Army Digital Systems Complexity

A Monograph

by

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This monograph examines the complexity of the Army's current digital systems. Currently the Army has an ever growing number of digital systems. These digital systems are supposedly designed to increase our Soldiers' efficiency and ability to command and control in a complex combat environment. The opposite can be argued in this paper.

Designing a method for establishing the needed changes in the digital systems architecture for the Army is complex. The requirements articulated by the Army and the branches within the Army are not holistic in nature. The organizations that make the decisions and develop requirements for the digital systems are numerous and have competing ideas of what the digital solution should look like in the 21st century.

The procurement and acquisition process is the underlying foundation by which we develop and purchase these digital systems. This procurement and acquisition process is a bloated and an outdated bureaucratic remnant of the industrial era. In order to gain the best that the digital era has to offer we must design a new and more resilient procurement and acquisition process

The U.S. Congress has a significant responsibility to pass laws and make worthwhile reforms in our acquisition system. The solution for designing and procuring digital systems in the 21st century should be codified through the Congress and understood by the American people.

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Abstract

ARMY DIGITAL SYSTEMS COMPLEXITY by MAJ Kevin R. Lynch, USA, 48 pages.

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Introduction

The premise of this monograph is to examine the Army's current crisis with regard to the number and functionality of the digital command and control systems. The current concept of the state of military affairs within the United States Army is that technology will be a force multiplier, an overall budget reducer, and provides an all seeing eye that will leverage technology in lieu of Soldiers on the ground potentially in harms way. Some, within the U.S. military, believe that too many systems exist, and that the U.S. is not focused on a minimal, simple, and converged set of digital tools that will provide the requirements to the war fighter from platoon through corps level. These current technologies and computing changes in society and the military are an Internet based communications evolution. How will the military forces of the United States cope with this transformation and more importantly what should it look like in the future? "The current state of Army digitization is immature and not uniformly delivering the promised capability to justify the current changes in the force structure. Despite great expenditures and effort, the current state of the digital "system-of-systems" and employment concepts makes clear the price of transformation to "accept risk in the near and mid-term, causing turbulence and unexpected change . . . [while] freeing up sufficient resources for the Army to invest in new technologies that will enhance its war-fighting effectiveness in the future."[1]

Some, in the military, believe a common sense approach to leveraging technology is not occurring. If that is the case, then how will the United States harness this emerging digital technology for the current fight and the 21st century? Many misunderstandings with regard to what the digital systems capabilities are will be described and the lack of interoperability will be evident. Regardless of how the systems integrate, these programs will remain in place and continue to multiply or morph into some other complex adaptation of digitized improvements.

[1]Christopher J. Toomey, "Army Digitization: Making it Ready for Prime Time," *Parameters* (Winter 2003-2004): 40.

These are, in fact, only band-aids to an ailing digital system. The other systems issues examined will be the financial burdens and the time and energy required to implement and make changes to these systems. The required software updates, extensive re-training, the constant overselling of the products, and the real "on the ground" reality of the systems is an organizational distracter and an overstatement of the facts. The ability to make changes in the systems or lack of changes in the systems is a consistent theme in chapter two.

What the systems can or cannot do will illuminate the current state of how the systems are supposed to operate within a network-centric environment. This section will also examine how each system functions, its designed purpose, and how it interoperates with the other digital systems. The discussion on the merits and prudence of embracing network-centric warfare continues as a great debate both within the Army and across the Department of Defense. Yet, regardless of its merits, it is safe to say that network-centric warfare, a term with a constantly evolving definition, but one firmly rooted in the concept of horizontal and vertical information-sharing using advanced information technology, is the chosen path for the transformation of the United States military, and the Army is incorporating its concepts. With network-centric warfare, the Army is shifting power away from an industrial-age focus on mass toward access and flow of information as an essential element of combat power.[2]

The United States Army is consistently updating its hardware and software. The digital systems are in a never-ending improvement cycle. The cost to the unit in time, training, and planning is not efficient. The overall intent of designing systems is to increase efficiency. Does having all these systems really make life more efficient? This clearly has a great impact on the units that require these systems. The training time to understand how the system works and the best use practices will dominate many training weeks. The training cycle will never seem to end simply due to the fact that the systems need constant updating. The current number of systems

[2]Ibid., 42.

within the force is expanding in short order. Why does one need a separate system for each specific battlefield functional area within staff elements?

Some, within the military, believe that the rules, regulations, and real world dynamics of acquiring and procuring these digital systems are inefficient.[3] This section will examine some of these dynamics of purchasing. Many of these rules are codified in laws that are mandated by Congress. The concern is whether these rules for procurement are overly complicating the mission to attain the best digital systems for the military. Additionally, the money generated by these defense contracts has significant economic impacts. These economic impacts are real and cannot be assumed away. Whether or not the defense industry gains or loses contracts may have a direct impact on many local economies, which can impact those in power.[4] Defense contractors also have a long-term vested interest in maintaining the operational, maintenance, and training contracts of these digital systems. These defense contractors also have a vested interest in not making the systems any simpler. The simpler the digital systems, the less the military needs to rely on the defense contractors. The required maintenance demanded for these systems can be significant. These defense contracts are worth many millions of dollars; this is a reality that needs to be considered when understanding the ways in which we procure.

The future of the nation is of paramount concern when one contemplates the future of warfare in the 21st century. A clear example of not understanding the importance of gaining the initiative in technology is Al Qaeda's (AQ) dominance of the Internet. By AQ gaining the upper hand in leveraging this technology against this country, the US is not keeping up in a very dynamic, asymmetric environment. The United States tends to default to Newtonian age rules of understanding complex issues and dynamics. The enemy, many of whom are living in caves and mud huts, are engaging in 21st century warfare. The United States, and its governmental

[3]Ivan Eland, "Reforming a Defense Industry Rife with Socialism, Industrial Policy, and Excessive Regulations," *CATO Policy Analysis*, No 421 (20 December 2001): Executive Summary, 1.

[4]Ibid, 2

bureaucracy, is still fighting an industrial age concept of warfare. It can be argued that the military and certain civilian agencies are engaged in 21st century warfare. The U.S. government is unfortunately procuring digital systems with an outdated 19th century acquisition paradigm. The ability to procure the right, or at least more right than wrong, digital systems must be corrected. This lack of understanding of future warfare and how the U.S. enemies will leverage our own weaknesses against the nation and people must be understood. A significant weakness for this country can be its self imposed rules in our bureaucratic methods and our inability to change more rapidly. As a nation and military, one must incorporate all available avenues to ensure one has the best and simplest digital systems for the U.S. warfighters.

Military Digital Command and Control

> The goal of Army operations will be to simultaneously attack critical targets throughout the area of operations by rapid maneuver in multiple dimensions and precision fires . . . . Improvements in situational understanding will facilitate extremely rapid, non-contiguous decentralized operations
>
> FM-1, *The Army*

The terms Newtonian and Quantum are used in the preceding section and these terms have significant importance when considering how we view our environment. The term Newtonian is used to describe a linear, deterministic, cause and effect understanding of the environment. The term Quantum is used to describe a chaotic, in-deterministic and less predictable environment. The use of these two terms is also relevant when explaining the shift from an industrial society to an information society.[5]

As societies change, so does the way in which the U.S. fights wars. The most stunning development in the past fifty years is the emergence of computers and the ability to pass information in the form of voice, data, and pictures. The change in technology from an industrial

[5]John F. Schmitt, "Command and (Out of) Control: The Military Implications of Complexity Theory," http://www.ndu.edu/inss/books/books%20-%201998/Complexity,%20Global%20Politics%20and%20Nat'l%20Sec%20-%20Sept%2098/ch09.html (accessed 12 May 2008).

based Newtonian mechanistic infrastructure that relied on massive investment and a large-scale requirement for resources was a hallmark of World War II. The ability of a nation to fight and sustain wars in the past was often determined by how it mobilized its industrial capacity. A change is taking place with regards to how wars can be fought using less industrialization. The current computer and communications era has become symbolic of a mobile and more knowledgeable global society. This ability to send and receive information at the push of a button is changing the way people think and act. No longer do the traditional institutions maintain the same prestige or the ability to control knowledge. This change in society has produced a Quantum paradigm where the horizontal and vertical lines are disappearing and cellular networks and relationships are emerging. While the United States Army has recognized the power of such technology, they have been slower in realizing the impact on what is changing in our society. With the increase in these technologies throughout the globe and within our own culture a Quantum world is rising and our comfortable Newtonian world is shrinking. The U.S. Government has spent and allocated billions of dollars to develop these technologies using Newtonian methods of command and control and ignored the more chaotic elements of a Quantum world, where they now find themselves.

The Army is committed to developing a force that leverages digital technology. The Force XXI project began in the 1990s. “A large step toward Information Age war-fighting was completed in March at the Army’s National Training Center (NTC), Fort Irwin, California. The Army’s Experimental Force (EXFOR)-the world’s first digitized ground force, the 1st Brigade, 4th Infantry Division (Mechanized)-deployed to the harsh conditions of the Mojave Desert at Ft. Irwin for an intensive, realistic war-fighting exercise against the NTC’s vaunted Opposing Force (OPFOR), the 11th Armored Cavalry Regiment. The exercise was the culminating event of the TF XXI Advanced Warfighting Experiment (AWE)-a key part of the Army’s Force XXI process of continuous experimentation and transformation which will result in Army XXI-the digitized

force for the 21st Century."[6] The 4th Infantry Division was selected as one of the first units to cross into Iraq during Operation Iraqi Freedom (OIF). However this did not occur as scheduled due to a breakdown in diplomatic efforts with Turkey. The 4th Infantry Division did eventually make it into Iraq and was instrumental in capturing Saddam Hussein.

This effort at leveraging new technologies is a historic part of the U.S. Army's way to increase capabilities. The latest endeavor to design a better way to command and control forces on the battlefield is through the use of the digital tools in today's society. This means that we, as a military force, need to understand the dynamic changes in our society beyond the fence line of our institutions. The military purpose of "command and control is the exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of a mission."[7] This process would dictate the maneuver of Soldiers on the battlefield. The advent of communications technology and digital systems to aid in that effort of maneuver has in many ways transformed the battlefield of the 20th century to the 21st century. This transformation, from mechanistic Newtonian warfare to an asymmetric Quantum paradigm of warfare, has required a more rapid understanding of the dynamics of the battlefield and what information means in regards to understanding. With continued advances in technology, the question is how will the military embrace and leverage this technology in the current Global War on Terror? Further, how will we advance into the 21st century understanding many of our short comings over the past five years? By relying on digital systems to gain a better understanding of our enemies' actions, we can mitigate some potential dangers. However, that means time spent understanding the enemy and synthesizing the knowledge we gain from these digital systems, it

[6]Mark Harmon, "Task Force XXI: The Army's Digital Experiment," *National Defense University Strategic Forum* no. 119 (July 1997), http://www.ndu.edu/inss/Strforum/SF119/forum119.html (accessed 10 May 2008).

[7]Department of the Army, Field Manual (FM) 3.0, *Operations* (Washington, DC: Government Printing Office 2008), 5-1.

does not mean spending an inordinate amount of time and energy learning how to use the systems.

The Net-Centric Environment-Why Digitalize the Force?

> The general unreliability of all information presents a special problem: all action takes place, so to speak, in a kind of twilight . . . like fog. War is the realm of uncertainty; three quarters of the factors on which action in war is based are wrapped in a fog of greater or lesser uncertainty. . . . The commander must work in a medium which his eyes cannot see, which his best deductive power cannot always fathom; and which, because of constant changes, he can rarely be familiar.
>
> Carl von Clausewitz, *On War*

"The Net-Centric Environment is a framework for full human and technical connectivity and interoperability that allows all DOD users and mission partners to share the information they need, when they need it, in a form they can understand and act on with confidence, and protect information from those who should not have it."[8]

Throughout history, military leaders have recognized that information is a key to victory. The more one knows about his enemy the better prepared he can be. But what is knowledge without understanding? So, commanders must not simply know some piece of information, they must understand what that information means and how to use that information against the enemy. "In order to gain this understanding of knowledge, you must understand the three distinct domains: the physical domain consisting of the natural environments in which the senses are dominant, the information domain consisting of data, information systems, and documented knowledge, and the cognitive domain which consists of situational awareness, assessment and understanding."[9]

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[8]Department of Defense, *Net Centric Environment: Joint Functional Concept* v 1 (Washington, DC: Government Printing Office, 2005), v.

[9]James L. Conatser and Vincent E. Grizio, "FBCB2, A Case Study in Accelerated Acquisition of Digital Command and Control System During Operation Enduring Freedom and Iraqi Freedom" (Research Project, Naval Postgraduate School, Monterey, California, 2005), 3.

It is any military commander's responsibility to gain a better understanding of both the friendly and enemy situation. By taking advantage of the current technology improvements in the recent years, one can gain a better understanding of the environment in which we fight. We can also leverage technology to do more with less; fewer dollars are needed to maintain a digital system or computer than to pay for a lifetime of benefits for Soldiers.[10] This concept in cost benefit analysis is what defense contractors and those wishing to maintain fewer uniformed personnel often tout as financially prudent and cost efficient for those elected officials charged with saving tax payer dollars.

While the reason for gaining a clearer understanding of the environment is certainly legitimate, the ways and methods in which we as a government proceed are often flawed. It can be argued that the Army has too many systems that provide the same or nearly the same capability with different user interfaces and different contractors with proprietary software programs that do not interface and integrate well. This is a significant vulnerability given the current conflicts in Iraq and Afghanistan.

Why Are the Systems so Complex?

What Are the Systems-A Description?

This section will examine what the digital command and control systems functions are, and how they are designed to work for the warfighter. The definition of the term warfighter in this monograph represents Soldiers in the platoon up through the corps level. This paper will focus on the current Army Battle Command System (ABCS) digital system architecture and focus specifically on the Maneuver Control System (MCS), All Source Analysis System (ASAS), Advanced Field Artillery Data System (AFATDS) systems, the Force XXI Battle Command

[10]Douglas J. Gillert, "Force XXI: Training for War on a Digital Battlefield," *American Forces Press Service* (4 December 1996), www.defenselink.mil (accessed 20 March 2008).

Brigade and Below (FBCB2), and Blue Force Tracker (BFT) systems. Also included are the emerging digital systems, specifically the Command Post of the Future (CPOF) system. These are the systems that are most utilized during the US Army's most recent conflicts in both Iraq and Afghanistan.

For this reason, the paper will focus on the command and control tools that are the most commonly used by the warfighter and also adhere to the Chief of Staff of the Army's (CSA) direction for ABCS integration.[11] The ABCS systems are divided for specific uses within the corps through battalion tactical operation centers (TOC). The descriptions of the ABCS and FBCB2/BFT are taken from the program executive office for command, control, and communications tactical (PEO C3T).

The Maneuver Control System (MCS) is the digital system within the ABCS suite that is normally found in the operations section of a TOC. "The MCS is the heart of the Army's Battle Command System, the system of system for battle command."[12] The MCS system is designed to track friendly forces, assist in the developing of planning, and provide a messaging function vertically across the ABCS suite of digital systems. The MCS's command and control function allows for the feedback from other staff sections using their digital system within the ABCS suite. Those other staff sections include the intelligence section using the All Source Analysis System (ASAS) system and the fires and effects section using the Advanced Field Artillery Data System (AFATDS). Not only can the ABCS systems communicate within the TOC, but they can also share the same common operational picture and messaging across the battle space. The MCS is also designed to message down to the FBCB2 digital systems. As a result of the needed

[11]Ibid.

[12]Project Manager, Battle Command, Homepage, http://peoc3t.monmouth.army.mil/battlecommand/battlecommand.html (accessed 19 April 2008).

requirement to plan at greater distances, the ABCS suite also provides collaborative planning functions and tools.[13]

The All Source Analysis System (ASAS) is the ABCS component designed for use by the intelligence section. The ASAS is able to template the enemy situation and then send the current and forecasted template to the MCS. The marked difference in the ASAS system and the MCS system is that the ASAS has no ability to see near real time friendly forces. The ability to upload the enemy situation to an MCS is also cumbersome.[14]

The Advanced Field Artillery Data System (AFATDS) is the commander's tool for integrating and synchronizing indirect fires and coordinating joint fires. The AFATDS system has a limited messaging ability to the MCS. The AFATDS systems are considered a functional system within the AFATDS stovepipe, much of the credit rests with the Soldiers who make the system work. The Field Artillery, as a branch, understands that communications is critical to being able to deliver fire support.[15]

The Force XXI Battle Command Brigade and Below (FBCB2) forms the principal Digital Command and Control System for the Army at brigade and below. The FBCB2 is integrated into the various platforms at brigade and below, as well as appropriate division and corps slices necessary to support brigade operations. The FBCB2 systems are interconnected through a communications infrastructure called the Tactical Internet via the signal company or signal battalion to exchange situational awareness data. (PEOC3T)[16]

The Blue Force Tracker (BFT) is a satellite enabled non-classified variant of the FBCB2 that was developed to increase the capability beyond line of sight and to over come the Army's

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[13]Ibid.

[14]Ibid.

[15]Ibid.

[16]Project Manager, Force XXI Battle Command Brigade and Below, Homepage, http://peoc3t.monmouth.army.mil/fbcb2/fbcb2.html (accessed 19 April 2008).

shortage of FBCB2s and the related required terrestrial signal network. The BFT provides a critical solution to battle tracking, although with no messaging capability. The BFT is especially useful in austere environments when no FBCB2 signal network is available. The interesting inclusion of a non-classified entity into another wise classified network demonstrates the needed requirements for speedy solutions on the battlefield.

The latest emerging system in the Army digital inventory is the Command Post of the Future (CPOF). The CPOF creates a commander centric software environment that can be tailored to fit specific visualizations needed by the commander. This custom view supports distributed and collaborative operations that allow the commander to command in any TOC on the battlefield. CPOF is designed to enable deep cohesion of the thought processes between the commander and his staff. Users are able to selectively and dynamically generate and transmit their evolving analysis, plans, and execution. CPOF is a comprehensible, collaborative environment from the moment the system is turned on. All one has to do is drag and drop a visualization product into the "Shared Products" region, and it is instantly shared with all registered users.[17] Although the drag and drop function is more intuitive, it sounds very similar to a more traditional commercial web based exchange server capability that already exists. The CPOF also resonates as a system that was developed to alleviate the problem of trying to get the entire ABCS system to function as advertised. The CPOF is the stop gap for solving the ABCS systems inability to effectively communicate across the current stove pipes in the ABCS system. This effectively means that the Army has just added another system and more complexity to the battle captain's requirements at the battalion level.

[17]Project Manager, Battle Command.

Battlefield Functional Areas

The ABCS system is divided neatly along the battlefield functional areas (BFA). Just as these systems are divided and function within the specific BFA, for example intelligence, they must also be able to integrate with the other BFA systems within the overall architecture. That would mean that an MCS platform and an ASAS, or other system in the ABCS umbrella of systems, should be able to work seamlessly together.

The combination of the ABCS and FBCB2/BFT digital architectures are the digital systems that have been most employed in both OIF and OEF over the past five years. These systems are the command and control systems that are designed to leverage technology for the commander on the ground. Why does one need a separate system for each specific battlefield functional area? The below diagram outlines the battlefield functional areas; the center of the diagram denotes that the leadership is connected to each BFA.

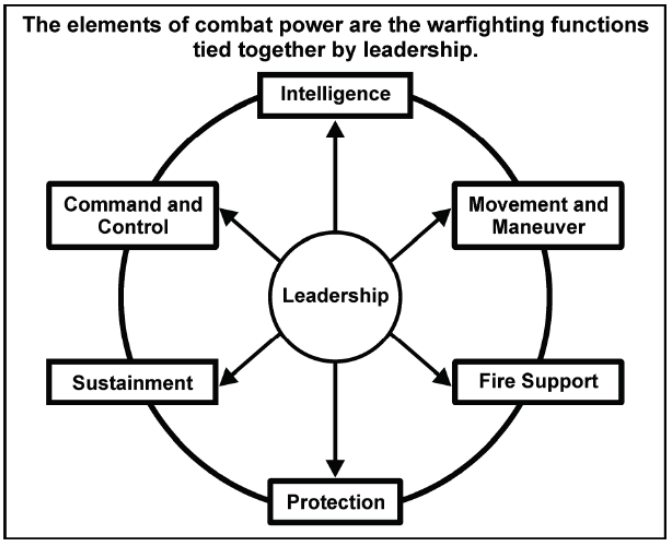

Figure 1. Elements of Combat Power
Source: U.S. Army, Field Manual (FM) 3.0, *Operations* (Washington, DC: Government Printing Office 2008), 4-1.

Currently the United States Army has eleven systems and growing. Each ABCS subcomponent system is designed to work within the greater ABCS umbrella, but a major problem is that most of these systems do not work as advertised even in a peer to peer mode, for example MSC to MSC mode, and certainly not across the stove pipes. Attempting to communicate between an ASAS computer and an MSC computer is excessively hard, if even possible. The question that the Army should ask is why so many systems and what are the purposes of these systems. Why does one system not suffice for all the requirements? Does the Army really have that many system requirements across their staff sections? It can be argued that the Army does not have a need for so many systems and does believe that both their needs and technology can provide a solution.

Having experienced first hand, as a brigade communications officer for a unit that was enabled with these systems, the utility for most of these digital systems is marginal. A better and less complex solution is needed and required.

The current growing inventory of the systems that are in the ABCS suite or on the fringe includes the medical community's MC 4 and the logistics community's MTS tracking system and BCS3 system. These additions to the network architecture are continuing to exacerbate the lack of a common simple solution. Each one of the branches in the Army seems to be trying to create a solution for their own functional purpose, and they seem less concerned with a more combined and holistic solution. In fact, this narrow mindedness is only wasting tax dollars and complicating an already complex environment.

With all these systems and a required need for a better solution, a pertinent question is; how do these systems function together, or do they? The below diagram is the current ABCS systems architecture. The PASS server annotated in the middle of the diagram supposedly will facilitate the passing of data between the individual systems. Note that the CPOF is also denoted on this diagram and is theoretically designed to also send data through the PASS server and

across the ABCS system. This adds to the ever-increasing complexity of where the information is flowing and how to best disseminate it at the battalion through corps level.

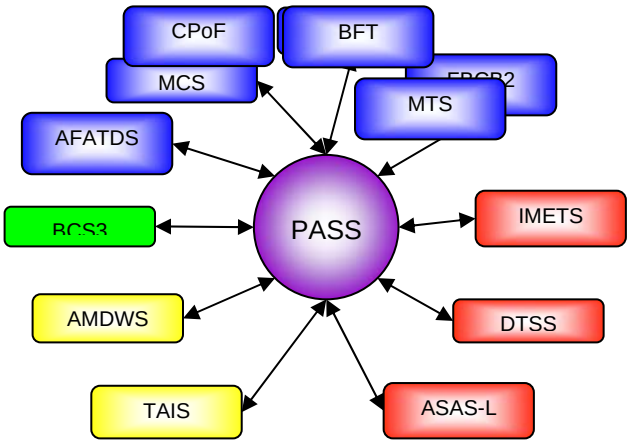

Figure 2. ABCS Network

Source: Carol Wortman and Rob Pitsko, Chief Architect, Battle Command PEO C3T, "Battle Command Path Ahead" (Command and Control Research Program 8 February 2006), pg#.

Issues and Concerns with the Systems

What do the systems do? How do these systems work together? This section will examine how each system functions with its designed purpose and how it interoperates with the other systems.

As the first section of this monograph described, each of the systems involved has a specific function that is designed to give the commander a visualization of his battle space. What prevents this from occurring in many cases, and with many of the systems, is the complexity of the systems involved. This intentional complexity within these digital systems is a byproduct of the ways in which we procure and design these digital systems.

> There is a danger of misalignment between applications and the businesses they purport to support and, through a lack of strategic direction, a risk that bespoke and stovepipe Information System (IS) development will continue. There is concern that there is a potential lack of coherence across, and within, Battlefield Information System

> programmes. Not only may this result in an inability to transfer data and information effectively between battlefield applications, it will seriously degrade the ability to exploit information and will impede the achievement of information superiority.
>
> *Kees van Haperen, MSc, Working Towards Information Superiority: Application Coherence for Digitisation Programmes–A Method for Coherently Defining Requirements for Future Command and Control Information Systems.*

One issue with these systems is the never-ending software and systems improvement cycle. These improvements have a great impact on the units that require these systems. The training time to understand how the system works and the best use practices will dominate many training weeks. The training cycle will never seem to end due simply to the fact that the systems need constant updating. Many of these updates can be simple antivirus updates that can have a potential impact on another system within the overall system. By the Army not having the required number of computers needed to meet the requirements within a TOC, computers are not solely dedicated as an MCS or ASAS workstation. The requirement to run more than one software program and perform a variety of duties is realistic and computer systems cannot be dedicated solely to function as an ABCS platform. The current number of digital systems within the force is expanding in short order, yet the resourcing for many platforms is not necessarily expanding as it should.

A procurement system where each separate defense contractor and battle field functional area (BFA) establishes their own system with a specific use and function to be integrated somehow later is a concern. A dilemma exists for the overall managers of these systems to integrate and create an environment where the systems function in concert with each other.

Additionally, in 2003 the Chief of Staff of the Army (CSA), frustrated by interoperability issues in the ABCS system, articulated his systems focus which he designated 7 plus 1.[18] They are:

[18]Greene, 198.

1. Friendly location
2. Current Enemy Situation
3. Running Estimate (Current Combat Power and Future Combat Power/Staff estimate)
4. Graphic Control Measures
5. Fragmentary Orders (FRAGOs)
6. Commander's Situation Report (SITREP)
7. Fire Support Coordination Measures/Capabilities Overlay
8. Joint and Coalition Interoperability

The demand for a simpler solution has been recognized by Army leaders. The latest attempt at simplicity is the newest inclusion to the digital network, the Command Post of the Future (CPOF). The Army is again adding another system to the net-centric environment.

The Cost to the Unit In Time and Training

The intent of designing systems is to increase efficiency, or simply to make a process easier, but does having all these systems really make life more efficient? Currently, most units in the Army have undergone a reset and transformation process that has increased and upgraded their command and control systems. The answer to the aforementioned question becomes clear as we have to retrain and address the training short falls and again the retraining of these new upgraded systems. In addition to training the core level tasks for warfighting, the added burden of establishing over many iterative cycles the training for digital systems, jeopardizes a coherent training philosophy.

A typical brigade Combat Team (BCT) will spend weeks training on digital systems. One argument could be to make these digital systems the standard within the unit, such as the unit should be using these systems to train everyday in garrison. Potentially that could mean converting the current email system in use, to a more tactically based approach to communicating in garrison. A phenomenon noticed during deployment and current operations as of 2005 is the

use of email servers and the reliance on the secure Internet router protocol-network (SIPR net). Once units were able to stand up servers, they defaulted back to PowerPoint briefings and the sending of email. With the exception of the FBCB2, and BFT the ABCS systems have become a secondary system.

What is the Training Requirement?

Any commander or staff member can attest to the ever-growing requirements to conduct training. The time required to ensure quality training and the resources allocated for mission accomplishments are intensive. As the Army continues to train the required basic soldier skills such as shooting, moving, and the ever more complex tasks of communicating, the demands on the units become unwieldy. What are the requirements for maintaining the proficiency of a digital warrior?

The requirement to train on all these digital systems consumes an excessive amount of time. The understanding that training time is a finite resource does not seem to be a major concern when selecting the systems for use in the Army.

"Formal training for digital systems is conducted at a U.S. Army facility called the Battle Command Training Center (BCTC). The BCTC provides Operator new equipment Training, leader training, and staff officer training for a number of different digital systems."[19]

"Operator new Equipment training for the FBCB2 is normally approximately 40 hours of training conducted over 5 days-36 hours of instruction with a 4 hour practical examination. It includes both classroom instruction and lecture and hands on training. There are usually three instructors per class; one instructor presents the material while the other two assist students."[20]

[19]John S. Barnett, "How Training Affects Soldier Attitudes and Behavior Toward Digital Command and Control Systems," *Military Psychology* 19, no. 1 (2007): 45.

[20]Barnett, 46.

The BCTC at Fort Lewis, Washington, was run by a group of contractors that provided specific services to the Army such as training and retraining in the digital systems that are in use in the units. That is not to say that the BCTC team of contractors does not provide a useful service, they do. They are also supervised by a small cadre of military members, and then the contract itself is a mechanism that provides guidelines and the rules under which the civilian contractors provide services. The mere fact that the digital training requirement exists makes the presence of such a service profitable to the defense contractors. Not only do the contractors provide the digital systems, but now they are able to provide the services for training the Soldiers as well.

How Complex Are the Systems and the Impact on Training?

With the constant evolution of the different software upgrades in the ABCS system and the evolution of completely new systems like the CPOF, training is a constant challenge. In 2003, the Chief of Staff of the Army (CSA) directed that the Army shift the ABCS software development from a bottom up to a top down approach. This initiative is know as the ABCS 6.4 good enough solution.[21] The 6.4 is a reference to the number of software changes in the system. Additionally, what is not commonly known is that an unadvertised number of patches can also be added to the software that incurs additional changes to both the software and training. In a recent lessoned learned paper, Col Greene, the project manager for ground command and control systems, outlines the problems with not having a system that was interoperable across the stove pipe. He indicates "this sharing of information across the network assists in providing the common operational picture-an important facet of digital battle command."[22] The ever-present battle of not just maintaining a relevant training regime, but also retaining qualified personnel is critical to our ability to conduct our missions.

[21]Greene, 201.

[22]Ibid., 199.

The current complexity of the computer and communications systems is extremely high. This complexity can be overwhelming. This can be demonstrated by the number of contracted civilians required to maintain and provide over-the-shoulder instruction in a real world combat environment. In October 2004, the 1st Brigade, 25th Infantry Division (Stryker) deployed with over 20 contractors to Mosul, Iraq. During that deployment, the 1st Brigade, 25th Infantry Division (Stryker) did not have the ABCS 6.4 "Good Enough" solution; the brigade was working with the 6.3 ABCS version. These contractors were from a number of different military contractors, each focusing on their particular computer system within the ABCS suite of systems. These contractors fell into a military organization dubbed the Central Technical Support Facility or simply CTSF. The CTSF organization was pseudo tactical organization made up of specialized computer trouble-shooters and specific software subject matter experts. The CTSF was a subordinate organization of the PEOC3T with its headquarters at Fort Hood, Texas. During the first initial days and weeks of the Stryker deployment, the CTSF team accompanied by members of the signal company, traveled to each Stryker unit to ensure the initial ABCS and FBCB2 networks were functioning and data was being transmitted to the Brigade and Battalion TOCs. The presence of contractors from the CTSF was critical throughout the deployment and the ability of the Stryker Brigade to communicate and the ABCS and FBCB2 system to function relied heavily on these contractors.

Why Do We Purchase and Acquire the Digital Systems the Way We Do?

> It's my view that this society has decided that it will only use a certain fraction of its human effort in its own defense in peacetime. The imperative just isn't there . . . so consequently we have no other alternative but to turn to high technology. That's it.
>
> DARPA Director Richard Cooper

Three case studies with regard to how the U.S. Army purchases will be examined in this chapter. It will also examine the acquisition and procurement hierarchy within the Army and the

relationship between defense contractors and the Congress. The three case studies that will be examined are the Bradley Fighting Vehicle (BFV), the Future Combat Systems (FCS), and the Army Battle Command Systems (ABCS) program. The relevance of these three case studies demonstrates the continued lack of both good business sense with regard to developing requirements and the importance to our country's national security with regard to coherent acquisition processes. The acquisition and development of the BFV was accomplished by a number of oversight committees. The end result was a development process that took too long and cost too much for the end product. The procurement of the Bradley Fighting Vehicle (BFV) and the BFV design and procurement process will go down in Army history as a black eye due to infighting between services and within the Army itself. The BFV procurement process was conducted in a dysfunctional and inefficient ways over a time period of seventeen years.[23] This dysfunction led to delays, changes, and cost over-runs. The second case study will examine the Army's most current transformation initiative, the Future Combat Systems (FCS) program. The current FCS program is reliant on digital systems. The FCS digital systems reliance is the centerpiece of the entire program and will link the weapons platforms and Soldiers via a supposed robust digital network. The third case study, the Army Battle Command System (ABCS), is critical to understand simply because of the Army's current predicament with their digital systems. The Army's inability to communicate digitally across the intentionally designed stove piped ABCS network has left the Army frustrated. Not frustrated due to lack of money and resources spent developing the systems, but on how the requirements for these systems were developed and why the Army designed them not to work functionally across the ABCS system suite. The Army intentionally designed the digital systems to be stovepipes; how did the Army miss the importance of developing a more flexible and coherent system.

[23]James G. Burton, *The Pentagon War* (Annapolis, MD: Naval Institute Press, 1993), 133.

The main points from these three case studies will be to examine the practices in the procurement and acquisition process over a thirty-year period. Furthermore, the BFV was an example of the Army not fully developing the requirements and then trying half-heartedly to add them as the vehicles were being manufactured. The Bradley was in development from the early 1960s up through the 1980s. However, during that time, the Army kept changing its mind about what it wanted the Bradley to do.[24] The Bradley was initially designed as a replacement for the M-113 armored personnel carrier. The generally advertised concept behind the development of the BFV was to update the Army's fighting capability while ensuring the combat effectiveness and survivability of the Soldiers inside the vehicle. Throughout the BFV testing and development phases, the vehicle had a number of issues. The identity crisis that afflicted the BFV was a significant issue. As stated, the BFV was to replace the M-113 as a personnel carrier. Then there is the notion that the BFV should engage other enemy vehicles and maneuver with tanks. If the BFV was going to engage another vehicle then it would also be engaged in return by enemy vehicles. However, the BFV armor was not adequately designed for engagement by other vehicles. This decision was made after the BFV was in production. "During the Bradley's development, several committees were formed to review the program and decide on its mission and features. These included the Casey Board, Larkin Committee, and others. Each time a committee met, the mission changed and new design features were added. By the time production was approved in 1980, the Bradley had three missions. It confirmed the old adage that a camel is a horse designed by a committee."[25] One can imagine that these constant changes and continual disruption would lead to a vehicle that did everything mediocre and nothing very well. One of the most contentious missions given to the BFV was an anti-tank mission. This meant that the BFV would be retrofitted with a TOW anti-tank weapon and loaded down with ammunition.

[24]Ibid.

[25]Ibid.

Understanding that the BFV was only supposed to be an armored personnel carrier and it was only protected for small arms fire, the change of mission to a tank killer made many of the design specifications inadequate. The end result of the Bradley Fighting Vehicle procurement process took seventeen years to field at a cost overrun of millions of dollars.

The more recent issues with procurement comes at a time when the United States is fighting a war against terrorism globally and has troops deployed in active combat. The second case study is the Future Combat Systems which is the transformation initiative currently on-going in the U.S. Army. This initiative is intended to leverage technology and high-speed data communication networks across the battlefield. This interconnected data network is intended to provide commanders and Soldiers a clearer situational understanding of the battlefield.

One of the main differences between the BFV and FCS procurement strategy is the employment of a new procedure for acquisition, the spiral acquisition process. The FCS program is designed in large part around advances in technology and computing. The spiral process continually builds and takes into consideration the developments in technology and computing power as the process goes forward. The spiral process is more flexible and less risky in regard to technological breakthroughs that cannot be leveraged by the older process; such as, BFV process. However, that does not mean that the process is fool proof.

"The FCS program consists of eight new Manned Ground Vehicles (MGVs), a family of unmanned air and ground vehicles, launch system, and advanced tactical and urban sensors that are all connected by a state-of-the-art network. Working together, these systems will help Soldiers share real-time information across the battlefield. Overall, FCS will provide Soldiers vastly increased situational awareness, survivability, and lethality-ensuring they can take the fight to the enemy before the enemy has time to react."[26]

[26]Department of the Army, "Program Overview: FCS 101," https://www.fcs.army.mil/program/ (accessed 10 February 2008).

The mission statement for the FCS program seems like a much-needed program during this time of conflict. However, currently the Congress is looking to make significant cuts in the program. Why is the Congress losing faith in this program? Part of the problem has to do with the out-sourcing of defense contracting responsibly. The systems the Army wants to procure are complicated, but are they so complicated that they need outside assistance and if so, is this a good business practice? In an article written by William Matthews in the *Armed Forces Journal***,** he states, "If it sounds complicated, it is. So much so that the military not only relies heavily on private defense companies to develop the systems, but also to manage the companies it hires to develop the components of the system-of-systems. The Army, the National Missile Defense program and the Coast Guard have all turned the management of major defense programs over to big defense companies called 'lead systems integrators."[27] And that is starting to worry Congress. It seems too many lawmakers that the Pentagon is surrendering too much of its responsibility and authority--and too much of its budget--to the "LSIs."[28]

It would seem that the Army is turning to civilian defense contracting companies to run the very programs the Army needs to function. This has caused great concerns in Congress. The inability of the Army to manage its procurement programs and rely on the LSI concept is equivalent to letting the prisoners hold the keys to the cells.

"Alarm about LSIs bubbled up repeatedly during congressional hearings in 2005. The most troubling lead systems integrator was the Boeing-SAIC team selected to head the FCS program. The Army hired the team in 2002 to manage the dozens of companies involved in developing 18 separate air and ground systems that are part of FCS. Last fall, the Defense Department reported to Congress that FCS costs had increased from $99 billion to $161 billion

[27]William Matthews, "Dis-integration," *Armed Forces Journal* (2006), http://www.afji.com/2006/02/1813758 (accessed 6 March 2008).

[28]Ibid.

and the program was at least four years behind schedule. Boeing and SAIC blame Army restructuring of FCS for the cost increases."[29]

The Army and Congress are negotiating the future of the FCS program. The Government Accountability Office in a recent report has outlined several other alternatives for Congress. These include scaling the program back and only funding certain portions of the overall program.[30]

The third case study, the ABCS digital systems that are denoted in this paper is also a by-product of the dysfunctional BFV dynamic of not developing the right requirements. The exceptions with regard to the ABCS systems is in each Battlefield Function Area (BFA), for example; Maneuver, Fires, Intelligence, and others, all played a part in the design and requirements process for their digital systems. This purposeful stovepipe solution was near sighted concerning the designers inability to understand future dynamic and complex requirements. The end result was that each of the BFAs was allowed to design the digital systems that they thought they needed and would fulfill their requirements without regard to the other BFAs. Only after the fact, did a realistic understanding emerge that the ABCS systems would have to reach across the stove pipe systems to communicate and collaborate with each other. To make matters worse the Program Executive Office (PEOs) and Project Managers (PMs) for the ABCS digital systems are not aligned for maximum efficiency. This only exacerbates the ability for true collaboration and coordination when attempting to integrate the ABCS systems given the complexity of the effort. Additionally, the proponents for the digital systems themselves are resident at their own military installations. Integrating the ABCS systems is very difficult and the institutional ignorance of not understanding the importance of integration remains prevalent. However, due to this lack of integration capability within the ABCS digital systems an innovative

[29]Ibid.

[30]Congressional Budget Office Study, "The Army's Future Combat Systems Program and Alternatives" (Research Study, Washington, DC, August 2006), xv.

solution was designed. The Defense Advanced Research Projects Agency (DARPA) provided a solution in the form of a digital system called the Command Post of the Future (CPOF). The CPOF is a digital system that provides commanders and staff with the ability to collaborate and share information. The CPOF also has a Voice over Internet Protocol (VoIP) connection that facilitates meetings and updates, along with the capability to show the situational update via the FBCB2 or BFT network with a several minute delay.

The Army needs to understand the requirements for the systems, whether a weapon or a digital system, before going into production. Both the BFV and the ABCS development processes were critically flawed. The FCS spiral process for acquisition is a more concerted effort at developing the systems that are required in a more measured way. The issue of LSIs and the amount of influence in the acquisition and procurement process leaves a lot to be desired from the author's point of view. An attempt to rely on immature or a not fully developed technology may not be the best solution for the future given the current efforts in both Operation Iraqi freedom (OIF) and Operation Enduring Freedom (OEF). This is not to say that Soldiers should not have the best systems available. They should, but the systems should work as advertised and for the enhancement of mission accomplishment. A major benefit from the use of these technologies is that it could mean fewer Soldiers on the ground. The antithesis of that statement must be addressed also; having more technology and not enough Soldiers is a common concern in the current Global War on Terror (GWOT).

Between the Bradley Fighting Vehicle procurement issues of the 1970s and 1980s, the current troubled FCS procurement process, and the ABCS digital stove pipe creations in the 1990s and early 2000, it would seem that procurement in the Army remains in a troubled state.

The concern of every American should be the ability for their government to procure the required resources needed by its Soldiers in combat environments. Given that the U.S. is fighting an enemy who does not play by any rule book and so far has proven to be a formidable foe in how they leverage technology, the mission cannot be overstated. The requirement for a better way

to procure what is needed, regardless of specific congressional district or defense contractor is imperative.

Who Leads the Army's Procurement Process?

The procurement and acquisition process for command and control purchases within the Army is complicated and bureaucratic. All Army acquisitions are over seen by the Assistant Secretary of the Army for Acquisition, Logistics and Technology (OASA/ALT). In the vision and mission statement the guidance seems relevant and clear:

ASA(ALT) Vision: To equip and sustain the world's most capable, powerful and respected Army.

ASA(ALT) Mission: Effectively and efficiently develop, acquire, field, and sustain materiel by leveraging domestic, organic, commercial, and foreign technologies and capabilities to meet the Army's current and future mission requirements.

Reading the mission statement above would lead one to believe that the Army office for acquisition clearly understands the critical importance of future technologies. However, within the Assistant Secretary's office layers of bureaucracy are formed that insulates the Assistant Secretary from gaining a truer understanding of the required effort needed for integration. A total of ten Deputy Secretaries and one acquisition executive are the immediate subordinates to the Assistant Secretary of the Army for Acquisition, Logistics and Technology (OASA/ALT). An additional ten Program Executive Offices (PEO) are subordinate to the Deputy Secretaries. The PEOs are responsible for overseeing the development of the projects and programs within their areas, a typical mission statement from "PEO C3T would be: To design, acquire, field and support numerous fully integrated and cost-effective C4ISR solutions that meet warfighter capability needs while sustaining a world class work force."[31]

[31]Command Post of the Future (CPOF) Program Executive Office, Command Control and Communications Tactical (PEOC3T), Homepage, http://peoc3t.monmouth.army.mil/battlecommand/bc_CPOF.html (accessed 19 April 2008).

Within each PEO are the Program Managers (PM), and each PM has the responsibility to manage a few programs. A significant question is whether all of the right programs are aligned within the right PMs or PEOs. The short answer is no, they are not. The PEO that is responsible for the ABCS, CPOF, and FBCB2 is the Program Executive Office Command, Control, Communications, Tactical (PEOC3T). The PMs that are responsible for the ABCS, CPOF, and the FBCB2 are two separate PMs offices. The PM responsible for the ABCS and CPOF systems is Program Manager Battle Command (PM BC) and the PM responsible for FBCB2 is Program Manager FBCB2 (PM FBCB2).

Understanding the mission statement for the PM FBCB2 and Battle Command is a relevant starting point. Both the FBCB2 and the systems within the Battle Command PM shop must integrate to work for the Soldier. But why are they two separate programs?

The mission statement for the PM-BC: "Provide Integrated Battle Command capabilities, training, and support to the Joint Land Component warfighter."[32]

The mission statement for the PM-FBCB2: "Field a digital command and control system that provides battle command and situational awareness information from brigade down to the soldier/platform level."[33]

Taking time to examine the two mission statements and understanding the need for a holistic approach to solving the Army's digital system integration problems, it is evident that these two programs should be combined into one. These two programs may be more useful as one combined program, integrating these systems into a PM shop focused on a unity of effort. Given the required relationship between the ABCS, CPOF, and FBCB2, it is bewildering that all of these systems do not belong to the same PM. This is a clear and insightful point with regard to the

[32]Project Manager, Battle Command.

[33]Project Manager, Force XXI Battle Command Brigade and Below.

dysfunction and lack of a holistic understanding needed in the organizational structure and how it should function.

To further complicate the digital integration process, the Army Training and Doctrine Command (TRADOC) has established an Army Capabilities Integration Center (ARCIC). The ARCIC is made up of TRADOC Capability Managers (TCMs). These managers help define the requirements for the individual BFAs.[34] As the Army continues to struggle with integration, having TCMs at the BFAs level may simply be developing a one-dimensional solution on behalf of the BFA. This may not be the best solution to the problem. The continuing development of many systems requires a sophisticated integration process.

The ever-changing technology landscapes with the remarkable increases in computing capacities make it almost impossible for procurement agencies to keep up. In a paper published in Policy Analysis by Ivan Eland he states, "The U.S military gets its technological edge from the brute force of applying large amounts of government R&D funds to the task rather than from spending money efficiently."[35] A specific example is the U.S. Airborne early warning system, which is currently the best in the world. However, these military technologies are older than and not as sophisticated as current commercial technologies. Many of these problems are self-imposed due to a more industrial based organizational chart mentality rather than a solving the problem state of mind. The U.S. is already seeing some of their enemies take advantage of commercial technologies on the battlefields of Iraq and Afghanistan today.[36]

[34]TRADOC, Army Capabilities Integration Center, Homepage, http://www.arcic.army.mil/ainm_mission.htm (accessed 14 May 2008).

[35]Eland, 11.

[36]Ibid, 12.

Congress and Defense Contractors

The acquisition and procurement process is layered in complicated laws and a complex bureaucracy. Additionally, the dynamics between the legislative branch and the defense contracting communities is a reality that must be addressed. This relationship can be both mutually beneficial and a source of conflict at the same time. The defense contracting companies are multi-billion dollar companies with tremendous resources. The economic well being of the states partially rests in the hands of elected representatives and the defense contractors who provide employment. A recently published Chamber of Commerce report entitled *Defense Trade: Keeping America Secure* in March of 2007, indicates that the defense industry employs nearly 3.6 million people in the United States. The over-all economic impact by the defense industry in local communities is significant. The U.S. Chamber of Commerce published report indicated that the national defense expenditures totaled $474.4 billion in 2005 and represented 3.8 percent of U.S. GDP.[37]

Many states benefit from the defense industry and the business has an impact on the everyday lives of normal Americans. The chart below from the U.S. Chamber of Commerce, published in March 2007, shows total direct defense expenditure projections.

[37]U.S. Chamber of Commerce, "Defense Trade: Keeping America Secure and Competitive." (2007), 8. http://www.uschamber.com/NR/rdonlyres/edwdaryibrhvvexxegnpdhzulmfbhnudlf2mlztw2wcrtfh34r4sds4ngw4a5y74zhfrk5bvinofam27rxczmn2r37e/defensetrade.pdf (accessed 20 March 2008).

Table 1. Top 10 States Rank by Projected Total Direct Defense Expenditures-2006
(in millions of 2007 dollars)

U.S. Total	$491,685	
1 California	$59,161	12.0%
2 Virginia	$52,228	10.6
3 Texas	$41,643	8.5
4 Florida	$ 25,124	5.1
5 Maryland	$18,775	3.8
6 Arizona	$15,439	3.1
7 Georgia	$14,961	3.0
8 New York	$14,835	3.0
9 North Carolina	$13,453	2.7
10 Massachusetts	$13,400	2.7

Source: U.S. Chamber of Commerce, "Defense Trade: Keeping America Secure and Competitive,"http://www.uschamber.com/NR/rdonlyres/edwdaryibrhvvexxegnpdhzulmfbhnudlf2mlztw2wcrtfh34r4sds4ngw4a5y74zhfrk5bvinofam27rxczmn2r37e/defensetrade.pdf :12, accessed Mar 20, 2008

As the chart depicts, the tens of millions of dollars in expenditures within these states drives the desire to attract business from the defense industry. These dollars have a direct impact on the well being of the local economies and the elected representatives understand the dynamic very well.

The connections between the defense industry and Congress can at times become elicit; several lawmakers have become embroiled in less than legal activities. An example of illegal activity includes former California Congressman Randy "Duke " Cunningham who was convicted of taking money from a defense contractor. At the time, Cunningham was a member of the Defense Appropriations Committee. In March of 2006, Cunningham was sentenced to 8 years and 4 months in prison. This prosecution of a major public official for taking bribes from a defense contractor is an example of the very conflict of interest that hinders the integrity of the best products being developed.[38]

[38]CNN.Com. Politics, "Congressman Resigns After Bribery Plea." *CNN.com*, 28 November 2005. http://www.cnn.com/2005/POLITICS/11/28/cunningham/ (accessed 20 March 2008).

Throughout this chapter the need for improving the way the Army selects and procures its equipment is evident. As far back as the early 1970s, and the flawed development process for the BFV, our acquisition process has failed. Given the ABCS systems status in OIF and OEF and the current problems with the FCS transformation initiative, the future continues to look dim with regard to improving our acquisition process. With the exception of the CSA and his 6.4 "Good Enough" solution, the leadership at the top does not recognize the need for a more streamlined organization that is focused on integration. Once a serious effort is made in reorganizing our procurement and acquisition process along with an integrated and results based ethos for development, progress may be forth coming.

What Should the U.S. Army's Digital Plan Be for the 21st Century?

Not underestimating the complexity of modern digitalization is critically important to the U.S.'s national security. The emergence of computing and digital technologies now allows adversaries to gain a marked advantage, which was not there in the past. The Army and the country must understand the power of these systems. The U.S' greatness can be marginalized by inexpensive technology in the hands of its enemies, yet the country pays a premium to the defense industry for inferior solutions. A course correction in how one establishes national and military priorities must occur. These dynamic changes in the way future wars are fought must be assimilated and understood. The following recommendations are not unique or newly thought of; many of the readings clearly articulate the challenges now being faced by the nation. These current challenges will only grow in the future as technology and advanced digital systems propagate across the globe.

The development of simple and well thought out digital solutions with solid requirements that decrease complexity as opposed to increasing complexity is critical. The requirements are as simple as the CSA outlining his 7 plus 1 concept under the ABCS 6.4 "Good Enough" solution.

That mandate gave a clear and concise direction for all of the BFA and acquisition and procurement proponents. This would also mean that special care would have to be given to not allowing for a system's "mission creep," similar to the BFV procurement problems.

That does not mean that upgrading cannot occur, but a special stakeholder board would need to approve this upgrade. This stakeholder board should be unlike any other board; it should be made up of junior level leaders, both officer and enlisted, with a vested interest in developing the best, most usable systems. Input from the field should be encouraged and sought for inclusion in this process. A limited number of senior personnel should be involved in recommending the best solutions and systems. The requirement for contracting civilians should be minimal, and it would be preferred to have zero civilian contractors involved with stakeholder interaction. A more permanent board of senior service members and scientists should be stood up across the joint community to begin to seek solutions for the next crisis with regard to systems interoperability. The next crisis may be more a joint interoperability problem. Again, no civilian contractors should be allowed significant access to the board members and the senior service members should not be from the acquisition or procurement communities. They should be from the field and should have had recent time with troops, preferably in combat. The ability to leverage commercial off the shelf technology should be a common thread for the way into the 21st century. That is not in contrast to the comments about the defense contractors; one should look at the society's usage with regard to these types of systems and leverage the best solutions for the military. The Army should mold and bend these technologies just as their adversaries do against them.

Technology, while a critical component for the conduct of war, is not the be all and end all. Soldiers have to place boots on the ground in order to secure the space and terrain our civilian leaders order us to take. That means our nation must understand the wars of the 21st century. These wars may not all be wars of annihilation, but more of exhaustion. It can be argued that the current over reliance on technology and systems and not enough reliance on the human dimension

has placed the country in jeopardy during this current conflict. By ensuring the U.S. has the individuals to fight the country's wars, these young men and women should and must be of the highest quality and the equipment they use must also be the best. All of the Unmanned Aerial Vehicles (UAVs) in the world can spot an enemy target, but if you cannot reach out and touch them with Soldiers, your technological advantage is wasted.

Developing a less bureaucratic acquisition process that would require fewer levels of regulation would also be a recommended step in the right direction. By developing more streamlined processes for procurement and getting the best digital systems into the hands of the Soldiers, will help ensure the national security. That does not mean that the process should be unregulated, but a common sense and speedy regulation process should be the goal while leveraging the current off the shelf technologies and ideas that the U.S. is known for developing.

Currently the systems being peddled by defense contractors are expensive and not very useful. The current ABCS digital systems are giving way to the CPOF system. The CPOF system was developed in large response to the inability of the ABCS systems to function as advertised. However, the ABCS systems still reside in TOCs where their use is arguable. The latest fielding of the CPOF system has provided a more relevant solution to the commanders and staff currently in the field.

The ability to hold defense contractors responsible for their actions in regard to a system failing to perform as required should also be investigated as a change in the way the Army does business. This would mean that certain contractors would be less likely to work for the military or government. That may not be a bad change.

Congressional involvement in the raising and resourcing of the Army cannot be overstated. This is especially true with regard to technology and digital systems. The evolution of digital systems in the future will increase. This evolution in digital systems and how societies conduct warfare has already been illuminated during this current war. The Congress and the military services, along with civilian industry, must come together in a shared effort to increase

the ability to gain the technological and systems advantage needed as a nation. The current effort in fostering a shared interest in developing the best and most useful systems has not emerged. This is plainly evident in systems that do not work and are cumbersome to operate.

Many of the endeavors in the future have to do with a willingness to change the current system of procurement and the way one understand digital systems. Additional changes such as working more closely with junior enlisted Soldiers and officers and moving away from the bloated and bureaucratic acquisition process will be beneficial. The halls of Congress should be filled with elected officials and service members working to solve increasingly more complex problems of the 21st century.

Conclusion and Recommendation

In conclusion, the digital age of complexity is here. This monograph has examined the complexity of the Army's current digital systems. The Army is currently playing catch up with their adversaries in the best ways to leverage these emerging digital technologies. What should be evident is that the Army has too many systems that do not work as advertised. Each of the Army's branches and Battlefield Functional Areas (BFAs) seems as though they want to solve a singular digital systems problem for their respective BFA endeavor. This is a myopic view and a shallow understanding of the larger Army's digital systems problem. Additionally, the manner in which one procures these digital systems is overly complex and is inefficient. The digital systems are organized within the separate Project Managers (PMs) shops inefficiently. Further complicating the digital systems issue, TRADOC established the ARCIC, which then established TSMs at the BFA level. Each BFA has its own agenda and reasons for wanting their own digital system. However, the CSA's establishing of the ABCS 6.4 "Good Enough Solution" should illuminate the problem with individual BFA continuing to establish their own digital system solutions. Further, the economic benefits that our defense industry gains from developing these digital systems are significant. The defense industry also has significant influence with many

Congressional representatives. Many Congressional districts have a significant tie with the defense industry and the economic well being of many of these districts is reliant on the defense industry for jobs. The employees for the defense companies are constituents to many of these Congressional representatives. Congressional representatives do not stay in office long by ignoring the voting public and the economic well being of their Congressional districts.

The country, the leaders, and the Army must understand that a change in 21st century digital system problems will continue to challenge the nation. The unique challenges with digital systems will continue as long as the Army relies on this technology to increase its advantage on the battlefield. Our enemy on the other hand will take advantage of every technological innovation that appears on the horizon. They will not wait on some procurement board for approval of a required digital system or some funding stream to become available. Our enemies will execute and continue to maintain their dominance of the Quantum arena.

The understanding that the country is in a real war seems in many parts of our society to be lacking. It has been said that the military and a few three letter agencies are the only ones fighting. The need to establish a real warrior ethos among the entities that are involved in the procurement process for digital systems to include industry, Congress, and the traditional military must be ignited.

The recommendations that could be undertaken over time must be initiated now. The four key recommendations are: first, understand the quantum digital world in which one lives. The second recommendation is to empower the young Soldiers who use the systems and have grown up in this current era of digital technology. The third recommendation is to redesign the acquisition and procurement process to include the current organization that attempts to integrate the Army's digital technology. The fourth, and final recommendation, is to pass laws through the Congress that allow the Soldiers to have the digital systems they need to protect the U.S.

The first recommendation means that we as a society, government and military community, must understand that we do not maintain the same dominance in the world through

our industrial base that we once did. The world has changed and digital technologies are leveling the playing field. That means that one needs to embrace a less concrete way of understanding. Moving from a world of industrial knowns to a world of quantum unknowns is our basis for an initial understanding. By developing the digital and technological systems that we need in the future we have to embrace a deeper understanding of our environment. No longer does the world revolve around the Newtonian law of physics, but we have moved into the quantum world of a more chaotic and cellular societal structure. Yes, we have moved quickly into this new place. Regardless, our system and the ways we approach problems must adapt. This includes our methods for designing digital systems.

Secondly, the selection of junior stakeholder boards should be a process that begins immediately. Gathering the right information from user and leaders and incorporating them into the process of designing and implementing these digital systems cannot be overstated. These young men and women have grown up with most of these digital technologies and have a more refined understanding of what is desired from the user perspective. Many of these Soldiers have numerous tours in combat zones and have been both the benefactors and suffered from these digital systems. Who better to help one's country's efforts in understanding the strength and vulnerabilities of the systems and this new way of conducting warfare than the Soldier on the ground?

Thirdly, the acquisition and procurement process for designing and developing digital systems for the Army must be changed. This current process of digital development has been steeped in an individual branch self-serving acumen that has produced the current predicament. Initially each branch seemed to think they understood the problems of digital systems best. The lack of flexibility with regard to the digital systems design imposed by the separate defense contractors provided little, if any, flexibility in the ABCS digital systems as a whole. An Army of one, or nearly one, digital system should be a new Army slogan. The ability to converge hardware and software is a reality in our modern 21st century world. The Army must make a concerted

effort for a broader based functionality and worry less about keeping the defense industry employed. This also applies to the way Congress enables the defense industry to maintain it hold digital systems on the Army.

The fourth and final recommendation is to ensure through Congress that the laws enacted regarding acquisition and procurement for digital and relevant information systems do not hinder the abilities, as a nation, to protect the citizens. There is no greater responsibility for the Congress. The American people must demand it.

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