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The Power of Information Age Concepts and Technologies

**COMMAND AND CONTROL
IN THE COLLABORATIVE INFORMATION ENVIRONMENT**

By

John H. Admire

Evidence Based Research, Inc.
1595 Spring Hill Road, Suite 250
Vienna, Virginia 22182-2216

Phone: 757-836-8054
Fax: 757-826-3939

Email: john.admire@je.jfcom.mil

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Abstract

In the current Information Age the speed and sources of information are increasing exponentially. Technology is redefining the traditional command and control models. The previous more vertical and distinct models are becoming more horizontal and diverse. The process is evolutionary, however, the basic purpose and requirements for information remain relatively standard. New concepts are nonetheless revolutionizing command and control concepts toward a deeper and broader quest for information. Collaborative Information Experiments (CIE), by the United States Joint Forces Command, Joint Experimentation Directorate, are transforming command and control concepts. This paper discusses the CIE's objectives and philosophies as well as reviews lessons learned from prototype limited objective experiments. We have a responsibility to think deeply and richly about how we can and will use this new concept of collaboration and its new technology tools to acquire and share information and knowledge.

Introduction

Victory in war is often achieved by the commander who is able make better and more timely decisions than his battlefield opponent and who thereby sets the pace and controls the course of all actions. The historical challenge is to collect and analyze sufficient information upon which to base such decisions. Throughout time it's the decision making ability of the commander that most influences battlefield success. Similarly, it's the sufficiency and quality of the commander's information that most influences his

decisions. Information is one of the most powerful weapons in the commander's arsenal. Information is power. Powerful information is lethal.

In the current Information Age the speed and sources of information are increasing exponentially. Technology is redefining the traditional command and control models. The process is evolutionary, however, the basic purpose and requirements for information remain relatively standard. New concepts and systems are nonetheless revolutionizing command and control concepts toward a deeper and broader quest for information, knowledge, and understanding as well as joint force and coalition interoperability.

The United States Joint Forces Command (JFCOM), Joint Experimentation Directorate, conducted a Collaborative Information Environment (CIE) Prototype Limited Objective Experiment (PLOE) in September-October 2003. In a continuing series of experiments to enhance collaboration between select groups of individuals and organizations, the CIE White Paper defines the CIE as "The aggregation of individuals, organizations, systems, infrastructure, and processes structured for the common purpose of creating and sharing data, information, and knowledge necessary to plan, execute, and assess joint force operations and enable the commander to make better and faster decisions than the adversary."

JFCOM leads the transformation of U. S. Armed Forces. A host of new concepts and prototypes for the military forces of tomorrow are in the development phase today. In select situations, however, the visions and systems are fielded to today's operational forces prior to their full maturity. This opportunity to concurrently implement and operationally test the concepts and technologies contributes to further refinement of their

capabilities as well as provides operational advantages to today's forces as well as those of tomorrow.

Similar "economies of innovation" and new concepts and technologies are improving our nation's warfighting capabilities, collaborative information sharing, and decision superiority initiatives. The CIE is one such initiative that helped contribute to actual combat operations in Iraqi Freedom as well as to the advancement of emerging concepts in a JFCOM experimentation environment.

Collaboration in the DCEE and SJFHQ

As a collaborative information sharing and decision superiority concept, the CIE experiments are conducted in the JFCOM Distributed Continuous Experimentation Environment (DCEE) facility. The DCEE initiative is basically an experimentation Internet. It's a laboratory capable of continuously conducting various experiments either locally at JFCOM or globally, as required by users. The DCEE's distributed nature permits the military services, combatant commanders, allied nations, and other agencies to participate at various levels and from multiple locations.

Accordingly, the recent CIE included service off-site participation by the Army at Fort Leavenworth, Kansas; the Navy at the Naval Warfare Development Command, Newport, Rhode Island; the Air Force at Langley AFB, Virginia; as well as the Marines on-site at the JFCOM DCEE co-located with the Standing Joint Force Headquarters and multinational observers.

The CIE initiative is designed as a capability within the emerging organization referred to as a Standing Joint Force Headquarters (SJFHQ). This SJFHQ is a cross-functional organization with core skills, knowledge, and capabilities to conduct effects based

planning in a network centric environment, maintain situational understanding, and fully leverage CIE information sharing to enhance command and control. The SJFHQ focus is on managing the flow of information and knowledge to facilitate decision-making and to integrate military force options within the broader context that includes all elements of national power.

The SJFHQ is organized with six functional teams or groups: Command, Planning, Operations, Information Superiority, Knowledge Management, and Logistics. The teams operate in an information- and knowledge- based commander-centric environment.

Individual or functional team members are integrated with members from the various teams to reinforce the belief that no barriers exist to limit full cross-group functionality.

Operators, planners, logisticians, information, and knowledge team members become true teams. This relationship is then extended to serving and supporting the Regional Combatant Commanders and staffs, subordinate and supporting commanders, and interagency and non-government communities.

Operating within this SJFHQ, the CIE concept combines advanced information technology with complementary organizational changes and dynamic processes to transform future command and control activities. This collaborative planning and execution concept promotes the transition from the traditional hierarchical serial planning and execution processes to a more parallel planning process.

One fundamental objective in a collaborative environment is to create a “virtual information enterprise warehouse” as a repository for information products. The CIE’s task is to develop a technology-based infrastructure to collect, maintain, and access such information. This warehouse will contain timely, fused, accurate, and relevant

information that can be tailored to force requirements. As a technology and computer based process, the CIE relies on secure, dependable, and functional network and communications systems to collaborate on a worldwide basis.

Sage Advice from Yesteryear

In the process of conducting the experiment it became apparent that, while today's technology is revolutionizing tomorrow's command and control concepts and systems, a basic need for information sharing procedures also remain based upon yesterday's needs. As the experiment progressed, I was reminded of the sage counsel of a Marine Master Sergeant Operations Chief many years ago. As a young infantry leader I was temporarily assigned as a watch officer in the Battalion Combat Operations Center for a major field exercise. The veteran Master Sergeant recognized that it was a new experience for me. Thankfully, he called me aside and gave me advice that helped me in this new environment as well as guided me throughout the next 30 years. His words are as relevant today as they were then.

The Master Sergeant was brief and to the point. He told me that to succeed as a watch officer I basically needed to continually ask myself and act upon four questions. First, what do I know? Second, what do I need to know? Third, who else needs to know? Fourth, have I told them? With that he turned around and went back to his coffee. I went back to those questions time and time again during my watch and the following years. They remain true and abiding to this day.

In their way the questions demonstrate the essence of the information collection and flow process and that nothing much is truly new in terms of the philosophy of the need for acquiring and sharing information. Decision makers have to constantly ask themselves

what they know and what they need to know. They initially do well with these questions because they require more of a pull of information to them than a push of data to others. In time, however, they learn, we all learn, that the push or sharing of information is equally critical. Shared information becomes more powerful information.

These initial four questions and the data sharing process expanded with time. I developed, for example, an appreciation for additional questions. I learned, sometimes the hard way, that to simply identify and tell others who needed to know was rarely the end of the process. Therefore, experience taught me more questions to ask myself. Fifth, did they hear or, more important, did they understand me? Sixth, what did they do with or about the information? Other questions emerged in time to help define and refine the information needs and sharing process to facilitate decision making in a command or organization.

The Collaborative Information Environment experiment validated the Master Sergeant's counsel, but expanded upon it by embracing new technology to create and make possible new and relevant questions as well as the means to obtain answers to those questions. New information technologies, decision support systems, and databases are proliferating at an unprecedented rate. Similarly, decision templates, automated decision support tools, and modeling and simulation devices enable decision makers to analyze vast quantities of data much faster than real time. We are today able to search, obtain, use, and translate information more quickly and accurately than yesterday. Tomorrow we'll be even quicker and more accurate.

The Quest for Information

As computer systems have increased the speed with which information can be acquired, they have also increased the need for more questions and more answers. The CIE After Action Review, for example, identified a series of additional questions that aid the decision making process. In the CIE context the questions illustrate a process for asking the right questions to receive the right answers and include: How do we prioritize our needs, where can we find it, how do we get it, how do we evaluate it, how do we reduce it to actionable knowledge, how do we integrate it, how do we share it, how do we preserve it, how do we protect it, how do we organize it, and how do we present it?

As CIE participants explored the virtual warehouse and considered the multiple sources for data, it became apparent that information overload or an overwhelming abundance of information could potentially be a detriment unless appropriately considered and controlled. Therefore, "How do we **PRIORITIZE** our needs?" became a critical concern and "**PRIORITIZE**" was capitalized for emphasis.

Experiment participants began to realize, for example, that in a technologically enhanced environment virtually any question may be answered by someone, somewhere. Questions initially exploded in the quest for information until participants understood that information simply for the sake of information is neither necessarily good nor right. In time sensitive situations the questions must be prioritized and relevant. Furthermore, the trend was at first simply toward collecting information without due diligence toward analyzing the information. Focused, targeted, and analyzed information became the goal. In the process, information became actionable knowledge and the decision making

process improved significantly. This transformation of information into knowledge is a critical aspect of the collaborating and sharing process.

The CIE is a technology and computer based process. Therefore, it relies upon secure, dependable, and functional networks and communications systems. The networks and systems have to be capable of sharing information across multiple geographical, operational, and organizational boundaries. The systems capitalize on the power of collaborating and sharing on a worldwide basis.

The initial focus of the CIE may be defense issues or concerns because of the military planning or operations upon which it is often primarily based. In time, however, relationships are broadened across a much wider and diverse spectrum and community.

The CIE is developing the capability to reach out and touch numerous individuals and institutions. One such entity embedded in the CIE process is the Joint Inter-Agency Coordination Group (JIACG). This group can be comprised of representatives from various government and non-government organizations and offices from the Department of State to the Department of Commerce, from the United Nations to the International Red Cross, from coalition partners to neutral countries, from regional service to local volunteer agencies. Quite simply, one of the CIE's goals is to be able to go anywhere, to talk with anyone, on any subject, at anytime.

This capability to access information from widely dispersed and diverse people and places requires the development of a worldwide network. Developing this network will be a major challenge. Contacts and relationships are needed and beginning to emerge with organizations referred to as Centers of Excellence or individuals known as Subject Matter Experts. The envisioned network will have access to the prestigious strategic

analysis “Think Tanks” in Berlin, Tokyo, or Calcutta; the Australian professor or South American engineer or African scientist; the British humanitarian or Iranian religious leader or Korean business executive. Whatever experience or expertise is required, the network will seek to assemble and access those who can and will contribute to the process of acquiring and sharing information and knowledge.

Collaboration Possibilities and Constraints

This network will have infinite possibilities. Yet, there are constraints that have to be resolved. How does the network, for example, contract with and contact the professor in Broken Arrow, Oklahoma, who is the world’s foremost authority on Arabic architecture, to assure she’s available at 2:00 a.m. on Christmas Eve for a crucial collaborative session designed to avert an emerging crisis in Syria? The security classification and time sensitive nature of the session may complicate when, where, and how the network communicates with the professor. The challenges are as infinite as the rewards and they are being addressed within the CIE framework.

The time sensitive requirements for information vary. Every question or concern, of course, is neither urgent nor critical. Operating in either a deliberate or a crisis planning process will help define when the information is needed and how it may be communicated. Similarly, the military or crisis situation will help frame the response time parameters. In a tactical situation, seconds or minutes may be crucial. In an operational situation, hours or days may be guidelines. In a strategic situation, weeks or months may be possible. Nonetheless, normally the faster information can be collected and transformed into knowledge the better. Knowledge is paramount. Timely understanding is crucial.

Throughout the experiment a valuable and familiar lesson was continually re-learned. Information is sometimes incomplete or inaccurate or unavailable or misinterpreted. Yet, decisions have to be made. The advantage of having the fastest, best, most accurate and complete information may at times be unavailable or unattainable to the decision maker. Risks are a fundamental aspect of military operations and at times must be accepted in the decision making process. We rarely ever know all we need or would prefer to know. Yet, we know we must decide and act. The only certainty in war is its uncertainty. We must be prepared to deal with uncertainty and respond to risks.

Obviously, decision makers prefer to know everything or as much as possible, but often may accept the 80 percent solution. Frequently, the need for information is based upon the situation. If Army or Marine ground forces or Special Operations Forces are tasked to destroy or neutralize a Theater Ballistic Missile the information requirements may be different than those for a Navy or Air Force precision guided missile. Ground forces may have different information requirements than missiles. At times it may be prudent to subordinate the quest for information to simply attacking the target. At other times we may be able to expand and extend the pursuit of information. The question to participants became how many questions are too many and how much information is too much. The lesson to the experiment participants was the proverbial “paralysis by analysis.” We may become too focused on the acquisition of more and more information when we may be better served by acquiring and destroying the threat or target with the information we have.

Testing the Technology

The success of the CIE experiment is based upon the standard need for good people, with good training, with good equipment. One of the experiment's priority objectives was to test the "tools," test the technology hardware and software. The tools included an array of capabilities across the respective functional areas as well as common user tools. Video collaboration groups, private and group chat rooms, internet protocol telephone software, standards based portals, web-enabled access to common operational pictures, and a multitude of software programs designed to acquire, store, fuse, and disseminate information and knowledge routinely and on demand were tested by the participants.

The major theme of the tools was to encourage and enhance collaboration. The types of collaboration opportunities included: single and multiple participant-to-participant or group chat by text, audio, or video; facilitated collaboration sessions, ad hoc sessions, scalable sessions, side bar sessions; and group broadcast sessions.

As participants experimented with the new systems and tools the value and necessity of training were continually reemphasized. Tool training is absolutely critical to the success of such experiments. The more technically proficient the participants are with the tools the more they can challenge and test the tools. To more fully leverage the capabilities of the tools, the tool user needs the appropriate training. Participation itself is invaluable training and contributes significantly to familiarity and confidence. Nonetheless, one of the more relevant daily "Hot Wash" comments was that "Fumbling with the tools detracts from the substance of the effort." Training maximizes and leverages tool capabilities and must be an integral part of the CIE initiative. Otherwise, the tools are never challenged to perform to their capability or tested to their potential.

The CIE, in some respects, alters a number of the traditional and cultural perspectives or principles leaders have regarding leadership. Junior leaders who have more experience with technology may adapt more easily and rapidly. For senior leaders who are adapting to technology, however, it may be slower and harder. This may be especially so in the area of personal rather than machine interactions. Senior leaders may have become more accustomed or comfortable with more direct and person-to-person contacts and communications. The CIE technology, however, is based more upon indirect and computer-to-computer contacts and communications. This reduction or absence of personal interactions requires that personal trust, as well as the veracity of the information, be affirmed in more non-traditional leadership styles in a changing cultural environment.

The Promise and the Potential

In summary, the promise and potential of the Collaborative Information Environment are evident in the conduct of military operations in Iraqi Freedom as well as in laboratory environments. Operations and experiments are contributing significant enhancements to the decision making process and the command and control of organizations. The CIE's contributions to the concepts of Situational Understanding, Knowledge Management, and Decision Superiority are unparalleled. The foundation of the CIE is in emerging technology, which demands user practice and proficiency. Tool training is essential if we are to realize the capabilities of this concept to acquire and share information and transform it into actionable knowledge and enhanced understanding.

In an experimentation venue the thought or possibility of failure is expected and accepted, possibly embraced at times, simply because it is understood that some concepts

will succeed and some will fail—and deservedly so. That’s the nature of concept development and experimentation. The success in any failure, however, is that we learn which paths are dead ends, which require detours, and which deserve further study and evaluation. This is the success of experimentation and the CIE. Accordingly the CIE experiment identified a host of recommendations to improve the collaboration process and tools.

One major challenge is in the human behavior domain of teaching and training leaders to lead effectively in the virtual and distributive collaborative environment. This may be more a cultural challenge, at least initially, than an educational one. But leaders must adopt new leadership techniques to leverage the new technologies.

A second major challenge is to assure that the technology tools are reliable, secure, and support the user and satisfy user needs. Users need to influence software development requirements, need simplified shared view functions, need improved data interoperability between multiple systems, need better visualization tools, need more friendly search and navigation tools, and other user friendly needs.

A third challenge, which is actually interrelated with and a composite of the first and second challenges, is how as individuals do we employ and respond to the collective technologies available to us. Unless we’re careful we may become deluged with data, traumatized by trivia, and overwhelmed by mountains of minutiae.

These three challenges are products of our ability to collect, retain, and distribute so much information that it diminishes our ability to focus on the truly relevant. Sometimes less is better, but that’s contrary to the supersizing biggie cultural phenomenon of today.

In the process, we may focus too much on technology and too little on human experience, intuition, and instinct, which are major factors in decision making. Technology by itself rarely, if ever, makes decisions. It's a decision making tool. Decision making is a human enterprise.

Unless we're careful, however, we may have a tendency to rely more upon technology and less upon human experience, intuition, and instinct. We may diminish the human factors. Yet, the human mind may be more capable of dealing with the subjective factors of risks and uncertainties, while technology may be more proficient with the objective ones of quantifiable facts and qualitative certainty.

Ultimately, success in war may be more dependent upon our ability to deal with what we may never know as opposed to what we know and how well we accept risks and respond to uncertainty.

In conclusion, the CIE is a work in progress, but it represents true progress. We have a responsibility to think deeply and richly about how we can and will use this new concept of collaboration and its new tools to acquire and share information and knowledge.

Technology is adding many questions to the Marine Master Sergeant's original four questions. Were he in the command center today, with coffee cup in hand, I'm confident he'd approve. He helped many young leaders learn how to seek and share their information needs and navigate and succeed in the command center of yesteryear. The CIE will help today's leaders succeed with tomorrow's collaborative decision making challenges as they navigate emerging technologies to collect and share information to achieve decision superiority.