# Design: Thinking not Process

*by* Dan McCauley

Senior officers capable of critical and creative thinking are needed more than ever to plan and conduct operations in strategic and operational environments that offer ever-changing uncertainties in increasingly complex conditions. Officers who have a broad body of knowledge gained through experience and extensive study and capable of identifying and evaluating potential military response options within the context of a grand strategy are necessary to achieve the goals of the nation. The development of such officers requires a shift in their extensive focus from the operational and tactical environments to the strategic environment. This is a tremendous undertaking given that by far one spends the majority of one's career at those lower levels of war and promotion to senior ranks relies upon excellence in tactical thinking and execution. The aim of the Chairman, Joint Chiefs of Staff, is to educate strategically minded officers with the ability to view military affairs in the broadest context.[1]

This essay posits that integrating design as a process within JOPP is a shortsighted attempt to legislate thinking whereas the more appropriate option would be to develop officers capable of design *thinking*. To develop senior officers who possess the requisite worldview, critical and creative thinking must underpin the concept of design. Senior officers must understand the role constraints play within design and how the strategic environment is affected. Two accepted approaches in design thinking, analysis/synthesis and conjecture/analysis, could provide senior officers with the unique perspectives necessary for planning at all levels of war. In addition, the unique skills that specific personality types possess that make strategic-thinking and design thinking more inherently natural must be recognized and promoted.

Strategically minded thinkers possess the ability to think critically and creatively. To think critically, one needs the ability to break concepts or objects into simpler parts and understand the relationship and organization of the parts relative to the whole.[2] To think creatively, one needs the ability to rearrange the components or ideas into a new whole; in other words, to produce something through imaginative skill.[3] Although some critical and creative thinkers are naturally gifted, given enough time almost anyone can develop these necessary skills.[4] Unfortunately, for the majority of senior military leaders, time is something that is not in vast supply. In fact, given the relatively short duration of time that senior officers spend operating in the strategic environment and the even shorter periods they serve in any one position, it is a natural desire to attempt to develop a checklist or shortcut that will guide these officers through the wicked problems rife within complex environments.

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[1] *Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 1800.01D*, Officer Professional Military Education Policy (OPMEP), 15 July 2009, Joint Staff J-7, p. A-A-1 – A-A-2

[2] Bloom, Benjamin S., Ed., *Taxonomy of Educational Objectives, Book 1 Cognitive Domain*, Longman, New York, 1956, p. 144

[3] Bloom, p. 162

[4] Lawson, Brian, *How Designers Think: The Design Process Demystified*, 4th Edition, Elsevier Ltd., Oxford, UK, 2006, p. 155-157

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Operational art is the application of creative imagination by commanders and staff – supported by their skill, knowledge and experience...."[5] As the definition implies, creativity is the essential component of operational art and is supported by critical thinking. Operational design concepts provide commanders with tools and a method of thinking that assists in the construction of plans[6] and is a natural extension of operational art. Currently, the attempt to develop and integrate a design process into the joint operation planning process (JOPP) is an attempt to develop a shortcut that dictates "when to think" as opposed to educating officers on "how to think." The design process is an attempt to give some of the officers who excelled in the tactical environment but lack the ability to think strategically, a pseudo-checklist to help them navigate their way through the environmental complexities.

Described in its broadest sense, critical thinking is "purposeful reflective judgment concerning what to believe or what to do."[7] Critical thinking examines goals and assumptions, detects concealed principles, and conducts assessments. "Critical," as used in the expression "critical thinking," denotes the importance of the thinking to an issue or problem of concern. Strong critical thinking allows evaluation of an argument as worthy of acceptance because it is valid and based on proper premises.[8] Critical thinking encompasses broad intellectual criteria such as clarity, reliability, precision, consequence, breadth, depth, and significance.[9]

In Bloom's Taxonomy of Learning, the Knowledge and Comprehension levels underpin the Analysis level of learning. To apply logic and to make purposeful judgment, one must possess a comprehensive understanding of the pertinent material obtained through the Knowledge and Comprehension levels of learning.[10] The critical thinking process involves the guarded attainment and interpretation of information and use of it to reach a reasoned conclusion. Reflection upon the nature of its concepts enables the application of critical thinking to any context or case. Consequently, critical thinking enables a system of thought composed of diplomatic thinking, sociological thinking, historical thinking, political thinking, and economic thinking, among other related and overlapping modes. Critical thinking, although its principles are universal, requires a process of reflective contextualization to understand the required disciplines properly.[11]

Often described as ability, an attitude or a process, creative thinking is essentially a combination of all three. As ability, creativity allows the imagination to explore new or novel concepts. In addition, by reapplying existing ideas or through the recombination of existing concepts, creativity can invent something new. Creativity is not the ability to make the irrelevantly novel—there must be value or purpose in creation. At times surprising and insightful, often creativity is simply a sensible idea that no one seems to have thought of yet. Attitude is the ability to accept something new and a willingness to experiment with ideas and possibilities, and is a primary characteristic found in creativity. Socialization limits an individual into accepting only a small number of permitted or normal things, like rotary or fixed-wing

[5] Joint Publication 5-0, *Joint Operation Planning,* Revision Final Coordination (RFC), 25 October 2010, p. III-1
[6] Ibid, p. III-1
[7] Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction. ERIC Document No. ED 315-423
[8] Sumner, William (1906). *Folkways: A Study of the Sociological Importance of Usages, Manners, Customs, Mores, and Morals.* New York: Ginn and Co.. p. 633.
[9] Internet search, "critical thinking," 16 November 2010, http://en.wikipedia.org/wiki/Critical_thinking
[10] Bloom, p. 144
[11] Internet search, "critical thinking", 8 November 2010, http://www.reference.com/browse/Critical+thinking

aircraft, for example. The creative person realizes that there are other possibilities, such as tilt-rotary aircraft. Creativity is a highly individualized cognitive process used by individuals to continuously develop or improve ideas and solutions through thoughtful contemplation of the problem or through changes or adjustments to their original works. Contrary to legend, creativity rarely occurs in a whirlwind of activity or with a flash of brilliant insight, rather it is the result of in-depth preparation, incubation, and illumination. The creative person knows that there is always room for improvement,[12] but from a planning perspective, the trick is to understand what constitutes ―good enough.‖

As a way thinking, design incorporates both critical thinking and creative thinking.[13] Design is one of the most creative of military pursuits and provides the construction of the framework that underpins a campaign or major operation and its subsequent execution.[14] Senior leaders will be leading the planning and execution efforts and thus must possess both of these thinking skills and, in essence, take on the higher level cognitive effort of design. At the senior levels, the creative thinking skill is of tremendous value and is an absolute necessity in operational design.

Creativity can occur in at least three ways. The first way is for creativity to be the result of an amalgamation of familiar ideas in unfamiliar combinations, which relies upon a vast knowledge base in a person‘s mind within which there are different ways of movement. The second way for creativity to occur is through the exploration of conceptual spaces or styles of thought. Styles of thought are normally associated with one‘s culture but exposure to other cultures can influence that development. Styles of thought are not original in the individual‘s mind, but within the given conceptual space, only developed some possibilities previously. The final way that creativity can occur is through the transformation of the space – creativity can change ―mind maps.‖ Unlike a physical map that cannot be altered, our minds can take the next step to think the ―unthinkable‖[15] and can push, alter or change the edges of a mind map.

Certain types of personal characteristics describe the creative personality. Researchers have found that creative types are highly intelligent, persistent, highly motivated, self-sufficient, confident, and assertive.[16] These traits are consistent for someone with the required knowledge when performing critical analysis and of someone who has taken the time to learn, understand and, in the case of proposing creative solutions, the confidence and assertiveness to do so. Poised and articulate, creative individuals operate on the fringes of the social group, but are self-sufficient. In addition, some of the less positive characteristics also include self-centeredness, bluntness, aggressiveness, and a very high opinion of self. As a result, creative people are generally more difficult to get along with – this social friction, however, does not typically bother them.[17]

Two types of thought are required for the creative personality to be effective: divergent and convergent. The divergent personality is an extension of the creative person who tends to want to do things their own way and to his or her own standard. Divergence typically conveys a

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[12] Harris, Robert, *Introduction to Creative Thinking*, VirtualSalt, 1 July 1998, Web 1 Nov 2010,
http://www.virtualsalt.com/crebook1.htm
[13] JP 5-0, RFC, p. III-1 – III-2
[14] Joint Publication 5-0. *Joint Operation Planning*, 26 Dec 2006, p. IV-1
[15] Boldin, Margaret, *The Creative Mind: Myths and Mechanisms,* pp. 4-6
[16] Lawson, p. 151
[17] Lawson, p. 152

difference or disparity in thought or opinion, and a failure to conform to the typical pattern or to the established rules of the group. On the other hand, convergence is an approach toward a definite value or common goal while conforming to established rules. The convergent personality is compliant and tends to seek approval from their superiors.[18]

Effective design and strategic thinking requires both convergent and divergent thought in equal quantities.[19] The divergent thinker spends the requisite time to understand properly the situation, to assess the major attributes and concepts, and then, based upon the unique set of circumstances, develop a creative solution to the problem. The convergent thinker can work within the group to convey the concepts and ideas that provide the intellectual foundation, and then, incorporating other insights and suggestions from the group, act as guide to develop a workable solution. The strategic thinker must incorporate both types of thinking to be successful.

A strategic thinker must be able to differentiate between original ideas and creative ideas – ―Good design results from the unexpectedly relevant solution not wackiness parading as originality.‖[20] A strategic thinker must be able to integrate divergent and convergent thought into a useful product, which is not an easy undertaking. In addition, good strategic thinkers must be at ease with the lack of resolution of divergent ideas or constraints for a good portion of the planning process. It may not be until late in the process that a central idea emerges that enables a solution to divergent constraints – this ―central idea‖ typically emerges only after a long period of intellectual struggle.[21]

Contrary to popular belief, a designer does not get to start with a ―blank slate‖ – there are a variety of influences that constrain the designer‘s thoughts. Even though these constraints are often frustrating and cumbersome, they are necessary to ensure the design or plan performs the desired functions. Constraints may be internal to the problem itself or externally imposed by Congress, the President, or an actor not under the control of the planner. The planner must strive to develop a course of action that meets the relative and incongruent sets of criteria that are many times, promulgated unconditionally by the POTUS or SECDEF, Congress, the COCOM, the JTF, or the affected population.[22]

Figure 1 below depicts a simplified concept of the influences that constrain the planner even before pen is put to paper. The left-hand column depicts a number of the major actors that have an effect upon design thinking. In some cases, the original impetus for the initiation of a plan comes from the President (POTUS) or Secretary of Defense (SECDEF). In this case, the POTUS or SECDEF have an outcome in mind and reasons for that specific outcome. Unfortunately, those reasons are often lost in translation or poorly articulated as the message passes to lower levels. In addition, the individual belief systems and emotions of the President or SECDEF constrain the understanding of the situation during concept initiation. Understanding ―how‖ and ―why‖ the task or mission was directed is as important as the task itself and must be understood, if possible.

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[18] Lawson, p. 153
[19] Lawson, p. 153
[20] Lawson, p. 154
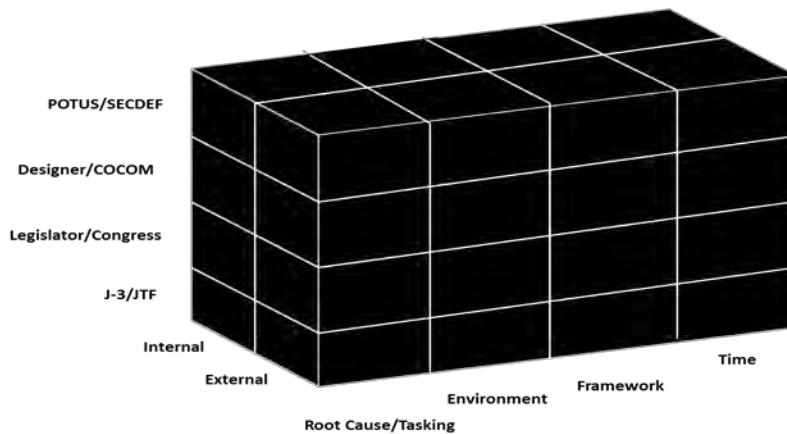[21] Lawson, p. 154
[22] Lawson, pp. 99-110

**Figure 1**[23]

The officer selected to lead the planning effort affects the scope of the problem and any potential solution or course of action. As previously discussed, the planner has a certain type of personality that will directly affect the understanding of the nature of the problem and how a solution is developed. In addition to the level of innate creativity within the individual, psychological, social, educational, emotional, marital, Service background, tactical training, and career factors directly affect the planner's perspective to the problem and solution. In addition, the individual's experiences with similar situations – either experiential or through intensive study – will significantly affect the planner's approach. The planner develops and applies value judgments to the situation and subjectively emphasizes certain aspects of the environment over others. The combatant command itself is a constraining factor – which specific COCOM, who is the commander, what position within the organization does the designer occupy, what other duties and responsibilities do they have as well as a number of other issues that deal with the organization.

Congress, although frequently not a direct actor within the design itself, imposes constraints within which the planner must work.[24] Laws, codes, and regulations can have a significant effect on the planning and execution of a plan. Legislation has often been passed for situations and circumstances no longer relevant or the new situation presents an entirely new problem set that could not be foreseen. Until rescinded, amended or changed, a planner must consider all legislation. For example, some security assistance programs' legislation written during the Cold War is irrelevant in today's environment, yet continues to have a significant effect on operations and programs around the world.

An often-overlooked constraint is the implementer or user of the design. In fact, the implementer is usually the farthest removed from the planner's sphere of influences even though they will ―bear the brunt‖ of the burden of the plan. The implementer will be executing the plan on a day-today basis and will have a direct effect on the root cause and environmental factors. Acting as implementers, COCOM J-3s, JTFs and Components often have the perspective that is most relevant to the problem, yet their expertise is rarely sought in the initial problem identification and design. Planners must be aware of the implementing agency, to include their organizational make up, their commander, their operations tempo, expertise, knowledge of the

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[23] Diagram was modified from a figure in Bryan Lawson's book, *How Designers Think: The Design Process Demystified,* p. 106
[24] Lawson, p. 89

problem and design, and a whole host of other factors that will affect their ability to execute the mission as envisioned by the planner.

Each of the actors listed above can develop their own internal and external constraints. Internal constraints are the more obvious as they typically form the basis for the problem. The structure, depth or breadth of the problem, the relationship to other environmental factors, and the interaction of factors within the problem and among the other environmental actors form some of the obvious internal constraints. Internal constraints generally allow a greater degree of freedom as they are typically governing factors under the control of the designer. External constraints range from the environment within which the operation will occur, the intensity of the national interests, or the joint operations planning and execution system (JOPES). Oftentimes, the external factors can determine the whole of the design form. External constraints, although they may only represent a small portion of the problem, are often highly significant because they are outside of the direct control of the designer. Usually the most demanding and challenging, external constraints tend to restrict the number of options available to the planner.[25]

The constraints listed above perform at least four functions that are an integral part of design thinking: the root cause, the environment, the framework, and time. The first function is the proper identification of the root cause or the purpose for the tasking in the first place. The root cause deals with the primary purpose of the plan or system under design and the focus is on the identification of the root of the problem. The second function that affects design thinking is the environment – the design problem deals with the reality of developing and executing the design. The focus is on the environmental response to the design and the durability of the design over the anticipated length of time for execution. The third function deals primarily with those things associated visually with the design – the format and rules of the design. The COCOM, CJCS, SECDEF, and others have a fundamental need for order and structure, so the design must conform to that need while still allowing variety and creativity. The fourth function of design constraints is its relationship with time – design has a need to connect with the past, present, and an uncertain future. The conditions that created the need for a design have a historical antecedent that must be understood and considered as a trend line for the future. The design must incorporate the past, integrate within the current environment, while being flexible enough to assimilate potential futures.

Draft joint doctrine describes —design" as a method for applying critical and creative thinking to understand, visualize, and describe complex, ill-structured problems and develop approaches to solve them. The draft doctrine presents design as an iterative process that is not linear.[26] Unfortunately, the problems associated with a non-linear iterative process suggest that it is not a genuine process, but a way of thinking. In his book, *How Designers Think: The Design Process Demystified*, Dr Bryan Lawson, through extensive interviews with designers, finds that although when asked, designers can propose a step-by-step process, when queried further, reveals that none of the designers follow their prescribed process.[27] What his research indicates is that the process is, in fact, iterative and endless and involves finding as well as solving problems.

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[25] Lawson, p. 93-99
[26] JP 5-0, RFC, p. III-1 – III-5
[27] Lawson, p. 40

Any design process is part of the planner's strategy and is typically heuristic. Design is simultaneously educational and solution seeking and far too complex for a simple model to describe. Any design process map may appear logical, but is misleading as design spans the range from engineering to art and is a highly personal and multi-dimensional cognitive process.[28] Another way of viewing design thinking within the planning process is to think in terms of ―patterns.‖ While the planning process is linear, if we think of design in patterns, then the iterative nature becomes more self-evident. See Figure 2 below.
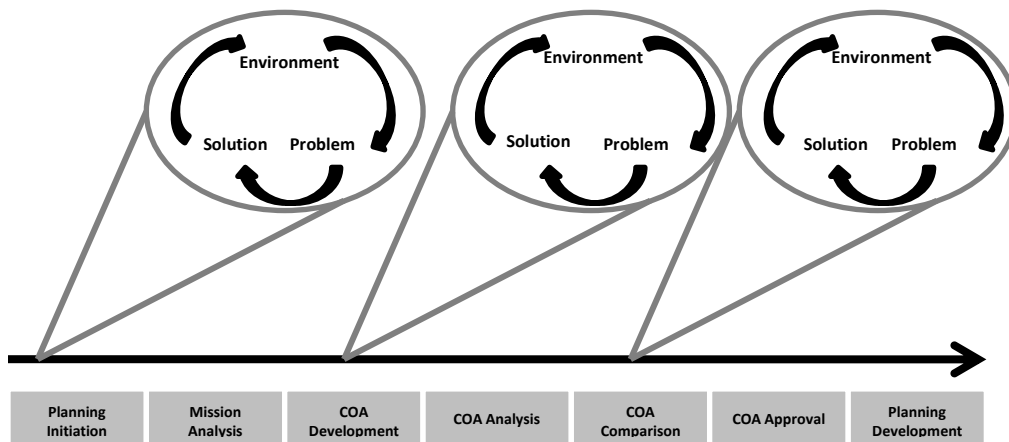


**Figure 2**

Because of the iterative and cognitive nature of a design, planners must be able to produce novel unexpected solutions while tolerating uncertainty and working with incomplete information. Planners must be able to ―apply imagination and constructive forethought to practical problems,‖[29] which is not conducive to a process per se, but more along the lines of a way of thinking. Any step within a process at this point would be akin to stating ―Develop creative thought now.‖

Rather than creating an artificial process to inject creativity in military ―lock step,‖ it would be better to look for individuals with the abilities that suggest an aptitude for design or, at least, develop those abilities within selected individuals. Planners should have the ability tolerate ambiguity, be at ease with a lack of resolution of their ideas for long periods, endure incomplete and often conflicting ideas, ―adopt solution-focused strategies, employ abductive-productive-appositional thinking, and use non-verbal, graphic and spatial modeling.‖[30]

Typically, two approaches are taken to design: the analysis/synthesis (a/s) approach and the conjecture/analysis (c/a) approach.[31] The analysis/synthesis method is the classic scientific approach to analysis to design based upon the concept of deductivism. The a/s method postulates that all of the facts can and would be observed and recorded without value applied to their relative importance. The observed and recorded facts would then be analyzed, compared, and classified through the logic of thought, but without assumption about their relative nature.

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[28] Lawson, p. 289-290
[29] Lawson, p 290
[30] Lawson, p. 290
[31] Bamford, Greg, *From analysis/synthesis to conjecture/analysis: a review of Karl Popper's Influence on design methodology in architecture*, Design Studies, 23, 2002, p. 246-250

After complete analysis of the facts, generalizations would be drawn about the relationships between them. After establishing the relationships, the process would delve back into the facts to draw conclusions and to apply value to the facts and relationships regarding their desirability in relation to the designer's needs.[32] In the example illustrated below (Fig. 3), the planner analyzes the overall problem and identifies sub-problems and individual problems, identifies a root cause or driver, and then develops a synthesized framework to address the overall solution.
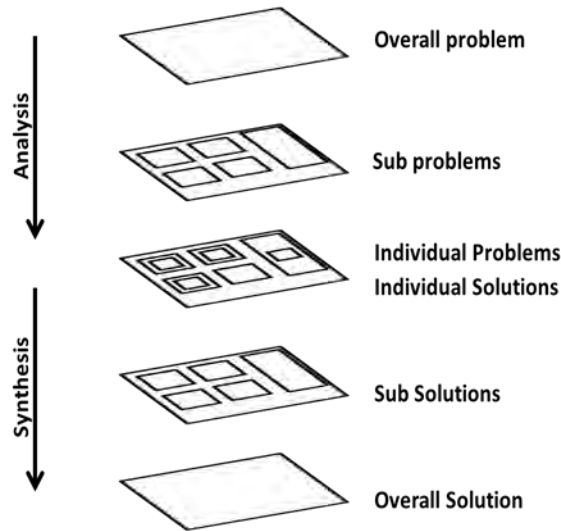


**Figure 3[33]**

This concept has at least two potential pitfalls as a design approach. First, this concept assumes no pre-conceived notions and no valuation of information that could limit the scope of the problem. It relies upon a strict application of the scientific method that dismisses knowledge and experience. Second, it fails to address the nature of the parts and whole. The properties and attributes of the whole and the individual parts vary as the system is broken down into smaller parts or when assembled back into larger pieces. The concept does not take the friction or the synergy of the parts into consideration as the solution or conclusions are drawn. In general, even though this approach may appear extremely mechanical for the reasons stated above, it is a useful approach for an individual or staff to use if the experience level is relatively low.

This concept does provide an opportunity, however, to view the nature of the levels of war in relation to the problem and identify the friction created resulting from the relative position to or perspective of the problem. Figure 4 below takes the same model and places the levels of war side-by-side to illustrate the relationship. For example, if an overall problem has been identified (strategic level), as the problem is analyzed and broken down into sub-problems (operational level), the nature of the problem changes. The nature of the problems change once again as sub-problems are further analyzed into individual problems (tactical level). Each of the individuals at each level of war are working the same problem set, but the perspective of the problem changes as the root cause is viewed as a part of the whole, as a part of the sub-problems, or as a part of the individual problem. Usually, at this point the confusion and frustration

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[32] Bamford, p. 246-247

[33] Diagram originally produced by IEA Task 23 and published in *Integrated design process: From analysis/synthesis to conjecture/analysis*, by Maureen Trebilcock

between commanders at different levels occurs and explains why tactical actions garnering tactical successes, have little, no, or adverse effects at the operational or strategic levels.  The synergy or friction generated by the individual components is not taken into account or are extremely difficult to predict.  In other words, ―'Decomposing' problems or _piecing together' solutions may be important tactics in problem-solving, but a striking disanalogy within design is that, unlike problems in the physics of motions, we do not end where we begin."[34]
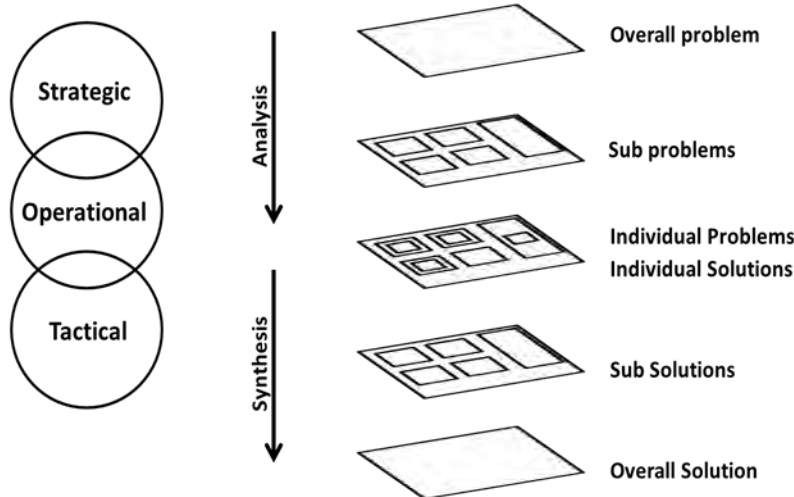


**Figure 4**

The conjecture/analysis approach uses foreknowledge and experience to develop a hypothesis regarding the solution to a proposed problem.  Unlike the analysis/synthesis approach, which is more problem-focused, conjecture/analysis has a solution-based focus that starts with ideas that can be quickly tested against the initial constraints.  The c/a approach places tremendous value on trial and error, subjective judgments, and personal systems of values and beliefs, and uses these tools to reduce the variety of the problem set.[35]  Figure 5 below depicts the concept that a solution to the overall problem will be hypothesized without the intermediate steps of sub- and individual problem analysis and individual and sub-solution synthesis occurring.  Sub-solutions would be derived from sub-problems without analysis of the broader overall problem of the specific individual problems.  Likewise, individual solutions would be developed in the context of individual problems.

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[34] Bamford, p. 249
[35] Darke, Jane, *The Primary Generator and the Design Process*, Design Studies, 1979, p. 38
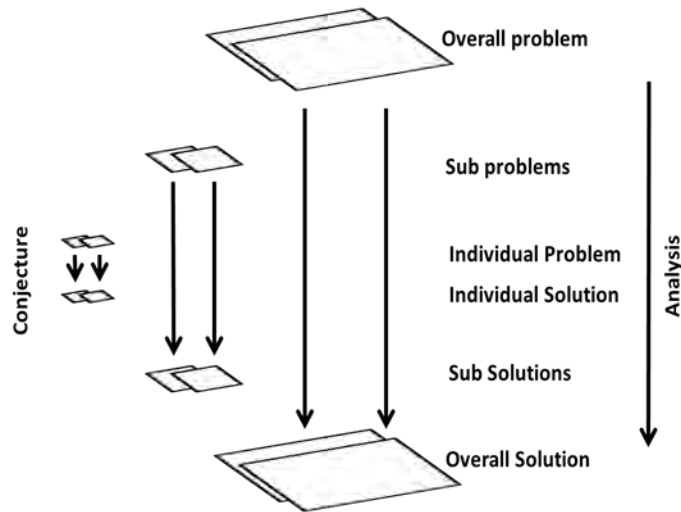
**Figure 5**

In the context of the levels of war, strategic solutions would be developed for strategic problems, and operational and tactical solutions developed for operational and tactical problems respectively (see Figure 6). The c/a approach relies upon the pre-structuring of problems, either by knowledge of solution types (e.g., counterinsurgency, humanitarian assistance, security capacity building, etc.) or by knowledge of the latencies of the problem set in relation to solution types.[36] The underlying principle is ―trial and error‖ in which as a group or variety of possible solutions fall away, one recognized solution reveals itself.
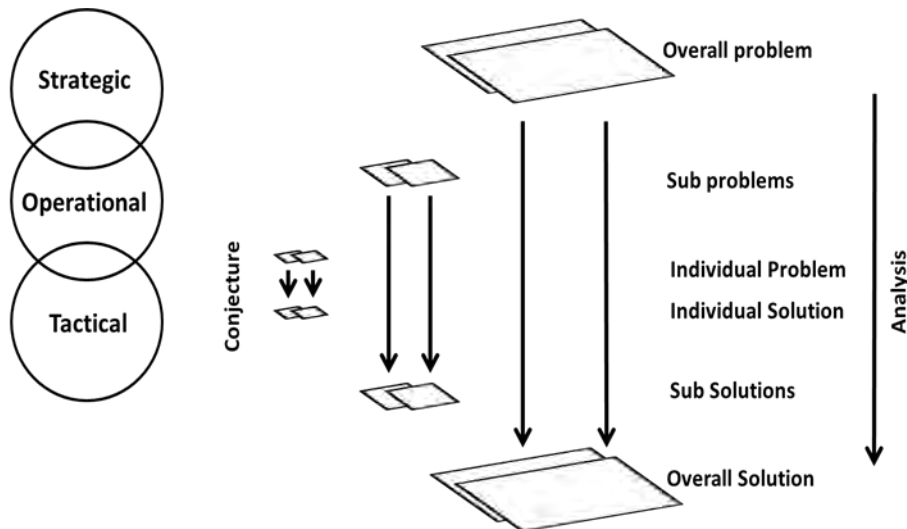


**Figure 6**

Three potential pitfalls immediately reveal themselves when using this approach. First, an awareness of and insight into the problems set or solutions and the effect the approach will have at the different levels are often overlooked or not fully understood. If the problems and solutions are removed from the context or if the interaction of component parts are poorly understood then the chances greatly increase that the proposed solution will be inadequate or

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[36] Darke, p. 38

even cause greater problems than those that currently exist. Second, preconceived ideas or improper preconceptions can lead to an inappropriate solution for the circumstances. Experience and expertise factor greatly into determining an initial —ballpark" approach. An individual with an insufficient breadth and depth of experiences or knowledge may undertake an inappropriate approach as a result. Third, the cost of time and resources expended during conjecture, especially the potential for loss of life or the detrimental life-changing effects on those who suffer as a result of a failed or inappropriate hypothesis has potential moral implications.

Both approaches have positive and negative aspects associated with them and under certain circumstances, either approach may be appropriate. To alleviate some of the worst aspects of each approach, using a hybrid approach is recommended. For example, using the conjecture/analysis approach initially limits the boundaries of the problem-set, but then using the analysis/synthesis approach to verify the conjecture through analysis of the overall problem and sub-problems.

One of the more challenging aspects of any design is to determine the central idea that narrows down the range of potential ideas and to act as an organizing agent to direct the decision-making process. The concept of a primary generator is used to restrict the range of possibilities while focusing on a limited number of constraints that enable movement toward a potential solution.[37] Composed of the planner's belief system and cognitive structure, the primary generator is a way into the problem.[38] The primary generator is an expression of value—it is the concept or objective that helps generate a solution. Closely linked to conjecture, the primary generator is a conceptualization of a possible solution of a design task. Once produced, a conjecture is tested against project requirements and modified as necessary.[39] In short, the primary generator attempts to resolve the competing constraints and requirements by getting to the root of the problem and prioritizing the constraints.
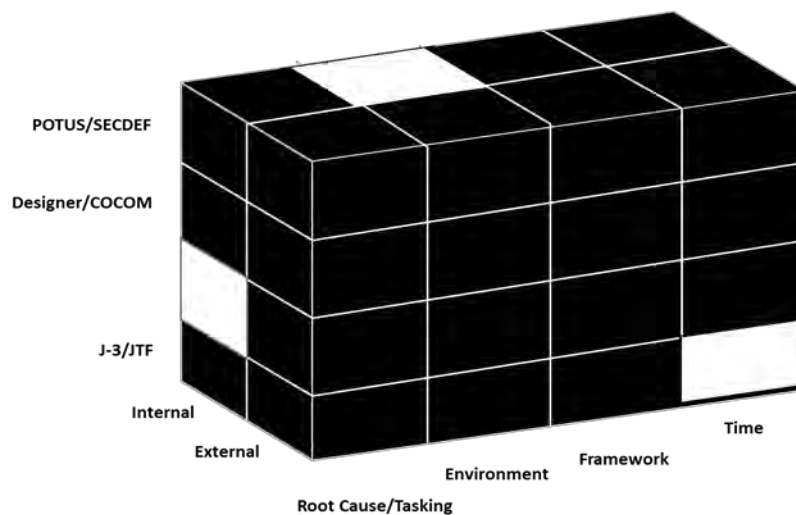


**Figure 7**

[37] Darke, p. 38

[38] Solovyona, Irina, *Conjecture and Emotion: An Investigation of the Relationship Between Design and Emotional Content*, Paper presented at the Design Thinking Research Symposium 6, University of Technology, Sydney, Australia, 17-19 Nov 2003, p. 4-6

[39] Darke, p. 38 - ⁴²

**Legislature/Congres**

Figure 7 depicts the concept of the primary generator.  Early in the design process, several primary generators may be identified some of which may be incompatible with one another. The planner must be willing to accept these initial incompatibilities, perhaps for an extended period, as the problem and solution are worked in detail.  Multiple primary generators may provide the planner with alternative approaches to solving the problem.  In the end, one primary generator typically emerges that the planner deems to have best satisfied the competing requirements and constraints.

The primary generator originates from several sources, the first of which is derived from the problem itself.  If one can determine the root cause or the driver of the problem, then the primary construction of any potential solution would spring from this source.  Some particularly important external constraints may be another basis for developing a primary generator.  For example, if it is against national policy to deal directly with countries that have human rights problems, then that constraint may form the primary generator in directing the design approach.  Third, the planner may have internal constraints or principles that may form the critical consideration in the design.[40]  In any case, the planner may have to identify several primary generators of which all or some may be incompatible.  The planner will have to accept this incompatibility of these generators for an extended period.

As expressed earlier in the paper, the focus on developing a process that encapsulates all of the design constraints and concepts is difficult at best.  Instead, the primary effort should be on identifying and training individuals who have the capability and capacity for design thinking.  There are general skills and abilities that a senior leader or planner possesses or is capable of developing.  The first is skillfully to find and state the problem, reformulate as necessary, and to give structure to ill-structured or wicked problems.  Leaders and planners must selectively focus for periods or phases that enable them to handle massive complexity and contradictions, and suspend decisions on issues that require additional detail.[41]

Senior leaders and planners must have the ability to externalize their thoughts in some way – drawing or writing are the traditional methods and compose the standard planning fixtures of ―narrative‖ and ―operational design.‖  Leaders must be able to converse with these representations and express their nuances and complexities to senior leadership and subordinates.  The ability to develop multiple representations facilitates understanding of the problem and assists in the reduction of risk.[42]  In those situations in which only a few (or one course of action) are developed, the commander increases and assumes risk.   Risk is learned in one of two ways: in course of action development or in execution.

The ability to transform an existing concept into a different one, even though carrying through some of the original characteristics, is a necessary design skill.  Designs are frequently the result of reflections and interpretations of them – lateral thinking is a term developed by Edward De Bono that focuses on developing ideas through an indirect or creative approach.[43]  In short, current thinking is ―broken‖ through the broadening of the search area for new ideas; for example, if ―winning the hearts and minds‖ is not creating the desired results, then perhaps another approach through economic development or social reform will.  In addition to taking an alternative approach, the planner must be able to move between problem and solution using the

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[40] Darke, p. 38-39
[41] Lawson, p. 292
[42] Lawson, p. 293
[43] Internet search 8 November 2010, ―Lateral Thinking,‖ http://en.wikipedia.org/wiki/Lateral_thinking

primary generators.  The planner must also maintain a sense of ambiguity and uncertainty and not get too concerned about a single answer too quickly.[44]

Senior leaders and planners must be able to make objective and subjective evaluations, even while using incompatible evaluation measures.  Judgments must be suspended long enough for creative ideas to flow and mature while also knowing when to stop.  The senior leader must have the ability to reflect on action – looking at the process as opposed to the state of the design, ask which problems have been examined and which ones have been neglected.  Finally, the senior leader or planner must collect precedents or references throughout a lifetime to help develop guiding principles.[45]

Problem formulation is a continual process and does not occur exclusively at the beginning of any design concept.  Rather, problems are influenced by the emerging concepts and constraints that manifest themselves as potential solutions and are explored in the context of the environment.  Critical and creative thinking are skills that underpin any strategic or design development.   Skills, acquired and developed, form the logical approach to developing sound strategies, plans and designs as opposed to a mechanical design process operating in parallel to or contained within the joint operation planning process.  Understanding the complexities or constraints and the role they play in the development of a strategy or design is critical.  This criticality illustrates the need for officers to attain a broad education base that spans the sciences and social sciences, and the need for officers to spend years developing regional expertise that encompasses the strategic, operational, and tactical levels.

Two basic approaches to design thinking form the basis for problem inquiry.  The analysis/synthesis approach is problem-focused and is a good tool for less experienced individuals to use in initial problem understanding.  The conjecture/analysis approach offers another avenue from which to begin, is solution-focused, and provides the more experienced individuals with an initial approach.  Both approaches have pitfalls and present significant potential problems in simplified or ignored relationships.  Senior leaders capable of planning and executing operations in a complex and multi-dimensional environment have certain personalities and traits that lend themselves to a greater understanding of that environment.  If not innate, then these skills can be taught and developed throughout an officer's career.  Unfortunately, there is not a shortcut to knowledge nor is there a process that forces critical and creative thinking on those individuals incapable of or unprepared for its complexities.

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[44] Lawson, p. 296-298
[45] Lawson, p. 298-301