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The world has witnessed unprecedented change over the last two decades, from the fall of the Soviet Union to the invention of the internet. This change has led to a corresponding alteration of the United States military's operating environment on a comparative scale. There were earlier warnings to changes in the operating environment, such as Vietnam, Somalia, and Beirut, but these went largely unnoticed. Perhaps our failure to properly recognize the signals of change from past events such as Vietnam was because it did not fit our concept of what conflict was supposed to be. Perhaps those preconceptions still exist and limit our ability to continue adapting to our new environment. Understanding how we comprehend information and recognizing that we are predisposed to view things in a particular way is important if we are to be successful at solving the ill-structured problems we as military professionals face today. Operational design is a comprehensive approach to understanding the environment and the problem through critical and creative thought and then applying that understanding to some form of a planning process. We are still coming to grips with how to operate in our new environment and the author will explore how applying operational design to our planning processes is the best bid for success.

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OPERATIONAL DESIGN AND IRREGULAR WARFARE

by

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Col   USMC

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: _____

21 October 2009

Abstract

The world has witnessed unprecedented change over the last two decades, from the fall of the Soviet Union to the invention of the internet. This change has led to a corresponding alteration of the United States military's operating environment on a comparative scale. There were earlier warnings to changes in the operating environment, such as Vietnam, Somalia, and Beirut, but these went largely unnoticed. Perhaps our failure to properly recognize the signals of change from past events such as Vietnam was because it did not fit our concept of what conflict was supposed to be. Perhaps those preconceptions still exist and limit our ability to continue adapting to our new environment. Understanding how we comprehend information and recognizing that we are predisposed to view things in a particular way is important if we are to be successful at solving the ill-structured problems we as military professionals face today. Operational design is a comprehensive approach to understanding the environment and the problem through critical and creative thought and then applying that understanding to some form of a planning process. We are still coming to grips with how to operate in our new environment and the author will explore how applying operational design to our planning processes is the best bid for success.

INTRODUCTION

Think of where our forces have been sent and have been engaged over the last 40-plus years: Vietnam, Lebanon, Grenada, Panama, Somalia, Haiti, Bosnia, Kosovo, Afghanistan, Iraq, the Horn of Africa, and more. In fact, the first Gulf War stands alone in over two generations of constant military engagement as a more or less traditional conventional conflict from beginning to end. As then– Marine Commandant Charles Krulak predicted just over 10 years ago, instead of the beloved "son of Desert Storm," Western militaries are confronted with the unwanted "stepchild of Chechnya."

– Robert M. Gates, Secretary of Defense, 2009

The above quote is from a recent article in Joint Force Quarterly written by Secretary of Defense Robert M. Gates entitled, *Striking the Right Balance*. Throughout the article the Secretary stresses the need to ensure that we have the requisite capabilities from an *institutional* perspective to succeed in complex conflicts in the foreseeable future. With complex conflicts come complex and ill-structured problems. The rational, analytical problem solving processes embodied in the various military planning methodologies are ill-suited to the challenges faced by military professionals today. The author will demonstrate that by incorporating operational design into military planning processes, military professionals will be better equipped to deal with the challenges faced in today's operating environment.

What is operational design? As it applies to military operations, operational design is not a very mature concept, consequently the definitions vary somewhat. As the Department of Defense (DOD) is in the early stages of truly understanding and implementing operational design, varying perspectives are a healthy attribute. The Marine Corps' definition of design is, ―an approach to problem solving that uses critical thinking in order to enable a commander to understand the nature of a problem and to visualize and describe how to solve it." The purpose of design is to achieve a greater understanding of the environment and the nature of the problem in order to identify an appropriate solution. Design provides a means to learn and

adapt." [1]   According to joint doctrine, operational design is —the intellectual framework that will underpin all plans and their subsequent execution." [2] Joint operations planning is a creative and iterative process that uses the elements of operational design to help commanders and their staffs visualize the arrangement of joint capabilities in time, space, and purpose. According to Nobel Prize winner Dr. Herbert A. Simon, —Design, as I am using the term, means synthesis. It means conceiving of objects, of processes, of ideas for accomplishing goals, and showing how these objects, processes, or ideas can be realized. Design is the complement of analysis, for analysis means understanding the properties and implications of an object, process, or idea that has already been conceived." [3] This concept, as Simon has described it, is critical to understanding and implementing operational design. In its most elemental form, planning is problem solving; how human beings consume information, break it down into digestible pieces, and apply some heuristic commensurate with the level of complexity in order to obtain a solution.

In order to limit its scope, the author will examine operational design and problem solving from three critical dimensions: 1) the human dimension–how human beings think and the associated limitations and capabilities, for example bounded rationality and critical thought, 2) the organizational dimension–how organizational structure affects the individuals that make up the organization and how it uses information, for example organizational learning, and 3) the operating environment dimension–how the operating environment has changed and the associated implications for problem solving and military planning, for example cognitive objectives and globalization. Following discussion and analysis of the various dimensions, appropriate analytical conclusions will be presented and based on those conclusions, recommendations will be made regarding operational design and its application

to the military planning process. These recommendations are proffered in order to improve our ability to operate in the current environment.

The scope of this paper is limited and the author no expert on the subject matter, but its purpose is simple, to provoke discussion regarding how we, as military professionals, plan in an operating environment of persistent complex irregular warfare.

THE HUMAN DIMENSION

Problem solving is intrinsic to planning and it is a uniquely human endeavor, therefore it is important to possess a basic knowledge of how human beings think and solve problems in order to improve the planning process.[4] Start with the belief that human beings are by nature, rational animals, yet we are limited in our ability to adapt to complex environments either optimally or satisfactorily; this is essentially the concept of bounded rationality.[5] As it applies to planning and incorporating operational design, there are three fundamental ways in which our rationality is bounded: 1) we only know a fraction of some percentage of what we need to know, 2) of the things we do know, our brains are only capable of performing an extremely small number of possible computations, and 3) we possess limited, inefficient internal storage called long-term memory, basically poor information access.[6] In addition to being limited, our long-term memory is accessed through a process called recognition, where we encounter an external stimulus and a stored piece of information causes us to recognize it. The point of this simplistic discussion is that recognition skills can vary greatly and based on experience, education, etc., human beings develop patterns of recognition whereby we seek to categorize pieces of information when we store them. Lastly, human short-term memory is incredibly limited and temporary, necessitating external augmentation, e.g., writing things down or storing information on computers.

While there are limitations on our capacity for thought, there are ways to maximize that capacity in order to improve our ability to plan; namely critical and creative thought. According to the U. S. Marine Corps, ―Critical thinking is purposeful and reflective judgment about what to believe or what to do in response to observations, experience, verbal or written expressions, or arguments. Critical thinking involves the high-order cognitive skills of analysis, synthesis, and evaluation."[7] Creative thought involves creation of new ideas, perspectives, or concepts and is often associated with activities such as poetry, writing, art and music, but creative thought can also lead to a different or more all-encompassing perspective of a question or problem that may reveal other possible solutions or options.[8] Operational design involves the complimentary application of critical and creative thought to the planning process. Current scientific theories indicate that human thinking and decision making is more integrated than previously understood and we should be cautious about arbitrary dichotomies such as intuitive versus linear thinking and creative versus critical thinking.[9]

Consideration of a few final aspects of the human dimension to operational design and problem solving will conclude this portion of the analysis; specifically satisficing, intuition, and culture. From his theory on bounded rationality, Simon coined the term satisficing. With numerous variables and uncertainty there will seldom be a single or optimal solution to ill-structured problems, what we seek is an adequate one.[10] The obvious inference is that there is more than one possible adequate solution, but once one has been identified, in order to preserve time, we move on with the process. We also need to consider human intuition, which Carl von Clausewitz referred to as coup d'oeil, ―Stripped of metaphor and of the restrictions imposed on it by the phrase, the concept merely refers to the quick recognition of a truth that the mind would ordinarily miss or would perceive only after long study and reflection."[11] Simon proposed that expertise is gained through extensive knowledge and that

the expert armed with this knowledge can respond to many situations ―intuitively‖ through recognition, making intuition an important component of human problem solving.[12] Lastly we will consider the influence of culture on problem solving. Awareness of culture, your own and your adversary‗s, is important in every facet of problem solving and operational design. For this discussion of the human dimension of problem solving, however, we are concerned primarily with our own cultural awareness. The military is getting better at cultural awareness of other countries, but we do a poor job of understanding the ramifications of our own culture on our thinking and how we approach problem solving. Humans are born into a culture that will shape every facet of their life; biases, prejudices, outlook, and demeanor, religion, race, education, and ethnicity to name a few.[13] These forces form a lens through which an individual views all things, consciously or subconsciously. This is commonly referred to as ethnocentrism, derived from the Greek word *ethnos*, meaning ―nation‖ or ―people.‖ Ethnocentrism is part of our subconscious and is, therefore, unavoidable and impacts our problem solving endeavors.[14]

THE ORGANIZATIONAL DIMENSION

Having discussed the human dimension, the next step is to address how individuals come together and create the organizational dimension. Organizations do not plan, design, or solve problems; obviously those activities occur in the human mind.[15] It is how knowledge is acquired and exchanged between individuals within an organization that is important to operational design and problem solving, because what is stored in one mind in an organization may be related to what is stored in other minds.[16] How an organization obtains knowledge is referred to as organizational learning and it occurs through the learning of its members. It also occurs when new members join the organization with knowledge that the organization did not previously have.[17] The acquisition of knowledge is a fundamental step in problem

solving and operational design, and organizations significantly influence how humans learn. Organizational learning is another vast topic, but the relevant concept to this discussion is that when human beings join an organization they will most likely assume the characteristics and/or behavior of that organization. The best way to explain organizational learning is through an example that illustrates the concept (the Bavelas communication network, 1950). There are two groups: A1, A2, A3 A4, A5 and B1, B2, B3, B4, B5. Each group utilizes a specific form of communication (information transfer). Group A utilizes the wheel pattern where one member is the leader, at the center of the group and the other members communicate through the leader, not directly with one another. Group B utilizes the circle pattern where members communicate only with the other members who are immediately adjacent. Each group is thoroughly trained in their respective communication pattern and operates for a sufficient period. Following additional trials, members are interchanged over a period of time, A1 with B1, A2 with B2, and so on until the entire original wheel group (A) is populated by B1 through B5, the entire original circle group (B) is populated by A1 through A5. The A's will now communicate in the circle pattern and the B's in the wheel pattern, even after a complete replacement of individuals a persistent pattern survived, which demonstrates an emergent property of an organization."[18] This concept of a persistent pattern simply means that even after 100% personnel turnover, the characteristics or traits of the organization persisted in the new personnel. This example and concept is particularly relevant to the military, considering the recurrent and substantial personnel turnover. How does the persistent pattern manifest itself in a military staff? Simple, because personnel turnover is frequent and anticipated, staffs develop methods to ensure organizational information patterns survive. We see evidence of this in the ever present turnover binders and pass-down files. Simon postulates that personnel turnover is advantageous, because it gets rid

of outdated irrelevancies and disadvantageous because it comes at the expense of organizational knowledge.[19] In the case of military staffs, however, there is often the unintentional consequence of actually institutionalizing the outdated irrelevancies as a result of our efforts to preserve organizational knowledge.

THE OPERATIONAL ENVIRONMENT DIMENSION

> The events of 9/11 did more than collapse a pair of buildings, or punch a hole in the Pentagon. It punctuated the end of one era of war, and heralded the dawning of a new one.
>
> -F. G. Hoffman, July, 13 2007, Quantico VA

There is no need to belabor the question of whether or not the operating environment has changed. The relevant question as it pertains to planning and problem solving is, what has it become? The author has utilized the term ‗complex irregular warfare' only because it seems to be a catchall and a common term. There is as yet no consensus on how to refer to current and future conflicts, and perhaps that is not a bad thing at this point. But understanding the environment in which we will conduct operations is an elemental step in planning and critical to problem solving. Is it 4th generation warfare, hybrid warfare, or is the operating environment strictly a function of where it occurs in the Range of Military Operations (ROMO)? Unfortunately, at this point it seems the answer is, *it depends*. It is beyond the scope or intent of this paper to answer these questions; rather it is to acknowledge that significant change has and continues to occur and to discuss the implications to planning and problem solving. The important take away from this brief discussion is that today's military professionals face ill-structured problems and, ―in complex, multisided, irregular conflicts such as Iraq, conventional warfare has failed to produce decisive outcomes. We have instead adopted policing, nation-building, and counterinsurgency approaches–and developed new interagency tools ―on the fly."''[20]
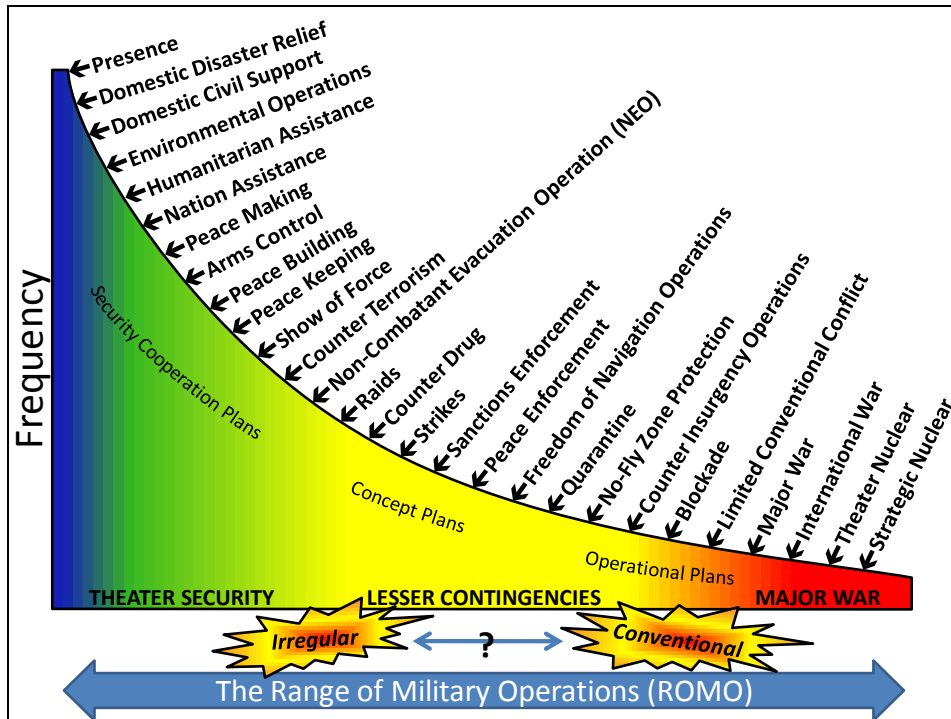
The Planning Continuum (adapted from William J. Hartig, Lecture, ―Problem Solving,‖ Naval War College, Newport, RI, 20 August 2009.)

Logically then, operational design and problem solving in today‗s operating environment is made more challenging due to the complex, ill-structured problems of the 21st century. Simon defined an ill-structured problem for architectural and engineering design as, ―when the goals themselves are complex and sometimes ill defined, and when the very nature of the problem is successively transformed in the course of exploration."[21] Though not intended for military application in its context, this definition aptly describes the challenges faced by military professionals today. Current military planning processes take a very linear, algorithmic approach to problem solving, with guidelines and procedures regulating progression through the process; it is very much a step-by-step recursive procedure for an established problem. This approach is ill-suited to complex irregular warfare. A form of conflict that more often than not deals with intangibles such as hearts and minds, cognitive battlespace, and cellular command and control. The line between traditional and irregular

warfare continues to blur, ―Conflicts are increasingly characterized by a hybrid blend of traditional and irregular tactics, decentralized planning and execution, and non-state actors, using both simple and sophisticated technologies in innovative ways."[22] An adaptive, intelligent, and innovative enemy employing a ―hybrid blend" of tactics that can range the entire spectrum of warfare in a completely non-hierarchal structure is the enemy faced in today's operating environment.

The argument could be made that current planning methodologies fit conventional state v state rational conflict and that by attempting to alter our planning processes for irregular warfare, we run the risk of losing the skill and/or ability to plan for conventional combat. Additionally, there is no ‗one size fits all' process as it pertains to irregular warfare and attempting to create a process will not only be at the expense of conventional capabilities, but it will prove ineffective in dealing with irregular warfare. Nation-states possess the ability to operate on the high intensity conflict end of the ROMO and this represents the gravest threat and lethality; therefore, our focus should be primarily for this type of conflict. The U. S. military also has a tendency to focus on the most recent conflict to the exclusion of everything else and even though the global war on terror is the main focus, the threats posed by nation-states are still present and significant. For instance, Russia and China have both increased their defense spending and modernization programs to the extent that some of their capabilities are now comparable to our own.[23] Perhaps even more disconcerting are the conventional capabilities possessed by rogue nations such as Iran and North Korea. Traditional state v state conflict is a real and current threat with grave potential consequences and since no process truly fits irregular warfare, it is illogical to change planning processes that work for conventional warfare.

The current planning methodologies fit the traditional state-on-state, conventional and rational form of combat. Secretary of Defense Gates cautioned in his article *Striking the Right Balance*, ―Don't forget the Nation-state."[24] But this is an issue of balance and for so long the United States has focused myopically on traditional warfare, even though the vast majority of conflicts in which we engaged were more and more of the irregular warfare flavor. Our conventional abilities have clearly outstripped any near peer competitor and it will require committed focus to prevent that advantage from evaporating, but this is truly about ―Striking the Right Balance."[25] As discussed earlier, irregular warfare is here to stay, and while the solutions to improve our ability to operate in the irregular warfare environment are still evolving, the application of operational design to the planning and problem solving processes will be beneficial. In fact, as the line between conventional and irregular warfare is increasingly blurred, the incorporation of operational design will most likely improve our abilities in the traditional operating environment as well. As for the conventional assumption that only nation-states operate in the most lethal areas of the ROMO and are therefore a more grave and serious threat is simply not the current or future reality. Non-state actors are actively pursuing weapons of mass destruction and there is little doubt as to whether or not they will actually employ such a weapon if they gain possession. This desire to obtain and willingness to use a weapon of this lethality clearly puts the non-state actor on par with traditional nation-states regardless of the form of warfare employed; further blurring of lines. Perhaps as we work to find solutions to these ill-structured problems, we will discover that there is less of a demarcation between reason and emotion, intuition and linearity, creative and critical thought.[26] The ultimate goal for the senior officer should be to develop planning and problem solving skills, regardless of process, that apply to traditional and irregular warfare by leveraging the complimentary aspects particular to understanding each form of warfare.

CONCLUSIONS

Human beings are creatures of limited information and limited ability to process that information.[27] Bounded rationality is a fact and the only way to overcome the associated limitations is acute awareness of its potential impact on every facet of design and problem solving. Over the last four decades, despite one conflict after another that moved the United States farther and farther into the arena of irregular warfare, the military has remained fixated on traditional state-on-state organization. Perhaps our innate limitations combined with the inertia of our established culture and organizations were so powerful that the need to adapt went unrecognized. As the author conducted the research and analysis for this paper, it became clear that it is all but impossible to separate the various dimensions (human, organizational, and environmental) that have been addressed as they pertain to operational design and problem solving. The dimensions discussed in this paper are inextricably linked in numerous and complex ways, therefore each conclusion may involve one or more of the dimensions addressed.

Understanding the problem. Unquestionably, the most important step in the planning process is defining or framing the problem. In other words, if the correct question is not asked you can never expect to get the correct answer. ―There is no such thing as an ―objective" perception and comprehension of a phenomenal reality. There is rather a complexly determined reciprocal action between a ―real world" not attainable as such and the *cognitive-affective organization* of the human problem solver."[28] Because we are bounded in our rationality, we have difficulty assessing complex situations with numerous possible combinations. The fact that we rely on cognitive recognition and can only see one piece of information at a time from our memory, leads us to proceed in a linear, step by step fashion and this is not conducive to framing an ill-structured problem accurately. To compound the

challenge to the problem solver, human perception is very much influenced by culture and ethnocentrism, and more often than not individuals with similar backgrounds will come to consensus. A misperception as a result of culture or an inability to accurately comprehend the situation at the initial stage of problem framing can have serious consequences during design.

Satisficing. As it relates to ill-structured problem solving and design, satisficing is a positive thing. Time is particularly critical in irregular warfare. The non-state actor utilizes a cellular command and control construct made possible by the internet and the information age and is capable of adapting at an incredible rate. This ability to generate tempo is a significant strength and is only further strengthened when we become embroiled in a time consuming journey to find the optimal solution. ―The search for perfect knowledge is a fool's journey.‖[29]

Organizational bounded rationality. Organizations provide structure and allow the U. S. military to function effectively. Organizational culture is, therefore, a powerful influence. It can, however, lead to inflexibility and an inability to adapt to the challenges presented by ill-structured problems. Generally speaking, military personnel are inclined to think a particular way and tend to have similar perspectives of many issues. Simon referred to this as being prefashioned and it enables an organization to ―create and maintain, along some dimensions, idiosyncratic subcultures.‖[30] In the military, these ―prefashioned‖ human beings are assigned to organizations that are very structured, some rigidly, and this combination further engrains the culture of that organization and makes it less and less adaptable. Consequently, the organization assumes similar traits of human bounded rationality and can even develop its own form of ethnocentrism. If not addressed, this is counterproductive to generating a valid operational design and solving ill-structured problems.

Intuition. Clausewitz said that the range of circumstances in war is so extensive and uncertain that the leader must possess an intuition capable of determining the right course regardless of

the ambiguity.[31] Much of the research reviewed for this paper focused on intuition as it

pertains to decision making and the ability to quickly reach a conclusion. But as it pertains to

operational design, intuition is essential for a leader to be capable of conceptualization. The

number of variables, the level of uncertainty and complexity that exists in today's battlespace

is unparalleled and certainly contributes to the organizational complexity we face. The ability

to consider all the factors and conceptualize a way ahead will require a leader and staff with

well developed intuition. Pattern recognition is an important aspect of intuition; when one is

presented with a situation the mind seeks a solution by comparing the present situation as it is

known, with similar situations stored in our memory to see if anything fits. Intuition is also

very important to the factor of time. Whether it is a split second decision in combat or a

leader staring at a map and a white board filled with assumptions and being able to

conceptualize the framework of an operation, it generates tempo. However, as Malcolm

Gladwell observes in his book *Blink*, ―we are innately suspicious of this kind of rapid

cognition. We live in a world that assumes that the quality of a decision is directly related to

the time and effort that went into making it."[32] Gladwell further makes his point by asking

what do we teach our kids, ―haste makes waste. Look before you leap. Stop and think.

Don't judge a book by its cover."[33] We are taught from a young age that it is better to collect

as much information as possible and take as much time as you need to decide. This does not

work in combat, regardless of its form. The ability to use pattern recognition and rapidly

translate that into sound judgment regarding the present situation is an intrinsic aspect of

operational design and it is not the exclusive domain of the leader–it is best achieved through

group effort.

Adaptability. Adaptability is the ability to adjust oneself readily to different conditions and it

is a critical component to successful operational design, with emphasis on the ability to do it

readily. In today's operating environment, non-state actors employ a hybrid form of irregular warfare that creates an almost unlimited combination of possible threats. The use of a cellular command and control structure with the ability to exchange massive volumes of information in near real-time, using cell phones, the internet, etc., gives the enemy the marked ability to develop tactics, techniques, and procedures to counter our efforts and to do so quickly. Operational design seeks the ability to adapt to these changes through continuous assessment. The following quote from MCWP 5-1 cogently illustrates this point.

> Design is a *continuous activity* and must never be viewed as an isolated event occurring only during Problem Framing. It occurs throughout the planning-execution-assessment continuum. Continuous learning is one of the most important aspects of design. As the problem evolves, the commander's understanding of the problem and how his command will conduct operations to achieve a desired end state must evolve, too.

Operational design as a continuous activity across the planning-execution-assessment continuum is a key strength, but if not considered in every aspect of design, the ability to adapt readily will not happen.

RECOMMENDATIONS

Operational design is an approach to problem solving that enables the leader and staff to understand the nature of the problem and the environment, and then over time to synthesize ends, ways, and means to achieve a desired endstate; it is an iterative and adaptable process. The U. S. Marine Corps recently released a draft revision of its Marine Corps Planning Process in an attempt, ―to explain *design* as it applies to the Marine Corps and expose a wider Marine Corps audience to the design discussion preparatory to a formal revision of MCWP 5-1."[34] As this draft revision indicates, there is work yet to be done, but incorporating operational design into military planning methodologies will enable us to better deal with the

irregular warfare challenges we will face tomorrow. The following recommendations are submitted for consideration.

Staff Composition. We should not allow important staff billets to be filled simply as a function of personnel vacancy and availability. Personnel considerations are an important aspect of operational design and each staff and the corresponding key billets are different, but there may be a specific professional background and/or experience level that would be more desirable. Consider the value of a multi-cultural staff, a perfect nexus of clashing culture that quite often results in the desired higher order thinking skills needed to solve ill-structured problems. The DOD made substantial progress in breaking down service barriers with the passage of Goldwater-Nichols, but is it enough considering the challenges we faces today? Perhaps the next step is increased interagency and multi-national participation at the staff level to provide broadened perspectives and introduce that beneficial clash of cultures. A more integrated staff with varied and diversified perspectives will be more capable at framing and solving complex ill-structured problems.

New Think. For the DOD, operational design is a new approach to planning and solving ill-structured problems. It will involve more than changing our doctrinal publications and incorporating new terminology. With new methodologies come training and education requirements. In pursuit of solving ill-structured problems, we must strive to overcome the limitations of bounded rationality, both human and organizational. This is accomplished primarily through the application of critical and creative thought; for instance, instead of consensus, the staff seeks divergence and thinking that challenges the institutional or organizational conventional perspectives. Force field analysis, root cause, analysis or brainstorming sessions that involve group interaction and open interchange of ideas that draw on staff members' experiences and intuition to frame or solve problems.   Perhaps even

something as simple as continuing to use chalk boards and butcher block paper in lieu of the dreaded PowerPoint, to visually display information from a brainstorming or analysis session that enables the staff as a group to establish a starting point or baseline of knowledge. As discussed in the analysis, human beings are visual animals and we access information stored in our minds through recognition and visualization. A white board, with schematics or other information, is easily updated and always present for staff members to contemplate. There is a reason a picture is worth a thousand words. Using computers to store and pass information has application, but it is impersonal, and as such the human interaction element and corresponding potential benefit is never realized. Operational design applied to military planning and problem solving is new; new, focused training and education is required if we expect to realize the maximum potential benefit.

Education/training-developing intuition and expertise. Professional Military Education (PME) within the various services promotes *institutional* learning to develop leaders through comprehensive career long education. Education is important to the cultivation of leaders and it is an essential ingredient to Clausewitz's coup d'oeil. But we have entered a period, possibly to be measured in generations, that may well be dominated by persistent hybrid irregular warfare that spans the ROMO, and just as we are reevaluating our planning methodologies to ensure we meet the challenges, we should rethink how we educate our leaders. A significant portion of PME is dedicated to the study of history and rightly so, since history does seem to mimic itself and pattern recognition is an important skill in both structured and ill-structured problem solving. But in today's operating environment there is also a necessity to think critically and creatively, both are concepts many consider foreign to the linearity of military planning processes. Critical and creative thought can be cultivated

with the proper education and it would help to develop the right intuition and expertise to solve the ill-structured problems that we will face in the future.

A proper education is one component of developing experience; training should reinforce that education and instill those mental patterns that enable a leader to develop that intuition or coup d'oeil. Training opportunities, regardless of scope or focus, are important in developing an ability to recognize patterns across a wide range of situations. For instance, prior to Operation Iraqi Freedom, America's terrestrial services, her soldiers and Marines, regularly trained at high intensity combined arms in a state-on-state conventional fight with physical objectives. This was good training and conducive to the development of a specific pattern recognition (intuition) ability. Since 2004 however, that training has stopped and now these ground units train almost exclusively for counterinsurgency (COIN) in an urban environment, with civilian actors and insurgent role players. For more than five years the Army and Marines have raised a generation of young leaders that will have good COIN and Phase IV pattern recognition, but what about Phase 0 through Phase III? The point is that the training is good, but it needs balance. As stated previously, maintaining our ability to conduct high intensity, state-on-state conventional warfare is crucial and we should be cautious of raising a generation void of training experiences in that area of the ROMO. Likewise, the need to continue and improve training in irregular warfare must be pursued.

FINAL REMARKS

For a particular institution, the most prevalent issue that faces its management is the problem of restructuring itself so that it can be a more viable and dynamic part of the ever-changing environment within which it exists. The challenge to synthesize form with process is possibly at the root of most social conflicts and dysfunctions.

- Edwin M. Bartee, 1973, Vanderbilt University

The United States military's operating environment has changed and while September 11, 2001 is the event that seems to have signified the dawn of this new reality, the fact is that change did not happen in one day. Our new operational environment is a function of many things that have evolved over time. Non-state actors capable of employing tactics that span the ROMO, globalization, and the information age are some of the more prominent changes. But taken collectively, what this amounts to is an environment that is incredibly complex with many variables, any one of which that can literally change in seconds. And while much of this evolution was occurring, the U. S. military was focused on the monolithic Soviet Union as we had became comfortable with an enemy that was easily identifiable and in many ways looked like us. Logically then, since the late 1940's, virtually every aspect of the U. S. military centered on fighting a Soviet Union type enemy and that is how we built our military machine, to include our planning and problem solving processes. Despite experiences such as Vietnam that conflicted with our idea of what war was supposed to look like, we did not alter how we approached planning and problem solving. 9/11 was a wakeup call and now the U. S. military is adapting and evolving to the new environment and fundamental to our ability to adapt is our ability to understand the adversary and solve complex ill-structured problems. To meet the challenges of our new environment we must be capable of critical and creative thought that allows us to solve problems that are ill-structured and unique. Sun Tzu said, ―Know the enemy and know yourself; in a hundred battles you will never be in peril."[35] How well do we know ourselves as it relates to planning and problem solving? As creatures of bounded rationality, what can we do to enhance our abilities to solve complex ill-structured problems? Can we see past our cultural and ethnocentric biases in order to accurately understand our adversary and frame the problem accordingly? It is the writer's opinion that we are in essence in the problem framing stage of understanding and

comprehending our new environment and it is critical to get it right. The implications of how

we plan and problem solve in this new environment are massive. Do we need to restructure

PME across DOD? How do we train to think critically and creatively? Do we need to

reevaluate how we organize staffs? Is there a better way to train that will develop the right

recognition patterns and associated intuition? At this point, there are more questions than

answers. That is not necessarily a bad thing, because questioning the status quo is a positive

sign.

> ―We wanted to show that every age had its own kind of war, its own limiting
> conditions, and its own peculiar preconceptions."
>
> -Carl von Clausewitz, 1832

NOTES

(All notes appear in shortened form. For full details, see the appropriate entry in the bibliography.)

1. U.S. Marine Corps, *Marine Corps Planning Process*, 3.
2. U.S. Office of the CJCS, *Joint Operation Planning*, IV-4.
3. Simon, "Problem Forming, Problem Finding, and Problem Solving in Design," 246.
4. Dewey, *How We Think*, 14.
5. Simon, "Bounded Rationality and Organizational Learning," 132.
6. Simon, "Problem Forming, Problem Finding, and Problem Solving in Design," 248.
7. U.S. Marine Corps, *Marine Corps Planning Process*, 3.
8. Facione, "Critical Thinking," 12.
9. Ibid.
10. Simon, "Problem Forming, Problem Finding, and Problem Solving in Design," 246.
11. Clausewitz, *On War*, 102.
12. Simon, "Bounded Rationality and Organizational Learning," 129.
13. Hartig, "Problem Solving Lecture."
14. Ibid.
15. Simon, "Bounded Rationality and Organizational Learning," 125.
16. Ibid.
17. Ibid.
18. Ibid., 128.
19. Ibid.
20. Kilcullen, "New Paradigms For 21st Century Conflict," 1.
21. Simon and Associates, "Decision Making and Problem Solving," 9.
22. Conway, Roughead, Allen, *A Cooperative Strategy for 21st Century Seapower*, 6.
23. Gates, "Striking the Right Balance," 4.
24. Ibid.
25. Ibid., 2.
26. Facione, "Critical Thinking," 12.
27. Simon, "Problem Forming, Problem Finding, and Problem Solving in Design," 247.
28. Ulrich, "The Design of Problem-Solving Systems," 1099.
29. Hartig, "Problem Solving Lecture."
30. Simon, "Bounded Rationality and Organizational Learning," 128.
31. Clausewitz, *On War*, 112.
32. Gladwell, *Blink*, 13.
33. Ibid.
34. U.S. Marine Corps, *Marine Corps Planning Process*, Foreword.
35. Sun Tzu, *The Art of War*, 84.

BIBLIOGRAPHY

Bartee, Edwin M. "A Holistic View of Problem Solving." *Management Science* 20 (1973): 439-448.

Chisholm, Donald. "Problem Solving and Institutional Design." *Journal of Public Administration Research and Theory* 4 (1995): 451-491.

Clausewitz, Carl von. *On War.* Edited and translated by Michael Howard and Peter Paret. Princeton, NJ: Princeton University Press, 1976.

Conway, James T., USMC, Admiral Gary Roughead, USN, and Admiral Thad W. Allen, USCG. *A Cooperative Strategy for 21st Century Seapower*. Washington: Department of the Navy, 2007.

Cowan, David A. "Developing a Process Model of Problem Recognition." *Academy of Management Review* 11 (1986): 763-776.

Dewey, John. *How We Think*. Boston: Heath, 1910.

Dillon, J. T. "Problem Finding and Solving." *Journal of Creative Behavior* 16 (1982): 97-111.

Duggan, William. *Strategic Intuition: The Creative Spark in Human Achievement*. New York: Columbia University Press, 2007.

Facione, Peter A. "Critical Thinking: What It Is and Why It Counts." *Insight Assessment* (2009): 1-23.

Fernandes, Ronald and Herbert A. Simon. "A Study of How Individuals Solve Complex and Ill-Structured Problems." *Policy Sciences* 32 (1999): 225-245.

Gates, Robert M. "The National Defense Strategy: Striking the Right Balance." *Joint Force Quarterly* (2009).

Gladwell, Malcolm. *Blink: The Power of Thinking Without Thinking*. Boston: Little Brown & Company, 2005.

Hartig, William J. "Problem Solving." Lecture. Naval War College, Newport, RI, 20 August 2009.

———. *Problem Solving and the Military Professional*. Naval War College, Newport, RI. 2007.

Kilcullen, David J. "New Paradigms for 21st-Century Conflict." *eJournal USA Countering the Terrorist Mentality* 12. (2007): 39-45.

Klein, Gary A., and J. Weitzenfeld. "Improvement of Skills for Solving Ill-Defined Problems." *Educational Psychologist* 13 (1978): 31-41.

Landau, Martin. "On the Concept of a Self-Correcting Organization." *Public Administration Review* 33 (1973): 533-542.

Landau, Martin, and Russell Stout. "To Manage Is Not to Control: Or the Folly of Type II Errors." *Public Administration Review* 39 (1979): 148-156.

Mintzberg, Henry, Duru Raisinghani, and Andre Theoret, "The Structure of Unstructured Decision Processes." *Administrative Science Quarterly* 21 (1976): 246-275.

Simon, Herbert A., and Associates. "Research Briefings 1986: Report of the Research Briefing Panel on Decision Making and Problem Solving." *National Academy of Sciences* (1986): 19-36.

Simon, Herbert A. "Administrative Decision Making." *Public Administration Review* 25 (1965): 31-37.

———. "The Logic of Rational Decision." *The British Journal for the Philosophy of Science* 16 (1965): 169-186.

———. "The Structure of Ill-Structured Problems." *Artificial Intelligence* 4 (1973): 181-201.

———. "On how to decide what to do." *The Bell Journal of Economics* 9 (1978): 494-507.

———. "Bounded Rationality and Organizational Learning." *Organization Science* 2 (1991): 125-133.

———. "Problem Forming, Problem Finding, and Problem Solving in Design." *The International Annual of Practical Philosophy & Methodology* 3 (1995): 245-257.

Sun Tzu. *The Art of War*. Translated by Samuel B. Griffith. Oxford: Oxford University Press, 1963.

Tallman, Irving and Louis N. Gray. "Choices, Decisions, and Problem-Solving." *Annual Review of Sociology* 16 (1990): 405-433.

Ulrich, Werner. "The Design of Problem-Solving Systems." *Management Science* 23 (1977): 1099-1108.

U.S. Marine Corps. *Marine Corps Planning Process*. Draft Revision. Marine Corps Warfighting Publication (MCWP) 5-1. Washington, DC: Headquarters U.S. Marine Corps, 2009.

U.S. Office of the Chairman of the Joint Chiefs of Staff (CJCS). *Joint Operation Planning*. Joint Publication (JP) 5-0. Washington, DC: CJCS, 26 December 2006.