Systemic Operational Design:
Learning and Adapting in Complex Missions

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N EARLY ALL MISSIONS this century will be complex, and the kind of thinking we have called "operational art" is often now required at battalion level. Fundamentally, operational art requires balancing design and planning while remaining open to learning and adapting quickly to change. Design is not a new idea. Command has always entailed responsibility for designing operations while penetrating complexity and framing problems that planners have to solve. Individual ability to learn effectively, adapt rapidly and appropriately, and to solve problems has always been self-evidently valuable to commanders. Yet, collectively, a command's overall quality of design, learning, and adaptation is what determines results. Military leaders may value individual creativity, critical thinking, continuous learning, and adaptability in their staffs and subordinate commanders, but individual traits do not necessarily add up to collective abilities needed for the best outcomes. Traditional approaches to imparting a collective quality to campaign design introduced in the 1980s, and more recent infusions from Joint doctrine, are no longer sufficient for achieving the best outcomes. Because operational environments evince increasingly dynamic complexity, commanders are looking for, and are in need of, help.

Operational Art in Modern Complex Conflicts

Operational artists at all levels need new conceptual tools commensurate to today's demands. Conceptual aids derived from old, industrial-age analogies are not up to the mental gymnastics demanded by 21st-century missions.

Parallel to the development of so-called (and now discredited) "rapid decisive operations" (RDO), and as a way to facilitate RDO planning, Joint doctrine writers at Joint Forces Command (JFCOM) introduced effects-based planning (EBP), operational net assessment (ONA), and system-of-systems analysis (SOSA). Intended to be tools of operational art and planning, these concepts have been nearly impotent for making any sense of the Iraq and Afghanistan missions.

The inherent logic of effects-based planning assumes a mechanistic understanding of causal chains. We can readily understand the logic of cause and effect in physical structures once we map them. Difficulty ensues when mapping social and political relationships: when we think we have a map, relationships shift. Moreover, such maps become unreliable because people need not act the way one expects they should.

Critically, SOSA attempts to map five categories of interconnected, organic structures that people create—political, economic, military, social,

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ILLUSTRATIONS: Hannibal, whose army is depicted here crossing the Alps, is likely the West's most competent example of skilled adaptation in operational design. Juxtaposed is a stylized portrait of Takeda Shingen, the Japanese commander of the 16th century who made Sun Tzu's operational philosophy the centerpiece of doctrine for his armies.

and infrastructure informational constructs. SOSA undermines critical and creative thinking about these structures by assigning them a Newtonian causal logic that promotes conceptual rigidity. Human constructs are inherently fluid. Assigning mechanistic predictability to them in doctrine amounts to erecting false assumptions as dogma. As doctrine, SOSA is antithetical to a coherent operational design.

Evolving Doctrinal Norms and Systemic Operational Design

The last four years have seen the Army promote studies to reinvigorate creativity, critical thinking, and adaptability as intellectual norms in a collective organizational framework. This inquiry, just like the Army's reforms of the early 1980s, has led it to examine what other disciplines and other militaries have learned about dealing with the difficulties of novel and complex challenges. In many fields, novelty limits the extent to which reasoning models derived from experience can apply to present problem settings. New systemic complexity defies the usual approaches to sensemaking.

Complicated versus complex systems. Merely complicated systems are composed of numerous parts and structures, all logically separable from their environment. An example would be the system for deploying units on a time table for an operation like D-day. Such a schedule could be accurately analyzed in the abstract. Complex systems are made up of dynamic, interactive, and adaptive elements that cannot be separated from interaction with their environments. The significant elements of complex systems are human beings and their relationships. An example would be the action-reaction interplay of the various actors in cooperation and contention on D-day. Analysis could never predict the relationships that were the most important part of the flow of events.

Where merely complicated systems require mostly deduction and analysis (formal logic of breaking into parts), complexity requires inductive and abductive reasoning for diagnostics and synthesis (the informal logic of making new wholes of parts). Because the elements of complex systems we care most about are human ones, making sense of relationships requires hypothetical synthesis in the form of maps or narratives. Such maps and narratives evolve as informal

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products that reflect a dimly perceived truth at a moment of understanding in time. To make the best sense of human relationships, interactions, trends, and propensities, military commands have to adopt a habitually skeptical approach to such non-deductive conclusions. Such habituation implies a new intellectual culture that balances design and planning while evincing an appreciation for the dynamic flow of human factors and a bias toward perpetual learning and adapting.

Recent trends in design. Over recent years the fruits of this inquiry have infiltrated parts of Joint Publication (JP) 3-0 and 5-0; into the new Field Manual (FM) 3-24, *Counterinsurgency* (Chapter 4); and into FM 3-0, *Operations* (Chapter 6). In early 2008, the Army's Training and Doctrine Command (TRADOC) published a guide entitled *Commander's Appreciation and Campaign Design* (TRADOC Pamphlet 525-5-500), and in late 2007 the Army War College expanded emphasis on design into its *Campaign Planning Handbook*. These documents represent initial attempts at articulating new ideas (a new intellectual culture) and harmonizing them with older knowledge. Necessary revisions are underway to make needed concepts more accessible. Just as 1982's FM 100-5, *Operations*, provided only a rudimentary treatment of operational art, these new publications represent initial efforts to evolve a competent approach for dealing with the human factor in complexity.[1]

Colonel Robert C. Johnson, Director of the Futures Directorate of TRADOC's Army Concepts Integration Center, launched and guided this study in its early years, introducing participants to the thinking of Brigadier General (retired) Shimon Naveh, Ph.D., who had developed an approach to operational art for the Israeli Defense Forces (IDF) called "systemic operational design" (SOD). In early 2006 the new IDF leadership rejected SOD

in favor of effects-based operations (EBO) and SOSA. All plans based on SOD were shelved, and its proponents were retired. This rejection of SOD had dire consequences for the way the Israelis then framed the "Hezbollah problem" they faced that same summer. Instead of following the logic outlined by Naveh, they attempted to follow American Joint doctrine: EBO and SOSA. The IDF's loss has been the U.S. Army's gain.

The remainder of this discussion is a distillation and further development of a yet unpublished paper Naveh and I wrote jointly in August 2008 entitled "The Theory and Practice of Design." The balance of this discussion answers four simple questions by summarizing necessary evolutions of operational art and how to institutionalize them:

● What is effective learning and adapting while campaigning?
● What is design in relation to planning?
● What is the logic and method of effective design?
● How do we institutionalize design?

Effective Learning and Adapting While Campaigning

The U.S. military is not the only institution facing the conceptual difficulties of complexity. It has been able to learn from others and adapt knowledge to its culture and missions. Adapting the learning and insights of others is always difficult, as it was during the reform era of the 1980s when America learned most from the Germans and the Soviet enemy. The following key ideas have been translated for American use.

Effective learning and adapting while campaigning, or "adaptive campaigning," is a key part of this newly evolved approach to operational art. "Campaigning" in this sense means extended operations requiring balanced design and planning. The Australian Army has made adaptive campaign-

ing a centerpiece of their doctrine. In one sense this is an adaptation of John Boyd's OODA (observe, orient, decide, act) loop. It also reflects adaptation of Darwin's theory of evolution to memetic ideas (rather than genetic natural selection). Adaptive campaigning is the art of continually making sense of dynamic situations and evolving designs, plans, modes of learning, and actions to keep pace.

Consciously or not, all living beings and societies follow the pattern of behavior described in the diagram below. So do America's combatant commands, including units rotating into Iraq and Afghanistan today.[2] They can be thought of as conducting one perpetual security campaign in pursuit of desirable change. There is no beginning and no end state. The idea of "end state" makes little sense in this context. There is a currently provisional desired state, one now believed desirable based on what is known. It may be achieved sooner than thought possible, or it may prove to be overly ambitious. What is actually attainable inevitably changes as more is known. During the current extended campaigns, each combatant command is continually adapting within the ecology of their environments, as do all living beings. Success depends on learning and adapting more rapidly than rivals in the ecosystem. This dynamic applies the same way to extended operations at their lower echelons.

Modes of understanding. The Greeks taught Western civilization to think heroically, to create a

Act based on a provisional theory of reality
On the current understanding of the problem, in order to learn to develop the situation and to influence behaviors toward objective.

Sense to discern what changed
Gain feedback for adaptation, study what to sense, and measure effectiveness.

Turn inside the Learning-Adaptation Cycle of Other Actors

Adapt to the new level of understanding

Decide what the sensings mean
Take decisions on several levels:
• Technique and course of action
• Methods and modes of learning
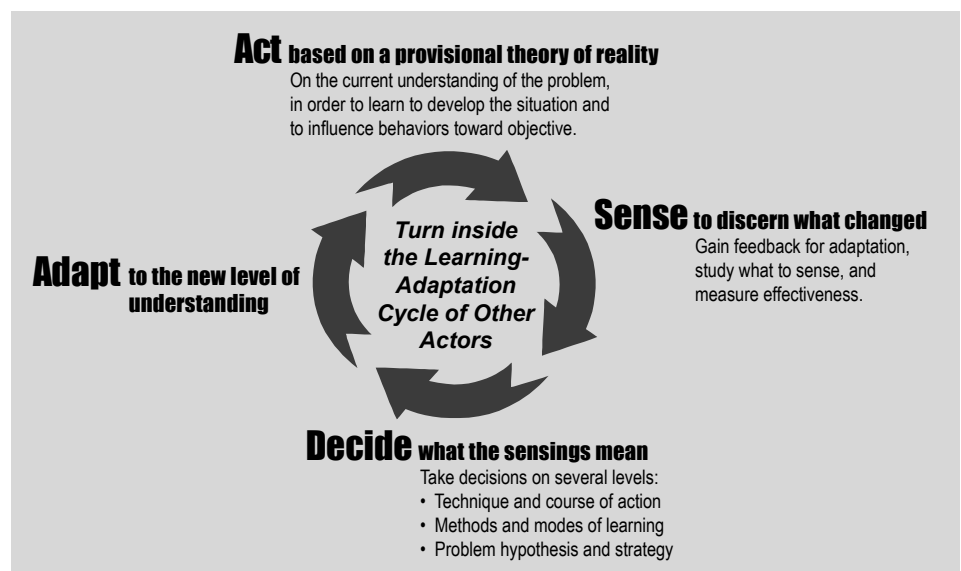• Problem hypothesis and strategy

Figure 1. Adaptive campaigning model.

vision of the future as an idealized "end" one desires, and to overcome any and all obstacles to force that ideal creation of one's mind onto the real world. This temperament involves a Manichean narrative that encourages polarized and inherently simplified distinctions. It also assumes a direct correspondence of truths (mental states) to facts (physical realities).

In contrast, the foundational discourses of the Confucian and Taoist East do not frame life experience in terms of idealized ends or "visions." Chinese sages thought it impossible to know what an idealized end could be. They did not trust the mind to have a mirror-like correspondence to external reality. Instead they thought that distinguishing "better" from "worse" was the best one could do. Life experience, in their Eastern perspective, was a perpetual and ever changing flow of events. Intellectual energy, in flowing with the way of the world, should ideally focus on understanding the forces, tendencies, and propensities of the contextual situation. In their understanding, one harmonizes with existence by enhancing the forces tending to flow toward "better" while subtly diverting and blocking those tending toward "worse." Although this distinction amounts to oversimplification, the differences drawn are sufficient to point up the pros and cons of the intellectual heritages of East and West.[3]

On their own, both ways of thinking have limitations; balancing these ways is valuable in a complex world. In a longer-term sense we need to think the Eastern way. For shorter term goals we need to work concretely in planning and acting based on a problem frame derived from our best current understanding of the situation. But unlike the Greeks, we should treat our mental problem construct as a contingency. Westerners often treat goals as conceptual ideals (as immutable realities), and consequently get wedded to plans that solve expired problem frames. The advice of the Chinese sages is to treat problem frames as provisional landmarks on the road to "better."

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Acting on shared perceptions. Because operational reality is complex, dynamic, and opaque, military commands should act on provisional theories of reality (of the relation between truth and fact) that its key members share. They should collectively develop a provisional road to doing and making things better. The more comprehensive, relevant, and reliable knowledge is, the better the outcomes will be in two equally important respects: actually advancing desired goals, and gaining more relevant understanding of the situation. An important aim of "design" is to develop a more comprehensive appreciation of the situation than we as a military institution now can.

As aforementioned, operating headquarters are continually sensing to discern what has changed as a result of its various interventions in the contextual ecosystem. Getting relevant feedback is challenging, as is learning how and what to sense and how to identify useful measures of effectiveness. However, since methods and modes are the product of past lessons learned, they may not be best for gathering the most relevant information. Another important function of design is to devote attention and forethought to this sensing process. Ascribing meaning and relevance to information leading to decisions about techniques and courses of action is not difficult. In this process, the Army can easily perfect "doing things right." The difficulty is the question of whether we are actually "doing the right thing" for the best outcomes.

Deciding whether our provisional theory of reality needs updating—i.e., are we solving the right problem, and do we have the right strategy?—is much more difficult. For this we have to depend on the experience, intuition, and creativity of our leaders. Because today we are facing both extreme novelty (primarily with information operations) and complexity combined, America's military leaders need help in this area. The biggest decisions of command are not about how to achieve set goals but what these goals ought to be within a campaign design.

Political authorities, responding to mounting pressure to do something in a crisis, regularly assign ambiguous missions to senior military leaders. What one can understand is a function of the granularity of one's view, often a perplexing condition. Ambiguous missions entail a cycle of understanding that turns continually and does not

conform to the abstract and linear mental models of campaign phasing established in current Joint doctrine. An adaptive campaigning model is needed for modern doctrine.

Design in Relation to Planning

Figure 2 shows how design meshes with planning and adaptive campaigning. The product of design is the provisional "conceptual problem frame" within which planning takes place. Whereas design sets the problem to be solved, planning solves it as set. Deciding what the problem is, and solving it are two different functions that the U.S. military conflated all through the 20th century, simply because it could. Countering the Soviet invasion of Western Europe, Iraq's invasion of Kuwait, and the North Korean invasion of the South are structurally much the same problem.

When experience, doctrine, and commonly held paradigms are valid, design is implicit. We all have the same mental model of the problem to be solved. In this conflated approach to design and planning, a commander's guidance to planners covers any doubtful issues of design. This comfortable situation has eroded over the last two decades under the pressure of mission demands. Changing a regime is a very different problem conceptually than countering an aggression. Lacking doctrine and experience leads to different mental constructs

in different minds, even in the same command. Every time our framing of the problem changes, plans need to be updated—new problem, new solution. A way to rapidly and continually evolve and share reliable mental constructs of the problem is needed.

Dealing with design separately and explicitly before we plan imparts deliberate logic, discipline, and rigor. There is no formulaic way of presenting it. (When doctrine writers develop one, you will know we have taken a turn off the path to better understanding.) Figure 2 indicates that design does not change military planning processes as they now exist; they precede and run in parallel with it.

The Logic and Method of Design

The U.S. military's comfortable, conflated design/planning paradigms need a re-think.

The interconnected operational environment of political, military, economic, infrastructure, and information (PMESII) systems-of-systems analysis portrayed in JP 3-0 and 5-0 is complicated, not complex. A complicated system behaves in a linear, predictable fashion. Automobiles and jumbo jets are complicated systems. These are systems that actually exist in the world. Technical missions (e.g., bombing, artillery fire, air strikes, and infrastructure repairs) deal with the logic of such systems. As aforementioned, joint doctrine encourages
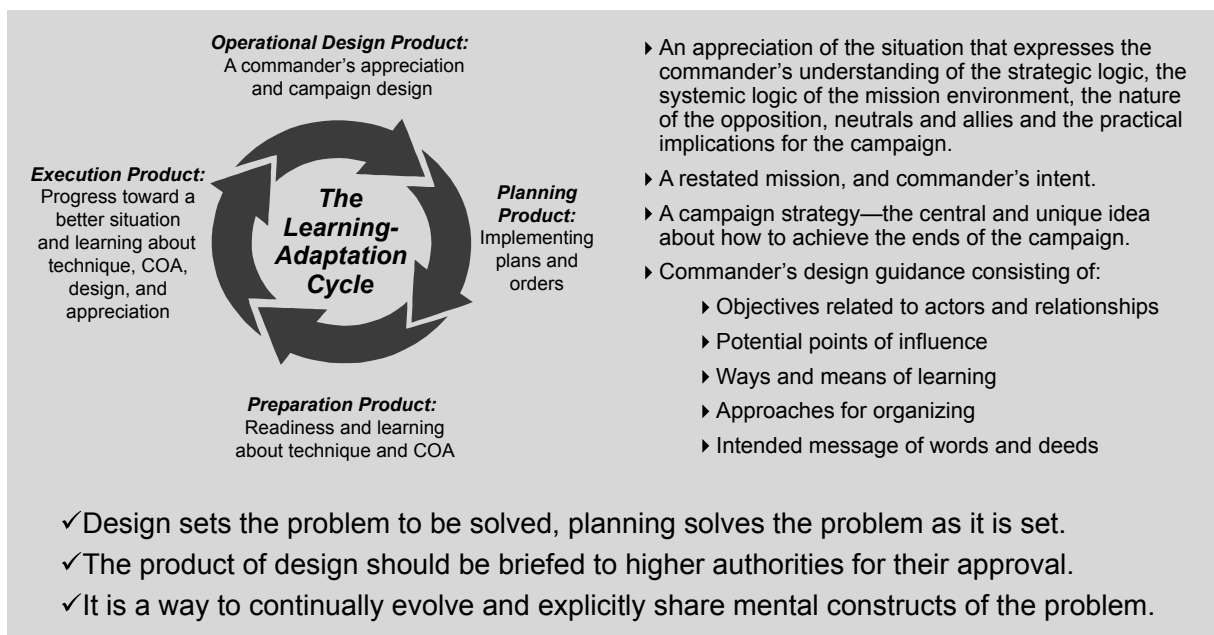
Operational Design Product:
A commander's appreciation and campaign design

Execution Product:
Progress toward a better situation and learning about technique, COA, design, and appreciation

The Learning-Adaptation Cycle

Planning Product:
Implementing plans and orders

Preparation Product:
Readiness and learning about technique and COA

‣ An appreciation of the situation that expresses the commander's understanding of the strategic logic, the systemic logic of the mission environment, the nature of the opposition, neutrals and allies and the practical implications for the campaign.

‣ A restated mission, and commander's intent.

‣ A campaign strategy—the central and unique idea about how to achieve the ends of the campaign.

‣ Commander's design guidance consisting of:
  ‣ Objectives related to actors and relationships
  ‣ Potential points of influence
  ‣ Ways and means of learning
  ‣ Approaches for organizing
  ‣ Intended message of words and deeds

✓ Design sets the problem to be solved, planning solves the problem as it is set.

✓ The product of design should be briefed to higher authorities for their approval.

✓ It is a way to continually evolve and explicitly share mental constructs of the problem.

Figure 2. A provisional conceptual problem framing guide.

THE INTERCONNECTED OPERATIONAL ENVIRONMENT

Information
Infrastructure
Social
Military
Political
Economic

The PMESII systems-of-systems portrayed in JP 3-0 and 5-0 is **complicated**, not complex. A complicated system is made up of many parts but behaves in a linear (that is predictable) fashion. Automobiles and jumbo jets are complicated systems. These are systems that actually exist in the world. Technical missions deal with the logic of such systems.

The current military mission environment is not such a system, it is **complex**. A complex system is a system that consists of a large number of interactive parts in which the number of relationships and feedback mechanisms make system behavior unpredictable in magnitude of response. Relationships are hidden, constantly evolving, and impossible to bound. They are also marked by self-organization and emergence of the capability to generate system changes without external input. Relationships of thinking humans are extremely complex.

Figure 3. The interconnected operational environment.

conflating what is in the mind with what is in the real world. It assumes a simple correspondence between ideas and facts, that the mind is the mirror of reality. Such a simplistic theory of knowledge assumes the world is a system and that the systemic reflection in our minds is real. It projects mental models back into the world and engineers solutions to problems it perceives to be immutable.

General Mattis at Joint Forces Command (JFCOM) recently acknowledged the inappropriateness of effects-based operations and effects-based planning for anything but technical missions for which causal chains are either predictable, or nearly so.[4] The systems-of-systems logic of JP 3-0 and 5-0 suggests that EBO/EBP is widely applicable to all current missions; more doctrinal reform is therefore necessary.

Current mission environments present complex rather than complicated systems. They are marked by self-organization and something called "emergence"—the capability to generate system changes without external input. Adding human beings to the equation adds even more to complexity. Mapping such complexity is not true to reality but an evanescently useful representation of reality. Keeping its transient quality in mind, any competent leader armed with an understanding of the logic required could "set" and "solve" mission-problems within a framework of adaptive campaigning.

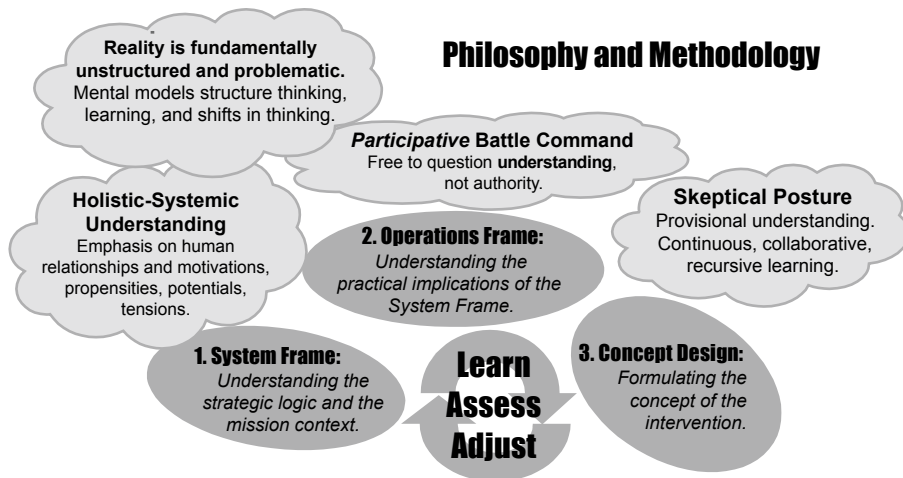**Doing the right thing.** When doctrine is sound and relevant, and experience has taught applicable lessons, leaders can recognize what "doing the right thing" is as well as "how to do things right." When one cannot be sure of doctrine, of one's own experience, or of the concepts generated by the Pentagon, one is sure to find operational complexity more intractable. These conditions yield a hazily imperfect knowledge of both the enemy and one's own capabilities. Because today's missions present novelty and complexity combined, designing components of operational art requires systematizing collective critical and creative thinking within a headquarters. Accomplishing that goal means using a systemic cognitive methodology more likely to lead to "doing the right thing."

Such a collective design approach attains a broader, holistic, and shared understanding of the situation. It benefits from multiple perspectives introduced in a rigorous and disciplined way. The "problem" is more likely to be a shared view within the headquarters, better defined, and more rigorously documented, making re-definition easier and faster. Planning to solve the problem is likely to proceed more effectively and more rapidly. Those who protest that time and rigor invested in design is wasted effort do not understand that "doing the right thing" is more important than "doing things right" on the way to "worse" or "irrelevant" rather than "better" outcomes.

The philosophy required of sound design is very much the opposite of the "hard systems thinking" encouraged by PMESII, SOSA, and EBO in which reality is structured and predictable. Design relies on mental models to structure thinking, learning, and shifts in thinking about a reality that is fundamentally unstructured, ephemeral, and intractable.

Collaborative design is commander-led, and the commander decides key questions concerning the interpretations of facts and the acceptance of key causal theories, but the quality of the result depends on the commander's willingness to entertain and consider challenges to his or her understanding (without considering them as a threat to authority or position). Questioning to achieve shared

Philosophy and Methodology

Reality is fundamentally unstructured and problematic. Mental models structure thinking, learning, and shifts in thinking.

Participative **Battle Command** Free to question **understanding**, not authority.

Holistic-Systemic Understanding Emphasis on human relationships and motivations, propensities, potentials, tensions.

2. Operations Frame: *Understanding the practical implications of the System Frame.*

Skeptical Posture Provisional understanding. Continuous, collaborative, recursive learning.

1. System Frame: *Understanding the strategic logic and the mission context.*

Learn Assess Adjust

3. Concept Design: *Formulating the concept of the intervention.*

Build a shared understanding layer-by-layer through a recursive dialectical process:
• Form a tentative explanatory theory based on the best information available.
• Test it by identifying problems or tensions between the theory and new information and perspectives.
• Construct a new theory to resolve such problems.
• Maintain cross-talk higher to lower, among command team and with subordinates.

Figure 4. Philosophy and methodology.

understanding of facts and expected consequences is a mark of professional conduct, not a challenge to authority to decide and direct. True discipline requires honest professional dialogue between peers, with subordinates, and particularly with superiors in recognition of the markedly short-lived truth of complex realities.

Business literature has long advocated "management by walking around." The military leadership version is called "battlefield circulation." The understanding of leaders is greatly enhanced when subordinates one or two levels down share their understandings candidly. Learning about complex situations is very much a bottom up process. Because systems of human relationships, the ecosystem of today's missions, are complex rather than complicated, design requires maintaining a skeptical posture. Every interpretation of facts is challengeable. Every analogous case is judged not only by the similarities but also by the differences. Every understanding is provisional. Collaborative and recursive learning is continuous. Every explanation is up for challenge.

This layer-by-layer approach of building understanding through a recursive dialectical process outlined at the bottom of Figure 4 is the empirical, inductive vehicle science employs to propose and test theories. Informal, inductive case-building is the procedural workhorse of the command's

design inquiry. This collective design methodology assumes a continual, cyclical assessment for relevance and periodically feeds new guidance to planners and subordinates.

Just as the Military Decision Making Process has a logical sequence that should not be violated even when the steps are abbreviated, operational design has a sensible and logical sequence that also can be abbreviated but not violated. Design should begin by constructing a broad conceptual frame of reference, the "system frame." This frame aids in understanding the strategic logic and context. Conventional wisdom is to think at least two levels down when drawing up plans. Designing wisdom is to initially think two mission levels up to frame the problem context. The next stage of design is to construct a narrower conceptual frame of reference, the "operating frame." This frame aids in understanding the systemic potentials, trends, and propensities within the situation and the way it can be transformed into a desirable, self-regulating state. From this frame of reference emerges the broader concept of "intervention": a clear statement of the "problem" and the "whole of government" or "governments" strategy of intervention suited to the particular situation and the interests of authorities. From this understanding emerges the concept design for the command.

It will be normal for problem framing at one level of design to differ from that of a higher authority. Difference may simply result from considering different sets of facts and different interpretations of

> *[Operational] design requires maintaining a skeptical posture. Every interpretation of facts is challengeable.*

the same facts. Different assumptions—theories of cause and effect—can also lead to different framing. Professionally, subordinate commands should challenge the understanding of the higher authority based on their own comprehensive design enquiries. Under the best of circumstances both levels will refine and harmonize their understandings and their designs. Harmonizing understandings, up and down as well as laterally, benefits all if it includes deliberate consideration of the basis for differences, not simply a lowest common denominator compromise. The commander's decision should not gloss over differences, as they become the basis for framing priority questions to be answered on the road ahead.

The "journey of learning." Collaborative design is a continuous and recursive "journey of learning." Figure 5 describes and explains important aspects of the main steps so briefly outlined above.

"Reading into" the situation and higher authority guidance implies a starting point. However, this starting point should be understood as a significant new emergence in the flow of events. Such points are reached anytime there is a reason to take a fresh look at the situation. They can be deliberately periodic, as when directed to undertake a new mission, or as the commander deems useful. An important aspect of this methodology is that every product is sanctioned

by the commander, otherwise it would be the design team's product and not a command product.

The first step to constructing the system frame is to record observed reality and learn about its complex evolution. A conceptual map and written narrative can best describe and explain the command's understanding of the emergent situation. (A map is best for economically describing and explaining relevant relationships. A narrative is best for describing and explaining the logic and sequence of how the situation evolves. Doing both is best.) If a recent system frame exists, it may have resulted from adjustments to a previous map and narrative.

All people individually reason informally in similar fashion, consciously or not. But one rarely creates a detailed, collaborative, graphic, and narrative interpretation of the relevant actors and their relationships in an emergent situation. More rarely does anyone make an explicit record of theory, of causal and influence networks, and of how a situation may evolve further if current strategy does not change. Even rarer is the likelihood that an individual, much less a group, ever conducts a logical, comprehensive, and systemic inquiry suited to setting the problem (design) as opposed to solving one (planning).
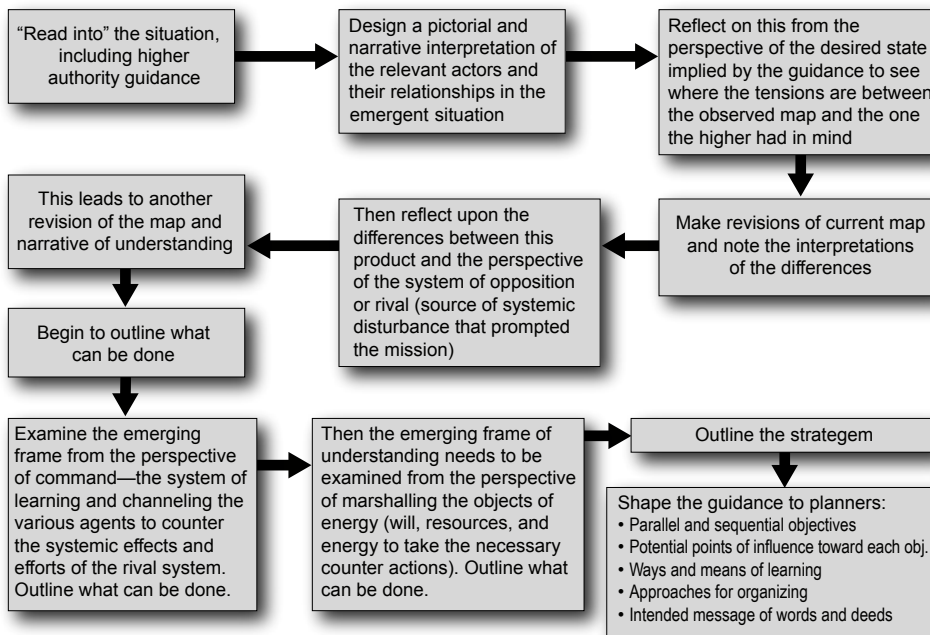
The exercise of deliberately creating, sharing, and periodically renewing such an explicit conceptual construct is an "official" reference and record of past assumptions of causal logic and provides a shared baseline for learning, and further critical thinking. In planning we make assumptions of fact, in design we make assumptions of truth in causal logic. Given current practices, we lose track of the logic that produced current efforts, especially as key staff and commanders change during the course of perpetual

Figure 5. The "journey of learning."

> *In planning we make assumptions of fact, in design we make assumptions of truth in causal logic.*

campaigning. In conflated design/planning we either mix the two kinds of assumptions indiscriminately or we disregard assumptions of causal logic altogether, especially if they are commonly accepted paradigms, or tenets of our doctrine.

Current doctrine needs to provide more wisdom about how to help the command think critically and creatively as a team. While they can easily identify relationships most apparent to the conventional and current way of looking at the situation, what is valuable, albeit more difficult, is to tease out relationships that exist outside the current paradigm of situational relationships.

Meta-questioning. Meta-questioning is an intellectual habit that can help one escape conceptual paradigms to tease out relationships. For example, Afghans are members of a tribal society. A meta-question would ask, "How does being a tribal member affect the way Afghans view governance, international boundaries, drug trafficking, and support for the Taliban?" While doctrinal definitions, categories, and patterns of behavior are useful for sharing understanding and organizing tactical efforts, they also confine one to current paradigms in thinking. Sound design requires one to critically test, break, and construct new and more relevant ways of understanding.

The next step is to create a mental model that defines the desired situation and outlines the strategic logic for intervention implied by higher authority guidance and as modified by any new knowledge gained thus far in the inquiry. Model creation involves creating two models of the "observed" and "desired" states that can be juxtaposed to grasp the tensions between the two. Reflecting on these two frames of reference and the tension between them leads to recognition of what actors need to behave differently and what causal and influence networks need to be altered, but not necessarily "how."

Then begins the narrowing of the broader perspective into the narrower operating frame of reference that shapes thinking about action and the "how." This effort produces a finer grained appreciation of the tensions between the observed system and the desired one. It also reveals the practical implications of bringing about desired systemic changes. In the end, this winnowing down leads to a broad theory of actions—actions in the context of collaborative "whole of government and alliance" efforts connected to a broader team of actors who are wholly or even partly in pursuit of the same outcomes.

Systemic changes (or disturbances) can produce an undesirable emergence. Any factor that tends to worsen prospects for a desired outcome is an undesirable emergence. Combined, the source of the change and the emergence itself can be thought of as the "system of opposition." This system may comprise actors in full or partial alliance, tendencies of particular allies, or the character and propensities of the environment. The next step is to give this opposed system more definition and use it as a foil to reflect on the path from the observed state of affairs to that desired. This step is analogous to Sun Tzu's dictum to "Know your enemy" but more broadly applies to the milieu of opposition. The object is to understand as much as possible about environmental tendencies and propensities. That inquiry would involve wrestling with the asymmetries between the system of opposition and one's command as a system.

A minimal inquiry into the system of opposition would address:
● How can we learn about it.
● What are the impacts of culture, politics, economics, and social dynamics on the opposing system's behavior.
● What is the nature and structure of its "logistical" system.
● What is its visible and invisible modes of operational maneuver.
● How might this system of opposition be disrupted.

The next logical step is to create another foil for reflecting on the asymmetries between the system of opposition and a system that hypothetically embodies all sources of potential resistance to it, specifically to the undesirable emergence. This step is analogous to Sun Tzu's dictum to "Know yourself,"

only more broadly applied to understanding oneself as a system, and oneself as a member of a "system of collaboration" (the command and other allied agencies) toward compatible desired outcomes.

This step of the "journey of learning" addresses four important questions:

● How elements of this system can combine efforts of actors (for instance, relevant service elements, coalition contingents, non-military governmental agencies, indigenous organizations, multinational corporations, inter-governmental organizations, and non-governmental organizations) to achieve comparative advantage.

● How to create a networked system of collaboration to effectively engage and sustain these varied potentials throughout the campaign, and at the same time, share information and learn effectively about the ever-evolving situation.

● How to exploit the self-defeating habits and tendencies of particular adversaries, the inclinations and propensities of neutrals, and aspects or trends of the contextual environment that oppose the undesirable systemic emergence.

● How the command itself should organize to learn, adapt, and continually re-design throughout the campaign.

The next logical step of the inquiry is a very broadly defined "logistical system"—in other words, the system for mobilizing, marshalling, delivering, and deploying the situation-changing means required to develop and sustain the campaign. The means required to change the situation may include the will and energy of allies to act, as well as various resources and military and non-military capabilities. Developing and sustaining the campaign requires overcoming systemic impediments such as barriers of time, space, and geography. This aspect focuses on the tension between what is required and what is available to actors and agencies that can be mobilized and on logistical issues of positioning, staging, timing, and geography. Sun Tzu is a good example, as *The Art of War* offers ample advice on these matters of design.

Given the specific situation, other relevant systemic perspectives also apply to further limit, scope, and shape the operating frame and form of the intervention. But each of these separate exercises in expanding our relevant knowledge leads to more revision of the cognitive map and narrative of our understanding. Each further outlines and limits the scope and form of the intervention and thus outlines the "operating frame"—the frame of reference that actually shapes our thinking about operations (e.g., where and how to apply positive and negative energy to transform the observed system into the desired situation).

What remains is to narrow a broad theory of intervention down to the role of the command itself:

● Where it will support.

● Where it will lead and be supported.

● How it will apply systemic leverage.

Abstract concepts have to be translated into clear and concise language and a logical flow of ideas to enable the formulation of guidance for the command's planning efforts and subordinate level design efforts.

The actual products of design consist of:

● The commander's appreciation that explains the strategic logic for the mission, the logic of the emergence that prompted it, and the logic of the operating frame.

● The concept design consisting of the restated mission, the commander's intent, and the strategy for intervention.

The "strategy for intervention" is the central and unique idea about how to exploit the following to achieve the desired outcomes:

● The peculiar characteristics of the situation.

● The nature and tendencies of the system of opposition.

● The asymmetries between the system of opposition and the system of collaboration.

● Other systemic propensities.

A statement of the strategy will normally address:

● Parallel and sequential objectives with regard to specific system actors and relationships.

● Potential points of influence toward these objectives.

● Ways and means of learning.

● Approaches for organizing.

● Intended "message" of words and deeds combined.

This journey of learning is continuous, iterative, and reflective because whatever strategy is applied in the real world, the mental models constructed along this journey are only imperfect representations of it. New constructs must account for new

> *…whatever strategy is applied in the real world, the mental models constructed along this journey are only imperfect representations of it.*

observations and new desired system states. New tensions between observed and desired states need to be reconciled. Enriched understanding then needs to translate into strategic adaptations and reformed intervention. Periodically new design guidance will flow to subordinates and planners while the operational design team continues to learn.

Institutionalizing Design

This new approach to operational art has demonstrated results superior to the alternative in every case. People who have the greatest experience of complex operations are its most ready converts. Converts have been more easily won among practitioners in actual operating environments than in sterile academic settings. Those most recently indoctrinated in EBO and SOSA and the "hard systems thinking" it promotes have been the most difficult to re-educate in this method. They keep trying to harmonize two incompatible ways of thinking or they are convinced that EBO and SOSA produce an acceptable product more quickly. Open-minded skeptics who have gained experience and understanding of the method have been brought around. Those who believe the military has no business in ambiguous missions and complex settings are its most ardent opponents. Then there are those who prefer the traditional approach to complexity: overwhelm and obliterate it.

Sometimes a culture grows from the bottom up, but there is no doubt that this new culture must be introduced at the top and directed downward. Senior leaders and higher headquarters will recognize the benefits of this approach more easily, and once a higher headquarters practices this form of operational art, subordinate headquarters will naturally follow suit.

The Army is more ready for this approach than some of its senior leaders, its proponents, now think.

Those officers who cut their teeth professionally in Panama, Haiti, Bosnia, or Kosovo, and who have more recently been serving in key leadership positions while rotating in and out of Afghanistan and Iraq should be naturally receptive. Such officers are moving into leadership at division, corps, and theater-Army levels. A sincere effort to practice this new form of operational art is underway in the 3d U.S. Army, the ARCENT component of U.S. Central Command. Key elements of the staff have invested time in immersive study and are practicing the art of collective design daily in their work. Much is being learned there to pass on to other headquarters. A corps would similarly benefit from doing a collaborative design inquiry at the front end of a rotation, well ahead of the mission readiness exercise. Commanders at all levels willing to try this approach would stand to benefit as well. But such an experiment should not be forced on an unwilling commander because going through the motions of collective critical and creative thinking and learning and adapting will be fruitless.

The introduction of new ideas that clash with sanctioned old ones is naturally more difficult in bureaucratic and conservative military academic institutions. Faculties at Fort Leavenworth and Carlisle have been more resistant than their students or practitioners in the field. This may be because these faculties have had to absorb EBO, ONA, and SOSA over the last decade in order to fulfill their obligations to teach Joint doctrine and concepts. This collective inertia is analogous to the asymmetries between the irregular who thinks pragmatically about his particular world, and the regular who must be expert across a wider world and thus relies on general principles of bureaucracies to tell him how to think about particulars. The irony is that decentralizing the thinking about particulars leaves educators to concentrate on education. *MR*

NOTES

1. Other "senior mentors" involved in this effort from time to time have been: retired Lieutenant General's Leonard D. Holder, P.K. van Riper (USMC), William Carter, James Steele, James Riley, and retired Major General Waldo Freeman.
2. See "Redefining the Military Strategy Problem Set" in the November 2008 issue of *Army*, 19.
3. For a deeper understanding I recommend reading Francois Jullien, *A Treatise on Efficacy: Between Western and Chinese Thinking* (Honolulu: University of Hawaii Press, 2004).
4. See Memorandum for U.S. Joint Forces Command, Subject: Assessment of Effects Based Operations, 14 August 2008.