal government responders is suited in many ways to respond to the classic local disaster type – an event, such as the recent Jesusita Wildfire in Santa Barbara County, begins with dry evening winds, high fuel and steep canyons dotted with million-dollar homes. First responders on the scene, a fire crew or two, one team leader assuming the command position, quickly realize that they need more resources. As they request more units to respond to the fire, and as conditions deteriorate, the incident command structure broadens to include more county responders. In turn, as demand outstrips the county units' capacity, the incident commander sends out a request for assistance to neighboring counties, each of which faces its own similar wind and fuel conditions. They respond and serve under the Santa Barbara County incident commander. As the fire and conditions intensify, the county calls for state help and it establishes unified command composed of local, county and state fire, law enforcement and government officials. The Governor declares a disaster and reaches out, if the situation overwhelms state resources, to the President. Ultimately, the President brings federal resources to bear under the unified command structure, until they extinguish the fire. This same command structure may also be applied to similar localized events that may turn into disaster – such as earthquakes, weak hurricanes, and floods – layers of responders serve under the local incident command, command remaining local because local officials know residents, capacities and terrain best.

But disasters are growing increasingly large and urban areas are at once growing increasingly dense and dispersed, meaning that the impacts of a single event are likely to be felt in multiple jurisdictions at once. These events have been called "transboundary"[*] crises[2] because they trigger parallel responses from parallel jurisdictions that may call upon the same layers of outsiders for support, including state, federal, private and NVOAD entities. The typical transboundary event distributes impacts over multiple jurisdictions at once such that simply drawing a wider command ring around the impacted areas cannot "contain" its location. Transboundary events are, thus, by definition, multijurisdictional and nonlocal; they often involve "whole of government" response (see article 5.8 by von Lubitz) by bleeding over

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[*] We use the term "transboundary" in three ways: 1) impacting more than one political, geographic or legal jurisdictions; 2) impacting or requiring response from more than one agency, governmental or national sphere or silo of influence; 3) implicating two or more potentially conflicting legal rules or procedures, whether statutory, common law or procedural. Thus, a *transboundary crisis* is one that impacts multiple political or legal communities such as a hurricane that makes landfall at the Texas-Louisiana border, while *transboundary response* may implicate several traditional action "silos" such as FEMA, HUD, ICE, the US military and local law enforcement.

traditional organizational and governmental boundaries, making local command structures difficult to implement. Emergency response combines the need for flexibility in interpretation and the rule of law; as such, lawyers play an important role in response efforts.

Too often, because of conflicting legal authorities, combined with a particularist jurisdictional agenda, lawyers can hinder rather than facilitate response efforts. Thus, an emergency manager or responder with a lawyer by his or her side, in a compliance-driven organization – one following every "letter of the law" in a voluminous rule-book, normally to evade future investigation – may be paralyzed in response efforts. Lawyers are trained to be risk managers, and thus, acting on their own, absent actionable understanding of the field and characteristics of operations, will tend toward being compliance-driven, especially where they view their own "clients'" interests to be zero-sum with other jurisdictions. Lawyers know too well that anecdotes of this type of paralysis are common. For the role of lawyers in a transboundary crisis to be facilitative, they must evolve beyond mere compliance to follow the "spirit of the law," essentially a shared understanding via collaborative process of how law operates in particular situations; a collaborative crisis response team that includes lawyers, expands the boundaries of governments' ability to respond.

Increasing social vulnerability to natural and human-made hazards expands the nature and character of response operations presenting a massive coordination problem: it can pit governmental response efforts against one another as they compete for zero-sum outside support resources – Texas and Louisiana, for example, competed for available private sector resources during the Hurricane Gustav and Ike response efforts.[3] In response, there is increasing need for a new readiness model that emphasizes both an increased flexibility and deployment readiness in local and particular environments while understanding and working toward realizing the overall mission.[4] Because federal laws often conflict with state and local laws, and the goals of one agency may differ from others; these conflicts are areas where lawyers traditionally litigate, and the threat of litigation is the ultimate in paralysis for response operations. Law may thus, in fact, increase social vulnerability by reducing public and private sector response capacity. Therefore, the presence of lawyers, from multiple jurisdictions, in a facilitative manner, is a key to avoiding the litigation mentality and its attendant paralysis.

5.9.B. Transboundary Events/Transboundary Thinking

Where a wildfire is the classic local disaster, a pandemic is the ultimate transboundary event. The pandemic originates at a single point of origin and becomes a global concern, outstripping local, state and federal resources, from the infection of "patient zero." Traditional ICS immediately becomes overwhelmed and may actually hinder efforts to limit the spread of the illness by requiring local responders to understand that their capacities are overwhelmed before they have identified the nature of the disease. The need for expertise in a novel virus outbreak is immediate, but by the time local officials understand that an outbreak is the beginning of a pandemic, the disease will have crossed through many jurisdictions, as the H1N1 virus did in the first several weeks of its publicity, and all efforts to contain it locally are rendered moot.

The transboundary nature of the pandemic thus requires *transboundary thinking* from the outset; that is, it is not enough to develop a response plan based purely on containment through quarantine or treatment based on injection-delivered vaccines that suggest that officials could stay in front of a fast-moving virus, the planning must include the assumption that such a virus will already have spread throughout much of the world by the time patient zero has been

identified. Response strategies must engage the whole of government from the inception; this include thinking through legal ramifications, conflicts of laws, and developing approaches that are both flexible and adaptive and honor the rule of law.

We discuss the Teams of Leaders ("ToL") (see also article 1.4 by Hilton and article 5.8 by von Lubitz, this volume) approach as a method of thinking and responding outside traditional jurisdictional silos. ToL is a process framework that brings multiple and varied perspectives, expertise and experiences to bear on difficult and complex problems. The ToL framework provides an ideal method for developing flexible, adaptive response on the fly – creating collaboration-informed response and mission-oriented understanding and allowing for the addition of expertise during a crisis as the challenges require it. This article sheds light on the importance of transboundary legal thinking to both anticipate and resolve conflicts of law as an integral part of *transboundary leadership* during a crisis.

ToL is a method intensively implemented by the US EUCOM that seeks to develop *actionable understanding*, a people-centered way of facilitating transboundary decision-making and activity across traditional spheres or silos of influence.[5] Actionable understanding, as a goal of the ToL framework, allows for resolution of simultaneous and conflicting response priorities and rivalries between agencies and levels of government during an acute crisis; technology plays a facilitative role in bringing together people with disparate agendas and priorities to allow them to work collaboratively to resolve challenges present during a crisis. In addition, as most crises, and in particular transboundary crises, "cascade" or evolve over time, the ToL approach allows for the growth of trust and collaboration between people ordinarily ensconced in their own organizations guarding their own information and influence. The domain of actionable understanding is a domain in which information becomes knowledge and knowledge becomes understanding through a process of collaboration across cultural, institutional, governmental and national boundaries. Actionable understanding is transboundary understanding that arises via transboundary collaboration and communication. Transboundary thinking can be juxtaposed with the classic federal, state, local or cross-agency "bunker" or "silo" mentalities, in which jurisdictional control or control over one's own environment and information and organizational survival (or one's own survival in the organization) are the utmost aims of organizational leaders.[6]

The goal of emergency and crisis response is to reduce output variability in a context in which inputs are highly variable; to that end, crisis response is, in part, about creating an orderly arena within a chaotic environment. In the organizational literature, research on High Reliability Organizations (HROs) has suggested that some complex, hazard-managing organizations, for which failure is not an option, can do precisely this through a process of relentless preoccupation with failure and ongoing training for the unexpected.[7] Observations of HROs provide an important bridge between traditional organizational leadership and decision-making under complex conditions and the extraordinary complexity of the transboundary event such as a pandemic or a natural or anthropogenic disaster (NAD).

5.9.C. The H1N1 Case and The MSEHP

The first US case of H1N1 was confirmed on April 14, 2009.[8] The United States declared a public health emergency on April 26, 2009 under the Model State Emergency Health Powers Act[9] (MSEHP), twelve days later.[10] Initial "patient zero" suspicion focused on a four year old boy in La Gloria who lived in close proximity to a commercial pig farm, though later

investigation revealed that the virus had been identified in Mexico as an unidentified respiratory virus as early as the middle of March. The virus had made its way to Mexico City by early April causing some panic in the city and ultimately bringing commerce to a standstill.[11] While the literature and the media are full of discussions regarding the technical challenges of a public health emergency, the pandemic brings up a number of legal issues, only three of which are: state sovereignty, definition of response roles, and respect for the federalist process.

Public health officials and emergency responders at all levels of government noted that they had trained for pandemic scenarios since the passage of MSEHP and the anthrax scare, but they still indicated a number of unresolved legal issues from antiviral hoarding and prioritization of treatment in New York City, to private hospitals receiving federal and state funds refusing treatment in Arkansas, to unresolved deportation and outreach and treatment issues for undocumented immigrants, upon whom the nation's food infrastructure relies, in California. Virus tracking maps showed the virus appearing in clusters in major cities and spreading to Europe and New Zealand. The World Health Organization (WHO), tasked with making scientific recommendations on whether to classify the outbreak as a pandemic, faced its own political and legalistic pressures, regarding raising the alert level to a full blown pandemic declaration (level 6) for fear that it would impact the global economy.

The US response systems for NADs and communicable diseases are based on similar response constructs. Under the National Response Framework (NRF), scalable ICS system resources are coordinated by the Incident Commander at the local level or under a unified command. This is the starting point of the "all hazards" response approach directed by the NRF and the Stafford Act. Under the Stafford Act, there is a strict chain of command in which the local government declares a disaster or emergency and appeals to the state for resources to support local response. The state then follows with a similar declaration and appeal to the federal government for support resources. When the President declares a disaster or emergency, the federal government, via FEMA and other resource agencies begins to ramp-up to full operations including making monies available to state and local responders to increase the size and capability of the response system.

The MSEHP attempts to promote uniformity and coordination between states and the federal government in a public health threat, but adoption is voluntary. As of 2006, thirty-eight states had adopted sixty-six provisions of the MSEHP leading at a minimum to conflicting legal authorities governing response. The MSEHP grants the Health and Human Services Secretary the power to declare a nationwide public health emergency without first having the state or local public health officials declare such an emergency, thus giving the federal government power during a potential pandemic or bioterror attack that is reserved for acts of terrorism alone under the Stafford Act. At the same time, the MSEHP grants broad powers to the states, allowing governors to declare and enforce public health emergencies and allows adopting states to seize medical supplies and drugs, regardless of ownership, during a declared public health emergency.

The declaration of a nationwide public health emergency triggers several federal level response programs including the use of federal detection and analysis resources such as the CDC, allows the federal government to avoid regulations that limit the use of particular drugs to particular treatments making unapproved treatments available, and also suspends protocols regarding the use of experimental treatments in children. Further, the MSEHP gives the federal government the power to order quarantine and isolation, powers that are traditionally within the purview of state and local public health and law enforcement officials, following federal protocols. The MSEHP

also positions pharmacies, hospitals, and outpatient service providers on the leading edge of the fight against bioterrorism. As such, it may be in conflict with the privacy provisions of the Health Information Portability and Accountability Act of 1996 (HIPAA), because it utilizes a "disclose now, obtain consent later" approach to health information, allowing, under appropriate circumstances – namely a pandemic or a bioterror attack – authorities to obtain, use, and even publicly release health information prior to complying with privacy regulations.[12]

All states and most local jurisdictions also have public health offices that make public health determinations, and because disaster and public health response traditionally falls under the purview of state and local public health officials, each is likely to have its own set of protocols and response obligations that may conflict with the MSEHP.[13] Communicable disease response relies on local and state public health agencies to make determinations regarding treatment, quarantine and isolation. Federal quarantine and isolation standards, however, in some instances, conflict with state and local quarantine and isolation standards and may "trump" local enforcement procedures leading to a potential conflict between a coordinated federal response effort and local sovereignty.

At the time of the H1N1 outbreak, the United States was operating without a permanent Secretary of Health and Human Services (HHS), a Surgeon General or a permanent director of the CDC. In the world of organizational safety, shift changes are the likeliest time for an organizational accident – this has to do with the time when the new shift is in the process of learning current operating conditions, getting information from the previous shift and "getting the bubble" in terms of organizing this information in a way that allows them to be in front of new developments.

Local public health officials had difficulties getting information about the virus, and with nearly a month between the first identification of patient zero in Mexico and the declaration of the public health emergency in the United States, local public health officials were the first and last domestic lines of defense. The HHS public health emergency declaration activated federal resources to be made available to state and local public health and law enforcement officials, thus following the National Response Framework federal resources support local resources, but piecemeal adoption of the Act has left how this support will be provided in question. Without a viable federal coordination mechanism each community will respond according to its resources, cultural biases, ability to look for specific symptoms and other concerns – in short, local public health and law enforcement officials are left responding to a "transboundary event" as though it was a traditional local event. While a federal strategy could provide guidance to local communities who may otherwise be overwhelmed, it may also reinforce traditional local event thinking.

The Teams of Leaders approach does not require legislation to create actionable understanding, rather it brings together a broader leadership and decision-making base that spans the traditional agency and level-of-government boundaries and generate a "whole of government" response that addresses the shortcoming of the MSEHP in its current form. A Teams of Leaders approach can provide this collaborative environment by providing a forum for boundary spanning expertise and ultimately actionable understanding. Lawyers are possibly the most jurisdiction-centric group of responders – indeed their bar memberships and ethical obligation to their clients require it. As a result, in traditional response operations, they may hinder efforts by acting as risk-managers bound in the litigant model of lawyering. Including lawyers in the ToL approach would be almost unprecedented. Bringing together traditional rivals in a facilitative and

collaborative process to resolve conflicts of laws could add extraordinary capacity to response operations and potentially reduce future litigation by helping them escape the limitations of a jurisdiction-centric approach.

5.9.D. The Teams of Leaders (ToL) Approach

The essence of the Teams of Leaders concept and the highly varied scope of its existing applications within the operational context of EUCOM are described in detail elsewhere in the present volume (articles 1.4 and 5.8) and other reports.[14] The ToL concept provides the foundation and clear methodology for thinking and acting beyond traditional jurisdictional boundaries required in devising and executing a collaborative, coordinated response to often exceedingly complex challenges.

The ToL-based approach helps to address essential aspects of any response to complex, multi-organizational challenge or crisis. In emergent situations ToL provides the fastest and most comprehensive method to address pivotal response issues.[15] ToL increases the required actions at a number of levels where currently significant difficulties are encountered despite strenuous national and international efforts to eliminate them,[16] e.g.,

- **Development of appropriate level of preparedness**
- **Clarification of operationally pertinent international diplomatic and economic issues** – including travel restrictions, international quarantine, vaccine manufacture and distribution, food infrastructure and trade, undocumented immigrants
- **Resolution of operationally relevant domestic issues** – including voluntary and mandatory quarantine and isolation, vaccine delivery and antiviral availability, Non-emergency treatment of undocumented immigrants, single-point information sourcing in multiple languages (some estimates suggest more than 300 languages spoken in 14 million US homes where English is not the primary language), whether physicians may refuse orders from public health officials, whether private hospitals may refuse treatment to people with symptoms of the illness
- **Private-sector issues** – including vaccine manufacturing, testing and treatment protocols, food production, packing, packaging, transportation, and serving, public space and congregation restrictions (balanced against individual constitutional rights), Family Medical Leave Act and job security, and maintaining delivery of increasingly privatized critical infrastructure.

It is important to note that the attributes of ToL-based operations are not restricted to pandemic/ bioterrorism events but encompass essentially all activities performed by DHS/DoD and Department of State – in essence the "whole of government." Thus, in the presently analyzed case, the cross-cutting issues include continuity of government, coordination of local, state and federal government response operations, international/multinational activities (JIIM level, "whole of governments" nature) combining with issues related to the potential involvement of the U.S. military or National Guard in providing treatment, law enforcement, and logistics.

Although vaccine manufacturing and distribution poses a supply chain and logistics problem of its own, pandemic response also requires intensive public-private partnering and engages the legal apparatus via government contracts, indemnifications and supply chain networks. Emergencies change the nature of typical business operations; they are now conducted within the reality of fragile "just-in-time" networks and complex transportation challenges but personnel must now also participate or respond to important legal and governance decisions about how to

allocate scarce resources and assure the most efficient and effective distribution within the affected population. Emergencies, particularly transboundary ones, result in rapid exponential growth in frequency and intensity of challenges affecting several domains simultaneously. However, instead of a rapid ramp-up of efficiency, there is a slowdown accompanied by increasing loss of operational coherence and, consequently, the utility of virtually all executed actions.[17] Response deterioration appears to be a common attribute of every complex bureaucracy exposed to sudden and largely unexpected stress (preparation to an *anticipated* adverse event is not equal to readiness to respond when such even actually takes place).[18]

The repercussions of large-scale events such as naturally occurring pandemics or events associated with certain forms of bioterrorist activity extend beyond the purely domestic level defined by operational boundaries of local or even national health, law, and administration agencies. The consequences of a local outbreak of a highly contagious disease may rapidly translate into international tensions, or unilateral acts. Thus, in the end, diplomatic and economic issues in the global marketplace are transboundary in nature, politicizing scientific decisions and creating a political environment in which the need for aggressive public health response is balanced against the economic desire for measured action.

Measured response, necessary for proper legal function, while decreasing short-term market disruption, also increases the risk of disease spread. The US refused to issue a mandatory travel ban to Mexico, opting for a travel "warning" against non-essential travel to Mexico (as of 11:20 am PST April 27, 2009), out of fear of crippling the Mexican tourist economy. Ultimately, the entire spectrum of reactions to swine flu both in the US and elsewhere had only apparent coherence. In reality, it was permeated with ad-hoc approaches, uncertainty about appropriateness and intensity of responses, and reactive rather than proactive threat countermeasures. Had the US H1N1 mortality been higher, general panic here (and potentially in the rest of the Western world) would become inevitable.

Altogether, the outbreak of swine flu served as the reinforcement of the fact already well established by prior instances of global healthcare "near misses" (e.g., SARS, avian flu, meningitis in Africa, etc.);[19] transboundary effects related to major cataclysmic events demand extremely close cooperation and collaboration of a very large number of otherwise entirely independent agencies which must, suddenly, work together, under pressure, and in the atmosphere of often pronounced uncertainty about "what next." It is in such environments that the recently popular concept of "whole of government" attains its full meaning and operational significance. Transboundary events tax resources, resilience, and ability to respond and recover to the maximum. They also reveal hitherto hidden rifts in mutual trust and competence of participants at all levels – from individuals to interacting agencies and governments. It is, therefore, of utmost significance that ToL is currently probably the *only* approach that has been demonstrated to reduce inter-organizational stress, reinstate operational unity and coherence to the chaotic and unpredictable environments, and generate both "just-in-time" and long-range solutions that are appropriate, evidence-based, and rooted in best practices.[20] More importantly, ToL has been demonstrated to be highly effective in "whole of governments/JIIM" environments where it served both as the mechanism for the development of actionable understanding but also an intellectual and operational "force multiplier".[21]

The ease of transforming from "business as usual" to ToL-based operations is among the most important functional attributes of the concept. The transition is facilitated by a largely unrecognized attribute: neither military, homeland defense/security, nor healthcare professions

are strangers to ToL. In reality, workers within these fields have practiced "intuitive ToL" for centuries as a matter of sheer necessity. Consultation among physicians is the proverbial "bread and butter" of their work[22] military relies upon cooperation of different branches and inputs from civilian agencies;[23] while homeland defense requires involvement of professionals representing a wide range of entirely unrelated specialties.[24] In the end, therefore, personal contacts and thorough awareness of shared skills, knowledge, and the fundamental attitudes characterizing many if not all of the relevant professions have been and remain the source of mutual confidence and trust. When shared skills and attributes combine with mutual confidence and trust, shared vision emerges from which the ultimate state of actionable understanding rapidly ensues. These subtle but firmly unifying processes are particularly prominent in medicine and military affairs where knowledge was (and is) generated at the level of practitioners – the "bottom" - whether at the front line or at the clinic - to be ultimately shared freely within the professional community (*lateral* or peer-to-peer knowledge spread). However, there is also a *downward flow* from the senior members of the profession that assures widest possible dissemination of "commander's intent", provides the required guidance, and assures overall coordination of effort. However, the reverse, *bottom-up flow* is essential or maybe even the most important; it provides executive command with access to continuously evolving best practices, provides a direct, real-time view of all conducted activities, and allows maintenance of strategic and operational coherence.

Poly-directional spread of ideas, information, and knowledge enhances *distributed* socialization *across unrelated but mutually relevant intra and inter-domain professional specialties* and coalesces High Performing Leader Teams into Teams of Leaders. The process is unattainable outside ToL environments and leads to the entirely unprecedented form of socialization whose immediate consequence is generation of entirely new *transboundary communities of practice.* The latter provide the most powerful impetus that fosters further innovation and increasingly wider lateral and vertical spread of knowledge and novel evidence-based solutions to issues that historically transcended the solving capability of individuals or domain-centered agencies.[25] The ultimate outcome of such processes is transmutation of monolithic bureaucracies regulated by well-proven and constraining hierarchical chains of command into creative multi-organizational entities that collaborate and cooperate to address ultra-complex domain-of-domains challenges presented by events similar to the outbreak of swine flu discussed above.

5.9.E. Conclusions

The ToL approach provides a method of engaging increasingly common transboundary crises that implicate multiple jurisdictions, often in a manner that "cascades" or "evolves" over time. Thus, in the process of evolution of a disaster and its attendant implication of new jurisdictions, whether by level of government or type of agency, one can anticipate the types of legal, sovereignty and constitutional conflicts that may emerge. Bureaucratic response deterioration in the aftermath of an immediate and overwhelming shock is a design-element – bureaucracies are structures designed to live for long periods of time relatively unscathed by external shocks. Law, too, evolves interstitially; it is designed to change slowly so that we may live comfortably, assured over our morning coffee that the basic rules and understandings have not changed during the night. Whatever benefits this interstitial and measured change provides a functioning society; it is contra-indicated in the context of the transboundary disaster where poly-jurisdictional flexibility of response is the key to saving lives. Compliance-centric organizations are essentially rule-bound bureaucracies; the method of overcoming the stasis of the compliance-driven organization is to utilize a method, such as ToL, that allows law to act in both letter and in spirit

via a collaborative development of shared actionable understanding. The law is suited for and to this purpose – the common law itself is a process of several centuries of development around historical interpretation and re-creation.

Teams of Leaders would do more than merely bring lawyers into the process, but would utilize legal thinking to overcome legalistic response. The law, in some way or other, defines many of the categories – from the definition of a disaster, to the types of permissible responses, from availability of funding to limitations on response options. The domain of actionable understanding is one that both shapes and is shaped by the legal process of definition, litigation, and compliance. A ToL approach would take into account the spirit of the law – an understanding that the importance of the rule of law is in the adherence to legal principles. A ToL approach that includes lawyers in the development of actionable poly-organizational understanding will do more than utilize lawyers to shape the universe of action; lawyers, too, are reflexively shaped by the process. Thus, silo-istic thinking is nowhere more present than in lawyers who are taught from the beginning that they must manage risk, defend turf, not give legal advice outside of their home jurisdictions, and avoid liability for their clients at all costs.

To do this, the actionable understanding domain changes the nature of the client from the home jurisdiction to the response. Successful legal participation is one that is not focused on protecting the organization but in facilitating successful response. ToL accomplishes this via its removal of not only jurisdictional and rank limitations, but by the presence of non-lawyers in the interpretation of the law's spirit. The entire process of collaboration and facilitation is at once foreign to lawyers used to engaging in or preparing for battle and intuitive in the common law.

Finally, lawyers are engaged in the definition of and response to the domain of actionable understanding whether they are present or not. Conflicting laws, jurisdictional domains, and the fear of litigation are present in every decision. As disasters grow larger and cross more boundaries, there is a need for legal interpretive collaboration or an understanding that the only alternative is rule-violation. Conflicting legal authorities at all levels and between sovereigns make this inevitable. It is the ToL approach that uniquely has the potential to resolve these conflicts from the outset of a disaster through planning and response operations.

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Appendix A. Acronyms

A2C2	Adaptive Architectures for Command and Control (program at Office of Naval Research)
ACH	Analysis of Competing Hypotheses
ACM	Association for Computing Machinery
AFRL	Air Force Research Laboratory
AI	Artificial Intelligence
AKO	Army Knowledge Online
ASW	Anti-Submarine Warfare
C2	Command and Control
CCT	Collaboration Consulting Team
CDC	Centers for Disease Control and Prevention
CEO	Chief Executive Officer
CIA	Central Intelligence Agency
CIE	Collaborative Information Environment
COCOM	Combatant Command
COI	Community Of Interest
COTS	Commercial-Off-The Shelf
CPU	Central Processing Unit
CRM	Crew Resource Management
CSCW	computer supportive cooperative work
CSSN	computer supported social network
DDNI	Deputy DNI
DDR&E	Director, Defense Research and Engineering (in OSD)
DHCP	Dynamic Host Configuration Protocol
DHS	Department of Homeland Security
DIME	Diplomacy, Information, Military, Economic - The four instruments of national power
DIMEFIL	DIME + Finance, Intelligence and Law Enforcement
DISA	Defense Information Systems Agency
DKO	Defense Knowledge Online
DNI	Director of National Intelligence
DoD	Department of Defense
DOS	Department of State
DPI	Deep Packet Inspection
DTI	Directed Technologies, Inc.
ERDC	Engineer Research and Development Center (US Army Corps of Engineers)
EUCOM	US European Command
FBI	Federal Bureau of Investigation

FC	Fiber Channel
FEMA	Federal Emergency Management Agency
FFRDC	Federally Funded Research and Development Center (e.g., IDA, MITRE)
GISC	Global Innovation and Strategy Center (STRATCOM)
GMU	George Mason University
GWU	George Washington University
HFE	Human Factors Engineering
HHS	Health and Human Services
HIPAA	Health Information Portability and Accountability Act
HPLT	High Performing Leader Teams
HPW	Human Performance Wing/Human Effectiveness Directorate (AFRL)
HRO	High Reliability Organizations
IA	Inter-Agency
IC	Intelligence Community
ICES	Intelligence Community Enterprise Services
ICS	Incident Command Structure
ICT	Information, Computers, Telecommunications
IDA	Institute for Defense Analyses
IED	Improvised Explosive Device
IM	Information Management
INR	Bureau of Intelligence and Research (DOS)
IP	Internet Protocols
IT	Information Technology
JIATF	Joint Inter-Agency Task Force
JIIM	Joint Interagency, International, Multinational
JOC	Joint Operations Center
JTF	Joint Task Force
JWICS	Joint Worldwide Intelligence Communications System
KM	Knowledge Management
LOE	Limited Objective Experiment
LSU	Louisiana State University
LTX	Leader Team Exercises
MBA	Master of Business Administration
MSEHP	Model State Emergency Health Powers (Act)
NAD	natural or anthropogenic disaster
NAS	National Air Space
NASIC	National Air and Space Intelligence Center (USAF)
NCES	network-centric enterprise services
NFCE	Nexus Federated Collaboration Environment
NGA	National Geospatial-Intelligence Agency
NJOIC	National Joint Operations Intelligence Center

NRF	National Response Framework
NSI	National Security Innovations, Inc.
NTI	National-to-Tactical Integration
NVOAD	National Voluntary Organizations Active in Disaster
ODNI	Office of the Director of National Intelligence
OLPC	One Laptop Per Child
OODA	Observe, Orient, Decide, and Act
OSC	Open Source Center
OSD	Office of Secretary of Defense
OSS	Open Source Software
P4CMI	Patterns for Computer-Mediated Interaction
RF	Radio Frequency
RHXS	Human Effectiveness Directorate (AFRL)
RRTO	Rapid Reaction Technology Office (OSD/DDR&E)
RSS	Really Simple Syndication - a family of Web feed formats used to publish frequently updated works
SARS	Severe Acute Respiratory Syndrome
SATCOM	Satellite Communications
SBU	Sensitive But Unclassified
SIPRNet	Secret Internet Protocol Router Network
SIS	Strategic Information System
SKA	Skills, Knowledge, and Attributes (or Attitudes)
SMA	Strategic Multilayer Assessment
SOP	Standard Operating Procedures
SPAWAR	Space and Naval Warfare Systems Command
STRATCOM	US Strategic Command
TCS	Task, Condition, and Standard
ToL	Teams of Leaders
TRADOC	Training and Doctrine Command (US Army)
TTPs	tactics, techniques and procedures
UNO	University of Nebraska Omaha
USAFA	US Air Force Academy
USG	United States Government
VTC	Video Teleconference
WHO	World Health Organization
WMD	Weapons of Mass Destruction
WoG	Whole of Government
WREN	Worldwide Rare Event Network