A Cognitive Assessment of Military Approaches to Understanding

A Monograph
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AY 2008

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE (DD-MM-YYYY)	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
22-05-2008	SAMS Monograph	July 2007 – May 2008

4. TITLE AND SUBTITLE
A Cognitive Assessment of Military Approaches to Understanding

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Major Daniel H. Hibner (U.S. Army)

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
School of Advanced Military Studies (SAMS)
250 Gibbon Avenue
Fort Leavenworth, KS 66027-2134

8. PERFORMING ORG REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Foreign Military Studies Office & Command and General Staff College
Director, FMSO
731 McClellan Ave.
Fort Leavenworth, KS 66027-1350

10. SPONSOR/MONITOR'S ACRONYM(S)
FMSO / CGSC

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public Release; Distribution is Unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
The U.S. Army is engaged in operations as part of the global war on terror. This presents a complex problem that requires the best possible methods to address. Although this is not the first time the Army has faced complex problems, the scale and protracted engagement of forces throughout the world demands accurate understanding of the situation at all echelons of command. The U.S. Army must achieve understanding in order to effectively and most efficiently meet the objectives set forth in today's contemporary operating environment. This monograph attempts to identify the most effective military approach to achieve understanding from among the currently available approaches in doctrine or in development. In cognition there are two forms of judgment. Given sufficient time for analysis, the cognitive method for judgment called rational analysis is the superior form of judgment. Intuitive judgment, which is fast and generally easier to draw conclusions, is best used in time constrained environments such as during execution of missions or during crisis action planning. A cognitive assessment is used to determine which military approaches to understanding best leverage these natural cognitive processes. This cognitve assessment seeks to identify the approach the cues rational analysis the most and intuitive judgment the least. The military approaches to understanding examined include FM 3-0's operational variables of PMESSI-PT, joint doctrine's system of systems analysis, the developing concept of systemic operational design, and the developing doctrine for commander's appreciation and campaign design.

15. SUBJECT TERMS
Understanding, Cognition, Complex Problems, Intuition, Rational Analysis, Operational Variables, System of Systems Analysis, Systemic Operational Design, Commander's Appreciation and Campaign Design.

16. SECURITY CLASSIFICATION OF: (U)			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
					Stefan J. Banach COL, U.S. Army
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. PHONE NUMBER** *(include area code)*
(U)	(U)	(U)	(U)	60	913-758-3302

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

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Title of Monograph: A Cognitive Assessment of Military Approaches to Understanding

This monograph was defended by the degree candidate on April 25, 2008 and approved by the monograph director and reader named below.

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Abstract

A Cognitive Assessment of Military Approaches to Understanding by MAJ Daniel H. Hibner, United States Army, 55 pages.

The U.S. Army is engaged in operations as part of the global war on terror. This presents a difficult and complex problem that requires the best possible methods to address. Although this is not the first time the Army has faced complex problems, the scale and protracted engagement of forces throughout the world demands accurate understanding of the situation at all echelons of command. The U.S. Army must achieve understanding in order to effectively and most efficiently meet the objectives set forth in today's contemporary operating environment and in the battlespaces of the future.

This monograph attempts to identify the most effective military approach to achieve understanding from among the currently available approaches in doctrine or in development. In cognition there are two forms of judgment. Given sufficient time for analysis, the cognitive method for judgment called rational analysis is the superior form of judgment. Intuitive judgment, which is fast and generally easier to draw conclusions, is best used in time constrained environments such as during execution of missions or during crisis action planning. A cognitive assessment is used to determine which military approaches to understanding best leverage these natural cognitive processes. This cognitive assessment seeks to identify the approach that cues rational analysis the most and intuitive judgment the least.

The military approaches to understanding examined include FM 3-0's operational variables of PMESSI-PT, joint doctrine's concept of system of systems analysis, the developing concept of systemic operational design, and the developing doctrine found in TRADOC Pamphlet 525-5-500 for the commander's appreciation and campaign design. This monograph provides the conclusions formed by the cognitive assessment of each of the four military approaches to understanding, and uses these conclusions to make recommendations for the Army to take that can best achieve understanding today and in the future.

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Introduction

The U.S. Army currently finds itself in its first protracted conflict since Vietnam. Leaders at all echelons are making decisions and conducting missions that influence enemy forces, economies, civil security, governance, and politics. They do this while reacting to ambushes, improvised explosive devices (IEDs), and snipers while avoiding harm to the populace without forsaking force protection. These sorts of problems require a doctrinal approach that that the U.S. Army can use to facilitate better understanding of the operational environment. By adopting any approach to understand the operational environment, the Army will provide the foundation of knowledge that allows leaders to perform in complex battlespaces with agility and adaptability through intuitive decision making on the ground. This approach to understanding should apply at all Army echelons and should work with natural cognitive processes to maximize effectiveness and efficiency.

It requires great mental agility to succeed in a complex, changing, and high-pressure environment and only an understanding of all the different systems of the operational environment and how they interact will allow problem solving and rapid decision making that leads to success. It is a daunting task, but achieving understanding can and must be done, and once accomplished, leaders must stay true to conclusions that are drawn without the pressures of battle. Carl von Clausewitz called obtaining understanding "accurate recognition" and described failing to obtain it as:

> …one of the most serious sources of friction in war, by making things appear entirely different from what one had expected. The senses make a more vivid impression on the mind than systematic thought–so much so that I doubt if a commander ever launched an operation of any magnitude without being forced to repress new misgivings from the start.[1]

[1] Carl von Clausewitz, *On War*, trans. and ed. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 117-118.

The Army is successfully conducting operations in this environment today, but most units achieve this level of understanding only after some time in theater and many lessons learned. The Army must provide leaders at all levels with an approach to achieve a systems understanding of the environment that enables units to better operate before initial operations in theater. This understanding must reach a deeper level than what a "battle handover" and "right seat-left seat ride" can provide.[2] This systems understanding can then be further developed at all echelons as operations continue throughout a deployment, allowing forces to tailor their training and change their missions to best suit the situation as the environment changes.

An ideal level of understanding effectively engages the best cognitive processes that occur in the brain. If the U.S. Army can choose an approach that effectively develops understanding and leverages human cognition, then Army forces can more effectively accomplish objectives and goals with less cost in treasure and casualties.

The purpose of this monograph is to identify the most effective military approach to understanding that cues advantageous cognitive processes. Through leveraging natural cognitive processes to understand the operational environment, better-designed plans that can adjust to changes in the environment are possible. This understanding brings leaders and soldiers closer to an expert level of knowledge that facilitates intuitive decision making. Better understanding also provides superior situational awareness to commanders at all levels that facilitate greater probabilities of success once engaged.

This monograph is broken into three general parts. First is an examination of understanding; its importance, and its implications. Next, this monograph will provide a

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[2] Battle handover is passing responsibility from one force to another. This term is often used when one headquarters is taking over responsibility from another to allow for unit repositioning or redeployment. Doctrinally, responsibility refers to a point on the ground and responsibility changes from a stationary to a moving unit. During a battle hand over, leadership positions are transitioned using a right seat-left seat ride concept. Right seat ride: The leader being relieved remains in position while the incoming leader observes. Left seat ride: The incoming leader takes over position while the leader being relieved observes.

summary of current systemic approaches followed by an analysis and cognitive assessment of these methods. A summary of the conclusions is presented to highlight the findings of the systemic approaches' analysis and cognitive assessment. Finally, and based on the conclusions, recommendations are made that suggest the best cognitively leveraged systemic approach to understanding and how it might be implemented in the U.S. Army.

The method for the cognitive assessment is a subjective interpretation of current systemic approaches using selected cognitive processes as a basis for analysis. Background research of cognitive psychology revealed how cognitive processes positively and negatively affect understanding. The identified cognitive processes most applicable to understanding form the basis for assessing current military approaches to understanding.

The cognitive assessment used to evaluate current approaches is a logical method to identify which current systemic approaches to understanding might best serve the Army. Cognitive psychology is the scientific study of knowledge.[3] It examines how knowledge is acquired, retained and then used as a basis for action or as a basis for generating further knowledge.[4] In general, systemic approaches to understanding seek to acquire knowledge, and provide meaning to that knowledge, which then serves as the basis for actions and learning. By analyzing for embedded natural cognitive processes within current systemic approaches to understanding, the systemic approaches that cue advantageous cognitive processes can be determined.

The Importance of Understanding

The Army field manual for command and control of Army forces (FM) 6-0 states, "Understanding is knowledge that has been synthesized and had judgment applied to it in a

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[3] Daniel Reisberg, *Cognition: Exploring the Science of the Mind* (New York: W.W. Norton and Company, 2007), 4.

[4] Ibid.

specific situation to comprehend the situation's inner relationships."[5] Of course, as the definition implies, understanding will not make anyone omniscient, but it will serve as the foundation of knowledge from which leaders can plan, adapt, and make decisions through comprehension of inner relationships.

Good understanding can and should be gained when dealing with Army problems before operations commence, and Army planners and leaders must work hard to get as close to an expert level of knowledge as possible within their environment. This is a difficult task to accomplish considering that expert knowledge and the resulting intuitive understanding in a field requires ten years or more of experience, and therein lies the difficulty of the problem for the Army.[6] It is unlikely that the Army can consider anyone an expert in all of the missions within the contemporary operating environment (COE). Even with the speed of learning that occurs in today's COE, expert knowledge cannot be relied upon to facilitate understanding. When available, outsourced expert knowledge should be used, but in most commands this level of first hand knowledge is unavailable.

Therefore, the resident ability in trained officers to derive meaning from the situation on the ground should be the primary resource for the understanding the Army seeks. Just as no situation is so familiar that a new perplexity cannot emerge, there is no perplexity that is so foreign or strange that one cannot derive meaning. The importance of meaning is that it serves as a platform for further understanding. Once meaning is given, it serves as a working tool for further comprehensions and is an instrument of understanding other things.[7]

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[5] U.S. Army Field Manual 6-0 *Mission Command: Command and Control of Army Forces* (Washington DC: Headquarters, Department of the Army, August 2003), B-2.

[6] Reisberg, *Cognition*, 492. Research shows it takes at least ten years to become an expert in a knowledge domain.

[7] John Dewey. *How we Think* (New York: Prometheus Books, 1991), 129.

Here the word "meaning" deserves more attention. Meaning provides definition, identification and distinction within a system.[8] The danger of determining meaning lies in vagueness. Vague meanings do not allow for analysis or support for other ideas. The problem is exacerbated when vague meanings, by the nature of lack of definition, disguise the mixing together of other meanings. This often results in the substitution of one meaning for another and covers up the failure to have precise meaning.[9] Therefore, it is precise meaning that results from a certain type of cognition that will best provide commanders and staffs with understanding.

The Need for Better Understanding

The Army's recent experiences did little to force Army leaders to devise a system for systemic understanding. In 1991, the U.S. Army faced an opponent that the U.S. Army was very well equipped and trained to defeat, the Iraqi Army, and the planned endstate for the operation was limited and defined. This opponent did little to adapt to the technological and firepower superiority of the United States. The Iraqi Army's ability to command and control its forces, and much less, its ability to exercise initiative and flexibility when faced with a fast and professional force was non-existent.[10] Given these circumstances, the U.S. Army did not need to gain a very complete understanding of the operational environment, only a complete understanding of the enemy situation. The Army certainly stood to benefit from employing a method to gain understanding of the operational environment (OE), but given the limited nature and overwhelming success of the conflict there was no strong movement within the Army to develop new concepts.

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[8] Ibid., 130.

[9] Ibid., 126-130.

[10] Brigadier General John S. Brown, "The Maturation of Operational Art: Operations Desert Shield and Desert Storm," in *Historical Perspectives of the Operational Art*, by Michael D. Krause and R. Cody Phillips, (Washington DC: U.S. Army Center of Military History, 2005), 459-465.

In Somalia, the U.S. participated in an intervention mission in 1993 to assist Somalis in promoting national reconciliation, rebuilding the central government, and reviving the economy. Engagement was limited to operations that centered on humanitarian relief. Disarmament of warring factions was not a United Nations mission.[11] On October 3, 1993 the "black hawk dawn" incident occurred and the U.S. Army suffered 19 soldiers KIA and 84 wounded. It is speculated that a low threshold for U.S. casualties played a major role when the U.S. ordered a stop to all actions and pulled out of Somalia in March 1994.[12] The incident provoked some interest in discovering the problems associated with the mission, but due to the short time of engagement the need to understand the systemic characteristics of the populace, government, and warring factions was not illuminated.

In Operation Iraqi Freedom, the U.S. forces planned to defeat an enemy that did change the way it fights in an attempt to more effectively counter the technological and firepower superiority of the U.S. armed forces. This was again the Iraqi Army, but Saddam Hussein adapted to counter the U.S. military's superiority by using his conventional force in asymmetric roles and paramilitary forces in urban areas. The U.S. plan worked and the invasion was a resounding success, but it required forces at all levels to change their understanding of the situation. As the invasion unfolded the adaptability of U.S. forces was tested. In a candid statement, LTG William Wallace, commander of ground forces for the invasion, gave an honest assessment of the enemy encountered saying, "The enemy we're fighting is a bit different than the one we war-gamed against because of these paramilitary forces."[13]

The U.S. armed forces adapted superbly but then faced the problem of stabilizing a nation. Iraq's political structure dissolved, security forces essentially disappeared, and the

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[11] The World Bank Group. "Conflict in Somalia: Driver and Dynamics," *Conflict Study* (Washington D.C.: World Bank InfoShop, January 2005), 11-12.

[12] Philip Rhodes, "No Time for Fear," *Airman Quarterly* (May 1994), 2.

population quickly slipped into an anarchic state. Given these conditions, budding insurgent movements and widespread criminal activity quickly beset Iraq. It did not take long for Army leaders to begin asking why commanders and planners did not anticipate the major developments that were virtually inevitable consequences following the ousting of the Iraqi regime.[14]

As the situation continued to deteriorate by mid 2003, the media began using a term that sent a chill across the Department of Defense (DoD): insurgency. DoD officials denied the assessment, perhaps due to the stigma of the term "insurgency" and its allusion to Vietnam, but also due to an inability to achieve an understanding of the environment.[15] The result was a delayed reaction to the changes in the environment and loss of the initiative to criminal, insurgent, and sectarian movements. The need for understanding became clear to Army leadership, and new tactics techniques and procedures (TTPs) and modifications to doctrine began to reflect this need.

Recent developments in doctrine and TTPs now make clear the need for better understanding of the operational environment, but the Army has yet to take a definitive path toward increasing understanding.[16] FM 3-0, "Operations" added the step "Understand" to the Battle Command concept of "Visualize, Describe, Direct" but does little to provide the reader with how to achieve understanding.[17] The addition of the step "understand" is a logical addition since commanders and their staffs will always struggle to visualize if they do not have a baseline understanding of their OE. The field manual indicates that the step "Understand" is to frame and

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[13] Jim Dwyer, "A Gulf Commander Sees a Longer Road," *New York Times*, March 28, 2003.

[14] David C. Hendrickson and Robert W. Tucker, "Revisions in Need of Revising: What Went Wrong in the Iraq War," (Carlisle Barracks: Center for Strategic Leadership, U.S. Army War College, December 2005), vi.

[15] Thomas E. Ricks, *Fiasco: The American Military Adventure in Iraq* (New York: The Penguin Press, 2006), 169 - 172.

[16] Joint Chiefs of Staff. Joint Publication 5-0 *Joint Operation Planning* (Washington D.C.: U.S. Government Printing Office, 26 December 2006), III-17.

then reframe the problem and PMESII-PT (Political, Military, Economic, Social, Information, Infrastructure, Physical Environment, and Time) operational variables are the method to help accomplish framing and reframing.[18] Once engaged in the OE, the FM shows that the steps "Understand, Visualize, Describe, Direct" are a continuous process where the commander reframes the problem (and leads and assesses) throughout the process.[19] FM 3-0 uses analysis of what are essentially systems, PMESII-PT, to achieve understanding, but it does not take a systemic approach to analyze how the systems relate, change, and interact with each other. The changes in the FM 3-0 are in a positive direction, but they do not provide an adequate process to achieve understanding of complex adaptive problems.

The Army's Future Combat Systems (FCS) objective force concept and transformation concept call for units to "see first, understand first, act first" and "finish decisively" but again, no clear method for achieving in-depth understanding is articulated. The objective force concept offers the following for "Understanding First":

> The common operational picture (COP) produced by Seeing First provides an unprecedented opportunity to understand what the enemy is doing and better anticipate its intentions…The key enablers for Understanding First include knowledge-based Battle Command system; mentally agile, intuitive, self-aware and adaptive leaders at all levels; and an execution-centric Command and Control (C2) system that goes beyond command and control on the move- - the commander has a tactical operations center (TOC) like capability on the battlefield.[20]

It is unwise to believe that seeing first provides understanding. Like a game of chess, opponents may see all the pieces on the chessboard but that does not mean that either opponent knows how the other will play or if they know and will play by the rules. In today's OE, the

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[17] U.S. Army Field Manual 3-0 *Operations* (Washington DC: Headquarters, Department of the Army, 2008), 5-3.

[18] Ibid., 1-5 and 5-3.

[19] Ibid., 5-3.

[20] U.S. Department of the Army, "United States Army White Paper: Concepts for the Objective Force," (Washington, DC, 2002), 4.

chess board can be seen well by only one opponent, the irregular threat opponent. This opponent's chess pieces are not recognizable and his moves are not in accordance with the rules. However, with an already established understanding of the environment, leaders can take advantage of new intelligence, surveillance, and reconnaissance (ISR), and C2 technologies to illuminate where the pieces are and what moves might be made while enhancing intuitive decision making. But it is the leader's understanding that provides the key ingredient to the desired agility and intuitive decision making of the objective force on the battlefield. As the Army moves forward with advancing technologies of C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance), it must not lose sight of the importance of gaining understanding through using sound critical thinking and cognitive processes. Transformation and the development of technologies cannot alone provide situational awareness and understanding.[21] Technology may provide a medium for the COP, but this COP only works to enhance understanding, not provide it, and is only as good as its inputs.

Understanding and Army Operations

Achieving understanding of the operational environment requires dedicated time and resources to planning staffs. A planner may find it difficult to trade time for better information and better understanding since time is typically the most valuable yet scarce resource to a planner, but this is a necessary trade off.

Army staffs, particularly at tactical levels, may move directly into mission analysis without doing research to gain greater knowledge and understanding of their environment outside of what is articulated in the higher headquarters operations order (OPORD) or operation plan (OPLAN). Staffs will arrive at some level of understanding through mission analysis, but not the

[21] Department of Defense Office of Transformation *The Implementation of Network-Centric Warfare* (Washington DC: Director, Force Transformation, Office of the Secretary of Defense, January 5, 2005), 18.

ideal level necessary to achieve a thorough understanding of an OE that consists of many complex adaptive systems in their geographic area of responsibility. [22] Mission analysis provides understanding only through the requirement to gather information to execute the steps of this military decision making process (MDMP) requirement.

Within MDMP, the intelligence preparation of the battlefield (IPB) becomes the primary method for understanding the environment. The staff's subject matter experts often times stay within their expertise during the IPB, and the intelligence officer becomes the resident and sometimes sole source of knowledge to answer questions that arise regarding the OE. This setup results in lopsided knowledge and analysis and incomplete understanding of the OE across the staff sections. When the environment is not understood and interpreted, staff officers improperly assess and update running estimates resulting in inaccurate situational awareness. In these cases the Commander, Operations Officer, and Intelligence Officer form the nexus for the unit's perception of the OE, while the intellectual energies of the remaining staff go underutilized.

This is not to say that mission analysis or MDMP are flawed processes, rather, it illustrates that a process is necessary to inform MDMP. This process is necessary to harness the intellectual energies of the entire staff to form the understanding of the OE. This shared understanding of the OE then contributes to the COP formed by other commands. When commanders, staffs, and soldiers achieve a shared understanding, a unit is able to accomplish any task more effectively due to unified effort. This allows for faster decision cycles at all levels and for faster planning and orders production within a command and staff.

In today's OE, the ability for units at all levels to act very quickly with bold initiative is highly beneficial, but is only possible when units at all levels work toward the same ends. Shared

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[22] Department of the Army, TRADOC Pamphlet 525-5-500 *Commanders Appreciation and Campaign Design* (Fort Monroe: Headquarters, U.S. Army Training and Doctrine Command, January 2008), 1. Complex adaptive systems are systems that exhibit coherence under change, via conditional action and anticipation, and they do so without central direction.

understanding makes this possible, but the COP is destined for flaws when units are unable to achieve a shared understanding even across their own staffs.[23]

A clear advantage in developing understanding of the OE is the ability to adapt in a changing environment. Understanding an OE may assist the planner or commander in predicting what happens next, and provides insight to explain why and how the environment is changing. Proper and relevant feedback mechanisms may then be established and effective counteractions taken.

Whatever method is adopted, it must provide understanding that can serve as the essential foundation necessary to conduct informed planning and should leverage natural cognitive processes. This understanding provides the planner with a more natural ability to determine appropriate answers to problems when operating in a new or familiar OE. Even in very complex OEs, the planner is more capable of providing valuable input to solving problems and developing cogent plans.

A Cognitive Assessment of Current Methods

Achieving understanding is no doubt a difficult endeavor, and many approaches exist to tackle the task. Approaches may appear overly simple while others seem quite difficult, perhaps making the approach itself part of the complexity of a problem. It is therefore important to determine a way to measure the effectiveness of approaches to determine what methods give a user advantages and disadvantages. This section of the monograph will describe the fundamental features of cognition that facilitate understanding problems in the context of their environment when manifested in military approaches to achieve understanding. These fundamental features

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[23] U.S. Army Field Manual 1-02 *Operational Terms and Graphics* (Washington DC: Headquarters, Department of the Army, 2004), 1-40. FM 1-02 defines common operational picture (COP) as (DOD) a single identical display of relevant information shared by more than one command. A common operational picture facilitates collaborative planning and assists all echelons to achieve situational awareness. (Army) An operational picture tailored to the user's requirements, based on common data and information shared by more than one command.

will serve as the means of comparison to test for embedded cognitive processes in current military approaches to understanding.

The chosen parts of cognition identified to assess systemic approaches all center around how the mind manages knowledge. This is a key idea since knowledge provides understanding through the process of translating information (in the form of knowledge) into meanings through judgment to appreciate the importance of events, people, conditions, and changes in an environment.[24] The best approaches should invoke these natural cognitive processes that help apply judgment by recalling relevant information, forming mental models, making decisions, and drawing conclusions that facilitate understanding.

Before moving into the cognitive processes used in judgment, it is beneficial to illuminate why judgment appropriately fits as a measure for systemic approaches to understanding. As originally applied in a legal system, judgment is the authoritative decision of matters of controversy.[25] So judgment is a matter of sifting through facts and information of a controversy and suggests different meanings and rival possible interpretations. When correlated to cognitive processes, the determination of the data that are important in the given case is inductive thinking, and the elaboration of the meanings suggested by the crude data is deductive thinking.[26] Finally, connections that bind previously independent features, facts, data, and information are made to reach a rational conclusion, and this is systematic inference.[27]

John Dewey, author of the book, *How We Think*, defines systematic inference as "the recognition of definite relations of interdependence between considerations previously unorganized and disconnected, this recognition being brought about by the discovery and

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[24] Dewey, *How We Think*, 126-127.

[25] Ibid., 102.

[26] Ibid., 103.

[27] Ibid., 80-81.

insertion of new facts and properties."[28] These are the same practical and cognitive processes that apply during rational analysis, the preferred method of judgment when attempting to achieve understanding.

The cognitive assessment used will attempt to determine what method of cognitive thought is suggested by current military systemic approaches. In particular, this test will determine the method of thought suggested when thinking about evidence, making inferences and drawing conclusions. Again, in cognition, this process is judgment.[29]

It is widely accepted that in cognition there are two types of judgment; intuition and rational analysis.[30] The first is the method most people use when analyzing evidence and making decisions, and normally involves recognizing a pattern in an observed stimulus and rapidly, perhaps automatically, taking action. People may know where their intuition is derived when making a decision, or taking action, and there are many instances when people do not recognize how their intuition is derived; they just seem to know what to do. Familiar descriptions of intuition include acting on a "gut feeling" or "sixth sense." [31] The second type of judgment is rational analysis, and is a method less often used by people in their daily lives and involves a more deliberate analysis of information. Rational analysis is slower, generally rule driven, requires greater effort and normally used only with deliberate intention.[32]

This cognitive assessment views rational analysis as the better form of judgment when in a planning environment and when attempting to achieve understanding of the environment. Of

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[28] Ibid., 81.

[29] Reisberg, *Cognition*, 403.

[30] U.S. Army Field Manual 6-0 *Mission Command*, 2-3 to 2-6. In FM 6-0 the U.S. Army calls the two types of judgments "two ways to make decisions" and refers to the two types of decision making as "analytic decisionmaking" and "intuitive decisionmaking."; Reisberg, *Cognition*, 427. Reisberg calls the two types of judgments "dual-process models of thinking" and refers to the two types as "intuition" and "reasoning" or "association-driven thought" and "rule-driven thought."

[31] Gary Klein, *Sources of Power: How People Make Decisions* (Cambridge, MA: The MIT Press, 1999), 31-34.

course, there are often times when rational analysis is inferior, particularly when time is the most important factor. To reiterate, commanders and staffs should use rational analysis when time is available, normally when using a systemic approach and when planning prior to mission execution. With the understanding gained from using a systemic approach based on rational analysis, leaders at all echelons become better equipped to make intuitive decisions in the battlespace, and intuitive decisions are the most effective decisions when conducting missions in the battlespace.[33]

A premise of this analysis is that rational analysis is a superior form of judgment compared to intuition to achieve understanding. Normally, people will rely on intuition to make most decisions, also known as heuristics, since it is fast, relatively easy, and can lead to a correct judgment.[34] However, given the speed and efficiency of intuition, the cognitive strategies used are not necessarily ideal and can lead to error. Rational analysis, though more cumbersome, is also more precise and often results in more accurate judgment when compared to intuition. Rational analysis done properly can often detect and overrule intuition's errors.[35] Therefore, this analysis will attempt to identify which systemic approaches influence commanders and staffs to use rational analysis versus intuition to achieve understanding.

The following sections describe the features of cognitive thought and judgment chosen for analyzing military approaches to understanding. The features chosen attempt to discover the

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[32] Reisberg, *Cognition*, 427.

[33] Malcolm Gladwell, *Blink: The Power of Thinking Without Thinking* (New York: Little, Brown and Company, 2005), 107, 143. Note is based on a Joint Forces Command planning exercise "Millennium Challenge" in 2000. Marine MG Paul Van Riper, Commander of the "Red Team", states that he was not opposed to rational analysis, he just thought it was inappropriate in the midst of battle, where the uncertainties of war and the pressures of time made it impossible to compare options carefully and calmly; rational analysis happens first, before the battle starts and is followed by rapid cognition.

[34] Reisberg, *Cognition*, 427. Heuristics is a fast, easy method of judgment but since conclusions are drawn based on experience and intuition it can lead to error.

[35] Ibid.

presence of rational analysis or intuitive heuristics. Processes with more cues for rational analysis and less cues for heuristics are viewed as advantageous.

Availability Heuristic

The availability heuristic is a method of judgment exercised when someone thinks of cases available to memory to arrive at a conclusion. It is a fast and efficient strategy that can lead to accurate conclusions; however, this is not always the case. Availability based judgments can be highly misleading.[36] The organization of the mind creates a tendency to recall a relevant memory that is easily available. The normal consequence is an overestimation of the frequency of events and an overestimation that the event will occur again. Cognitive research proves that this mental shortcut approach is used even when the circumstances of a wrong conclusion carry important or severe consequences. [37]

For example, if two soldiers are asked to recall counterinsurgency situations and one recalls twelve situations and the other recalls six situations, the soldier that recalled twelve events is much more likely to conclude that the situation will happen again. The availability in memory dictates how strongly a person will believe a conclusion is accurate. Therefore, the harder someone has to work to recall situations, the weaker their conviction that their judgment is correct; while those who easily recall situations have a stronger conviction the conclusion is accurate. This can feed into belief perseverance and confirmation bias, heuristics that are explained in a following section.

In military operations, exaggerated estimates of a situation can result in wasted resources, but most damaging is the resulting misunderstanding of the environment and flawed situational awareness. Obviously, this is problematic to someone attempting to achieve understanding.

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[36] Ibid., 409.

[37] Ibid., 407.

Using the availability heuristic will tend to skew understanding, and unless realized, only time in the operational environment will provide enough contradictory evidence to overturn the belief.

Rational analysis requires a simple solution. Realization that conclusions are made with information available in memory, then using systemic searches to confirm the information in memory. In other words, either change the information source from memory into information that is definitive and testable, or use information that is already known as true and is considered factual. This type of information is called diagnostic information and is typically used in rational analysis.[38]

Representative Heuristic

The representative heuristic relies on gathered information instead of what is available in memory. Like the availability heuristic, the representative heuristic can result in flawed judgment.

The representative heuristic makes inferences based on information gathered resulting in an assumption that the categories people use to sort information are largely homogeneous.[39] Note that this gathered information is generally gathered by observations, not searches for diagnostic information. To explain further and simplify the following example is suggested: A shopper sees someone in a store. The observed person is wearing the same style and color shirt worn by employees. It is not uncommon for a shopper to make the inference that the person wearing the style and color shirt is an employee. This inference is based on the shopper's experience that when asking questions about products, or when checking out, all employees wear a particular style and colored shirt. Since the shopper engages the representative heuristic, he or she may approach the person wearing the style and color shirt category that matches an employee and then

[38] Ibid., 421.

[39] Ibid., 409.

ask for assistance. The shopper may be right that the person is in fact an employee, and get an answer to the question, or the shopper may be wrong and receive a quizzical and embarrassed gaze.

As the example above indicated, use of the representative heuristic can lead to judgment based on a small sample size. Using rational analysis requires that conclusions are generally drawn from a large sample size to provide statistical reliability. In the COE, use of the representative heuristic would result in drawing a conclusion regarding one or just a handful of events. Clearly, drawing the conclusion that an IED set in a neighborhood makes the inhabitants of the neighborhood part of an insurgent support network is flawed and dangerous. Rational analysis can lead to proper conclusions about the inhabitants by basing judgment on sound statistical data or other information that is considered reliable.

Anchoring and Adjustment Heuristic

Another commonly used heuristic used in intuitive judgment is called anchoring and adjustment. Like the previous two methods, anchoring and adjustment is widely regarded as a shortcut to drawing conclusions from evidence.[40] When applying anchoring and adjustment, a person will use their general knowledge about a subject to establish an anchor from which a conclusion is made regarding another subject this is mostly unfamiliar. This can prove a useful method, but in most cases people using this heuristic will adjust too little from the anchor because the initial anchor is believed more correct than it is.

Of course there are situations when use of this heuristic will result in an exaggerated conclusion; that is, a conclusion that overstates the magnitude of the circumstances. In these cases, it is not normally the result of adjusting too far from the anchor. It is the result of setting

[40] Ibid., 413.

the original anchor too high and the tendency remains to adjust too little up or down from the initial anchor.[41]

In military operations, use of this heuristic can result in many problems since conclusions will not typically appreciate the magnitude of the circumstances, or will underestimate the magnitude of the circumstances. The conclusions and subsequent misunderstanding of the environment and skewed situational awareness can prove costly in a battlespace.

A commander that moved to a new sector in a COIN (counterinsurgency) environment will serve as an example of anchoring and adjustment. This commander needs to begin operations soon, but first wants to determine the number of vehicle borne improvised explosive devices (VBIED) his unit may encounter. In his previous sector, this unit averaged four VBIED attacks per day. Given the relative calm of this sector, the commander adjusts from his anchor of four, given his previous observations, down to less than one per day.

Rational analysis requires that statistical data or known information is tested or analyzed to determine accuracy and relevancy before making judgment. In the example above, the commander perhaps did not have the time or historical data available to make a rational analysis based determination of possible VBIED attacks in his new sector. In cases when this type of information or data is unavailable, or time does not permit thorough analysis, anchoring and adjustment can still be used. In order to stay within the realm of rational analysis, however, the anchor should be determined more carefully, using any readily available resources such as statistical data or available intelligence to ensure that the anchor is as accurate as possible.

Disconfirmation

Confirmation bias is the act of more readily accepting ideas and evidence that confirm prior beliefs. A characteristic of confirmation bias is quickly accepting ideas or evidence that are

[41] Ibid.

intuitively believed as true.[42] The belief a person has that an idea or evidence is true is a result of that person's prior experience and knowledge. This prior experience and knowledge forms the mental library of information and data available to draw intuitive judgments. Generally, confirmation bias leads people to remember evidence that agree with their beliefs while forgetting evidence that disagrees.

The instinct to accept confirming evidence is very strong and is generally done with no scrutiny. When given conflicting evidence, the instinct to reject information is very strong and normally results in great scrutiny to expose any flaws.[43] Again, this is a useful and important cognitive function, but when an idea or evidence is presented that conflicts with one's mental library, this natural tendency for rejection can lead to flawed judgment. To override what is believed as true when facing conflicting information requires mental energy and effort.

In military operations this problem is most prevalent in planning processes. Confirmation bias can lead to sluggish planning especially considering the variety of knowledge and backgrounds of members of the staff. In other cases, the staff might share understanding only to have new information arrive late in the planning process that challenges conclusions. A type of blindness to contradiction sets in. The reason for this blindness when trying to find flaws is a form of confirmation bias and belief preservation that results when a planner is too confident and familiar with a plan. A type of numbness to problems ensues and even very experienced planners are unable to detect problems in a plan that resulted from a deliberate and rational process.

It can be difficult to invest additional time and effort into understanding, only to have new evidence present a significant challenge to beliefs and previous discoveries. This reinforces the natural tendency to reject contradictory evidence. The mind will naturally gravitate to belief

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[42] Ibid., 438.

[43] Ibid.

perseverance, where beliefs are not altered even in the face of overwhelming contradicting evidence.

In rational analysis, people will accept conflicting information as potentially valuable and will even seek out conflicting evidence to challenge beliefs. This process is known as disconfirmation and requires accepting conflicting information and attempting to discover the meaning of it, not discard it, and assess how it affects previously acquired meanings.[44]

Another useful form of disconfirmation is the practice of pre-mortem strategy, a method of disconfirmation. The premise of this strategy is that you make a concerted effort to see flaws in a plan. The pre-mortem strategy attempts to cure the blindness and numbness of belief preservation by, prior to actual execution, stating that the plan created has failed at particular time during notional execution.[45] Planners must then explain why the plan failed. By creating a scenario of failure, the forcing mechanism is created to help planners more easily see flaws in a plan and the natural instinct for meaning and explanation is fully engaged.

Categorization

Categorization is a rational analysis method that breaks evidence into its component parts, or categories, in order to simplify understanding of the broader context and meaning.[46] This technique is very much like the problem solving method of breaking a problem into subparts and establishing subgoals towards problem resolution. The difference here is that the aim is to understand evidence and information and acquire meaning, not solve a problem.[47]

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[44] Ibid.

[45] Klein, *Sources of Power*, 71.

[46] Reisberg, *Cognition*, 491.

[47] Ibid., 492.

Expert chess masters show a consistent reliance on this method in order to understand the structure of chess, its parts, and how these parts relate to each other. Daniel Reisberg, the author of the book *Cognition* provides an excellent example of categorization.

> When tested for memory recollection, chess masters viewed a chess board for five seconds and were then tasked with replicating the piece placement on a new board. The chess masters were, on average, able to place twenty pieces in their exact previous location while novices could only place a few. The test revealed that chess masters placed pieces a few at a time, separated by slight pauses. The chess masters were placing the pieces by their tactical function categories such as type of attack formation or type of defense formation. Novices failed to see the functional category of the formations on the board and therefore relied on memorizing where each individual chess piece was located on the board. Not surprisingly then, when the pieces were arranged in a ambiguous and random way, the chess masters fared no better than novices since their ability to categorize by function was gone and their understanding stripped away. [48]

The goal in categorization is to organize evidence into meaningful chunks to stimulate the best level of understanding. The process of categorization does more than categorize evidence, it actually organizes thinking.[49] This helps focus on the broad importance of the categories without getting lost or bogged down in details.

In military operations, categorization helps give planners the ability to focus on what is important. By carefully selecting categories, planners can effectively break evidence into more digestible parts, easing understanding and discovery of meaning. Categories are normally broken into two types; by function and by homogeneous characteristic. Function categories focus on identifying actions and activities while homogeneous characteristics focus on identifying common traits of a person, place, or thing and organizing by these common traits.[50]

Categorization is a useful method, but it is normally optimally utilized when tailored for a particular situation. Using already established categories can limit a person's creative ability to customize a construct that best helps solve a problem or understand a situation. Providing a

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[48] Ibid., 491.

[49] Ibid., 492.

[50] Ibid.

person with a predetermined construct can create a heuristics trap since no cue is sensed to exercise analytic rigor to determine information. When provided with a construct it is best to first carefully consider the situation, establish categories that are particular to the situation, and then add new categories to the set provided. This is a good method to ensure categorization is properly conducted when it may appear no analysis is necessary.

Current Methods and Analysis

There are military approaches to understanding and problem solving in current U.S. military doctrine. These approaches all attempt to provide understanding and clarity to complex adaptive systems that the U.S. military encounters and these approaches all differ in form and level of development.

Joint doctrine is leading the way by developing a systemic approach to understanding through systems of systems analysis (SoSA). SoSA is method embedded in the effects-based approach to joint operations and achieves a systems perspective that gives commanders an understanding of the OE.[51] The Navy's method of understanding the environment is found in the planning step "Commander's Estimate of the Situation" which includes mission analysis. The Army's planning doctrine is much the same as the Navy where understanding is limited to gathering and analyzing information as required to update staff estimates and conduct mission analysis.[52] The Army's planning manual, FM 5-0, lacks any systemic approach to understanding a complex adaptive system; however, there are other manuals that include, at least in part, a systemic approach.

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[51] Department of Defense, *Commander's Handbook for an Effects Based Approach to Joint Operations* (Suffolk, VA: Headquarters, U.S. Joint Forces Command, Joint Warfighting Center, 24 February 2006), II-2 to II-3.

[52] U.S. Army Field Manual 5-0 *Army Planning and Orders Production* (Washington DC: Headquarters, Department of the Army, January 2005), 3-10, 3-13, 3-15.

The Army quickly updated FM 3-24, the counterinsurgency manual in 2006 to provide a better way of understanding the environment in Iraq as insurgency and criminal activity engulfed the country following the fall of Baghdad in 2003. There are many systemic approaches included in FM 3-24, many of them resembling Systemic Operational Design (SOD).[53] Another step in the right direction is FM 3-24's discussion of operational design and redesign in order to learn from a changing environment and adapt to changing conditions.[54] FM 3-24 describes these systemic concepts, and social structure and network analysis but there is no introduction of these ideas in the Army's capstone doctrinal manuals.

The newly published FM 3-0 takes a different approach to understanding the operational environment. It departs from FM 3-24's systemic concepts by adopting the operational variables of PMESII for analysis.[55] FM 3-0's failure to adopt the systemic approaches introduced in FM 3-24 moves it further away from the ideas employed in counterinsurgency operations, but closer to the SoSA approach indoctrinated in JP 5-0. FM 3-0 adopts PMESII and supplements the acronym adding the Physical Environment and Time (referenced in the FM as PMESII-PT) but its likeness to SoSA largely stops there.[56] FM 3-0 does not consider the components of PMESII-PT as an overarching system and does little to give planners and executers a means towards analyzing how these system components relate to one another, or how planners learn and adapt as these related systems change.

Training and Doctrine Command's Pamphlet 525-5-500 Version 3.38 titled "Commander's Appreciation and Campaign Design" (CACD) presents another concept the Army

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[53] Systemic Operational Design (SOD) is a systemic approach to problem solving authored by former Isreali Defense Force Brigadier General Shimon Naveh and adopted by the U.S. Army to facilitate further development of systemic approaches to problem solving.

[54] U.S. Army Field Manual 3-24 *Counterinsurgency* (Washington DC: Headquarters, Department of the Army, December 2006), 4-5 to 4-8.

[55] U.S. Army Field Manual 3-0 *Operations*, 1-5.

is examining to achieve understanding the operational environment. Described as a "cognitive model," this pamphlet is intended for use by commanders and staffs responsible for campaign design.[57] The purpose of the pamphlet is to provide a concept for use in creating a shared understanding of complex operational level problems. The concept is grounded in experimentation with SOD during the Army's annual future warfare study and capstone wargame known as Unified Quest.[58] While SOD is the foundational concept for CACD, CACD is a translated version of some of the best practices from SOD and other approaches in a doctrinal style and language. The two concepts are distinctly different and are both at different stages of development.

System of Systems Analysis

Joint doctrine embeds SoSA in the effects based approach to operations in order to gain a broader and deeper understanding of the OE as both a functional and dysfunctional system.[59] This is accomplished through developing a comprehensive systems perspective of the environment at the theater strategic and operational levels. Understanding the OE through SoSA, as an integral part of the effects based approach, allows U.S. forces to focus efforts on achieving effects through operations characterized by unified effort that most effectively accomplish mission objectives that work towards achieving the desired operational endstate. This is accomplished while avoiding effects that are counter to objectives and the desired endstate.[60]

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[56] Department of Defense, *Commander's Handbook for an Effects Based Approach to Joint Operations*, II-2; Ibid.

[57] Department of the Army, TRADOC Pamphlet 525-5-500 *Commanders Appreciation and Campaign Design*, i.

[58] Department of the Army, *Commanders Appreciation and Campaign Design*, 1.

[59] Department of Defense, *Supplement One to Commander's Handbook for an Effects Based Approach to Joint Operations (Theory)* (Suffolk, VA: Headquarters, U.S. Joint Forces Command, Joint Warfighting Center, 24 February 2006), Supplement-8.

[60] Department of Defense, *Commander's Handbook for an Effects Based Approach to Joint Operations*, II-2.

Like all methods for gaining understanding, SoSA requires investment of time up front to conduct the analysis, however the investment in time pays off in more efficient planning during the JOPP (joint operation planning process) and better execution of the plan to include the ability to adapt and learn once operations commence. SoSA allows commanders and staffs to monitor and assess changes to the systems in the OE, learn from the changes and react appropriately through refined plans and execution.[61]

SoSA is conducted during the JIPB (joint intelligence preparation of the battlespace) and is usually led by the J-2 (Joint Force Intelligence Directorate).[62] Normally, planners conduct SoSA within the framework of the JIPB to enhance the JIPB process. SoSA involves analyzing the interconnected systems of the operational environment. These interconnected systems are referred to by the use of the acronym PMESII; Political, Military, Economic, Social, Infrastructure and Information. The systems are categorized as friendly, enemy and neutral (or unaligned) and are graphically depicted to form a model of the interconnected systems of the OE.[63] Planners identify the important nodes within each system. These nodes are persons, places, or things that comprise the system under analysis. While the nodes are established, or after nodes are established, links between the nodes are identified that establish relationships. As nodes and links are built, potential key nodes are identified which may then become decisive points for future operations.[64] Key nodes, those that relate to an operational effect or center of gravity, are typically found in more than one system.

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[61] Department of Defense, *Commander's Handbook for an Effects Based Approach to Joint Operations*, viii-ix.

[62] Joint Chiefs of Staff. Joint Publication 3-0 *Joint Operations* (Washington D.C.: U.S. Government Printing Office, 17 September 2006), IV-4.

[63] Department of Defense, *Commander's Handbook for an Effects Based Approach to Joint Operations*, II-1 to II-2.

[64] Ibid., II-3.

The planner may model the system or parts of the system using node-link analysis. This involves conducting a more exhaustive analysis of the nodes and links of a system or part of a system to gain a more detailed picture of how the system or node operates. It also identifies what links make up the system and determines what subsets or hierarchical relationships make up the node or system.[65] As analysis continues, the key nodes and links help planners identify potential centers of gravity that feed operational design, mission analysis and course of action development.[66]

When operations begin, SoSA is continually updated, and established MOEs (measures of effectiveness) and MOPs (measures of performance) help commanders and their staffs evaluate whether or not actions on systems in the OE are creating desired effects or undesired effects that work towards or against objectives. This process allows commanders to learn from actions taken to effect systems in the OE, continue to monitor the system or adapt operations and actions as necessary. This cyclical and iterative process forms a monitor–assess–plan–direct loop.[67]

One of the benefits of SoSA is its simplicity if it is conducted in isolation from the effects-based approach. The process is built on answering questions regarding the PMESII systems. These questions are answered using classified and unclassified data mining. This data informs the planner and enables the identification of systems and nodes and corresponding links. This concept is simple enough that it allows for variation and judgment in its application. Current and developing doctrine identifies the PMESII systems as the basis for analysis but does not limit the planner from adding new systems that are unique to the situation.

SoSA is well developed doctrinally, and is routinely used at the joint level. One reason for this level of development is that it is a part of the effects based approach, a mature concept in

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[65] Ibid.

[66] Ibid., II-3 to II-4.

[67] Ibid., IV-1.

the military services. It is strikingly similar to the Air Force's doctrine for strategic bombing of vital centers of the past, with some current terminology updates.

Planners conduct SoSA by itself or as part of the larger joint doctrinal concept for effects based approach embedded in the JIPB process.[68] There is ample doctrinal material that makes SoSA ready for application at the joint level, and it is sufficiently developed to allow for application at various commands uniformly.

A drawback is that SoSA is rooted in the concept of effects based approach to joint operations. Effects based operations are not foreign to Army planners, but current doctrine states that the Army does not conduct effects based operations. FM 3-0 states that "Army forces do not use the joint systems analysis of the operational environment, effects-based approach to planning, or effects assessment. These planning methods are intended for use at the strategic and operational levels by properly resourced staffs."[69] This does not mean that the Army would not find utility in using the process, however, it is doctrinally best developed in the context of effects based approach to operations and would require further development for integration into the Army's MDMP, as it is in JOPP. Focusing on the SoSA process to gain understanding is not to be ruled out; especially considering the operational environment the Army finds itself in today. Echelons as low as Company and Platoon are conducting operations with implications in all PMESII categories.[70] The following section (PMESII and PMESII-PT) explains how the Army is adopting and adapting the concept of SoSA.

Analyzing SoSA using the cognitive assessment produces mostly positive results. Many elements of rational analysis are included in SoSA, although it is not void of intuitive processes.

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[68] Ibid., IV-6.

[69] U.S. Army Field Manual 3-0 *Operations* (Washington DC: Headquarters, Department of the Army, February 2008), D-2.

[70] Colonel Robert B. Brown, "Transforming in Peace and War," *Military Review* (May-June 2005): 22.

First, SoSA calls for data mining. This step may seem obvious, but it is a very positive step in the direction of preventing overuse of heuristics during the process and is often overlooked by planners. Data mining is required when assessing the systems and subsystems. Planners are influenced to use rational analysis to conduct assessments by finding necessary and useful data required for each system, subsystem, node, and link. The process calls for planners to engage intelligence organizations, other government agencies, and nongovernmental centers of excellence to create and sustain the systems perspective, which again, establishes a forcing mechanism for rational analysis and discouraging use of heuristics.

SoSA recognizes the importance of time in developing a systems perspective, and the inverse relationship of time and fidelity of systems analysis. Sufficient time allows for rational analysis and lack of time forces planners into making intuitive conclusions, thereby lowering the fidelity of assessments.

SoSA warns planners against using the representative heuristic when conducting systems analysis. It explains the utility in using systems knowledge and identifying common elements from areas already analyzed from within the same region.[71] This can prove a time saving and useful method, and is an effective use of the representative heuristic in some situations. SoSA then further explains that, although many operational areas may share common characteristics, the specific nodes and links are inevitably different.[72] This kind of doctrinal language will cue use of rational analysis and influence staffs to conduct in depth analysis in cases when the natural instinct to use a heuristic is strong.

SoSA is good example of using categorization to help achieve understanding. Effects based approach doctrine breaks the PMESII systems into subsystems, providing a blueprint for

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[71] Department of Defense, *Commander's Handbook for an Effects Based Approach to Joint Operations*, I-2.

[72] Ibid.

categorization. SoSA continues by requiring a systems perspective of not only the environment from the friendly perspective, but also the enemy and neutral perspectives as well.[73]

SoSA prevents using anchoring and adjustment by emphasizing establishment of baseline information regarding the operational environment. Joint doctrine states, "SoSA…allows the staff to gain a baseline appreciation of the environment and to organize information in a form useful to the commander."[74] This baseline data establishing a foundation of knowledge facilitates effective assessment of the environment as military operations are conducted. This baseline also provides a more accurate anchor for planners if it is necessary to resort to using the anchoring and adjustment heuristic, allowing for more accurate judgment of new evidence.

There is also an element of rational analysis through disconfirmation in the SoSA process. Disconfirmation is found in "center of gravity" analysis by considering not only the enemy sources of power and vulnerabilities but also identifying friendly sources of power and vulnerabilities. This allows commanders to attack enemy sources of power and vulnerabilities while protecting his own.

SoSA cues heuristics in some areas. In particular, when SoSA asks analysts to evaluate potential effects, it does not detail what methodology to use. This can result in intuitive judgments to forecast effects. In contrast, rational analysis calls for information to support forecasts. In this case, rational analysis calls for use of statistics or diagnostic information to determine trends that support a forecast.

Another area that can prove problematic is determining desired and undesired effects or behaviors. Like forecasting effects, desired and undesired effects should force examining necessary diagnostic information and ensuring the validity of the information when determining a

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[73] Ibid., II-2.

[74] Ibid.

desired or undesired effect. As written, SoSA provides no guidance to make this calculation so there is no cue for rational analysis, therefore intuitive judgment will tend to take over.

SoSA does little to guard a planner against not conducting additional analysis to check categories and to attempt to discover new categories. The process does not limit the systems from further breakdown or from adding additional systems into the analysis, however, it also does not offer any method to conduct an analysis to add new categories when necessary.

To summarize, the cognitive assessment revealed that SoSA not only invokes the use of rational analysis, but also generally protects against heuristics. SoSA effectively cues planners to search for diagnostic information, remain cognizant of baseline data, utilize categorization, and exercise disconfirmation. There are two important areas where SoSA invokes heuristics risking inaccurate analysis and biased conclusions. These are found when evaluating effects and also when forecasting effects.

PMESII and PMESII-PT

The Army's current capstone doctrine does not include coherent systemic approaches to understanding. Instead, currently fielded manuals include the embryonic components of systemic approaches, the importance of understanding the operational environment, and general information for solving ill structured and complex problems. FM 5-0 describes that Army forces normally face medium to ill structured problems and describes how to identify and state the problem using a problem statement. [75] This is very closely related to problem setting or problem framing that most systemic methods describe early in their approaches. FM 5-0 does not cover understanding in great detail with the exception of explaining the importance of gathering

[75] U.S. Army Field Manual 5-0 *Army Planning and Orders Production*, 2-5. Medium structured problem: Some information regarding the problem is available; the problem may be partially defined and may or may not lend itself to routine solutions. Ill structured problem: Not all required information is available; no clear formulation of the problem appears possible and the problem is very complex involving many variables, making them difficult to analyze.

information and continuous staff estimates as part of MDMP. It does not introduce the concept of PMESII or PMESII-PT.

FM 3-0 introduces some rudimentary characteristics of systemic approaches beginning with the dimensions of the OE. It explains the operational environment as comprising six dimensions: Threat, political, unified action, land combat operations, information, and technology. FM 3-0 defines but does little to explain how to analyze these dimensions to make them useful to achieve understanding of the OE, or how they interrelate and interact.

FM 3-0 places the proper level of importance on achieving understanding of the OE first by adding "Understand" to the battle command's "Visualize, Describe, Direct" and by its placement and explanation in the manual. However, the importance of understanding the OE lost some emphasis in FM 3-0 before it was published in February 2008. The prior FM 3-0 draft dedicated the first chapter to the OE, like the final draft, but also the first section of that chapter to understanding. That section was titled "Understanding the Operational Environment," and stated that "understanding the OE and how Army forces conduct operations in it as part of an interdependent joint force underpins mission success."[76] The removal of this section is an unfortunate development, however, many of the methods for better understanding survived implementation into the 2008 FM 3-0, such as the operational variables of PMESII-PT.

The operational variables of PMESII are used because they best capture the human dimensions typically found in land operations' OE. Understanding these variables helps commanders comprehend how they nest within the national instruments of power. It is clear that the Army is falling in line with joint operational planning, where joint planners use SoSA and the PMESII components of the OE for analysis, the Army uses PMESSI and adds physical environment (terrain) and time. This is by design, and it is intended that Army commanders will

use the joint analysis to shape their understanding of the situation, and Army staffs will collaborate with specialists at the joint level.[77]

FM 3-0 does not describe the acronym PMESII-PT as systems within the OE. The FM refers to PMESII-PT as operational variables and reserves the use of the operational variable for the operational level of war citing that they are too broad for tactical planning.[78] At the tactical level, METT-TC (mission, enemy, terrain and weather, troops and support available, time available, and civil considerations) is used to form a framework for mission analysis and the operational level PMESII-PT informs, as appropriate, METT-TC.

Here the lack of a systemic approach for Army operations becomes most evident. The manual leads a reader to conduct analysis of the operational variables in isolation from one another. It is likely that relationships will become clear to a planner as certain persons, places, things, or relationships show up in multiple operational variables. The FM does not call for looking at the operational variables as a system of systems. Failing to identify the links and relationships among and within the operational variables limits the level of understanding and utility of using PMESII-PT. Limiting tactical level commanders and staffs to METT-TC also limits understanding, and is a shortfall in the field manual. As commanders serve in the capacity of city mayors in Kosovo, Iraq, and Afghanistan, it can be interpreted that Army doctrine is limiting the utility of PMESII-PT when it is most appropriate, simply for the reason that the echelon of the force is too low.

When tested against the cognitive assessment, PMESSI-PT proved to influence the use of rational analysis, but not consistently. In addition, FM 3-0 offers no identifiable protection

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[76] U.S. Army Field Manual 3-0 Post-DRAG Draft 04 (Student Review) NOT FOR IMPLEMENTATION *Operations: Full Spectrum Operations* (Washington DC: Headquarters, Department of the Army, July 2007), 1-1 to 1-3.

[77] U.S. Army Field Manual 3-0 *Operations*, 1-5.

[78] Ibid., 1-9.

against the use of heuristics and injects no method of disconfirmation when using PMESII-PT with the exception of reframing.

Operational variables narrow the range of systemic assessment due to the limited scope and purpose of PMESSI-PT as described earlier. These variables enhance understanding but the potential for greater understanding appears capped at the joint level or reserved for subject matter specialists. FM 3-0 states that, "Army commanders continue analysis of the variables to improve their understanding of their environment," and "commanders and staffs utilize specialists in each variable to improve analysis."[79]

By implying that comprehensive analysis (or rational analysis as this monograph proposes) is best kept in the hands of joint commands and specialists, the Army invites the use of availability, representative, and anchoring and adjustment heuristics when assessing operational variables. There is a strong cue to use heuristics to draw conclusions and the operational variables propose few forcing mechanisms for rational analysis. It seems to suggest leaving such analyses to others. Given the professional competency of most staffs, it is likely that rational analysis will still occur –perhaps quite often– but a forcing mechanism assures broad and consistent use of more sophisticated methods of judgment.

Although FM 3-0 suggests no protections from using heuristics, there are elements found therein which are generally limited in scope that promote rational analysis. For example, when considering the "Military" operational variable, FM 3-0 states, "Analysis should focus on organizations' [regional land forces] ability to field capabilities and use them domestically, regionally, and globally."[80] Focusing on this alone narrows a staff's analysis and fails to cue rational analysis by not considering how these capabilities interact and interrelate with other

[79] Ibid., 1-5.

[80] Ibid., 1-6

variables, or the enemy. This is an important point and Daniel Reisberg best emphasizes the implication:

> …people rely on fast and loose heuristics even when incentives are offered for accuracy; even when making important professional judgments; even when making medical diagnoses that may, in some cases, literally be matters of life and death. Surely people would choose to use system two thinking [rational analysis] in all these cases if they could, and yet they still rely on the heuristics, and still fall into error.[81]

It is therefore often necessary to cue rational analysis in some form to trigger the deeper, analytical thought processes. Using the example above, rational analysis cues in the narrative of the FM would consider more than the ability to field capabilities. Properly cuing rational analysis would investigate or discover other considerations such as organizational structure, command and control, unique capabilities, paramilitary and irregular forces, and types of tactics to include terrorism.

PMESII-PT does influence categorization. This is logical considering PMESSII-PT uses, with the exception of the PT, the same construct as SoSA which proved to encourage rational analysis. There is a difference, and it is found where FM 3-0 presents each operational variable with characteristics and not subsystems. The verbiage alone steers clear of systemic approaches. The characteristics of the variables, with few exceptions, suggests drawing conclusions in isolation from the other variables.[82] The result is a limitation in the depth of systemic analysis made possible by not offering subsystems, and instead opting for characteristics of the operational variables. Effective categorization would normally require at least a one level below PMESSI-PT level "systems" analysis to adequately conduct rational analysis.

FM 3-0 seems to go into some effort to avoid adopting a systemic approach. A common characteristic of systemic approaches was discovered when identifying elements that encourage rational analysis. (This characteristic of systemic approach is consideration of how different

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[81] Reisberg, *Cognition*, 427.

systems and subsystems interrelate and is intentionally or unintentionally included.) As examples, FM 3-0 states the following; under the military operational variable, "…analysis should include the relationship of regional land forces to other variables"[83]; under the political variable, "Understanding political implications requires analyzing all relevant partnerships-political, economic, military, religious and cultural [the latter two found in the social variable];"[84] the economic variable states, "…indicators enhance understanding the social and behavioral dynamics of friendly, adversary, and mental entities."[85] Other examples exist under the other variables. As shown, while FM 3-0 implies a lack of systemic approach by Army echelons and that systemic approaches are inappropriate and best reserved for specialists, the text of the operational variables suggest otherwise, and may cue rational analysis.

PMESII-PT inconsistently invokes rational analysis and provided little protection against heuristics. The operational variables may invoke rational analysis through categorization, and despite disavowing joint systemic approaches, recommends making connections among the variables. Analysis suggests that PMESSI-PT cues all types of heuristics in the cognitive assessment while offering little protection or warning of heuristics use.

Systemic Operational Design

The concept of SOD is based on a number of problem solving theories and systemic approaches to ill-structured problems, or complex adaptive systems theory. Some of these theories are relatively new while others date back to the 1950s. While there are other authors, theorists and consultants that develop similar approaches to complex adaptive problems and systems theory, Dr. Shimon Naveh, a former Brigadier General in the Israeli Defense Forces, is

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[82] U.S. Army Field Manual 3-0 *Operations*, 1-5 to 1-8.

[83] Ibid., 1-6.

[84] Ibid.

[85] Ibid., 1-7.

the author of the SOD concept the Army is experimenting with in the effort to develop the concept for implementation.[86]

SOD has a very free construct that allows planners, or as SOD describes, designers, great latitude in the way it is applied. There are general steps to the SOD process: System framing, rival-command-logistics as rational, operational framing, determination of operational effects, and determination of forms of function.[87] Members of the design team practice discourse throughout the design process. Each of the steps above are accomplished by conducting open discourse starting with the first step which is broad and abstract, and moving towards the final steps which are more concrete and detailed. Discourse is the sharing of ideas and openly and freely opposing the ideas or logic of other members of the design team.[88] Discourse is considered a key to successfully creating a design. The purpose of discourse is to allow all members of the design team to think creatively, allow for collective reasoning, and avoid groupthink. Any member can and should disagree with another team member's idea if it is possibly flawed; of course this may include ideas that come from the commander.[89]

The design team frames the problem by taking strategic guidance and relating it to the situation under consideration for design. It involves considering the state of affairs that changed and now requires the possible involvement of U.S. forces. The designer then bounds the system under consideration within the global system. Once the system is bound, the designer logically displays the systems within the system frame and identifies tensions, relationships, possible

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[86] William Sorrells et al., "Systemic Operational Design: An Introduction," (Fort Leavenworth, KS: School of Advanced Military Studies, U.S. Army Command and General Staff College), 8.

[87] Ibid., 23-28.

[88] Ibid., 30-31.

[89] Ibid.

trends, and emergences. This model is refined and updated as the design team continues through each step of the SOD process.[90]

The design team would next examine the discourse called rival as rationale. The purpose of this step is to determine the motives, purposes and potential behavior of all rivals within the system.[91] Command and logistics as rationale are similar but focused on determining potential strengths, weaknesses, or vulnerabilities in the command structure and logistics systems in order to determine the most effective command and logistics structure.[92]

With an understanding of the rival established, and the best potential command and logistics structure identified, SOD begins to link together strategic aims to possible operational actions. Subsequently moving forces in space and time can then exploit the tensions and emergences in the system as it is modeled. This step is called operational framing and it begins to paint the picture of how an operation may unfold.[93] The designer then determines operational effects that may lead to accomplishment of the desired endstate. Each effect explains the part of the rival system acted on and when the effect will take place. The designer then identifies the forms of function by determining what resource will accomplish particular tasks that work to achieve the previously determined effects.[94]

SOD is commander led and commander centric.[95] The commander carefully selects his design team from those among his subordinate commanders and staff with the requisite

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[90] Ibid., 23-24.

[91] Ibid., 24-25.

[92] Ibid., 25-26.

[93] Ibid., 26.

[94] Ibid., 28.

[95] Brigadier General Huba Wass de Czege (Retired), "Unified Quest 07 Postscript 2: On Inserting Systemic Operational Design Derived Ideas Into U.S. Army Doctrine" (handout presented to Advanced Military Studies Program students, Fall 2007); Brigadier General Huba Wass de Czege (Retired), "Systemic Operational Design: Part Two" (handout presented to Advanced Military Studies Program students, Fall 2007), 6. States that the commanders role, "…is to design. His role is to learn from design

intellectual capacity to handle the design process. The commander's staff, to include the planners, does not necessarily participate in the design process and selected members of the design team should be able to think not only traditionally, linearly, reductively and analytically but also creatively, abstractly, non-linearly, constructive, and in visionary terms.[96]

Benefits of SOD include the use of the best practices of prevailing problem solving and systemic theories. SOD draws from the best of available systemic theories including system ontology, complexity theory, general systems theory, complex systems theory, (also known as dynamic systems theory) and, to a lesser extent, chaos theory.[97] SOD uses the concepts found in the aforementioned theories and collates them into a workable problem solving and design process that is applicable for strategic and theater-strategic campaign design. SOD's use of discourse is also a potential benefit.

The greatest weakness in SOD is its stage of development. SOD requires refinement before it is ready for Army wide implementation. The conduct of SOD is quite ambiguous and lacks clear fundamental principles for its conduct that doctrine requires. "There are challenges associated with transferring such agile design methods into large organizations."[98] SOD is intentionally not a lockstep process or a checklist driven process, but this introduces subjectivity that will make the execution of SOD markedly different among different commands within the Army. Doctrine is "a set of fundamental principles by which military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgment in

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and action. He is the process…He owns the designing process. He is the lead creator…He personally conducts it."

[96] Sorrells et al., Systemic Operational Design, 36.

[97] Ibid., 55-61.

[98] Ibid., 43-44.

application."[99] It will prove very difficult to uniformly apply SOD across the Army without clearly establishing these fundamental principles.

In its current state, SOD is not authoritative and requires much judgment for application. While liberal use of judgment is a trademark of SOD, a logical structure of fundamental principles is a trademark of doctrine. Many of the ideas in the concept of SOD remain in the realm of the abstract, and are therefore very difficult to implement into a standardized military process with a logical structure that permits anyone to participate.

SOD invokes an interesting mix of heuristics and rational analysis. Throughout the process, designers will run through the cognitive scale from the use of simple heuristics to in-depth and careful rational analysis when considering evidence and drawing conclusions. Most of the SOD method, through the prevalent use of discourse, invites the use of heuristics. However, as a balancing measure, SOD requires rational analysis by way of disconfirmation to test and validate the previously determined conclusions formed through heuristics.

Taking a closer look at the heuristics in SOD, a designer will engage in representative, availability, and anchoring and adjustment heuristics, since discourse allows for the free engagement of intuitive thought and heuristic conclusions throughout the process of discourse. This will not always prove true, but in general, most designers will not be able to avoid the use of these heuristics without some mental energy and effort. SOD uses discourse as "a mode of learning and engaging subjective interpretations."[100] Subjective interpretations are typically derived from heuristics since subjective thought requires no type of detailed analysis to determine diagnostic information to form conclusions. It allows for designers to make conclusions that, once shaped by the design group through discourse, are generally accepted as true until proven

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[99] Joint Chiefs of Staff. Joint Publication 1-02 *Department of Defense Dictionary of Military and Associated Terms* (Washington D.C.: U.S. Government Printing Office, as amended through 17 October 2007), 169.

[100] Sorrells et al., Systemic Operational Design, 29.

otherwise. Rational analysis requires that, to the maximum extent possible, subjective interpretations are carefully considered and analyzed before implemented into campaign planning.

To use heuristics is easy and problematic in SOD, particularly when it takes only one strong willed member of the design team to force his or her intuitive conclusions on the design team. The open dialog discourse intends to prevent such a scenario, but it defies logic to believe a group of free thinkers with different backgrounds and personalities would not confront this problem. It is reasonable to accept the experience and memory of some design members given an in-depth immersion to the environment, but such conclusions should still be backed by rational analysis. SOD states that, to help alleviate this problem, commanders must possess an air of egalitarianism to make the process work as intended.[101] It is true that an egalitarian commander can help prevent these types of problems; but to make this a key component to effectively use heuristic conclusions is not ideal, and determining that all commanders are capable of being egalitarian is unrealistic. If a truly egalitarian environment is created, the problem arises of giving less qualified or perhaps less thoughtful people equal opportunity and time to inject information.

To provide an example of heuristic use, consider the discourse called rival as rationale. Designers "determine the form of the enemy through critical discussion."[102] Critical discussion is obviously a useful exercise; however, if critical discussion is based on a person's experience and memory alone, and the analysis of the situation is not carefully considered and integrated into conclusions, then accuracy of conclusions will suffer. In other words, in rational analysis, careful

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[101] Brigadier General Huba Wass de Czege (Retired), "Systemic Operational Design: Part Two", 7.

[102] Sorrells et al., Systemic Operational Design, 24.

study of the subject matter and integration of the results of the study should inform all critical discussions in conjunction with experience and memory.

SOD also cues some very good rational analysis processes. An example is the seven discourses. This appears contradictory, however the heuristics cued in the process of conducting the discourses do not diminish the effective categorization of the discourses. The seven discourses generally begin at the broad level and move to specifics, and they are generally nested. This structuring invokes effective categorization. However, allowing designers to then determine the conduct of the discourses will generally cue heuristics. Therefore, the SOD process categories cue rational analysis, but the judgment used within the categories invokes heuristics.

SOD effectively cues the practice of disconfirmation. Disconfirmation is cued in Command as Rationale where it states, "designers must describe the difficult ties and challenge the assumptions or objectives established by the national command authorities or strategic level policy makers."[103] Here SOD recognizes the confirmation bias and belief perseverance that likely occurs in subordinate headquarters and uses disconfirmation to prove guidance from higher is logical and likely to produce success. SOD does not limit disconfirmation to higher level authority.

Disconfirmation is also found in the process of reframing. Here SOD invokes the rational analysis process of disconfirmation and balances the use of heuristics when conclusions are made during the conduct of the discourses by reframing. As stated, "reframing is a reconsideration of the dialogue that led to the final operational forms and effects. If necessary, it demands the current design be re-examined through SOD and a new operation developed."[104] This demonstrates the importance of validating conclusions formed through heuristics by using rational analysis.

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[103] Ibid., 25.

[104] Ibid., 27.

The cognitive assessment revealed that SOD allows for rampant use of heuristics based judgment throughout the discourses. The danger with SOD is a campaign designed around conclusions that are at risk of inaccuracy and error if these conclusions are not checked by rational analysis. SOD uses a process of disconfirmation through reframing to check heuristic based conclusions. From the viewpoint of the cognitive assessment, SOD exposes itself to be a weak candidate for a rational analysis based approach to understanding.

Commander's Appreciation and Campaign Design

CACD is a process to enable a commander to gain an appreciation for the mission and environment, and subsequently establish a campaign design that addresses strategic objectives and major components of the campaign.[105] Like SOD, CACD is an iterative process so designers may jump from step to step whenever necessary for the betterment of appreciation and design. CACD is described in TRADOC Pamphlet 525-5-500 and is primarily the product of experimentation with SOD during UNIFIED QUEST, an annual warfare study and capstone wargame, but also incorporates elements of EBA and current doctrinal operational design.[106] TRADOC Pamphlet 525-5-500 is broken down into three parts: Conceptual Framework to describe the concepts that are rooted in the process; Commander's Appreciation explains how to gain an understanding of the situation; and developing a Campaign Design explains how to build a relevant campaign that achieves strategic objectives.[107]

The first chapter in TRADOC Pamphlet 525-5-500 provides a general background of systemic theory and why systemic approaches are important in today's global environment. Chapter one describes the theory, concept, and ideas behind systemic approaches, systemic

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[105] Department of the Army, DRAFT TRADOC Pamphlet 525-5-500 *Commanders Appreciation and Campaign Design*, 20.

[106] Ibid., 1.

[107] Ibid., 20-21.

approach utility and importance, and how these subjects contribute to achieve situational understanding and campaign design. Chapters two and three provide the "how" of Commander's Appreciation and Campaign Design.

The first step in Commander's Appreciation is framing the problem, and throughout the process of CACD designers should revert back to this step when better information is available, there is a change in the situation, mission, strategic objectives or commander's guidance, or there is a realization that the problem framing needs modification.[108]

The purpose of framing the problem is to establish a shared understanding of the situation within which they will operate. Framing the problem allows designers to estimate initially what the problem is, what solutions are possible, and establishes the initial estimate of the situation. The commander will then use the framed problem as a basis for learning at the onset of operations. As the commander and subordinates learn more from the situation by acting within the environment, designers then reframe the problem and better capture the situation on the ground.[109]

To frame the problem, designers establish the strategic context through examination of the cause and history of the problem and importance of the problem to strategic leaders. Next, designers synthesize the strategic guidance by determining strategic leaders' purpose for assigned objectives, relating strategic guidance to established policy, identifying decisive strategic conditions, identifying conditions for success, and required time and resources for success. Designers describe the systemic nature of the friendly, adversary, and neutral forces through analysis then description of their factors, constituents, and their positive or negative relationships.[110]

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[108] Ibid., 21

[109] Ibid., 30.

[110] Ibid., 25.

Determining strategic trending is a critical part of problem framing and begins to build the visualization of how the situation may develop. As trends are identified, designers decide which trends to influence, if they can be influenced, and how to influence them. The final steps of problem framing include: Identifying gaps in knowledge, establishing assumptions, and identifying the critical factors of the operational problem and determining the initial mission statement.[111]

Once the initial mission and problem statements are approved, the next step in CACD is mission analysis. This is not a replacement for the second step in the Army MDMP, it is an analysis of what is necessary to achieve success given the approved mission statement. The products of mission analysis are identified conditions for success, objectives that support the conditions for success, and points of influence that support accomplishing the objectives through the critical capabilities, critical requirements, and critical vulnerabilities (CC-CR-CV) analysis.[112]

In campaign design, designers describe how to achieve strategic objectives focusing on points of transitions, particularly transitions of responsibility from one to another. (i.e. military to civilian, civilian to international, etc.) To begin, the Commander provides commander's intent, (also called campaign intent) which articulates the what, why, and risk of the campaign. With the commander's intent providing the azimuth, designers then describe the campaign approach. This step first describes the start conditions then arranges operations in time and space (to include parallel efforts and how the campaign will support parallel efforts) and how the force will organize, to include command and control and sustainment. Also, designers describe the IO (Information Operations) or "campaign messaging" for each critical actor or population throughout the campaign.[113]

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[111] Ibid., 26.

[112] Ibid., 27-28. The method for analysis uses Dr. Joe Strange's COG analysis.

[113] Ibid., 30.

With the first design complete, designers then describe the requirements for reframing. Given the premise of CACD that the problem is likely to change and the commander's understanding is likely to further develop, this step explains how the campaign intends to change understanding, learn, and adapt. In general, this involves identifying what would cause the commander to reframe or refine his approach followed by identifying what information requirements are necessary to recognize a cause to reframe or refine the approach. These information requirements are expressed in terms of CCIR (commander's critical information requirements) plus environmental information requirements (EIRs). EIRs are information requirements relative to the campaign environment.[114]

The final step, the campaign plan, is the conceptual representation of the design that explains the problem and overall approach to achieve the campaign objectives. The campaign plan describes the capabilities and resources for each operation in the campaign and the respective command and control and logistics structure. The plan should articulate the campaign in a clear and concise manner that facilitates planners' and subordinate commands' own framing of the problem and subsequent plans.[115]

An examination of CACD for rational analysis and heuristics revealed protection from heuristics and cues for using rational analysis to draw conclusions from evidence. It must be recognized that heuristics might be used with some frequency while using the CACD approach. However, only one part of the process seemed to cue heuristic conclusions while the remaining processes either protected against heuristics use or cured rational analysis.

CACD describes the purpose for commander's appreciation as, "essentially an understanding of the nature or meaning or quality or magnitude of the situation before you."[116]

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[114] Ibid., 31.

[115] Ibid., 32.

[116] Ibid., 20.

Here, very early on, CACD begins communicating a need for deliberate analysis of the situation and readers are already drawn towards and primed to perform rational analysis. The purpose goes further, explaining that, "each unique problem requires a unique approach…,"[117] which serves as a warning that a unique problem or situation demands its own analysis, deliberate thought, and mental energy. This is a very good example of protection against use of the representative heuristic.

CACD continues to cue rational analysis in a number of ways, as the following selected example illustrates. In problem framing, CACD calls for planners to "inquire into the nature or character of the factors of the situation from the viewpoint of all constituents including friendly, enemy or opposing, and the larger environment."[118] This part of CACD cues a planner or commander to not make heuristic or snap judgments but to dig deeper and make qualified and analyzed judgments as cued by selection of the words "inquiring into." Had CACD instead used "decide how" or "determine" the nature or character of the factors of the situation, then rational analysis is not invoked and heuristics would be applied. As stated earlier, this is no light matter since, generally, rational analysis requires a trigger or cue especially when planners are not trained to use rational analysis or are in the habit of routinely using heuristics to draw conclusions.

Throughout the process of CACD, questions are proposed for consideration. They are not checklist type questions; rather, they force a search for deeper meaning and explanation. One example, "What caused the problem to come to the fore?"[119] cues rational analysis given the characteristic of searching for the root of problem. Of course, these questions can still be

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[117] Ibid.

[118] Ibid., 21.

[119] Ibid., 23.

answered using heuristic methods. However, given the requirement to search for the core of the problem, the need for examination is triggered and will likely receive a rational analysis response.

The examination of CACD for rational analysis produced evidence of disconfirmation in some areas. For example, the requirement to examine the interests and strategies of each constituent "as they understand them, and how they relate- positively and/or negatively- to one another."[120] By examining viewpoints of all constituents, CACD provides protection from heuristics through disconfirmation. Disconfirmation should act as a forcing mechanism to perform a balanced evaluation of the situation and prevent belief preservation in the face of other points of view.

Another example is found during CACD's "mission analysis" where planners identify "what we do not know (things we must learn) or what we must confirm to operate effectively."[121] By stating that these are things we need to know to operate effectively, CACD prevents the natural tendency to fill in unknown information with a heuristic conclusion. This statement requires diagnostic information, cueing rational analysis, and places the proper emphasis on level of effort, in this case, on CCIR.

There was only one area found that seemed to clearly cue heuristics. This cue is found when CACD requires determination of strategic trending. In this step, planners determine the possible future that could unfold based on current understanding. CACD is searching for the logical trends and asks only "How do we expect it [the situation] to unfold without intervention?"[122] Heuristics are cued since the question triggers no search for diagnostic information to support a forecast. Especially when speaking of trends, rational analysis calls for base rate information and statistical support, both of which are absent in this portion of CACD.

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[120] Ibid., 25.

[121] Ibid., 28.

[122] Ibid., 25.

Simply asking a planner what their expectation is for an outcome without requiring good analysis, base rates, statistical support, or examination begs for a conclusion reached using heuristics.

Another potential drawback of CACD is the lack of a clear cue to conduct categorization. CACD leads a planner through a process of questioning and thought that may naturally invoke the need to conduct categorization, however it is not apparent and may be overlooked.

CACD fared well when measured against the cognitive assessment. CACD primed or cued rational analysis on a consistent basis throughout the process. This priming and cueing is accomplished through reflective inquiries provided in the pamphlet that lead a reader towards reasoning and rational analysis and away from heuristics. CACD appears to directly cue heuristics in only one instance, and therefore reveals itself as a very good rational analysis based approach to understanding.

Summary of Conclusions

The Army should adopt a rational analysis based systemic approach to understanding. This understanding must derive from more sources than a higher headquarters mission analysis brief or operations order. To gain understanding requires research and effort in the areas and subjects that are particular to each unit and each unit's environment. Given the complexity of the OE, systemic approaches provide the best potential solution to gaining the understanding necessary for future success.

The process of gaining understanding does not require modification of MDMP. Rather, understanding is a necessary and important prerequisite to MDMP and should continuously inform MDMP. As most of the systemic approaches examined are structured, understanding can inform other processes like staff estimates, targeting, and planning. This is the logical place for understanding, and given the historic reliability of MDMP when informed with accurate information, changing MDMP is unnecessary. It is the input to MDMP that is appropriately under examination.

Cognitive psychology provides a good basis for gaining an understanding of each unit's operational environment, and provides a foundation for understanding how Army planners will arrive at certain conclusions given particular evidence and information. Because all humans generally share cognitive tendencies, both good and bad, examining how humans arrive at conclusions provides a method to determine the quality of current systemic approaches in development or in doctrine today. The cognitive processes of judgment explain how commanders and planners will draw conclusions in most situations. It is the type of judgment chosen that will determine how accurate these conclusions are, and subsequently how well commanders, staffs, and units actually understand the environment, situation, and how their mission affects the environment and higher headquarters.

There are two types of judgment in cognition. Heuristics based judgment is fast, generally effortless, and relies on intuition. The use of heuristics to draw conclusions is the most common method of judgment, but can lead to inaccurate conclusions and understanding. Rational analysis is slower, requires greater effort, and relies on research, examination, and scrutiny of evidence to draw conclusions and generally leads to more accurate conclusions and understanding when compared to intuitive or heuristic based judgments.[123]

There is a time and place for each type of judgment. When attempting to gain understanding before the commitment of troops to a mission, rational analysis is the type of judgment that should be used. However, there are occasions when rational analysis is the wrong choice since it tends to take more time and effort and is inefficient compared to heuristics. It is appropriate and advantageous to use heuristics when time does not allow for rational analysis. Generally, this is during crisis action planning and mission execution. However, understanding gained from rational analysis can inform intuitive judgment and assist in quality intuitive decision making when operating in a battlespace or in a constrained planning cycle.

Given the utility and importance of using rational analysis to gain understanding prior to commitment of troops, it should be a ubiquitous component to the systemic approach adopted by the Army. Using rational analysis as a cognitive assessment for current approaches produced important findings. When examined against SoSA, the test revealed that the approach included rational analysis in many forms, and it was also found to protect against heuristics. There was also evidence of cueing heuristics but, for the most part, SoSA did well and proved more often to cue rational analysis. Drawbacks outside of the cognitive assessment begin to limit integrating the process into the Army. As stated earlier, FM 3-0 does not allow for the use of effects based operations, making SoSA an unlikely candidate for integration into the Army without significant modification and adaptation.

PMESII and PMESII-PT influenced the use of rational analysis but not on a consistent bases. The PMESII-PT approach offered no method of preventing belief perseverance and did not offer any evidence of preventing use of heuristics. The best aspect of PMESII-PT is that it cleanly embeds into SoSA, and makes for a useful common platform and common language when considering joint interoperability. Of course, the greatest drawback to PMESII-PT is that it is not a true "systemic" approach, and FM 3-0 goes to some effort to ensure it is not called a systemic approach, despite evidence of systemic characteristics throughout.

SOD was fraught with cues for heuristic based judgments. At first glance SOD would appear useless as a rational analysis based systemic approach, but investigation finds some redeeming qualities. Despite repetitive cues for heuristics, SOD embeds rational analysis methods such as disconfirmation to validate and check against previously made heuristic or intuition based judgments. SOD may prove a useful approach but is weak when evaluated against tests for rational analysis. As SOD is further developed, improvements in this area and others

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[123] Reisberg, *Cognition*, 427.

may be made making it more suitable for integration into the Army as a systemic approach to understanding grounded in the best cognitive psychology processes.

CACD fared better than the other approaches when evaluated for rational analysis. CACD is well developed concerning its potential for doctrinal implementation and contained few cues for heuristic based judgments. While the approach was somewhat prescriptive, each step allowed freedom to move in a number of different ways when examining the problem. And from the cognitive assessment perspective, the value of CACD was consistent priming for and cueing of rational analysis. Throughout DA pamphlet 525-500-5 readers are reminded to examine, inquire, evaluate, and not make snap judgments.[124] For this reason and others already covered, CACD reveals itself as the best potential candidate for integration into Army doctrine as a systemic approach to understanding that invokes the best cognitive practices.

Recommendations

By achieving understanding commanders, staffs, and forces at all echelons will better perform in complex adaptive environments before and after commitment of troops. This understanding is best accomplished through harnessing the best cognitive methods for judgment found in rational analysis. By adopting such an approach to understanding, the Army will better perform in unfamiliar and complex environments and with a lower cost in blood and treasure.

The Army needs to move forward with adopting a systemic approach to understanding. Given the findings of this monograph, CACD seems best suited to serve this purpose. Given its state of development, and how favorably it tested using the cognitive assessment, CACD emerges as a good choice. The Army should continue to move in the direction of implementation of the concept and establish the means and methods to train the Army in using CACD.

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[124] Department of the Army, DRAFT TRADOC Pamphlet 525-5-500 *Commanders Appreciation and Campaign Design*, 23-28.

However, CACD is not yet without drawbacks. CACD does not nest within a joint systemic approach to understanding and is not designed for use at all echelons of command in the Army. An optimized solution is one that integrates CACD and PMESII-PT and does so in a manner that makes it applicable to all echelons of command. This optimized solution would produce a concept that nests within current joint doctrine, as PMESII-PT does, and provide an approach that leverages rational analysis at all echelons, as CACD proved to do in the cognitive assessment for operational level headquarters.

An optimized solution would benefit all echelons of command by providing a systemic approach to understanding that is missing but necessary for today's OE. The Army needs to adopt this doctrine and make the necessary adjustments and adaptations so that it is applicable at lower echelons. This is necessary given the complexity of the environments that platoon leaders, company, battalion, and brigade commanders are responsible for in the OE. The environments these lower echelons are responsible for are essentially microcosms of the environments of higher echelon commands. To say a systemic approach to understanding is not applicable at lower echelons is myopic and does not acknowledge the complex and ever-changing environment that these lower level leaders must operate in daily.

As the Commanding General of Multi-National Forces-Iraq, LTG David Petreaus stated,

> What they're dealing with [tactical level officers in Iraq] is much more complex and much more nuanced than what we were trained to do when I was a Captain. You have to understand not just what we call the military terrain…the high ground and low ground. It's about understanding the human terrain, really understanding it.[125]

This monograph examined the approaches as articulated in their resident forms found in research papers, evolving doctrine and current doctrine. The next logical step, and area for future research, is to observe these approaches in practice using the same cognitive assessment to

[125] Babak Dehghanpisheh and Evan Thomas, "Scions of the Surge: Five Years on, the War is Transforming the American Officer Corps," *Newsweek*, March 24, 2008, 31-32.

determine if the findings here are accurate and consistent. It is important to understand how these systemic approaches are executed within the dynamics of an Army staff, and how time, personalities, and commanders positively and negatively affect the use of rational analysis and heuristics when using systemic approaches.

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