Case Study:

Network Centric Warfare in the U.S. Navy's Fifth Fleet

Web-Supported Operational Level Command and Control in Operation Enduring Freedom

Drs. Mark Adkins & John Kruse

THE UNIVERSITY OF ARIZONA
Center for the Management of Information

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Executive Summary

This case study examines the employment of Network Centric Warfare (NCW) systems and practices in the U.S. Fifth Fleet's Commander Task Force Fifty (CTF-50). The staff and commander of CTF-50, embarked on the nuclear aircraft carrier USS Carl Vinson (CVN 70), led a coalition force of 59 ships in combat operations against Afghanistan during the execution of Operation Enduring Freedom (OEF). The task force adopted a number of networking and collaboration tools that had significant effects on how CTF-50 was able to plan and execute missions in the Arabian Gulf and Afghanistan. This case study is of significant value in the investigation and practice of the NCW conceptual framework in that it is one of the first studies of a staff at the operational level of war. Additionally, considerable attention is given to the conditions and climate that made CTF-50's implementation of NCW tools successful. As such, the elaborated concepts expand on the social domain of the NCW conceptual framework.

This case study draws on NCW, technology adoption, decision-making and human communication theories to examine and explain the behavior of NCW system users. Specifically, CTF-50 experienced improvements in breadth and depth of information dissemination, situation awareness, and speed of command as envisioned with the NCW framework. The research team also found evidence of self-synchronization of forces that would not have been possible without these tools. The sum total of the application of NCW tools and procedures was a marked improvement in flexibility and planning that enhanced mission accomplishment.

In addition to the focused findings with respect to NCW, the researchers also explored the social and leadership conditions set by CTF-50 that allowed for success with the NCW tools and techniques where other implementations had failed. In particular, the leadership of the task force (1) selected simple tools that could be quickly mastered, (2) rewarded frequent use of NCW systems up and down the chain of command, (3) deemphasized redundant legacy systems and practices that did not support NCW operations, and (4) delegated responsibility for information to lower levels. The combined effect of these actions was a widespread acceptance of the tools and a considerable amount of innovation among the system users.

Introduction

At the height of the Cold War, the United States military faced a known enemy that used conventional strategies and tactics. In 1989, the world situation quickly and unexpectedly shifted. The Soviet Block broke into smaller components, and its posture toward outside countries softened. Small, unknown terrorist groups, terrorist nations, and small civil wars emerged as the primary threats to international stability. At the same time, the U.S. military establishment began to broaden its role in international disaster relief efforts and more localized small intensity threats. All of these changes demanded that the U.S. military be able to respond more rapidly in less known or anticipated situations.

New technology has often made the difference between winning and losing battles, both on land and at sea. Though technology is no substitute for leadership, intelligence or training, effective use of warfighting tools can substantially stack the deck. The chariot, gunpowder, steam engine, and the atomic bomb are all dramatic examples of technologies that allowed the possessor to outclass his opponent and leave him with little recourse.

Traditionally, the U.S. armed forces have looked to technology as a "force multiplier" to win the day while minimizing risks to the army or fleet. The U.S. military is quite willing to sacrifice larger force structure in order to leverage new technology that could be pivotal. Network Centric Warfare, the leading edge theory on military operations (Alberts, Garstka, & Stein, 1999) requires changes in thinking on how to accomplish missions, interrelate, communicate and acquire systems to support military actions. Just as radio communications changed the nature of battle, the networked computer is expected to change all facets of the military. From the 5000-man super carrier, down to the individual infantryman, there are plans being tested and implemented to leverage vast networks to better share information, improve responsiveness and multiply the effectiveness of forces.

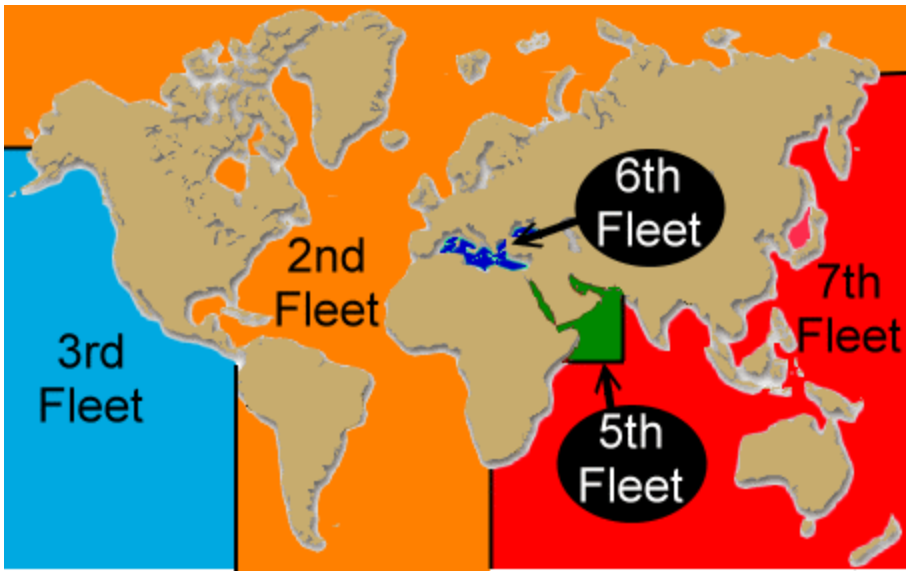
With the increased emphasis on high technology in the military and the ever-increasing pace of change, there is a necessity to reevaluate the accepted ideas that technologists hold with regard to the successful development and fielding of automated systems, networks and collaborative tools. This case study applies scientific rigor to understand how NCW is being implemented in the field and how commanders, technologists and acquisition personnel might achieve greater success in implementing Network Centric Operations (NCO) within military forces.

Specifically, this case study looks at the U.S. Fifth Fleet's Commander Task Force Fifty (CTF-50) the execution of Operation Enduring Freedom (OEF). The commander and staff of the task force, aboard the USS Carl Vinson, adopted a number of networking and collaboration tools that had significant effects on how CTF-50 was able to plan and execute missions in the Arabian Gulf and Afghanistan.

Background

Naval Operations

The United States Navy is like the other services in many ways, but there are unique qualities and a few idiosyncrasies that need to be recognized to better understand this case study. Structurally, the U.S. Navy is currently separated into geographically based fleets. The Fifth Fleet, based in Bahrain, is responsible for supporting United States Central Command (CENTCOM) – the theater commander of forces operating in the Middle East.



U.S. Fleet Areas of Responsibility

Fifth fleet has limited organic forces. Instead, ships and battle formations from the other fleets are usually trained and sent to the Fifth Fleet area of responsibility (AOR) for duty. Often the ships and boats that rotate into Fifth Fleet have trained for deployment in Second Fleet (Norfolk, Virginia) or Third Fleet (San Diego, California). Usually these deployments last six months, however, this varies greatly as the Navy's requirements around the world are addressed.

Typically one Carrier Strike Group (CSG) is on station in Fifth Fleet at any given time. In routine deployments this flotilla is based around an aircraft carrier and includes a Destroyer Squadron (DESRON), submarines and an Amphibious Ready Group (ARG). The wide-ranging capabilities of these ships, sailors and marines allow for a great deal of flexibility in dealing with contingencies. There are times, nonetheless, when such a force is not large enough or needs to be realigned to meet a specific situation. When such operational needs dictate, the CSG can be expanded to include other naval forces.

Commander Task Force Fifty

The core of CTF-50 during OEF was Carrier Group Three (CARGRU 3) under the command of Rear Admiral Thomas Zelibor. This command was comprised primarily of

the nuclear aircraft carrier USS Carl Vinson (CVN 70), Destroyer Squadron Nine (DESRON 9) and Carrier Air Wing Eleven (CVW 11). CARGRU 3 left the state of Washington in July 2001 and arrived in the Arabian Sea on 12 September 2001. Over the next three months CARGRU 3 would be designated CTF-50 and would command multiple Carrier Strike Groups and coalition forces in strikes on Afghanistan during Operation Enduring Freedom (OEF). Over the course of OEF there were over 59 ships from six nations including six aircraft carriers in CTF-50. The United States ships in CTF-50 came from homeports in Second, Third, Fifth, Sixth, and Seventh Fleets. This is significant in that these ships had never trained or operated all together prior to CTF-50. The mission requirements created an operational area for CTF-50 stretching over 800 nautical miles. Executing tactical and operational campaigns over this large of an area presents numerous communication and logistic challenges for any force.

Staff Organization

A Captain (O6) serving as the Chief of Staff (COS) leads the CTF-50 staff. The staff is composed of officers and sailors who plan, research and coordinate for the admiral (O7-O8) in command. CARGRU-3 is organized along typical military staff organization codes with an officer in charge of each:

N1 – Administration and personnel

N2 – Intelligence

N3 – Current operations

N4 – Logistics

N5 - Plans

N6 - Command, Control, Communications and Computers

Naval Culture

A worthwhile note is that the U.S. Navy developed over hundreds of years in relative isolation from other services. Prior to the advent of radio communication, ships commonly to operated autonomously for months at a time. To this day, naval corporate culture reflects this relative independence.

The most telling manifestation is that the Navy places a great deal of power and discretion with commanders. This approach has served the Navy well for over 225 years, as the officers are trained to take command and use judgment in the absence of detailed instruction. Where the Army or Marine Corps have had to stress standardization to ensure close coordination on a crowded battlefield, the U.S. Navy has always favored giving commanders more leeway. This approach can, conversely, cause problems with some of the standardization required by Network Centric Warfare.

Theoretical Foundations

Though this case study is primarily based on the Network Centric Warfare conceptual framework, an important note is that such a complex model is underpinned by research in

the social sciences. Consequently, the researchers drew on a wide variety of concepts to understand and explain the actions of the subjects. By understanding the use of technology in decision-making by the individual, one can begin to extrapolate out to the use of networks by organizations.

Decision Action Cycles

In a conflict situation, a general pattern emerges for the command and control of forces. Commanders and staffs try to understand the situation and anticipate potential enemy actions. In effect, this is a kind of theory building about the situational picture. They then try to take action to expand their own options and to limit those of their opponent. By doing so, the commander hopes to control the conditions and continue to force his will on the enemy until victory is attained. Most people instinctively recognize this sequence, but as with most decision theory, the iterative nature is largely ignored. People generally view decisions and their accompanying situations as though they are discrete. In an adversarial conflict, nothing could be further from the truth. Each decision and action builds on the last.

By studying air combat actions in Korea, U.S. Air Force Colonel John Boyd was able to distill some lessons about decision cycles and competition. Boyd (1987) found that in competitive asynchronous engagements a faster decision cycle is an inherent advantage. Briefly stated, Boyd's theory is that before one can take an action against an enemy, one must first observe the situation, create a mental model and then decide on an option based on the mental model. By interfering with this decision cycle, one can impede the opponent and cause paralysis and ineffective counteractions.

Each time an opponent acts, there is the ability to disrupt the enemy's decision-action cycle. Thus, whoever can act first has an advantage because of the changing of the situation. This causes the opponent to either act inappropriately or to restart the decision cycle. This is often referred to as "getting inside" of the enemy's decision cycle (Boyd, 1987).

Boyd then found that this process could be generalized to a much larger scale. When viewed in terms of this approach, one can easily find many historical situations where this has been true. In the early stages of WWII, for instance, the French had a large well-equipped standing army. In spite of this, the French army quickly dissolved in the face of the fast-paced German blitzkrieg. The French were not defeated because they were outfought on an individual level. Rather, the defense disintegrated because the Germans were operating at a pace the French were totally unprepared to match.

Obviously, the advantages of a compressed decision-action cycle are not realized in the single masterstroke. One can really only expect to maintain a competitive advantage through repeatedly forcing the enemy back on their heels and wresting control of the situation from them. Applying this methodology can provide a real advantage, provided the opponent does not disengage or purposefully slow down the battle. Commonly, the application of this theory is referred to as speeding up the operational tempo (OPTEMPO).

This realization lies at the core of NCW. The expressed goals of NCW are to network the

force so that the common goals (commander's intent) and constantly updated situation awareness can be shared throughout the battlespace. This awareness, in turn, allows units to support each other and the master plan without resorting to the traditional military hierarchy.

Network Centric Warfare

In the 1990's there was widespread acceptance of Boyd's theories on decision-making among adversaries. Acceptance of Boyd's theories provided a broad understanding of how to defeat the enemy. There was, however, a need for an extended theory that could integrate the sea change brought by new information technologies with the aggregated concepts of modern warfare.

In 1997, Cebrowski and Garstka published "Network-Centric Warfare: Its Origin and Future." This article marked the nascent effort at bringing the lessons learned in business, economics and technology into the realm of the warfighter. The basic premise of Cebrowski and Garstka was that the leveraging of networks was driving massive changes throughout the world. Furthermore, the military could take advantage of the power of the network to become more responsive, flexible and lethal.

Indeed, the industrial and business communities were rapidly accelerating through a "revolution in business affairs" presaged years before. Economist Ronald Coase (1937) revealed that proportionately large amounts of organizations' resources are focused on activities within the firm. Additionally, he posited that the transaction costs of doing business outside of the firm are the primary driver of organizational size.

For instance, General Motors grew to mammoth size and scope because there was more efficiency in making all parts internally than to finding external contractors that could provide parts. The advent of the Internet was changing this concept. A large organization is no longer more efficient in a world where businesses can quickly and easily find materials, goods and services from a wide range of vendors around the world that deliver all over the planet.

NCW concepts bring the advantages being realized in the business world to the military. Specifically, there is a belief that the extensive use of networks can lower the transaction costs of sharing information to a negligible level. This in turn, opens a flood of accurate and timely information to every level of the warfighting organization.

The individual warfighter in such an organization knows to a high degree of certainty the current situation, the goals, and the plans of the force. The networked warrior is freed to act and react with unmatched speed in the battlespace. According to Boyd's theories (1986, 1987), a higher operational tempo creates an untenable state of affairs for the opposition. A concerted force comprised of independent, yet harmonized commands can eliminate the traditional bottlenecks inherent to a hierarchical force.

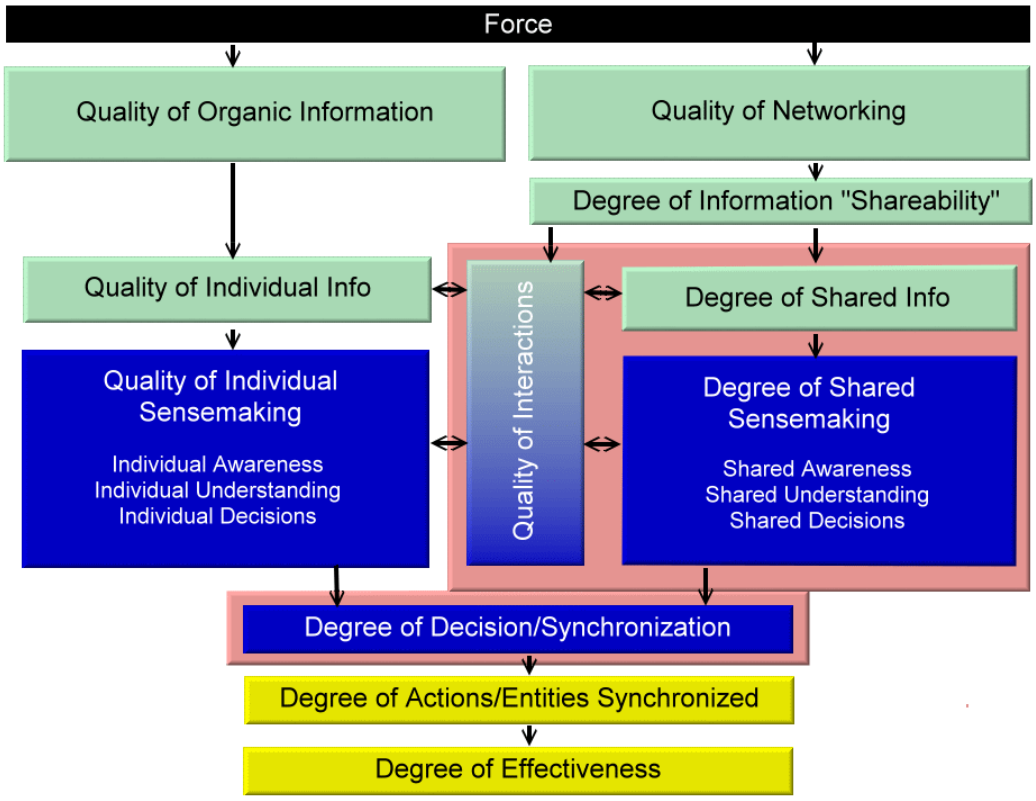
Undeniably, a primary goal of NCW is that of self-synchronization – a state where diverse and distributed commands can act with unity of effort primarily through a thorough understanding of the commander's intent and common situation awareness (Alberts, Garstka, and Stein, 1999). The commander's intent supplies the strategic and

tactical goals explicitly crafted to ensure that the force understands the desired end state for the operation. Accurate situation awareness in turn, is a necessary precondition for effective decision making (Endsley, 1995; Klein, 1998).

Situation awareness (SA) cannot be provided as directly as the commander's intent since SA is an aggregation of information and intelligence from throughout the battlespace. All members of the force need to maintain a degree of SA so that they can act in concert with the whole. Nevertheless, they cannot afford to bog themselves down with the minute details of every aspect of the operation. Striking a proper balance between enough and too much incoming situational data continues to be a problem for the military.

NCW Conceptual Framework

The next step in the evolution of NCW was the development of a high-level conceptual framework that could begin to provide a mechanism for making informed predictions about the application of technology and combat power. The NCW Conceptual Framework (CF) is an effort at bringing all of the varied hypotheses together in one model.



NCW Conceptual Framework

The CF is comprised of four dimensions: (1) the physical domain - the tangible world of objects and actors; (2) the information domain – the figurative space where information resides and is transferred; (3) the cognitive domain – the seat of individual and group

thought, sensemaking and awareness; and (4) the social domain – the intersection of people living and working together, either in person or through the network.

Briefly, the CF posits that an individual (or group) needs accurate and timely information to build situation awareness and understanding in the *cognitive domain*. The network allows the participants to both push and pull information from the *information domain*. By doing so, the aggregation of synchronized actors creates a virtual team in the *social domain* that works together toward common ends. Ultimately, the shared understanding allows warfighters to make effective decisions in line with the plans and goals of the group that can be enacted in the *physical domain*. Effectively, the team members working in parallel are able to accomplish far more through enlightened self-organization than would be possible through traditional hierarchical organization.

Within the conceptual framework, individuals decide and act independently, but always within the context of the group norms and expectations. As per Coase's (1937) expectations, the network nullifies transaction costs, which affords the opportunity to utilize smaller more responsive and flexible units. For instance, instead of fielding a self-supporting armor brigade, one might be able to send a cavalry troop that has a smaller footprint and can instantly gain greater firepower through the network. Information superiority allows forces to eliminate command bottlenecks, be more efficient and flexible, and, in the end, be more effective.

Human Communication

In a networked environment, communication channels are often narrowed by medium choice. The NCW environment capitalizes on distributed assets so a rich face-to-face medium is usually not practical. Instead, the majority of the communication occurs over voice radio or computer-mediated channels in the form of standard Navy message, e-mail, text messaging or chat. Ellis (1999) presents an examination of the relationship between language and communication that is particularly relevant in an NCW environment because regardless of oral or literate cultures, human beings use language to exert control. For decades, scholars have studied human expression in an oral and a written form to determine the effects of language use on human interaction (Bernstein, 1975, 1981; Bradac, Bowers, & Courtright, 1979; Burgoon & Miller, 1971; Ellis, 1982, 1992; Ong, 1982). In a NCW environment, language is especially important because the information exchange process is both conversational and critical. Senders often use unformatted text and verbal commands over noisy and broken communication circuits to transmit messages. Hence, the language used in a NCW environment has neither the formal structure of standard Navy message traffic nor the unrecorded free flow of face-to-face oral communication. Therefore, language use in a NCW environment is unique and demands attention. Often in an NCW environment, senders and receivers are only sending written text to convey intent, yet the interaction is "conversational" in a text chat. The exchange between sender and receiver is instantaneous and informal, so the opportunity for misunderstanding of the sender's message in a text chat is increased compared to the formal structure of standard message traffic (see appendix B).

There are few social context cues (i.e., status cues, vocal inflection) available in an operational NCW environment to distract the communicators or to enhance the meaning

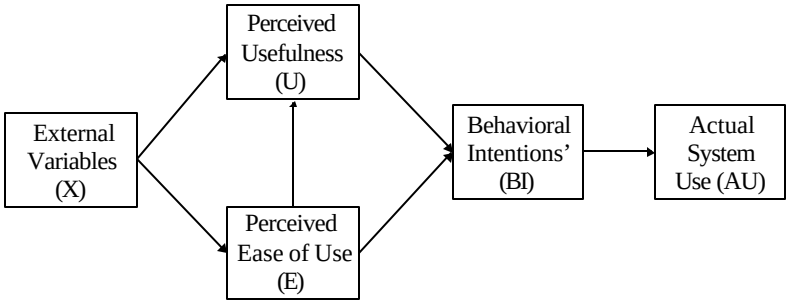
of the message (Fowler & Wackerbarth, 1980; Hiemstra, 1982; Rice & Love, 1987; Sproull & Kiesler, 1986; Williams, 1978), especially if communicators have little or no history interacting. For example, when the force was assembled in Operation Enduring Freedom many of the personnel that interacted in the networked environment had no history other than that which common training provided. The lack of social context cues can be both a positive and negative in an NCW environment. On the one hand, users can focus on the actual message without necessarily thinking about the sender. On the other hand, NCW participants require contextual background to assess the validity and priority of a message.

One means of acquiring context information is by evaluating language style of the sender. Adkins and Brashers (1995) found that language style has a significant impact on impression formation in computer-mediated environments. Specifically, the user of an explicit language style in a computer-mediated group is perceived as more credible, attractive, and persuasive than the user of an abstract language style while contrasting language styles caused perceptions to be more extreme than if users shared a common language style. Several assumptions illustrate language impacts in a NCW environment. Language style creates distinguishable impressions of the sender and communicates beyond the content of the message. O'Barr (1982) suggested that message form must support content or people will question the validity and sincerity of the message. Past research supports O'Barr's contention that every message has both content and relational meaning and that these two levels of meaning affect impression formation (c.f., Watzlawick, Beavin, & Jackson, 1967). Clearly, a number of areas regarding human communication require attention as warfighters operate in tactical and operational NCW environments.

Technology Adoption & Transition

One of the primary theories of technology adoption is the Technology Acceptance Model (TAM). TAM is a causal model of actual system use, the key indicator of success for technology transition.

TAM (Davis 1986; Davis 1989) posits that actual technology use (AU) is directly caused by behavioral-intentions (BI), a measure of the strength of ones intentions to perform a specific behavior. Intention is a useful construct because it can be measured well in advance of actual use.



TAM further posits that BI will be determined by two attitudes: perceived-usefulness (U) of the technology for getting the job done and perceived ease-of-use (E), or the degree to which using the technology will be free of effort.

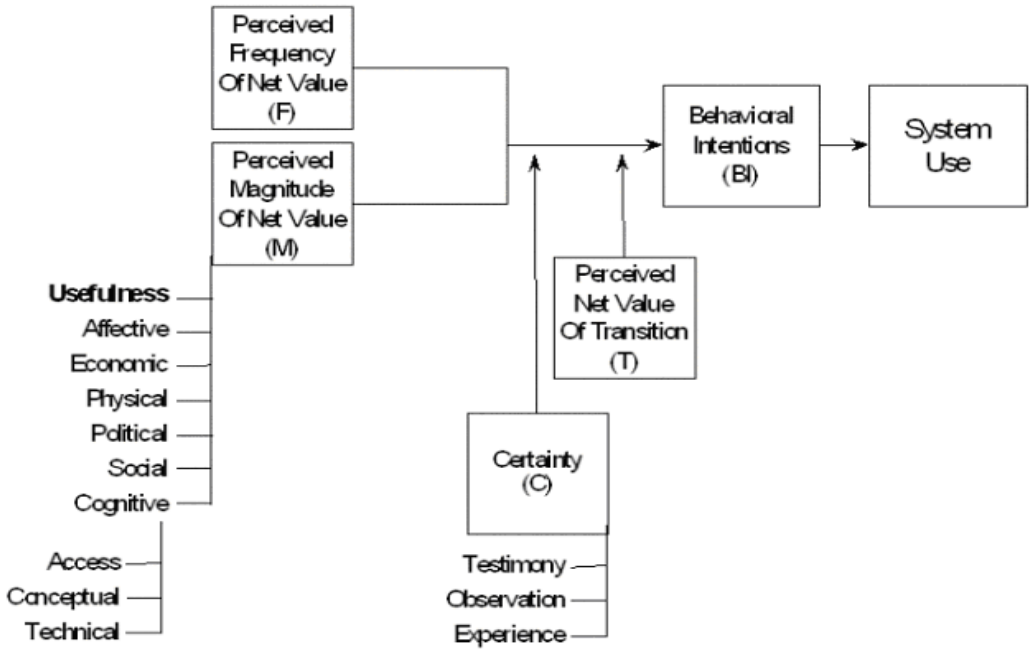
U and E may seem at first to be very similar, but they are quite distinct. U is the degree to which one believes that using the technology will lead to improved job performance: *"Will I do my job faster? Will my boss be happier with my results?"* On the other hand, E is the degree to which one believes the technology will leave ones mind free to work. *"Will I remember how these menus work? Will I have to fight with the network?"*

TAM proposes that a myriad of external variables (X), like system-design-characteristics and self-efficacy, may combine to change one's perception of usefulness and ease-of-use. The model also posits that an increase in E should cause an increase in U. The unspoken assumption underlying this proposition may be that cognitive resources are limited, therefore the cognitive load imposed by the tool will interfere with task performance. If the tool is easy to use, it will be more useful for the task than if it is hard to use.

During the course of research with the U.S. Third Fleet, a new, somewhat richer model emerged (Briggs, Adkins, Mittleman, Kruse, Miller & Nunamaker, 1999). The result is the Technology Transition Model (TTM). While TTM springs from TAM, it does not replace it. TAM predicts and explains a state-of-mind achieved after a one-hour exposure to technology; TTM attempts to explain what causes a group of technology users to become self-sustaining.

The Technology Transition Model

Like TAM, TTM posits that actual system use is a function of Behavioral Intentions (BI). However, it posits that BI will be a multiplicative function of perceived-magnitude-of-net-value and perceived-frequency-of-net-value.



Technology Transition Model

Perceived-Magnitude-of-Net-Value

Perceived-magnitude-of-net-value (M) is defined as an attitude, a subjective assessment of the probable consequences of changing from existing technology to the proposed technology. Note that M is not a measure of how big the differences will be, but of how the prospective user feels about those differences. Upon being exposed to the technology, prospective users will synthesize a holistic sense of how their lives will be different if they change to the new technology. That perceived difference will evoke an affective judgment, for example, *"overall, this will be good for me"*, or perhaps, *"life is going to get a lot worse."*

Dimensions of Net-Value

There may be a number of dimensions for perceived-magnitude-of-net-value. Davis (Davis 1986; 1993; Davis, Bagozzi, Warshaw, 1989) identifies a most prominent instance of perceived-value as usefulness, the degree to which the user believes the technology will enhance job performance. If the user thinks the new tool will greatly improve job performance, this might be an instance of a positive perceived-value. However, there are other dimensions of perceived-value such as: affective, economic, physical, political, social and cognitive.

Prospective users may synthesize a variety of competing values of different magnitudes and directions into an overall assessment (Robey, 1979; Nickerson, 1981). For example, the users might believe that a new technology would substantially improve organizational profitability (large positive economic value) but that it might cause the users to lose a modicum of influence with managers (small negative political value). They might find the new system somewhat more awkward (small negative cognitive value) and therefore

a lot more frustrating (big negative affective value) than the present system. However, it might be that the new technology provides a forum for more frequent exchanges of ideas among friends (modest positive social value). In the end, the prospective users generate an overall net assessment of how much they will like or dislike the changes engendered by the new system. We call this final assessment the perceived-magnitude-of-net-value of the change (M). M may be positive or negative.

M pertains to a comparison of the existing system to the proposed system. It is a net assessment, not an absolute assessment. For example, the old system might be terribly difficult to use, a negative cognitive value. The new system might also be hard to use, also a negative cognitive value in absolute terms, but if it does not seem as hard to use as the old system, the result may be perceived as a net positive cognitive value.

TTM posits that any number of factors external to the individual may be perceived as creating positive or negative value along one or more dimension in one or more directions simultaneously. Thus, in TTM the dimensions of value subsume and explain the effects of the external factors, so there is no separate construct in the model to represent them.

Perceived-Frequency-of-Net-Value

Users also consider how frequently (F) they expect to derive the net-value they perceive. Will they derive value moment-to-moment? Daily? Twice a year? TTM posits that F and M combine multiplicatively to cause BI. F may be zero or positive, it cannot have a negative value because there is no frequency less than zero occurrences per time unit.

No matter how high M becomes, if F is zero, BI will be zero. Likewise, no matter how high F becomes, if M is zero, BI will be zero. A small positive perceived-net-value obtained frequently may lead to a positive BI. Likewise a large positive M and a low F may lead to a positive BI. If M becomes negative, BI may also become negative, and the user may actively avoid system use.

Among other things, this model suggests that a frequent minor irritation, such as, having to reset a server twice a day, may be sufficient to outweigh larger, but less-frequent benefits.

Perceived-Net-Value-of-Transition

But what of a technology that engenders a small positive M and a low F? Will it be accepted? That may depend on perceptions of switching costs and benefits. TTM posits that users also attend to the perceived-net-value-of-transition (T) when choosing whether to accept a new technology. While F and M relate to a comparison of the existing system to the proposed system, T represents the value derived from the transition activity itself, apart from the value the new system will deliver. For example, the learning curve for the new system would represent a negative cognitive value. On the other hand, a trip to San Francisco for training classes might be perceived as having positive economic, affective and social values. Being regarded by one's boss as the project champion for new technology might offer positive political and social values, while having to shepherd the multitude of technical difficulties of establishing the new system might be a negative cognitive value. In the end, the prospective user will synthesize the perceived values

associated with effecting the change into a subjective judgment of the net-value-of-transition (T).

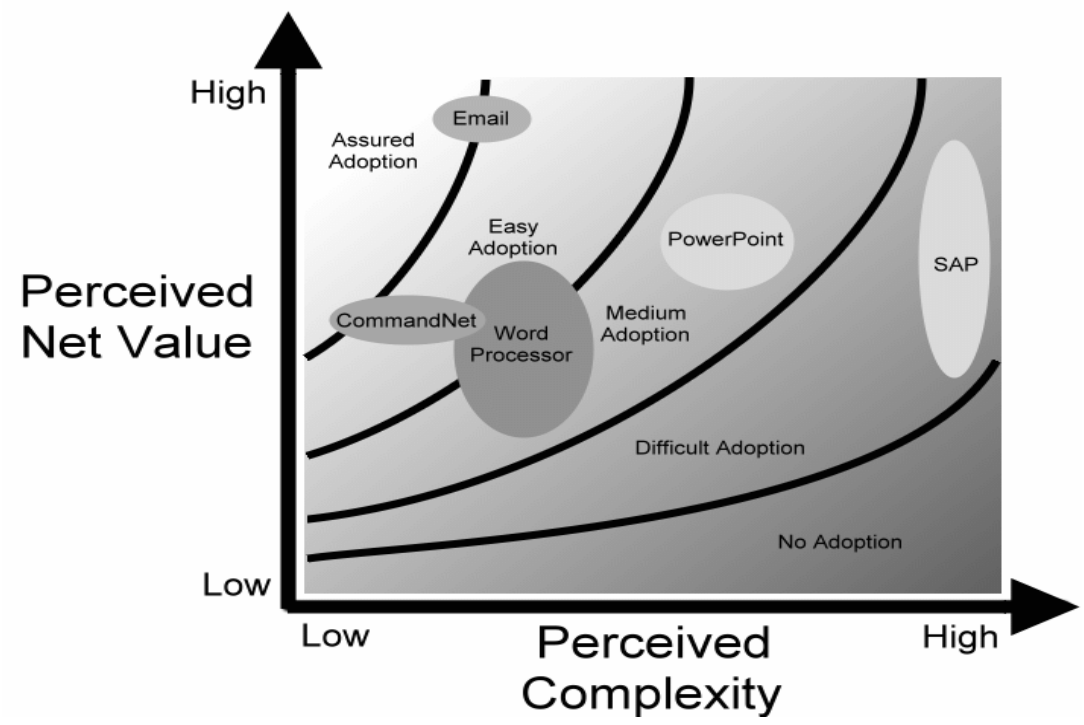
Certainty

People develop their attitudes toward a new technology based on exposure to the information system. Briggs, Adkins, Kruse, Miller and Nunamaker (1998) identified three kinds of exposure: testimony, observation, and experience. Testimony may be as informal as a conversation at a water cooler or as formal as a refereed academic article. Observation may range from a glimpse of a video clip to several days of watching over people's shoulders as they use the technology. Experience may range from a few minutes of hands-on playing to days of intensive use for mission-critical applications.

Whatever the form of exposure, the prospective user will use it to form some assessment of not only the magnitude of the perceived-net-value, but also some degree of certainty (C) about that assessment. Certainty is a subjective probability that an expected net-value will actually be obtained.

Technology Transition Simplified

A much simplified description of TTM theory is that successful adoption of new technologies is based primarily on two factors: (1) Perceived Net Value - the benefit that warfighters expect to experience each time they use a technology combined with the frequency that they anticipate using the technology, and (2) Perceived Complexity - the cognitive effort associated with using the technology.



Simplified Technology Transition Model Representation

A relatively simple and frequently used technology like email is easily adopted as users realize significant value on a daily basis. A technology with little benefit and/or low usage frequency may not be able to overcome its perceived complexity to achieve a successful adoption. Users are not willing to put forth the effort if they do not expect to gain a net benefit. On the other hand, users will go to extensive lengths to adopt complex, but very useful technologies. For instance, enterprise resource planning systems like SAP are extremely complex and expensive. Many users are willing, however, to take on a high level of complexity in order to gain the great benefits that have been demonstrated in other environments.

Research Context

NCW Technologies

CTF-50 utilized a number of different technologies during the deployment, but the key collaborative tools that tied the users together in a novel way were chat rooms, Knowledge Web (KWeb) and CommandNet (Adkins, et. al. 2001).

Chat Rooms

Chat is a relatively ubiquitous technology that was primarily used in the civilian world for social interaction. Generally, the way chat works is that different channels or virtual rooms are set up on a server. These rooms are typically arranged to support a specific interest group. Within naval commands, the researchers have observed rooms centered on such interest groups as meteorology and oceanography (METOC), tomahawk land attack missile (TLAM) targeting, and logistics. Chat rooms were spawned and died as needs and interests changed in CTF-50. Ad hoc chats were also set up for specific conferences between users.

Knowledge Web

The knowledge web (KWeb) is a web-based information system originally developed by Space and Naval Warfare Systems Center SSC. Commander Carrier Group Three's first use of the KWeb capability was at the Global 2000 wargame. The initial concept was to display "lots" of information to various members of the staff. According to Morrison (2001):

> "the knowledge wall features a series of windows incorporating decision support tools tailored to the Commander Joint Task Force (CJTF), as well as windows with "summary status" information being "pushed" from the anchor desks used by liaison officers representing the various CJTF departments. The battlewatch captain in charge of the command center can choose which aspects of the situation to focus on by moving relevant content to the center of the wall and drilling down into deeper levels or related information. The knowledge desk uses software tools (COTS and information push Web applications) together with computer display hardware to enable the operator to create and publish value-added information to the Web. It consists of an integrated "desktop" spread across four different display surfaces.

The top-right display is dedicated to routine office tasks such as preparing briefs, processing e-mail, writing memos, etc. The top-center display is dedicated to providing the tactical situation "big picture" tailored to the user's decision-making needs. The bottom center display is a dedicated place for monitoring the execution of an operational plan. The top-left display is a tool explicitly designed to facilitate sharing information. The concept uses templates to "push" information from the operator to a Web site viewable by the rest of the command staff. The information "pushed" consists of worksheets, forms, and prompts to others on the command staff that would facilitate their understanding information relevant to their decision-making tasks. The software tools cause the information pushed to be formatted in a manner that others would recognize and understand, and published to a shared database in the Web environment.

The knowledge-wall hardware consists of a dual-processor Information Technology for the 21st Century (IT-21)-compliant workstation using three 4-port Appian Jeronimo Pro COTS video boards. The knowledge wall display is made up of ten 21-inch CRTs and two SmartBoard rear projection large-screen displays with internal liquid-crystal display (LCD) projectors. The displays operate as a single, integrated digital desktop, where each physical display has a resolution of 1024 by 768 pixels. This creates a digital desktop of 6144 by 1536 pixels. An additional CRT was dedicated to video and video teleconferencing requirements. The peripheral displays were intended to provide summary information for each of 14 functional areas of the CJTF command identified through knowledge engineering with the staffs of the U.S. Navy Third Fleet, Carrier Group One, and Carrier Group Three. Each summary display is formatted consistently by using a template-authoring tool that facilitates the creation of, and linking to, a variety of Web content without the operator responsible for producing content having to know hypertext mark-up language (HTML). Additional authoring tools were provided to facilitate the creation and publishing of map-based tactical data. All pages are implemented as HTML pages on a common server, with numerous links to more detailed pages for supplemental information. The title line indicates the functional areas described by the display. The "stop lights" in the top-left quadrant are intended to be viewable from 15 to 20 feet away, and indicate the status of activities in various time frames. Light colors indicate the severity of the alerts in terms of their deviation from the plan. The bottom-left quadrant provides space for a summary graphic or multimedia object. The right side of the screen provides space for amplifying links/headlines. The "Alerts" section describes specific problems within this domain/ functional area that might be of interest to others. The "Impacts" links describe the impacts of alerts in terms of effects on other functional areas. The "Links" area allows access to reference and supplemental material. Any text or graphic in the page may be linked to a more detailed Web page" (Morrison, 2001, p. 193-194)

CommandNet

The Defense Advanced Projects Agency (DARPA) sponsored the Center for the Management of Information's (CMI's) initial development of CommandNet in 1996 with

a one-year research grant. The original DARPA research directive was both broad and flexible. CMI was required to share collaborative technology expertise with the staff of the U.S. Navy's Third Fleet and the component Commands while learning about collaborative processes within the U.S. Navy. The development of the initial CommandNet prototype came after a year of researchers being underway observing, interacting, and effectively becoming members of the Third Fleet staff. During the course of this research the CMI team members spent months on board all types of U.S. Navy ships studying the requirements of battle staffs and commanders. CommandNet developed from a need for group situation awareness within the intelligence community of the Third Fleet staff.

CommandNet was designed to propagate critical incidents throughout a distributed force. A technical requirement for CommandNet was to use minimal bandwidth and withstand the temporary loss of bandwidth. Hence, when users enter encapsulated critical incidents in the system other subscribers see the entry within seconds (Adkins, et al, 2001). Because CommandNet entries are created by trained watchstanders, there is a minimum of fluff or extraneous information. Entries are concise and focused on the vital knowledge required by the command. CommandNet provided the Commander accurate situational awareness anytime or in any place a terminal was located on land or at sea.

Methodology

Yin (1994) proposes five components of case studies as a guide: (1) identify the major question(s); (2) provide propositions; (3) identify the unit of analysis; (4) outline the logic linking the data to the propositions; and (5) provide the criteria for interpreting findings (p. 20). This research investigates CTF-50's use of Network Centric Warfare capabilities to enable self-synchronization, speed of command and mission effectiveness. The nature of the questions led the research team to use an explanatory-exploratory case study, hence there are no propositions. In this case study the unit of analysis is at the individual and organizational level (Sjoberg, Williams, Vaughan, & Sjoberg, 1991). Since there are no propositions, the linking of the data is not relevant. The criteria for interpretation of the findings are verifiable evidence of Network Centric Warfare capabilities enabling self-synchronization, speed of command, and mission effectiveness.

Three types of evidence are used for this case study: interviews, documents and physical artifacts. The documents used in this case study are an unclassified CTF-50 post deployment brief, a Space and Naval Warfare Systems Center Knowledge Web brief, a classified "K-Web" site, an Armed Forces Journal article "ForceNet Is Navy's Future: Information Sharing from Seabed to Space (Zelibor, 2003) and two Naval Proceeding articles: "Net-Centric Intelligence Works!" (MacKrell, 2003) and "Knowledge Web plays big in transformation" (Majeranowski, 2003). The documents were used frame questions for interviews and to corroborate evidence gathered from other sources (Yin, 1994). Physical artifacts are photos of the Task Force Command and Control operation center, meteorological reports, classified and unclassified videos and maps. Meticulous diligence was paid in determining the origin and accuracy of the records during interviews.

Interviews are one of the most important sources of case study information. The

interviews were open-ended, in which the researcher asked for the informant's opinion on events and facts. Questions were exploratory and framed to corroborate previously gathered data. Tape recorders were not used during the interviews due to classification level of some of the conversation.

Context for Data Collection

The Center for the Management of Information (CMI) at the University of Arizona has a long history of working with the U.S. Navy on shore and at sea. CMI researchers have expertise in human communication, management information systems, and computer science. The researchers have spent thousands of hours at sea during deployments and exercises doing research and developing and implementing collaborative information technologies. By leveraging this vast understanding, CMI researchers were able to glean information from warfighters on NCW capabilities.

In the summer of 2000, Commander Carrier Group Three participated in Global War Game 2000. The Global War Game is the annual war game sponsored by the Naval War College. The Global War Games of 1998, 1999, 2000, and 2001 are a series of games designed to explore operational potential of forces with 21st century capabilities as articulated in the strategic documents, Joint Vision 2010 and 2020. According to Morrison (2001) “the objective of the Global 2000 war game was to explore how the elimination of "stove pipe" command and control systems (i.e., "network-centric warfare") might change the way we perform military missions.”

In Global 2000, new tools were introduced, such as the Knowledge Wall, Information Workspace, and the Theater Assessment and Profiling System. The game’s rapid pace and scope quickly challenged CARGRU 3 with knowledge management efforts, “information overload” and the tools that could overload the “system.” Global 2000 saw the emergence of a role for a facilitator of information at the Commander Joint Task Force (CJTF). On the CARGRU 3 staff this was the deputy operations officer (a Navy Captain, O-6). This person handled the problem of "shaping the knowledge" from the information on the Knowledge Wall, at first in response to the CJTF’s information requirement and, as the game progressed, in anticipation of the CJTF’s information requirements. According to Harrigan, Jenkins, Winters, Mohs, and Hay (2001) this “greatly increased the speed in which the Commander could make decisions.”

After CARGRU 3 experience with Global 2000, the tenets of Network Centric Warfare were propagated with technological capabilities during workups with the USS Carl Vinson (CVN 76) crew, Destroyer Group Nine (DESRON-9) and Carrier Air Wing (CVW-11). In July 2001, CARGRU 3 left port to join up with 12 ships and boats for a Western Pacific (WESTPAC) deployment. During the transit from the Western United States to the North Arabian Sea, the carrier group continued to sharpen their skills with the use of Network Centric capabilities to increase operational effectiveness. On 11 September, 2001 terrorist attacked the Untied States by flying planes into the Pentagon, the World Trade Center and a field in Pennsylvania. CARGRU 3 was thrust into command of six aircraft carriers and at least 59 ships from seven nations to fight a war

across 800 nautical miles. This size and combination of coalition force had never been brought together in history and provided a great test of Network Centric Warfare concepts.

Conducting Interviews

The interviews were conducted with staff members of CARGRU 3 and Commanding Officers of ships in the battle force. Interviewees were chosen by location, access and functional experience. The researchers requested interviewees that used NCW capabilities to fight the war. Interviewees were recommended by the commander of CTF-50 and CARGRU 3 staff members. In addition to senior staff members and operational users, bandwidth limited users were sought out for interviews.

The interviews were conducted between 14 April and 06 May 2003. Interviews lasted between sixty and seventy-five minutes and were conducted in the interviewees' offices. Prior to the interview, the subjects received a 3 slide "pre-brief" (Appendix A). All interviews were conducted with two interviewers alternating with a lead and scribe style gleaning information on NCW capabilities used to enable self-synchronization, speed of command & mission effectiveness. All interviewees were asked for verifiable evidence to support an "End-to-End" story, to tell us about the dramatic successes with NCW, a typical day using NCW capabilities and what they noticed was different with NCW. Specific interviews were conducted with the officers in the following positions:

(1) Commander – CTF 50 – Rank=O8-Rear Admiral

(2) Commander Carrier Group Three (CARGRU 3) – N6 – Rank=O6-Captain

(3) CARGRU 3 – Chief of Staff - Rank=O6 – Captain

(4) CARGRU 3 N3 Deputy - Rank=O6 – Captain

(5) CARGRU 3 N2 - Rank=O6 – Captain

(6) Commanding Officer - Guided Missile Aegis Cruiser (CG) (Anti-Air Warfare Commander) - Rank=O6 – Captain

(7) Commanding Officer - Guided Missile Frigate (FFG) (Protection of Shipping (POS) mission as Anti-Submarine Warfare (ASW)) - Rank=O6 – Captain

(8) CARGRU 3 - Battle Watch Captain - Rank=05 –Commander

(9) CARGRU 3 – Assistant Battle Watch Captain and TLAM Officer – Rank=03 –Lieutenant

Findings

This section outlines the findings and interpretations of the case study at CTF-50. Theoretical sources in sociology, judgment and decision-making and human communication are used to complement the core NCW premises. As per the expectations set forth by NCW conceptual framework, CTF-50 experienced many improvements in operations and decision-making. There were, however, effects that were not inline with NCW's current explanations of the social domain. In response, the greater portions of the

findings are discussed with respect to the social and cultural implications for adopters of NCW technologies and operations.

Predictive Value of NCW Conceptual framework

CTF-50 found benefits from the widespread implementation of NCW supporting technologies and processes. In accordance with NCW conceptual framework, the task force experienced improved ability to share information, propagate and maintain situation awareness, and brought these improvements to bear in support of combat operations. The following are several specific areas of interest that the research team looked at when gathering data.

Breadth and Depth of Information Dissemination

A key indicator of NCW success that the researchers looked to in this case study was the breadth and depth of information dissemination. This maps to what is called "degree of shared information" within the NCW conceptual framework. Although this is not necessarily a variable set forth explicitly in NCW literature, it does act as a good measure of the potential for shared battlespace awareness. As this case study was performed approximately 18 months after the conclusion of Operation Enduring Freedom, the research team did test the situation awareness of the participants. The research team addressed different indicators that could indirectly paint a complete picture of the information capabilities of the subjects. By looking at the potential for information superiority and the effects that the task force experienced, conclusions were drawn with regard to NCW conceptual framework and practice.

Breadth and depth of information dissemination was selected as it is a precondition of situation awareness that people have access to information about the battlespace. Without widespread access to salient information, one can easily say that combat success had nothing to do with NCW practices as the force did not even have the preconditions established to exercise NCW operations.

The task force staff and commanders displayed numerous and widespread evidence of extensive and broad-based information sharing. One could argue that much of the information that was shared on the KWeb was already available through the common operational picture (COP), email and record message traffic. This argument, however, really ignores the importance of information accessibility, or "share-ability" in NCW parlance.

Record messages, for example, are notoriously inaccessible. Naval officers spend large amounts of time sifting through hundreds of messages on the off chance that buried somewhere within the all-capitalized, computer formatted text, something important is buried (Appendix B) elements that the KWeb offered was a predictable formatted method for each person to gather a great deal of useful information. The interviewees mentioned that the KWeb pages had a relatively steep learning curve. They required users to spend a significant amount of time learning the topology of the KWeb. They also stated, nevertheless, that once a person was familiar with the site they could more easily find regularly needed data than was ever the case before. KWeb was the "go to" place for the

most recent and accurate information regarding the operation. Voice circuits, record message traffic and e-mail no longer carried the most accessible or up to date and accurate information. Critical information was being shared with users from multiple services, government agencies, ships and land based installations.

Moreover, users did not resent this "ramp up" period. Instead, they viewed it as the price of having the critical situation awareness that was required for operation. Generally, the thought was that the unfamiliarity of KWeb caused users some extra work, but that this work was an investment that paid off greatly after each user had mentally mapped out the KWeb pages. Not only could they find the data they regularly needed, but supplementary data was often referenced as users sought to become more generally knowledgeable about the conduct of the task force's operations and the war as a whole. This was especially true for watch standers at various operations centers as when the battle tempo was low they surfed for information and made themselves more effective.

> A example of "share-ability" from a watchstander during OEF
>
> Before
>
> When I was on southern watch as a department head with a squadron all I had was the Air Tasking Order. The squadron is looking only at what they need to do not the big picture.
>
> With NCW Tools
>
> As a Battle Watch Captain in OEF I knew the flight schedule, logistics flight, vertical replenishments, where Pakistani forces would be. I had a picture in my mind what was happening.

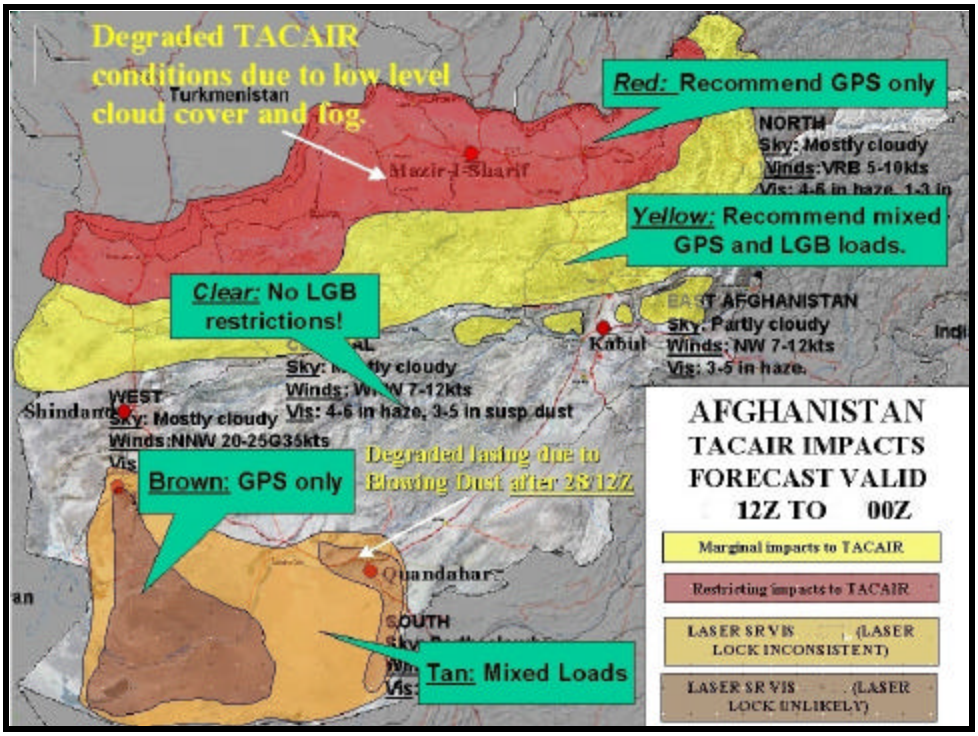
An additional consequence of the predictable organization of information in the task force was that any concerns about information overload quickly evaporated. The synthesized and formatted KWeb information afforded users at all levels the opportunity to avoid sifting through large amounts of raw data themselves. Thus, the users developed a division of labor that allowed for a greater aggregated efficiency. Additionally, the expert synthesis of data brought a higher quality of information to users than they would be able to generate on their own. Essentially, all the information consumers using KWeb acted as editors and veracity checkers. When posted information conflicted with another source "electronic conversations" brought the issues up and often a more accurate information picture was posted after a discussion. Below is an example, that supports the discussion of breath and depth of information sharing during OEF.

> Normal operations are built around operational summaries and intentions messages. Every night they would send out their daily intentions. You went thru all of those and the operational task structure. People carried big tabbed notebooks of their information, operation officer's notebook, 3-4 guys would just spend their time updating notebooks. With NCW Tools, like KWeb you don't have to read thru everything to get information. "I didn't read a single intentions message during the entire deployment" - Cruiser Commander

```
WSNT12 KKCI 151949
SIGA0L
KZMA KZHU SIGMET LIMA 3 CNL WEF 1949 UTC.
CONVECTION HAS MOV INTO DOMESTIC WTRS AND CONVECTIVE SIGMET UNIT
NOW ISSUING BULLETINS ON GLFMEX TS.
J.HENDERSON
```

Raw Meteorological Data

A telling example of this kind of enhanced information brought to the larger community was with the aviation weather reports. Usually, weather is widely distributed in a standard text format. It requires, nonetheless, time and skill for each aviator or squadron to make useful sense of this raw data.



Synthesized Meteorological Picture

Within CTF-50 the METOC section brought this cryptic data together and published it in a form that was accessible and understandable to many more people. The net effect of this for the squadrons was that they were able to plan missions more quickly and select munitions and tactics that were more appropriate to the environment. Decision-making was also pushed down to lower levels as it was obvious to air and support crews when an aircraft would be going into weather that might impact the mission.

Speed of Command

Clearly one of the more important prescribed effects of NCW organization is the ability to significantly enhance speed of command throughout a force. In the NCW conceptual

framework this is described as command and control agility. CTF-50 certainly experienced real changes in the time that was required to plan and execute missions. The way this played out operationally was, nonetheless, surprising in light of NCW conceptual framework.

CTF-50 interviewees credited the new IT tools with making the staff and commanders more agile. The staff displayed different behavior than was expected by the research team. Coming into this case study the researchers anticipated finding an increased operations tempo as a result of the increased use of NCW tools. This did happen, but was less quantifiable than projected.

Instead, it appeared that the efficiencies gained through the application of NCW capabilities were from a gain in system slack. This makes sense in that the strike aircraft had to fly long distances to attack targets in Afghanistan. As such, the primary weapons systems employed by CTF-50 were already fully tasked. Speeding up the command's decision cycles did not appreciably alter the amount of time and effort it takes to fuel, arm, maintain and fly combat missions.

The gains afforded by the NCW systems and procedures did not, however, go to waste. Instead the staff used this extra time for contingency planning. The subjects often spoke of the great depth in "what if" discussions after the daily staff meeting. The staff officers felt NCW capabilities gave them excellent situation awareness and the time to do more tactical and strategic thinking. One particular element several staff members mentioned was that the information required for these "informal" in depth discussion was always available at any terminal. They no longer had to run to a stateroom, ready room of operation center to get information critical to the discussion.

As early as CARGRU3's training exercises with Third Fleet, the staff was finding the advantages of the NCW capabilities. At one point, during the JTFEX training the Third Fleet Vice Admiral stated that Third Fleet was not able to move the training scenario fast enough to challenge the carrier group because NCW had enabled CARGRU3 unprecedented information availability and sharing capability.

The ability to do in-depth contingency planning was of great value as Operation Enduring Freedom progressed. Rather than improvising and reacting to changes in the war as battle groups previously had, the CARGRU3 staff was able to enact well thought out plans. Of the 35 war plans developed by the staff during the deployment, 33 were executed. Executing all these war plans was an impressive accomplishment.

Another important, but often overlooked, gain for the staff was an increased ability to sleep and wind down. The senior leaders encouraged rest and relaxation among the staff. In the high stress environment of OEF being well rested provided opportunity for optimal performance from the staff when the operations required execution. Additionally, the senior leaders made a point to be seen winding down themselves, often by playing cards. This action by the senior leaders made it acceptable for junior officers and enlisted personnel to do the same – not a small thing in the "sleep when you are dead" workaholic culture of the embarked Navy.

Social Domain of NCW

The Social Domain (SD) of NCW conceptual framework is the least developed and tested. Social issues do, however, remain central to the way that actors within groups behave. Society and group interaction shape and mediate our actions and decisions to a greater extent than most people are aware.

Humans evolved, for the most part, in small familial and clan groups. The myriad forms of descent and clan affiliation are a testament to how important our forbearers found it to establish strong links to those around them. They sought shelter and food together and came to see their very survival as being tied directly to the group. Though one could argue that modern civilization has taken us beyond the need for such close affiliation in our day to day interactions, the reality is that we still have a desire to establish a feeling of connectedness and trust. Moreover, this need colors our organizations, actions and communication.

As societies grew larger it became impossible to maintain close personal ties to every individual in the group. The need to establish an "us" and "them" did not diminish as can be seen in religious and nationalistic movements throughout history. Additionally, social mores were codified into laws that helped to pull together whole nations. In the absence of a web of personal relations, the rule of law allows people to go out and interact with people throughout the world with predictable results. The certainty associated with predictability allows people to think, act and grow beyond means of an individual or a small group.

An oft cited example is that of the car rental. Because of an established network of laws and business relations, amazingly one is able to go out and easily rent a car half a world away. Such structured systems help to establish trust in lieu of actually getting to know someone to personally establish confidence. The car rental company trusts that it can rely on the credit card company, which in turn relies on a demonstrated history of dependability by the renter.

The social domain of the NCW conceptual framework did not provide a means to evaluate the effectiveness of human interaction. As discussed earlier, NCW capabilities provide multiple mediums to convey information. All communication has two levels of meaning. One level is the relational level meaning and the other is the information level of meaning. The relational level of meaning is directly related to the social domain of the NCW framework. An example of relational level meaning is in the classroom scene during the movie a "beautiful mind" with the window open. The professor tells a student to close the window, she refuses to close the window as it is hot in the classroom, and the professor is dumb founded by the student not obeying his directive. The professor goes over to the window and closes it. The student gets up and opens the window then asks the construction workers who are making noise outside the window if they could break for lunch early, they agree and the class goes on with the window open. The informational level meaning of the communication or position was the action of "closing the window." The relational level meaning or issue was the noise that is distracting the class. Some mediums such as face-to-face have capability to convey relational and informational meaning. Other mediums such as chat or K-Web have limited capability to convey both

levels of meaning. The current NCW framework focuses mostly on the informational level meaning and needs to expand the social domain to capture the relational level of meaning.

Divisions of Responsibility

The community of warriors has adopted a similar, but very specialized form of this structured interdependence. Military interaction is not based around financial transactions. Instead, military interactions are based upon a complex structure of supporting roles. From a functional standpoint, each type of unit provides a specific type of support to the whole. For instance, the aircraft carrier is able to launch strike missions because the cruisers and destroyers are providing air defense.

Soldiers often speak of the intense bond they feel in combat. Combat veterans experience an overwhelming motivation to not fail the unit. Thus, in the military sphere the societal requirements for trust and understanding are driven to unparalleled levels. A failure of one person to understand his mission can be catastrophic, and only through an extensive network of trust and interdependency can commanders be liberated to worry about anything but their own units' security.

Typically, trust is greatest among those within the immediate unit. The rifle platoon members or shipmates become the soldier or sailor's clan. As one moves farther out from this core group, the less one feels affiliation and trust. Thus, a sailor may have complete trust in his shipmates, somewhat less in the Navy as a whole, and may be a little suspicious of the Air Force.

To overcome these all too human reactions, the militaries of the world have developed a very explicit division of responsibilities. This affords everyone the ability to know who is responsible for dealing with any given threat. Without these trust relationships commanders will tend to become paralyzed, isolated and ineffective as they abandon their missions to defend against every potential threat.

Within the specific task areas, warfighters have tended to break up such responsibilities spatially. For instance, each infantry battalion is given a sector that they are responsible for controlling, or each cruiser is given an area of the sky to defend. Commanders are generally given a fair amount of latitude within their sectors as long as they meet their responsibilities and coordinate with adjacent units with like missions.

Such a division of responsibilities is a simple and reliable way to coordinate forces in a world of linear battles and attrition warfare. Much like the Greek phalanx, the armies of the world wars would line up shoulder to shoulder and slug out the battle. This is not an imaginative or economical way to fight, but does minimize the need for training, coordination and trust. As long as every unit does the assigned job, the whole force is able to function and the operational commander is able to cognitively manage the situation.

The primary casualties of this structure are efficiency, and by extension, effectiveness. Such a rigid system does not allow for rapid or flexible responses. Thus, a common situation on the battlefield finds some units over tasked while others have little to do. The

division of responsibilities is often set up to minimize cognitive load and confusion. Moreover, changes are difficult to make in such an arrangement once the system elements are established.

Network Centric Warfare, on the other hand, demands speed, initiative and independent action. NCW owes much of its power to the increased ability of units to maximize their own effectiveness. Rather than wait to be directed to take action, commanders are free to use situation awareness to act on their own initiative as long as the action supports the mission and commander's intent. This tends to drive out inefficiencies and allow commanders to actively engage the enemy more often and for greater duration. This in turn will overwhelm the enemy that is not as flexible and responsive.

An example, of increased speed of command occurred when a pilot had to bail out over the Indian Ocean. The following is from a battle watch captain

- Search and Rescue
  - USAF B-1B bailout over Indian Ocean
  - I look at one log that has the coordinates of the bailout.
  - Surface ship heading north towards the bailout area didn't have the same communication ability.
  - I pulled the lat/long and gave it to the surface ship in a chat and he said thank you then did his mission.
  - It was fast and efficient SAR [search and rescue]. The network centric capabilities saved time and allowed the SAR team to act faster.

With greater freedom, however, comes greater responsibility. Under the tenets of NCW, commanders and staffs are given greater latitude, but in return they face higher expectations. Warfighters can no longer be content to simply "stay within their lane" and be ignorant of what is happening over the horizon. Instead, they must maintain constantly updated situation awareness. Furthermore, this situation awareness must be consistent and shared among the larger team. Only by sustaining a shared mental model of the battlespace can units hope to attain the holy grail of NCW – flexible and quick self-synchronized action in support of the commander's intent.

NCW Mandated Changes

Network-centric operations demand a high degree of trust and understanding among all of the players. This is, nonetheless, hampered by the distributed nature of the participants. As outlined above, people develop trust relationships most readily among those with whom they have close personal interaction. Forming and maintaining the necessary trust bonds over an electronic network, among people who have never actually met, is difficult at best.

Although the major players within CTF-50 had met, they still faced the problems associated with building and maintaining trusted relationships. In lieu of the rich interactions that take place in a face-to-face environment, they were forced to create new norms for behavior, accountability and reward around artificial networks.

Two theories that can help to explain the competing factors in supporting trust and understanding over networks are social presence theory and media richness theory. Capabilities of NCW such as CommandNet, KWeb, e-mail and instant-messaging (IM) have become standard communication tools over the world. The NCW environment is unique because, although it allows for relatively high-speed interaction between participants, it also "filters out" certain informational cues (e.g., Adkins & Brashers, 1995; Daft, Lengel, & Trevino, 1987; Sproull & Kiesler, 1991; Williams, 1978). For example, IM generally transmits only text-based (including "rich" or "styled" text) messages, thereby omitting some nonverbal cues or channels that are typically used to transmit contextual and social information. Determining the availability of cues in NCW and how this compares to other communication media is part of the tradition of cross-media comparisons in the communication literature. Two theories have been developed to explain cross media differences: social presence theory (Short, 1974; Short, Williams & Christie, 1976) and media richness theory (Daft & Lengel, 1986).

In the first, social presence is defined as a subjective, cognitive synthesis of all of the many factors that reflect the social immediacy or intimacy of a communication medium. It is creating a sense of "being together with another" in a virtual environment, including primitive responses to social cues, awareness of the physical presence of an embodied other (co-presence), mutual awareness, and psychological and behavioral engagement (Biocca, Harms, & Burgoon, in press). Social presence depends on the visual nonverbal cues transmitted, the apparent distance of the target person(s) being communicated with, and the "realness" of those being communicated with (Short, Williams & Christie, 1976).

There are measurable factors that determine a medium's social presence, including the ability of a medium to convey nonverbal cues, the social or organizational role of users, and the potential for interactivity (Rice & Williams, 1984). All other things being equal, these measurable factors are thought to determine which media are chosen for communication and the consequences of the communication. Short and colleagues (Short, Williams & Christie, 1976) thought media could be ordered from least to most social presence as follows: business letter, telephone/speakerphone, multispeaker audio, television, face to face. Researchers hypothesized that the suitability of the communication medium depends on the social presence of the task. If a medium with low social presence is chosen for a task requiring high social presence, then the consequences of the communication interaction should be very different from what would have occurred had a more suitable medium been chosen for that particular task.

Daft and colleagues (Daft & Lengel, 1986; Daft, Lengel & Trevino, 1987) explain why managers overwhelmingly prefer oral communication, even when other channels are available. The argument is that communication media can be characterized in terms of their "richness" or ability of information communicated on the medium to reduce equivocality. The media possessing higher degrees of each of these attributes, speed of interaction, cue multiplicity, language variety, and personal focus are considered richer. Daft, Lengel and Trevino (1987) report media high in richness are preferred for communication that is high in equivocality, and that media low in richness are favored for communication that is unequivocal. Face-to-face communication is considered the richest medium, followed in descending order by the telephone, addressed written

communication, and unaddressed written communication.

The overall ratings of communication media are similar for both social presence and media richness theories (although reached in theoretically distinct approaches).One clear implication from both theories of cross-media differences is that some media are thought by communicators to be more successful at conveying information than others. While this capability is often generalized as greater or lesser bandwidth (Short, et al., 1976), it is necessary to realize that not all structural elements that support bandwidth (e.g., synchronicity) necessarily affect presence or richness to the same degree or in the same manner. In fact, while we use the term bandwidth as a form of shorthand for "the degree to which a medium supports rich, socially-present interaction," individual propositions for each specific media capability are developed.

As a communication channel becomes leaner it becomes necessary for actors to be more and more explicit in their communications. For instance, two staff officers working in a room together can easily monitor each others' demeanor, work load and actions and glean a great deal of information. If they are separated, however, they no longer have access to all of this observed contextual information. To make up for this, the officers now have to give each other overt updates. Previously to NCW capability one officer was immediately aware of an emergency phone call to another officer in the operations center, now the officer only knows about the emergency if he is purposefully brought into the fold.

Fortunately, another framework, known as channel expansion theory (Carlson & Zmud, 1994; 1999), does give some hope for better use of currently available technologies to build trust and understanding. The crux of channel expansion theory is that as users become more familiar with a particular communication medium they become more skilled in pushing greater amounts of information through that channel.

Chat is a good illustrator of this idea. As users become more familiar with chat, they tend make the most of established conventions by utilizing a whole range of emoticons, common acronyms and abbreviations to transmit social context (citation). For instance, a simple acronym like ROTFL (rolling on the floor laughing) can easily set the tone that might otherwise require a paragraph of prose.

This was certainly the case at CTF-50. Chat rooms were numerous and varied. They ranged from one-on-one communication between the admiral and his commanders to the massive "Kmart" chat that held hundreds of participants. Interviewees all echoed the idea that chat became the primary mode for dialog. Several interviewees mentioned that radio circuits were silent and the Task Force Command Center became strangely quiet when users switched to electronic chat. Chats not only took over the role previously held by radio circuits and telephone calls, they expanded that role. Small interest group chats were established that allowed close coordination among those that previously had to use record message traffic – a notoriously cumbersome channel with little in the way of feedback. Below is a description of chat by a staff officer.

> "Chat was awesome. Chat is like getting 20 new radios and being able to work all at once. There were times, however, when the subordinates moved too quickly and agreed to things on chat that they couldn't perform. We had to back them off. We needed to delegated chat authority but were able to do this well."

Potentially more rich communication channels such as video teleconferencing (VTC) were also pushed aside in favor of chat. VTC was seen as a good tool for a very narrow range of high level communication among senior officers. Within CTF-50 itself, however, VTC was viewed as something with little bang for the buck. In line with TTM, too much time, expense and bandwidth were required to gain marginal returns. The simple and effective tool often trumps the more complex one.

Developing Trust

The research findings at CTF-50 were very much in line with the expectations set by media richness, social presence and channel expansion theories. Again and again, the researchers found that chat emerged as the primary mode of communication for developing immediacy and comradeship. These running dialogs helped to build the common situation awareness required for NCW operations. The users learned to expand the chat channel by communicating more explicitly and frequently about issues. Additionally, the "lurkers", those who just monitored chat rooms, were able to stay abreast of happenings throughout the task force. A frequent complaint about chat was when your lost connectivity you lost the text or when you just come into a chat you do not see the history.

Another mode of electronic communication that was instrumental in the success of CTF-50 was KWeb, the fleet's web intranet. As was outlined above, the task force commander made an early commitment to the extensive use of KWeb. What is more, the CTF-50 commander constantly enforced this commitment through some subtle and not so subtle actions. For example, the researchers found that one of the keys to the successful use of KWeb was the insistence of the admiral on making it his central mode for gaining situation awareness.

Typically, in high-level naval commands the presentation software PowerPoint is king. Staff officers succeed or fail on their ability to put together and brief from electronic viewgraph presentations. They spend much of their duty day gathering and formatting information for presentation the next day at the commander's morning brief. The commander of CTF-50 fundamentally changed the way that his staff worked by breaking with this convention.

He, and his chief of staff, felt that the staff was expending too much effort in creating these briefs and making the information "pretty". Additionally, he felt that the information was often not the most current and that the effort put into making briefing viewgraphs was often wasted, as they were not used by anyone after the brief.

In response, the staff was instructed to completely abandon traditional viewgraph presentations (MacKrell, 2003). Instead, they would be expected to maintain current web pages that they could then brief from. The admiral believed that this would not only cut down on the staff's workload of building disposable briefs, but would also give the fleet an invaluable tool for situation awareness. The N2 stated she now had a deputy that could perform valuable work other than creating daily PowerPoint briefs for the boss. Staff officers' web pages were updated incrementally as new information arrived. As such, the best information was readily found on the KWeb. There was no need to call the Intel

officer and ask what was happening, one could simply go to the web page and see the most recent developments. MacKrell stated that she did not create a PowerPoint brief the entire deployment.

The commander and senior staff officers would then update their situation awareness prior to meetings by reading through the fifteen major KWeb pages. They were so confident in their situation awareness that they dispensed with the actual informational briefs and instead used the meeting to discuss problem areas and brainstorm solutions. There was consensus among the officers interviewed that the staff was freed to do more proactive planning and less reacting to emergencies. Ad hoc planning meetings often occurred around the ship after a thirty minute morning brief (traditional morning briefs are usually one to two hours). These ad hoc briefs were supported by accurate information on KWeb at any computer terminal on the ship.

Changes in Work Norms

Previously, information was not circulated as widely because the formats, media and transportation of information were unwieldy and inefficient. The KWeb significantly lowered the barriers to widely sharing information. Staff officers and enlisted personnel simply put the work they would have spent on PowerPoint shows into maintaining their web pages. Because these were automatically shared, the staff as a whole became better informed and more responsive as previously narrowly distributed information was made available to everyone. The chief of staff even found that watch standers were studying the KWeb out of curiosity and a desire to understand the operation.

After a time, other important secondary benefits to KWeb were found. Although the staff did not recognize it immediately, they found that the development of trust within the task force had changed. Prior to NCW capabilities the staff had developed working relationships through the aforementioned personal networks, now people were creating close working ties through chat and monitoring KWeb pages. The constant updating of available information allowed widely distributed users to feel that they had the best information available. Thus, the users were able to trust that supporting warfighters "had their six" and were able to focus on being effectively doing their job.

The measure of success among the staff became how good and current your web page was in KWeb. In effect, the staff found that one could trust a person who was diligent in putting out quality information for the group. The admiral reinforced this new means for gaining status by giving public recognition to the best information providers. At first, the concern was that people would hoard their information; soon the opposite was true and staff members were actually competing to share more and better information with the staff.

The CARGRU3 staff also found advantage in being able to pull what they found important from different KWeb pages rather than relying on the old information push to which was the custom prior to KWeb. This allowed the information providers to do less information filtering. The users preferred unfiltered information because they could find out where on the KWeb site to find specific information required for their mission. Staff members no longer had to wade through large briefs to glean the nuggets they needed.

The staff even tagged this concept with the name "smart pull."

Another benefit was gained through an elimination of duplication of effort. Case in point, in most commands the JAG officer will work with the commander to develop rules of engagement (ROE) to govern the use of force in the battlespace. On the carrier each squadron then sends some savvy junior officer to get this guidance and boil it down into a simplified ROE card that can be carried into the cockpit and easily referenced. One of the problems of such a system is that each squadron would have different short versions of the ROE distributed to their pilots and that each of them might have subtle errors that could cause serious problems. In CTF-50, the JAG officer made up both long and short versions that could be downloaded. This eliminated extra work and the potential for error. Everyone got exactly the same standardized KWeb product and there was much less radio chatter such as "say again your last, over."

Originally, many on the staff were fearful that the KWeb would just add work rather than make them more efficient. The exact opposite was true. The commander made a point that he did not expect perfection on the KWeb. Formats were intentionally kept simple and trivial errors (e.g., spelling) were ignored. The admiral was well aware that a common mistake of staff officers is to be too conservative and play it safe in an effort to avoid getting in trouble. In response, he told everyone that he wanted people to give their best information estimates on KWeb and that no one would get their head cut off for making a mistake. Drafts documents were allowed and the petty officers were given the authority to publish on their own without having their work vetted through several layers of superiors.

As the KWeb became ingrained in the task force, this effort to streamline paid off handsomely. The staff was able to make battle plans with more accurate, rather than more cautious, estimates. The command made it safe, even desirable, to be both an information provider and consumer. It even gave rise to some long overdue social changes.

Cultural Shifts

The researchers have noted previously that when at sea naval staff officers and NCOs work very long hours. The Navy's culture is ingrained with saying such as, "You can sleep when you're dead." KWeb and the other automation efforts within CTF-50 allowed the command to begin chipping away at these dubious beliefs.

The admiral set the tone by giving permission for staff members to sleep and have time to wind down without guilt. Because staff members would update KWeb pages, CommandNet logs and chat rooms throughout the day, they were not tied so strongly to a single schedule of events. Additionally, the staff was convinced that these tools had greater effects with less work. To drive home the message, Admiral Zelibor held a very public card game every night. By seeing him have some regular recreation with his senior officers they were then freed to do the same when their work loads permitted. The senior staff felt that this made the staff more effective since they were able to more easily shift gears when true emergencies surfaced.

There were even gains realized by the world outside of the task force. According to the interviewees, normally a strike group staff spends a great deal of time responding to

information requests from fleet and theater commands. In CTF-50 the staff was given direct orders to avoid tracking down information requests. Instead, they were told to simply direct the requestor to the appropriate KWeb page so that he could get the best available information from the network. As the admiral stated, "We just new it was different and so powerful. Where we knew it was powerful is that if we didn't update, we got calls from around the globe." After the deployment they even found out that the FBI had been accessing the task force's Intel page. The staff appreciated the freedom from distraction. As the admiral stated, "We were in the middle of a war, and we weren't getting any calls (from Washington or higher headquarters)."

Potential Hazards

There are, of course, potential pitfalls to striking out on the course CTF-50 took. First off, it is no accident that this experiment succeeded with this commander. In the case study interviews staff members often mentioned without prompting that RADM Zelibor is a unique flag officer. On the whole they felt that most naval commanders of his generation did not possess the command style that would allow for this level of decentralized decision making. Admiral Zelibor was quite candid in admitting that he was ready to immediately quit using KWeb if the tool did not pay improvements to the staff, but that he had great trust in their abilities. He was willing to give up some personal control to realize the benefits of NCW. In the intervening time, no carrier strike group commander has moved the bar higher and many have settled for far less networked forces.

Security is another prospective problem that one can associate with NCW operations. By lowering the barriers to gaining information, the force also opens up new opportunities for those that might breach the system either on purpose or inadvertently. A wealth of information was available on the KWeb and CommandNet systems to anyone with SIPRNET access. There is a fine line between an officer exercising a bona fide need to know and nosing around. On the one hand, NCW dictates that information should be readily available. This high degree of freedom does, however, require greater responsibility and discretion on the part of information producers and consumers in the absence of other checks and balances.

Associated to the security issue is that of visibility. The CTF-50 commander took a great professional risk by opening up his command to outside scrutiny. By allowing the world to see his command's "dirty laundry" he went against human nature and the military culture. One visiting Air Force general was shocked that he was able to drill down into the KWeb pages and find weapons status information. He expressed a common fear that such transparency would enable 5th Fleet and Central Command the ability to micromanage the task force. Instead, the greater levels of information made the higher commands more trusting. It seemed to reinforce Admiral Zelibor's mantra, "A smarter more informed boss makes life a whole lot easier."

Implications

This case study identifies and ties together many different sociological and technological theories. Ultimately, through a better understanding of what makes up a successful collaborative environment the researchers hope to facilitate the push towards more

effective and efficient network centric operations. Such understanding has profound implications for the United States, coalition partners, and even potential adversaries. One of the big criticisms of NCW is that it costs too much in terms of hardware, software and training to be widely implemented by coalition forces that have only a fraction of the United States' defense information technology budget.

This work, however, begins to show that beyond the core robust, widely-distributed networks, the applications that drive NCW can be rather simple. The "have-nots" are able to participate by leveraging their strengths while profiting from the information generated and shared from wider high-tech sensor grid. For instance, in the case of CTF-50, the Martine Interdiction Operations (MIO) operations in the Arabian Gulf, hundreds of miles away, were made possible because the task force was able to make the operations transparent throughout the fleet. The bulk of the task force was able to devote efforts to strike missions in Afghanistan while the MIO force operated with a great deal of autonomy farther north. The collaborative tools allowed the CTF-50 commander to stay closely abreast of the MIO operations while providing occasional guidance. The MIO forces, on the other hand, understood the commander's intent and the disposition of the task force, which allowed them to complete their mission with a greater degree of independence. This was primarily accomplished through constant updates over simple tools - chat, web pages and an electronic log.

This may also help to focus the procurement and fielding of systems within U.S. forces. There seems to be a search for some holy grail of collaboration that has driven billions of dollars of research, development and acquisition. Many of these efforts have fallen flat. They often demand ever greater levels of bandwidth, maintenance, and training and have not generated the expected return on investment.

The CMI researchers' experience, nonetheless, suggests that much of this could be avoided through a more focused understanding of NCW requirements and human nature. First, no system is going to be useful if it is not used. As per the Technology Transition Model, CTF-50 users adopted and used the KWeb and other tools because (1) they were simple, (2) provided value, and (3) there was high frequency of use. Information systems which provided NCW capabilities have been shown to be a critical "weapons systems". Decision makers must recognize this and authorize training and spending accordingly.

The commander set the expectation that these tools would be the primary method for exchanging information. To back this up and remove redundancy and confusion, he deemphasized other modes of communication. The users realized that they would be using these systems tens, if not hundreds, of times each day. Thus, they were willing to put forth the cognitive effort to learn how they worked. As participants were drawn into use, they began to find that value increased as the number of users grew and the amount of information increased.

As a consequence, users found value both in contributing to the system and learning how the information space was structured. Many so-called collaborative systems provide little value for the lowest level contributors. All of the value is focused at senior leaders while the rank and file "feed the beast." By creating a system with value for all users there is a greater sense of ownership and commitment.

Social Domain Insights and Recommendations

Gaining practical and applicable lessons from a case study such as this can be daunting for the reader. In response, the researchers kept this in mind. Throughout the course of the research the team worked to distill simple and pertinent lessons that could be applied by leaders in an NCW environment. Following are some of the observations and associated recommendations that the researchers believe may make NCW transformation and implementation more successful.

Observation: Systems that provided value up and down the chain of command were used extensively. KWeb worked at CTF-50 in large part because the users at all levels derived real value from the system. It was not just a reporting system for senior leaders.

Recommendation: Field systems that benefit more than just the senior leadership. Those that are perceived as only benefiting a few are resisted by the many.

Observation: Frequency of Use is key to both adoption of tools and establishing communities of trust.

Recommendation: Select and put into action systems that require regular interaction from contributors and consumers. By forcing regular interaction through NCW systems leaders can foster effective virtual teams.

Observation: Cheap and Simple Tools can be very effective if a common structure is enforced. KWeb was, in reality, a fairly simple web authoring system. Much of its power lay in a predictable and useful organization that provided a common organizational memory.

Recommendation: Put less emphasis on searching for "holy grail" systems and field simple ones now.

Observation: NCW need not create more work. By relying on incrementally updated web pages and logs, the CTF-50 staff was able to eliminate a great deal of outmoded message traffic, PowerPoint shows, and the associated work.

Recommendation: Emphasize the desired communication channels and eliminate redundant communications.

Observation: Waiting for perfection has costs. By letting petty officers post their own information the command bet that the faster access to information would be more valuable than old information that had been verified by the chain of command.

Recommendation: Take calculated risks – a best guess today is often better than a perfect answer next week.

Observation: Engaged people will innovate. In accordance with Channel Expansion Theory, the people at CTF-50 were able to leverage their experience with NCW tools and make the whole system more valuable.

Recommendation: Let people experiment with NCW tools to find new and valuable uses.

Future Directions

This case study is of significant value in the investigation of NCW theory and practice in that it is one of the first studies of a staff at the operational level of war. Additionally, it looks into the specific case of naval warfare.

The CTF-50 staff did not realize they were breaking ground when they started the move into NCW systems and practices. Instead, the staff were just looking to implement tools that would be effective while cutting workloads. They did, nonetheless, create a self-sustaining system for situation awareness support that proved itself in actual combat operations.

Although this case study proved to be fruitful it does have many of the shortcomings associated with qualitative research. First, this study is missing much of the qualitative data that would help to confirm the efficacy and efficiency of NCW in a fleet staff. For instance, the case study is lacking "hard" data such as server logs and message counts.

In response to these shortcomings, the researchers feel that the best avenue for future work should be in doing a more comprehensive study with one or more carrier strike groups. Since there is no directive at the fleet or "Big Navy" level to use any of the collaborative tools, there is a possibility to study both a control carrier group and one augmented with NCW tools. This would provide an effective comparison that would go a long way towards helping to isolate the specific attributes of NCW in the fleet, which could in turn offer hard lessons for military leaders and technologists.

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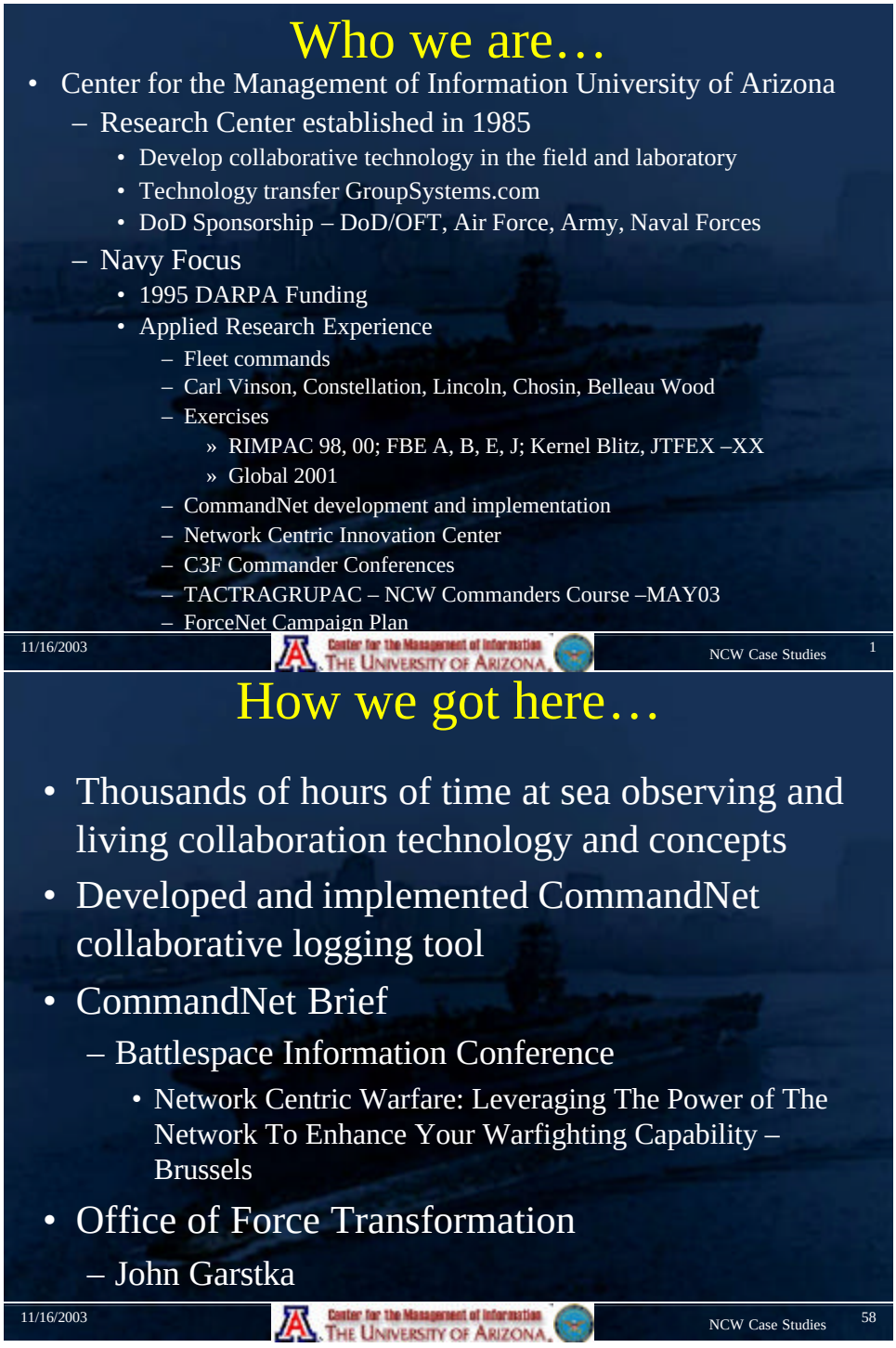
Appendix A

Interview Pre-brief



What we need…

- An "End to End" story of how NCW capabilities enable self-sychronization, speed of command & mission effectiveness
- Verifiable evidence of NCW capabilities enabling self-synchronization, speed of command, and mission effectiveness
  - Types of evidence – Indirect and Direct
    - Outcome evaluations
    - Observational studies
    - Systematic Reviews – Archival data
    - Experiments
- A case study illustrates NCW concepts and increases understanding

Appendix B

Example Record Message

R 011200Z JUL 03 ZYB PSN 127252H19

FM COMNAVSURFOR SAN DIEGO CA//N00//

TO SWOLANTPAC

INFO CNO WASHINGTON DC//N76//

COMNAVSURFLANT NORFOLK VA//N00//

COMNAVPERSCOM MILLINGTON TN//PERS41/PERS412//

BT

UNCLAS //N00000//

THIS IS AN UNNUMBERED SWOLANTPAC

MSGID/GENADMIN/COMNAVSURFOR//

SUBJ/FY 2004 SWO MBA PROGRAM ANNOUNCEMENT//

REF/A/GENADMIN/CNO WASHINGTON DC/182000ZNOV2002//

AMPN/NAVADMIN 385/02 - GRADUATE EDUCATION VOUCHER (GEV) PROGRAM//

POC/SUNVOLD/LCDR/PERS412A/TEL: 901-874-3485/DSN: 882-3485/

FAX: 901-874-2687/EMAIL: DANIEL.SUNVOLD@NAVY.MIL//

RMKS/1. EXECUTIVE SUMMARY: THE SURFACE WARFARE COMMUNITY CONTINUES ITS COMMITMENT TO PROVIDING AN EXPANSIVE ARRAY OF GRADUATE EDUCATION OPPORTUNITIES IN THE NAVY. IN FISCAL YEAR 2004, WE WILL SEND THREE OF OUR COMMUNITY'S TOP JUNIOR OFFICERS TO PURSUE GEV-FUNDED, FULL-TIME STUDIES IN BUSINESS ADMINISTRATION AT ONE OF THE NATION'S TOP BUSINESS SCHOOLS (HARVARD, WHARTON, AND KELLOGG) WHILE RECEIVING FULL PAY, ALLOWANCES, AND BENEFITS. THE INTENT OF THIS PROGRAM IS TO EXPOSE SELECTED OFFICERS TO THE TYPES OF REVOLUTIONARY FISCAL AND MANAGEMENT PRACTICES THAT WILL BE ESSENTIAL TO OPERATE OUR 21ST CENTURY NAVY.

2. ELIGIBILITY: TOP-NOTCH SURFACE WARFARE JUNIOR OFFICERS (O-2 AND

0-3) WHO ARE ELIGIBLE FOR THEIR FIRST SHORE TOUR, AS WELL AS THOSE JUNIOR OFFICERS SERVING IN THEIR FIRST SHORE TOUR ARE ELIGIBLE. SELECTION WILL BE BASED PRIMARILY ON DOCUMENTED PERFORMANCE AT-SEA WITH CONSIDERATION GIVEN TO UNDERGRADUATE ACADEMIC RECORDS AND GMAT SCORES. SINCE ADMISSION TO THESE THREE UNIVERSITIES IS EXTREMELY COMPETITIVE, ONLY THOSE OFFICERS WITH STRONG UNDERGRADUATE RECORDS NEED APPLY. OFFICERS WHO ALREADY HAVE A GRADUATE DEGREE FUNDED USING ANY DOD ASSISTANCE OR VETERAN'S EDUCATION BENEFITS ARE NOT ELIGIBLE. OFFICERS ELECTING TO PARTICIPATE IN THIS PROGRAM SHOULD PLAN TO COMPLETE THE TWO-YEAR MBA COURSE OF STUDY IN TIME TO BEGIN DEPARTMENT HEAD SCHOOL BY THE 7.5 YEAR POINT OF THEIR CAREERS. ADDITIONALLY, OFFICERS MUST APPLY FOR AND ACCEPT SURFACE WARFARE OFFICER CONTINUATION PAY (SWOCP) BEFORE ORDERS WILL BE RELEASED.

3. PROGRAM SPECIFICS: OFFICERS PURSUING FULL-TIME STUDIES WILL DO SO WHILE ASSIGNED FOR ADMINISTRATIVE PURPOSES TO THE RESPECTIVE NROTC UNIT ASSOCIATED WITH THE UNIVERSITIES OUTLINED ABOVE. THEY WILL NOT, HOWEVER, BE ASSIGNED ANY OTHER DUTIES. GRADUATE EDUCATION VOUCHER (GEV) FUNDING WILL BE USED TO SUPPORT STUDIES AT THEIR SELECTED SCHOOLS. ONCE SELECTED TO PARTICIPATE IN THE PROGRAM, ACCEPTANCE INTO THE RESPECTIVE GRADUATE EDUCATION PROGRAMS IS THE OFFICER'S RESPONSIBILITY. BASED ON APPLICATION DEADLINES OF THE PARTICIPATING UNIVERSITIES, EXPECT ORDERS TO BE RELEASED IN THE SPRING 2003 TIMEFRAME. ONCE SELECTED, OFFICERS WILL BE ENTITLED TO UP TO 20,000 DOLLARS/YEAR FOR GRADUATE STUDIES UNDER THE AUSPICES OF THE GRADUATE EDUCATION VOUCHER PROGRAM (GEV) OUTLINED REF A. COSTS EXCEEDING 20,000 DOLLARS/YEAR WILL BE PAID BY THE OFFICER.

4. OFFICERS PARTICIPATING IN THIS PROGRAM SHALL AGREE TO REMAIN ON ACTIVE DUTY FOLLOWING COMPLETION OF GRADUATE STUDIES (OR AFTER DISENROLLING FROM THE PROGRAM IF BENEFITS WERE USED) FOR A PERIOD OF UP TO THREE TIMES THE NUMBER OF MONTHS OF EDUCATION COMPLETED UP TO A MAXIMUM OBLIGATION OF 36 MONTHS. THIS OBLIGATION IS DISCHARGED CONCURRENTLY WITH SWOCP REQUIREMENTS, AS WELL AS ANY OTHER SERVICE OBLIGATION ALREADY INCURRED. THIS AGREEMENT DOES NOT OBLIGATE THE NAVY TO RETAIN THE OFFICER ON ACTIVE DUTY. IF AN OFFICER FAILS TO COMPLETE THE PERIOD OF ACTIVE DUTY SPECIFIED IN THE AGREEMENT, AT THE SOLE DISCRETION OF THE SECRETARY OF THE NAVY, SUCH OFFICER WILL REIMBURSE THE UNITED STATES GOVERNMENT FOR COST OF THE ADVANCED EDUCATION RECEIVED, PRORATED FOR THE OBLIGATED TIME SERVED.

5. JUNIOR OFFICERS DESIRING TO APPLY FOR THIS PROGRAM SHOULD SUBMIT A WRITTEN REQUEST TO COMMANDER, NAVY PERSONNEL COMMAND (PERS-412) USING THE FORMAT BELOW. APPLICATION DEADLINE FOR PROGRAM SELECTION IS 05 SEPTEMBER 2003. NOTE THE REQUIREMENT FOR GMAT SCORES AS PART OF THE APPLICATION PACKAGE. OFFICERS UNABLE TO COMPLETE GMAT DUE TO DEPLOYMENT SCHEDULE SHOULD CONTACT POC TO COORDINATE ALTERNATIVES. FOR SHIPS AT SEA, APPLICATIONS VIA NAVAL MESSAGE CONTAINING THE REQUISITE INFORMATION WILL BE ACCEPTED. PERS-412 WILL COLLATE REQUESTS FOR THE PROGRAM, REVIEW APPLICANT PERFORMANCE RECORDS AND PROPOSE A SLATE OF THREE PRIMARY AND FIVE ALTERNATE NOMINEES TO COMNAVSURFOR FOR FINAL SELECTION. SELECTEES WILL BE NOTIFIED BY THEIR DETAILER NLT 26 SEPTEMBER 2003.

6. FOR OFFICERS INTERESTED IN THE WHARTON BUSINESS SCHOOL, APPLICATIONS SHOULD BE SENT VIA PERS-41 VICE DIRECTLY TO THE WHARTON SCHOOL. A PRIMARY WILL BE SELECTED AND THE REMAINING APPLICATIONS WILL BE SENT AS RANKED ALTERNATE CANDIDATES. FULL APPLICATION PACKAGES SHOULD BE RECEIVED AT BUPERS NLT 03 OCTOBER 2003. ALL REQUIREMENTS IN PARA 5 STILL APPLY, HOWEVER, CANDIDATES NEED NOT WAIT FOR THE FINAL SELECTION ANNOUNCEMENT PRIOR TO SENDING APPLICATIONS. THIS REQUIREMENT IS PART OF A PILOT AGREEMENT BETWEEN WHARTON AND THE SWO COMMUNITY. ACCEPTANCE AT WHARTON WILL STILL BE BASED ON THE APPLICATION AS A WHOLE WITH NO GUARANTEE OF ACCEPTANCE.

7. SUBMIT REQUESTS USING THE FOLLOWING FORMAT:

FROM: (GRADE, FULL NAME, SSN/DESIGNATOR)

TO: COMMANDER, NAVY PERSONNEL COMMAND (PERS 412)

VIA: COMMANDING OFFICER

SUBJ: 2004 SWO MBA PROGRAM APPLICATION

REF: (A) THIS MSG

1. I REQUEST SELECTION FOR THE SURFACE WARFARE MBA

PROGRAM. I MEET ALL THE ELIGIBILITY REQUIREMENTS AS SPECIFIED IN REFERENCE A. MY PRD IS (DATE) AND I AM INTERESTED IN PURSUING GRADUATE STUDIES AT (SCHOOL). I DO NOT HOLD A GRADUATE DEGREE FUNDED WITH ANY DOD ASSISTANCE OR VETERAN'S EDUCATION BENEFITS.

2. ADDITIONAL INFORMATION/JUSTIFICATION.

3. MY GMAT OVERALL SCORE WAS

4. I UNDERSTAND THAT IF SELECTED FOR THIS PROGRAM I SHALL REMAIN ON ACTIVE DUTY FOLLOWING COMPLETION OF THE PROGRAM (OR AFTER DISENROLLING FROM THE PROGRAM IF BENEFITS WERE USED), FOR A PERIOD EQUAL TO THREE TIMES THE NUMBER OF MONTHS OF EDUCATION COMPLETED UP TO A MAXIMUM OBLIGATION OF 36 MONTHS. THIS OBLIGATION IS DISCHARGED CONCURRENTLY WITH ANY OTHER SERVICE OBLIGATION I MAY ALREADY HAVE INCURRED. THIS AGREEMENT DOES NOT OBLIGATE THE NAVY TO RETAIN ME ON ACTIVE DUTY. ADDITIONALLY, I UNDERSTAND I MUST APPLY FOR AND ACCEPT SURFACE WARFARE OFFICER CONTINUATION PAY (SWOCP) PRIOR TO RECEIVING ORDERS TO PARTICIPATE IN THIS PROGRAM. I CAN BE CONTACTED AT (HOME/WORK MAILING ADDRESS, HOME/WORK PHONE NUMBER, E-MAIL)

8. PERS-41 POC FOR THIS PROGRAM IS LCDR DAN SUNVOLD (POC INFO ABOVE).//

BT