



## To Design or Not to Design (Part Three):

### Metacognition: How Problematizing Transforms a Complex System towards a Desired State

by Ben Zweibelson

*Editor's Note: This is part two of a six part series on design. Parts one and two can be found [here](#) and [here](#).*

*If our previous experience with systems analysis proves anything, it proves that anyone who tries to use all the information- even about the simple systems existing today- will be drowned in paper and never accomplish anything...The synthesist is someone who makes very specific plans for action, and more often than not stays around during the execution of those plans to adjust them to ongoing reality.<sup>1</sup>*

FM5-0 Chapter 3 Design describes design's purpose as a methodology used to "make sense of complex, ill-structured problems."<sup>2</sup> The term 'make sense' deals with explanation of the open system. The previous article of 'To Design or Not to Design' demonstrated how military institutions have a strong propensity for describing an open system instead of explaining it. To make sense of a complex system, humans instinctively attempt to categorize information through descriptive monikers and reductive classifications. Knowledge is usually "pursued in depth in isolation...Rather than getting a continuous and coherent picture, we are getting fragments-remarkably detailed but isolated patterns."<sup>3</sup> FM5-0 Chapter 3 Design follows military institutional preference for reconstructive and mechanical methodology prevalent at the tactical level of war by misapplying it to the operational level with design. Army design doctrine does not articulate why and how to transform a complex system into a desired one.

To understand something conceptual requires thinking about thinking, also known as metacognition. FM5-0 Chapter 3 Design implies metacognition by stressing the requirement of thoroughly understanding the nature of the problem and prescribing three frames through which planners operate to transform the system.<sup>4</sup> Design doctrine graphically depicts the environmental frame, problem frame, and operational approach with minimal insight on how they function, or how operational artists actually 'transform the system.' Ironically, design doctrine stresses the

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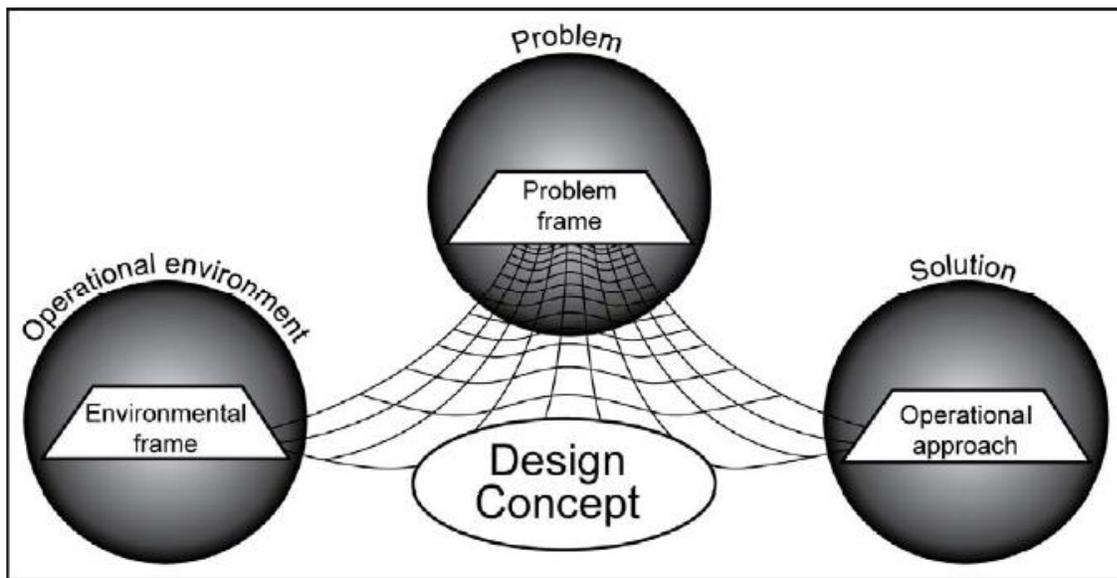
<sup>1</sup> Gerald M. Weinberg, *Rethinking Systems Analysis and Design* (Boston: Little, Brown and Company, 1982) 12.

<sup>2</sup> United States Army Training and Doctrine Command, *Field Manual 5-0; The Operations Process*. (Headquarters, Department of the Army, 2010), 3-6.

<sup>3</sup> Ervin Laszlo, *The Systems View of the World; a Holistic Vision for Our Time*. (New Jersey, Hampton Press, 1996) 2; Valerie Ahl and T.F.H. Allen, *Hierarchy Theory: A Vision, Vocabulary, and Epistemology* (New York: Columbia University Press, 1996) 1. "In all ages humanity has been confronted by complex problems. The difference between then and now is that contemporary society has ambitions of solving complex problems through technical understanding;" Ian Stewart, *Nature's Numbers* (BasicBooks, 1995) 62. "Because all of the classical branches of science have grown so vast that no single mind can likely encompass even one of them, we now live in an age of specialists."

<sup>4</sup> United States Army Training and Doctrine Command, *Field Manual 5-0; The Operations Process*. (Headquarters, Department of the Army, 2010), 3-8.

importance of clear and illustrative graphics with explicit narratives for conveying understanding, yet the below vague and generally incomprehensible graphic is all that design doctrine offers for conveying design methodology.



**FM 5-0, The Operations Process (2010) figure 3-1; The Design Methodology.**

How does the design concept function in relation to each of the depicted spheres? Which one occurs first, and does one take priority over another? How are they interrelated? Does the graphic convey any design methodology at all? Design doctrine’s figure 3-1 is a significant disappointment visually; however, the Army should be encouraged to advance both the graphic and the underlying concepts behind it to a new level of design understanding where the audience can appreciate and apply design operationally. ‘To Design or Not to Design’ draws from a variety of design theorists, general system scientists, social scientists, and fuses several interrelated design concepts into what this series of articles offers as an alternative design methodology for operational artists.

As discussed in the second article of ‘To Design or Not to Design’, FM5-0 Chapter 3 Design’s fifteen pages of design doctrine directs a reductionist and teleological methodology towards complex system phenomenon, and the dual-use vocabulary and emphasis on ‘tacticization’ proves problematic. FM5-0 Chapter 3 Design’s liberal use of ‘end-state’ insinuates that designers can not only reverse-engineer ends back to ways and means in the same manner as detailed planning, but all ‘lines of effort’ that transform the system are teleological (purpose driven) and ignore the principles of ontological ecologies.<sup>5</sup> “Complex problems have no central

<sup>5</sup> Francois Jullien (translated by Janet Lloyd), *A Treatise on Efficacy Between Western and Chinese Thinking*. (Honolulu: University of Hawai’i Press, 2004), 34. “Human action takes place in irreversible time, and, so long as it is not verified by experience, the instrumental causality of the means remains hypothetical...there is always a danger that, between the means and the projected end, unpredictable events may intervene, blocking the supposed efficacy of the means and rendering the end unattainable.”; Peter Novick, *That Noble Dream* (New York: Cambridge University Press, 1988) 252. “Philosophers are professionally concerned with the careful “unpacking” and disaggregation of complex ideas, reducing them to purely denotative expression, and considering them in isolation from their surroundings.” While Novick criticizes philosophers and historians, the actions that military planners perform when developing environmental frames is ultimately a combination of both academic fields; United States Army Training and Doctrine Command, *Field Manual 3-0; Operations*. (Headquarters, Department of the

point of control.”<sup>6</sup> Individual operations in the tactical realm do have ‘problems’ and ‘end-states’ in that many problems yield to reductionist approaches.<sup>7</sup> The trick is not to allow reductionist success on the tactical level to begin explaining emergent patterns at the operational level.

“Man as designer is a teleological being, able to create means of enabling ends to be pursued, and to do so on the basis of conscious selection between alternatives.”<sup>8</sup> Every boxing match ends with a winner and a loser, regardless of how short or long the fight lasts, or whether the boxing was spectacular or timid. Humans as social entities possess an extraordinary grasp of the tactical perspective; they heuristically seek the beginning, middle, and end of a story to define patterns. When the boxing match expands to a hundred fighters in the ring and the rules start changing during the fight, teleological and reductionist conceptualization handle such complexity poorly.<sup>9</sup>

Take away the familiar patterns of closed systems and reductionist scientific approaches begin to lose their predictive capabilities. The ‘end-state’ of a boxing match loses meaning when the rules change and the actors adapt. This illustrates the conceptual divide between simple problems (closed systems) and ill-structured ones (open systems).<sup>10</sup> Instead of misapplying the tactical mechanistic term ‘end-state’ towards a complex system, perhaps another term is required. Postmodernists Gallais, Fabbri, and Schmitt offer a potentially more accurate conceptual term instead of ‘end-state’ for design methodology in their complex system economic model; this term is ‘vision.’

‘Vision’ embraces the ontological approach where a projection of the future is “not done in an absolute way like we said before but in interaction with the present.”<sup>11</sup> Unlike FM 5-0’s environmental frame, problem frame, and operational approach methodology, ‘vision’ creates a desired state that links the past with the present state and helps with future state considerations

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Army, 2001), 1-47. The Army’s capstone doctrine (as it describes FM 3-0 on page viii) uses a purely Clausewitzian ‘reverse-engineering’ methodology to explain campaigns and joint operations. “Joint planning integrates military power with other instruments of national power to achieve the desired military end state...this planning connects the strategic end state to campaign design and ultimately to tactical missions.” Essentially, one builds tactical missions after the future end state is established; Alex Ryan, *The Foundation For An Adaptive Approach; Australian Army Journal For the Profession of Arms, Volume VI, Number 3* (Duntroon: Land Warfare Studies Centre, 2009) 81. “Adaptability is not contained in any single component, and it cannot be separated from the other functions of the system.” Therefore, depicting linear actions towards a preconceived ‘end state’ eliminates adaptation.

<sup>6</sup> Chris Smith, *Solving Twenty-First Century Problems with Cold War Metaphors; Australian Army Journal For the Profession of Arms, Volume VI, Number 3* (Duntroon: Land Warfare Studies Centre, 2009) 95.

<sup>7</sup> Gerald M. Weinberg, *Rethinking Systems Analysis and Design* (Boston: Little, Brown and Company, 1982) 27. “There is nothing inherently wrong with analysis, for many problems yield willingly to this [scientific-disciplinary-inductive] approach.”

<sup>8</sup> Peter Checkland, *Systems Thinking, Systems Practice* (New York: John Wiley and Sons, 1981) 119.

<sup>9</sup> W.T. Singleton, *Man-Machine Systems* (edited by Open Systems Group), *Systems Behavior, 3<sup>rd</sup> edition* (London: Harper & Row Publishers, 1981) 121. “At the scientific level research workers have become more and more specialized to the point which is proving self-defeating.” Singleton criticizes psychologists with this point, however military over-specialization is isomorphic to this example when considering American military emphasis on greater forms of technology and precise violence.

<sup>10</sup> Peter Checkland, *Systems Thinking, Systems Practice* (New York: John Wiley and Sons, 1981) 102-103. Checkland distinguishes between physical systems that are closed and work well with mechanistic explanations, and abstract systems often involving human agents where prediction is much more challenging. “Given the systems hypothesis that it will be insightful to take the apparent chaotic universe to be not a set of phenomena (whose laws can be established by the reductionist experimental approach) but rather a complex of interacting wholes called ‘systems.’”

<sup>11</sup> Marie Gallais, Remi Fabbri, Christophe Schmitt, *Problematization and Translation of the Vision: Toward New Entrepreneur’s Competences* (Colloque: En route vers Lisbonne, 4 et 5 decembre 2008,

[http://www.tudor.lu/cms/lu2020/publishing.nsf/0/FDECF548D12BC30BC12575140048AB73/\\$file/16h15\\_GALLAIS\\_FABBRISCHMITT.pdf](http://www.tudor.lu/cms/lu2020/publishing.nsf/0/FDECF548D12BC30BC12575140048AB73/$file/16h15_GALLAIS_FABBRISCHMITT.pdf) last accessed: 17 December 2010), 3.

without taking the tacticized teleological approach that design doctrine prescribes.<sup>12</sup> The graphic below is a reproduction of figure 3 from *Problematization and Translation of the Vision: Toward New Entrepreneur's Competences* that depicts the problematization's place in the entrepreneurial situation. In contrast to FM5-0 Chapter 3 Design's confusing graphic on design, this one conveys meaning and explanation without the reader even knowing the specific economic context of the article.

Reproduction of Gallais, Fabbri, Schmitt's figure 3:

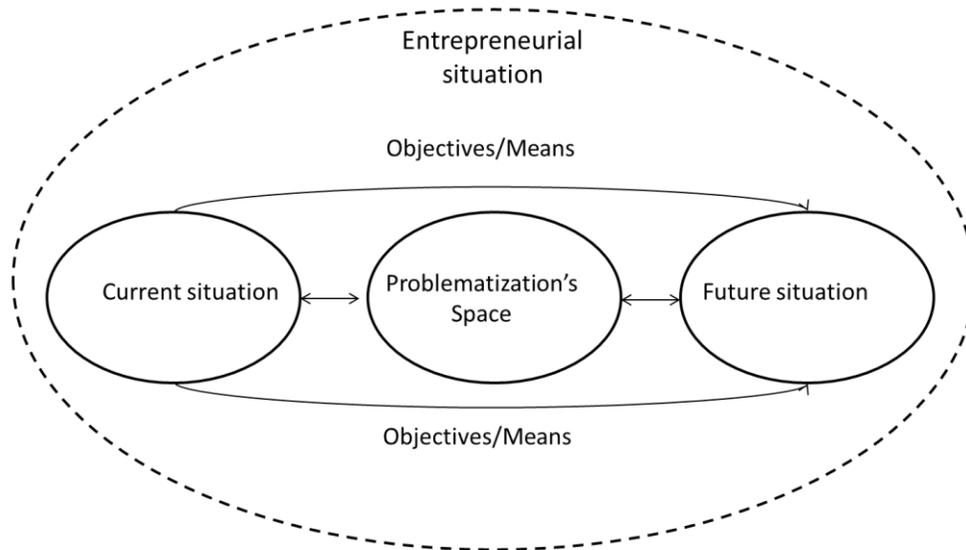


Figure 3: The problematization's place in the entrepreneurial situation:

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Gallais, Fabbri, and Schmitt produce a holistic system transformation graphic that, although designed for entrepreneurial application, shares many overlapping contextual features that military design doctrine attempts. Most significantly, they bound their entrepreneurial situation around the entire system in a manner that correlates to an ecological or environmental frame. Gallais, Fabbri, and Schmitt bound the current situation and future situation in a manner

<sup>12</sup> Glen James, *Chaos Theory; The Essentials for Military Applications* (Newport: Naval War College, Center for Naval Warfare Studies, Newport Four article series on Army Design Number Ten, October, 1996) 75. While James discusses Chaos Theory specifically, his system design methodology for chaotic system modification coincides with design theory. Novel system transformations are possible via choosing "from a range of desired stable behaviors;" Alex Ryan, *The Foundation For An Adaptive Approach; Australian Army Journal For the Profession of Arms, Volume VI, Number 3* (Duntroon: Land Warfare Studies Centre, 2009) 84. Ryan supports non-linear flexible goals over rigid and linear 'end-states' by explaining a complexity paradox. "It is easier to design environments that foster adaptation than to directly impose it...complexity increases the incidence of second and third order effects (because of interdependence) while simultaneously decreasing our ability to predict those effects." Current Operational Design and detailed planning linear processes that start with a specific end-state cannot function with complex adaptive systems; Chris Smith, *Solving Twenty-First Century Problems with Cold War Metaphors; Australian Army Journal For the Profession of Arms, Volume VI, Number 3* (Duntroon: Land Warfare Studies Centre, 2009) 96. Smith uses the term 'accepted enduring conditions' that reflects Australian *Adaptive Campaigning* doctrine and implies that the goal is "not a precise and static target."

<sup>13</sup> Marie Gallais, Remi Fabbri, Christophe Schmitt, *Problematization and Translation of the Vision: Toward New Entrepreneur's Competences* (Colloque: En route vers Lisbonne, 4 et 5 decembre 2008, [http://www.tudor.lu/cms/lu2020/publishing.nsf/0/FDECF548D12BC30BC12575140048AB73/\\$file/16h15\\_GALLAIS\\_FABBRI\\_SCHMITT.pdf](http://www.tudor.lu/cms/lu2020/publishing.nsf/0/FDECF548D12BC30BC12575140048AB73/$file/16h15_GALLAIS_FABBRI_SCHMITT.pdf) last accessed: 17 December 2010), 7. Original graphic unavailable; this is a reproduction composed by the author.

similar to military design's observed state and desired state. These temporal concepts easily translate interdisciplinary in keeping with General System Theory principles. Gallais, Fabbri, and Schmitt further bound problematization into its own bounded space in a method that evokes Army design doctrine's problem frame; although the first article of 'To Design or Not to Design' already expanded upon the differences between mechanistic reductionist 'problems' and problematization.

Problematization and Translation of the Vision: Toward New Entrepreneur's Competences depicts in figure 3 the concepts of contextual bounding that greatly increase understanding. Bounding is yet another design element where Army design doctrine falls short conceptually in its self-inflicted brevity. Open Systems Group's Systems Behavior provides an effective definition of this design concept. A boundary is "the conceptual division between a system and its environment; it may or may not correspond to recognized geographical, physical, legal or cultural divisions and will be drawn according to the observer's purpose."<sup>14</sup> For military designers, applying boundaries to a system provide understanding of system activity by identifying relevant actors and other imports into the open system and in a highly permeable respect to social organizations, these boundaries regulate functions and activities of the system.<sup>15</sup>

FM 5-0 prefers the term framing to bounding in design doctrine to "understand and isolate the root causes of conflict- defining the essence of a complex, ill-structured problem."<sup>16</sup> Either term is sufficient conceptually, however FM 5-0 stresses throughout its operational doctrine the significance of operational and mission variables that help commanders and staff analyze and describe the operational environment- specifically the categories contained within PMESII-PT and METT-TC.<sup>17</sup> Categorizing military principles once again reflects the traditional scientific worldview where 'chunking' information into relevant piles demonstrates the illusion that man's physical environment is increasingly under his control.<sup>18</sup> The lesser problem of categorizing observations pales in comparison to the hierarchical systematizing of categories in relation to each other. Reductionist scientific and academic fields as well as military institutions are prone to prioritizing categories because "when we choose boundaries, we are powerfully influenced by easily recognized physical features."<sup>19</sup> Just as human nature influences national boundaries to adhere to rivers, mountains, and major geographical features out of simplicity, institutional hubris influences combat arms units to place a 'security line of operation' on top of a campaign plan graphical depiction, with lower priority lines of effort that are not intimately associated with self-defining military roles underneath.<sup>20</sup>

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<sup>14</sup> Open Systems Group (editors), *Systems Behavior*, 3<sup>rd</sup> edition (London: Harper & Row Publishers, 1981) 17.

<sup>15</sup> F. E. Kast and J.E. Rosenzweig (edited by Open Systems Group), *The Modern View: A Systems Approach*, *Systems Behavior*, 3<sup>rd</sup> edition (London: Harper & Row Publishers, 1981) 50.

<sup>16</sup> United States Army Training and Doctrine Command, *Field Manual 5-0; The Operations Process*. (Headquarters, Department of the Army, 2010), 3-52.

<sup>17</sup> United States Army Training and Doctrine Command, *Field Manual 5-0; The Operations Process*. (Headquarters, Department of the Army, 2010), 1-5. "They analyze and describe an operational environment in terms of eight interrelated operational variables: political, military, economic, social, information, infrastructure, physical environment, and time [PMESII-PT]...they use mission variables, in combination with the operational variables, to refine their understanding of the situation...the mission variables are mission, enemy, terrain and weather, troops and support available, time available, and civil considerations [METT-TC]."

<sup>18</sup> Draper L. Kauffman, Jr. *Systems I, An Introduction to Systems Thinking* (The Future Systems Series: T. Lance Holthusen, 1980) 22.

<sup>19</sup> Gerald M. Weinberg, *An Introduction to General Systems Thinking* (New York: John Wiley and Sons, 1975) 146.

<sup>20</sup> Carl H. Builder, *The Masks of War; American Military Styles in Strategy and Analysis* (RAND Corporation: John Hopkins University Press, 1989) 142. Builder criticizes the U.S. Army's fixation over a Central European conventional war during the

Yet those phenomenon that fall outside these categorical 'piles' because they do not match averages and analysis are often the very unknown factors that illustrate the true meaning of systemic organization within an observed system. In reality, the contextual factors that make something unique rather than general offer a glimpse into where an open system is moving.<sup>21</sup> For example, in much the same way human nature inclines to bound things based upon easily recognizable relationships, military institutions are disinclined to split things that normally appear to function together. "We hesitate to define a boundary between two solid bodies rigidly attached so that they always move together."<sup>22</sup> The appearance of Islamic unilateralism in the presence of an infidel occupier similarly masked the difference between Iraqi Sunni insurgents and their foreign al Qaeda partners. Only later when ground commanders investigated the differences and tensions between the two did new boundaries emerge.<sup>23</sup> "The boundary around a 'forest' is never quite as clear as we first imagine."<sup>24</sup>

FM 5-0's design methodology (figure 3-1) and Gallais, Fabbri, and Schmitt's entrepreneur situation (figure 3) graphically depicted the passage of time with the system. Design methodology requires temporal consideration as a key component of problematization because understanding entails holistic visualization of the past, present, and anticipated future. The future state (also the desired state) in design theory and its relationship with the present state (observed state) and past (legacy system) correlate to the principle structure of narrative. There is a beginning, middle, an end, and the whole story synergizes together with a plot that provides meaning.<sup>25</sup>

Postmodernist Hayden White in *The Content of the Form* makes a central argument that narrative is unique from other forms of historical forms such as annals or chronicles. The narrative is "a solution to the problem of general human concern, namely, the problem of how to translate knowing into telling...narrative is a meta-code, a human universal...about the nature of a shared reality [that] can be transmitted."<sup>26</sup> A narrative differs from other historical forms because it attaches value that provides meaning to the social world.<sup>27</sup>

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entire Cold War as a self-defining and self-preserving mode of perpetual behavior, even when the reality of the conflict conflicts. "That concept of war is most harmonious with the Army's aspirations for the future, its perceptions of today's realities, and its remembrance of yesterday's glories."

<sup>21</sup> Peter Checkland, *Systems Thinking, Systems Practice* (New York: John Wiley and Sons, 1981) 74.

<sup>22</sup> Gerald M. Weinberg, *An Introduction to General Systems Thinking* (New York: John Wiley and Sons, 1975) 146.

<sup>23</sup> Jim Michaels, *Behind Success in Ramadi An Army Colonel's Gamble* (USA Today, October 30, 2009);

<http://usatoday.printthis.clickability.com/pt/cpt?action=cpt&title=USATODAY.com&ex>; Greg Bruno, *Finding a Place for the 'Sons of Iraq'* (Council on Foreign Relations; January 9, 2009). <http://www.cfr.org/publication/16088/>. Greg Bruno quotes CFR Senior Fellow Steven Simon in part of this passage; that reference is subsequently located at <http://www.foreignaffairs.com/articles/63398/steven-simon/the-price-of-the-surge> under Steven Simon's *The Price of the Surge*; also for the Council on Foreign Relations.

<sup>24</sup> Gerald M. Weinberg, *An Introduction to General Systems Thinking* (New York: John Wiley and Sons, 1975) 149.

<sup>25</sup> Paul Ricoeur (translated by Kathleen Blamey and David Pellauer), *Time and Narrative, Volume 3* (Chicago: University of Chicago Press, 1985) 250. Ricoeur offers the notion 'totalization' which describes how reflection on the past, present, and expectation of the future holistically requires historical analysis placed in 'the practical dimension.' "This totalization appeared to us to be the fruit of an imperfect medication between a horizon of expectation, the retrieval of past heritages, and the occurrence of the untimely present." John L. Romjue, *American Army Doctrine for the Post-Cold War* (Fort Monroe: Military History Office, United States Army Training and Doctrine Command, 1997) 71-72. Romjue describes TRADOC operational doctrine review in 1992 where "Commanders-in-chief needed to understand the desired end-state of any action begun...Capabilities now at a commander's disposal had the effect of blurring the levels of war." Even as late as the 1990s, operational doctrine continued to link strategic levels of war to tactical end-states.

<sup>26</sup> Hayden White, *The Content of the Form* (Baltimore: The John Hopkins University Press, 1987) 1-3.

<sup>27</sup> Australian Head Modernisation and Strategic Planning- Army, *Australian Army's Future Land Operating Concept* (Australian Army Headquarters, Canberra, September 2009) 3.10. Australian design doctrine uses a variation of the term 'narrative' that it

This is a postmodernist perspective that often conflicts with traditional objectivist worldviews typically associated with military institutions. For example, ten out of eleven books on the U.S. Army Chief of Staff's professional reading list for field grade officers are history books with the one anomaly being social scientist (and retired military officer) Dave Grossman's physiological study *On Killing*.<sup>28</sup> Can objective narration occur the way most historians and military professionals convince themselves, or do postmodernists like White and general systems theorists such as Checkland and Weinberg have a valid argument that "clearly it is not possible to write objective history."<sup>29</sup>

White's theory essentially invokes the design process and illustrates conceptually the logical fallacies that FM 5-0 prescribes with the environmental frame, problem frame, and operational approach methodology. "Does the world really present itself to perception in the form of well-made stories, with central subjects, proper beginnings, middles, and ends, and a coherence that permits us to see "the end" in every beginning?"<sup>30</sup> Instead of relying on FM 5-0's teleological and reconstructive methodology as denoted earlier with categorization concerns and misapplied vocabulary, design theory requires a more ontological and problematized approach that embraces open-system ecology. "The general systems approach concerns itself greatly with issues of what an observer can and cannot know...[to perform this] we use a variety of approaches."<sup>31</sup>

The below graphic depiction is a fusion of current design theory, applicable philosophical and graphical concepts espoused in this four article series on Army Design, and relevant military considerations with respect to FM 5-0's design doctrine. Instead of an environmental frame, problem frame, and operational approach linkage, a proposed design methodology combines the primacy of the narrative with the dual concepts of problematization and metacognition concerning open-system dynamics.

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explains as 'dominant narrative.' Requiring a strong ethical and moral foundation, the government and military holistically apply information operations to create "the fundamental 'story' or perception that has been established as valid in the minds of one or more target audiences." Meaning is conveyed within the conflict with a purpose; *perception management* is just as critical as actually winning tactical battles in complex system conflict.

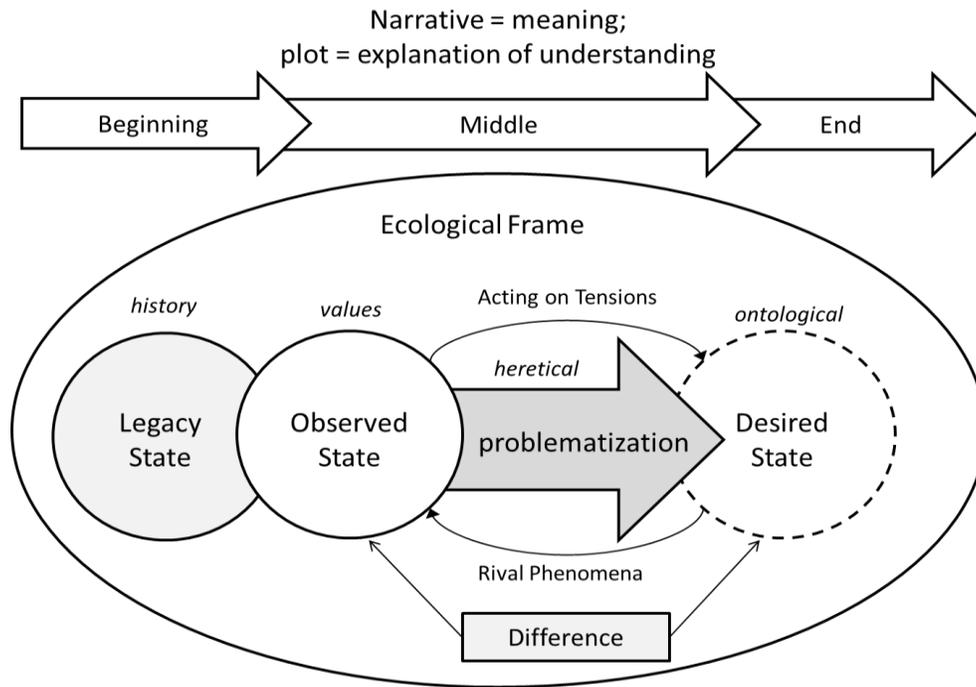
<sup>28</sup> U.S. Army Chief of Staff's professional reading list for field grade officers, [http://www.history.army.mil/html/reference/reading\\_list/list3.html](http://www.history.army.mil/html/reference/reading_list/list3.html) (last accessed: 27 December 2010). The Chief of Staff reading lists for the Navy, Air Force, Marines, and Coast Guard are also available online at: <http://www.ndu.edu/Library/index.cfm?secID=217&pageID=126&type=section> (last accessed: 27 December 27, 2010) and present similar historically centric reading lists. As of the last access date, the Coast Guard reading list was still under construction.

<sup>29</sup> Peter Checkland, *Systems Thinking, Systems Practice* (New York: John Wiley and Sons, 1981) 23; Peter Novick, *That Noble Dream* (New York: Cambridge University Press, 1988), essentially Novick's thesis centers on this question of whether man can truly achieve any semblance of objectivity in historical narrative; Gerald M. Weinberg, *Rethinking Systems Analysis and Design* (Boston: Little, Brown and Company, 1982) 37. "There is no one truth about what happened...it's dangerous, therefore, to use history for answers to today's problems."

<sup>30</sup> Hayden White, *The Content of the Form* (Baltimore: The Johns Hopkins University Press, 1987) 24-25.

<sup>31</sup> Gerald M. Weinberg, *Rethinking Systems Analysis and Design* (Boston: Little, Brown and Company, 1982) 15.

Figure 1-0; Another Methodology for Design:



Unlike U.S. Army design doctrine that graphically depicts their environmental frame as an independent component from the problem frame and operational approach, the above ecological frame follows Gallais, Fabbri, and Schmitt’s entrepreneur’s model by bounding the ecological frame to contain the entire temporal concept. Essentially, the narrative components of the past (legacy state), present (observed state), and future (desired state) are bounded within the ecological frame along with relevant actors and observable phenomenon.<sup>32</sup>

FM 5-0 defines the term environmental frame as “a narrative and graphic description that captures the history, culture, current state, and future goals of relevant actors in the operational environment.”<sup>33</sup> How many military organizations when producing an environmental frame place only the ‘enemy’ or rival actors and nation-states within the battle-space in their environmental frame and not also include the United States, allies, and both American military and domestic actors?<sup>34</sup> Design doctrine describes the environmental frame in much the same manner that Fritjif Capra criticizes ‘shallow ecology’ in holistic worldviews. This design limitation requires further investigation as it illustrates Army design doctrine’s identity crisis as a methodology.

<sup>32</sup> W.T. Singleton, *Man-Machine Systems* (edited by Open Systems Group), *Systems Behavior*, 3<sup>rd</sup> edition (London: Harper & Row Publishers, 1981) 126. “One general difficulty about translating the systems philosophy into practice is in the identification of the boundaries of the system under consideration.”

<sup>33</sup> United States Army Training and Doctrine Command, *Field Manual 5-0; The Operations Process*. (Headquarters, Department of the Army, 2010), 3-9.

<sup>34</sup> *Ibid*, 1-1 to 1-8. FM 5-0 uses the term ‘enemy’ exclusively throughout the first several pages of Chapter 1: Fundamentals of the Operations Process. “The enemy is not an inanimate object...the enemy resists and seeks to impose its will on friendly forces...the exact location and strength of an enemy force...this requires defeating the enemy while simultaneously understanding...”

Capra calls such worldviews “anthropocentric, or human-centered. It views humans as above or outside of nature, as the source of all value, and ascribes only instrumental, or ‘use’ value to nature.”<sup>35</sup> Whereas Capra discusses worldview faults with academic fields of scientists, his ‘shallow ecology’ criticism translates to environmental frame in that the designers likely consider their military institution and subsequently their culture and nation-state above or outside of the frame. The greater geographic and socio-cultural distance between the United States and a conflict region, the more likely designers are prone to taking a shallow ecology perspective when establishing an environmental frame.<sup>36</sup>

As the second article of ‘To Design or Not to Design’ emphasized unique and tailored vocabulary for design concepts, the importance of ecology over environment reinforces this position. Capra uses the term deep ecology that “does not separate humans-or anything else-from the natural environment. It sees the world not as a collection of isolated objects, but as a network of phenomena that are fundamentally interconnected and interdependent.”<sup>37</sup> The term ecological frame suffices to replace environmental frame; however, this is not merely a semantic ruse. In the alternate design methodology graphic depiction, the ecological frame encompasses the entire system and is not merely one frame in relation to the other concepts.<sup>38</sup> The ecological frame draws a larger boundary around those phenomena observed in an open system than by doctrinal description the environmental frame does; bounding the system into what is relevant and irrelevant is important to designers because the bounding also helps denote another key design concept- what is known, and what is unknown.

The ‘known’ within an open system is where military institutions face the same principle challenges that historians and scientists face when seeking ‘truth.’ History is littered with narratives discredited because the historian projected the ‘known’ and ignored what was ‘unknown’ in what topic he researched; the term ‘history is written by the conquerors’ applies in this case. For scientists, after a paradigm shift occurs in a scientific field, the rest of academia are often perplexed as to why they did not ‘see it coming.’ Military organizations in conflicts follow a similar pattern where they enter a war and realize that the opponent they expected and prepared for was not present. “We arrange in our minds a war we can comprehend on our own terms, usually with an enemy who looks like us and acts like us.”<sup>39</sup>

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<sup>35</sup> Fritjof Capra, *The Web of Life* (New York: Doubleday, 1996), 7.

<sup>36</sup> Paul Fussell, *Wartime; Understanding and Behavior in the Second World War* (New York: Oxford University Press, 1989) 115-143. Fussell’s ‘Type-casting’ chapter discusses how “soldiers and civilians [in war] reduce it to a simplified sketch featuring a limited series of classifications into which people, in the process dehumanized and deprived of individuality or eccentricity, are fitted.” The more alien and animalistic an opponent’s culture could be pictured, the easier it became to conduct violence against and justify. Is this happening currently with issues over radical Islam and terrorism?

<sup>37</sup> Fritjof Capra, *The Web of Life* (New York: Doubleday, 1996), 7.

<sup>38</sup> M.B. Dale (Edited by Open Systems Group), *Systems Analysis and Ecology, Systems Behavior, 3<sup>rd</sup> edition* (London: Harper & Row Publishers, 1981) 214-215, 225. Dale differentiates an open system from the larger ecosystem as follows. “An ecosystem is a system open for at least one property, in which at least one of the entities is classed as living. This definition is very broad...it must be remembered that an ecosystem is a special case of the general system and will possess all properties of the general system.” The ecosystem reflects complexities in all human societies, and virtually every possible military conflict must involve human populations in often multiple regard. Every operational level design concept must consider an ecosystem frame over a mere *open system frame* or even *environmental frame*.

<sup>39</sup> Brian McAllister Linn, *The Echo of Battle; The Army’s Way of War* (Cambridge: Harvard University Press, 2007), 4; Australian Head Modernisation and Strategic Planning- Army, *Australian Army’s Future Land Operating Concept* (Australian Army Headquarters, Canberra, September 2009) 4.9. Australian design doctrine explains how tactical problems, often complex in nature, are often framed in advance by higher headquarters (operational level) before the task is even given. “Therefore, the imperative to solve a problem right will often be greater than the imperative to solve the right problem (original emphasis).” This criticism of institutional bias and ‘tacticization’ supports key arguments of this series of articles on design; Trent Scott, *Adapt or*

The ‘unknown’ represents a void where institutions do not apply doctrine because doctrine only applies to what is ‘known’ by an organization. Theory habitually targets the unknown because successful paradigms in every scientific and academic field often emerge from chaotic and uncharted territories. “Every model [or system frame] is ultimately the expression of one thing we think we hope to understand in terms of another that we think we do understand.”<sup>40</sup> When framing an open system to problematize how to transform an observed state into a desired state, the fallacy of Army design doctrine is that it succumbs to doctrinal predilections on operating only within the safe boundaries of what an institution knows as truth. “Rather than encourage informed analysis and criticism, the army’s interpretation of the past serves to enforce complacency and the ‘comfortable vision of war.’”<sup>41</sup> Current Army design doctrine fails to explain design framing in a manner that facilitates sufficient metacognition. To frame is to ask deeper questions about the system observed.

The essence of deep ecology is to ask deeper questions. This is also the essence of a paradigm shift...so deep ecology asks profound questions about the very foundations of our modern, scientific, industrial, growth-oriented, materialistic worldview and way of life. It questions this entire paradigm from an ecological perspective: from the perspective of our relationships to one another, to future generations, and to the web of life of which we are part.<sup>42</sup>

Capra’s explanation on deep ecology inspires this sixarticle series on Army Design’s position on the ecological frame as a larger bounding of a system based upon deeper questions. As the second article of ‘To Design or Not to Design’ explained aspects of problematization, these deep questions in the ecological frame are likely heretical; especially with regard to institutional and societal boundaries applied by military organizations and western ethnocentrism.<sup>43</sup> Heretical questions frighten institutional knowledge because they escape the boundaries of what is ‘known’ and usually catch institutions off-guard.

In 1992 when TRADOC pursued operational doctrine revision in the post-Cold War era, General Frederick M. Franks provided expressive guidance to SAMS writers at a Commanders’ Planning Group in July. “Franks’ follow-on instructions...were to hold an evolutionary, not revolutionary approach, and not to “surprise the Army.” He told them...there would be no radical change from the 1986 manual’s 12-chapter structure.”<sup>44</sup> This is a telling example of how

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*Die; Australian Army Journal For the Profession of Arms, Volume VI, Number 3* (Duntroon: Land Warfare Studies Centre, 2009) 120. Scott criticizes Australian traditional problem solving as irrelevant in modern complex adaptive systems because “they tend toward the linear reduction of a problem that might not even be the right problem. But we solve it, or try to, anyway.”

<sup>40</sup> Gerald M. Weinberg, *An Introduction to General Systems Thinking* (New York: John Wiley and Sons, 1975) 28. Weinberg observes that new perspectives are gained when working with incomplete system models; “at the very least, an analog jiggles the mind- and heaven knows our minds need a little jiggling.” Confronting the ‘unknown’ is healthier than surrounding oneself with only the comfort of known variables.

<sup>41</sup> Brian McAllister Linn, *The Echo of Battle; The Army’s Way of War* (Cambridge: Harvard University Press, 2007), 237.

<sup>42</sup> Fritjof Capra, *The Web of Life* (New York: Doubleday, 1996), 7-8. Capra paraphrases Arne Naess in the first sentence. Arne Naess, quoted in Bill Devall and George Sessions, *Deep Ecology*, (Salt Lake City: Peregrine Smith, 1985), 74.

<sup>43</sup> Shimon Naveh, Jim Schneider, Timothy Challans, *The Structure of Operational Revolution; A Prolegomena* (Booz, Allen, Hamilton, 2009) 26. “The authority of doctrine, however, created a new player in society- the *heretic*. The heretic could share his own beliefs, but these beliefs were socially subversive...all ideas that challenge existing beliefs and doctrines must be a novel expression of some kind of conceptual design- a new understanding that shatters existing modes of thought and worldviews;” Trent Scott, *Adapt or Die; Australian Army Journal For the Profession of Arms, Volume VI, Number 3* (Duntroon: Land Warfare Studies Centre, 2009) 124. “The quality of [design] result depends on the commander’s willingness to entertain and consider challenges to his or her understanding and therefore depends on a climate of trust and acceptance.”

<sup>44</sup> John L. Romjue, *American Army Doctrine for the Post-Cold War* (Fort Monroe: Military History Office, United States Army Training and Doctrine Command, 1997) 78.

senior military leadership protects the boundaries of institutional knowledge and function from the disruptive and transformative powers of the ‘unknown.’ For true problematizing to occur, deep and often heretical questions require discourse, and the ecological frame must include the very military institutions driving the design process.

Within the ecological frame, ‘To Design or Not to Design’ proposes a legacy state that relates to the observed state of a system.<sup>45</sup> Unlike FM 5-0, design doctrine, which piles these concepts into the environmental frame, this series of articles suggests an alternative design methodology that draws upon the work of current design theory. Legacy state appears in Naveh, Schneider, and Challans’ *The Structure of Operational Revolution* and provides designers with “a perspective of exteriority (meta-perspective)... [that] set the systemic boundaries (system framing) for the understanding of the environment of the future campaign.”<sup>46</sup> Essentially, the legacy state provides the history of the current system and, when the designer holistically considers the past (legacy), present (observed state), they can cognitively project into the future (desired state) and explore potential for transformation. As the graphic depiction denotes above the ecological frame in the alternate design methodology, each of the temporal states within the ecological frame correspond to either the beginning, middle, or end of the system narrative.

Narrative inextricably links physical objects to time; therefore, design theory takes temporal relationships and the interconnectivity of phenomena that comprise an open system into great consideration during system framing. “We are oriented, as agents and sufferers of actions, toward the remembered past, the lived present, and the anticipated future of other people’s behavior.”<sup>47</sup> Without temporal notions of past, present, and future, humans would be unable to perform metacognition because “we would be not able to make any sense of the idea of a new event that breaks with a previous era, inaugurating a course of events wholly different from what preceded it.”<sup>48</sup> FM 5-0 consolidates past and present into the environmental frame while anthropocentrically removing the military institution from consideration. For true problematization of the system to occur, ‘To Design or Not to Design’ suggests that ‘chronicle time’ and clear awareness of internal cultural and institutional bias must be considered; the initial step of bounding the ecological or environmental frame is critical for design to begin problematizing what the system is doing.

When FM 5-0 describes cultural understanding, it tasks operational artists to pursue nearly identical academic tasks normally associated with historians and social scientists. “Culture is the shared beliefs, values, customs, behaviors, and artifacts members of a society use to cope with the world and each other... understanding the culture of a particular society or group within a society can significantly improve the force’s ability to accomplish the mission.”<sup>49</sup> While military operational artists must assume the methods of historians and social scientists to execute

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<sup>45</sup> W.T. Singleton, *Man-Machine Systems* (edited by Open Systems Group), *Systems Behavior*, 3<sup>rd</sup> edition (London: Harper & Row Publishers, 1981) 126. “For a given design a trio is under consideration: the system, its parent system and its subsystems.” Singleton’s concept of ‘parent system’ is isomorphic to this article’s ‘legacy system.’

<sup>46</sup> Shimon Naveh, Jim Schneider, Timothy Challans, *The Structure of Operational Revolution; A Prolegomena* (Booz, Allen, Hamilton, 2009) 26. “The authority of doctrine, however, created a new player in society- the *heretic*. The heretic could share his own beliefs, but these beliefs were socially subversive...all ideas that challenge existing beliefs and doctrines must be a novel expression of some kind of conceptual design- a new understanding that shatters existing modes of thought and worldviews.”

<sup>47</sup> Paul Ricoeur (translated by Kathleen Blamey and David Pellauer), *Time and Narrative, Volume 3* (Chicago: University of Chicago Press, 1985) 112-113.

<sup>48</sup> *Ibid*, 107.

<sup>49</sup> United States Army Training and Doctrine Command, *Field Manual 5-0; The Operations Process*. (Headquarters, Department of the Army, 2010), 1-5.

design, Army design doctrine incorrectly links situational and cultural understanding to reductionist and categorical processes defined in FM 5-0 as “operational and mission variables.”

Detailed planning routinely use these variables (PMESII-PT, METT-C) to refine understanding at the tactical level, however their continued employment in the conceptual level of design misdirect operational artists into making similar methodological errors that historians and social scientists are prone to.<sup>50</sup> “Categorizing always produces reduction in true complexity.”<sup>51</sup>

By assigning categories to determine what phenomena were relevant and which were not, humans naturally explain observations through patterns and categories of previous (known) knowledge. Historical ‘cherry-picking’ that abounds most military historical literature reinforces Mark Twain’s satirical quip that ‘there are lies, damn lies, and statistics.’ Without ontological and heretical questioning that challenges the unknown, the designer “will never ascend above the level of description, and thus remain in a state of reprocessed understanding.”<sup>52</sup>

Historians struggle with objectivity when interpreting history and thus share similar institutional bias that military operational artists face when attempting to achieve understanding through design. As Peter Novick explains in *That Noble Dream*, historian objectivity has been a systemic challenge throughout historiography because even the selection of facts “was necessarily a value-laden process.”<sup>53</sup> Systems Theorist Ervin Laszlo remarks in *The Systems View of the World* that, “Cultures are, in the final analysis, value-guided systems... Values define cultural man’s need for rationality.”<sup>54</sup> How objective can U.S Army design’s environmental frame accomplish when the methodology comprising the content and form rely on categorization selections prioritized within the teleological framework of military ends, ways, means?

While Postmodernist Peter Novick’s book provided discourse on the evolution of historians’ attitudes on objectivity, Hayden White takes an even more provocative position in *The Content of the Form* by postulating that humans imagine the concept of objectivity, and historical narrative is no different from fictional work with respect to the concept of ‘truth.’<sup>55</sup> Naveh, Schneider, and Challans take a balanced position on objectivity and ‘truth’ in historical analysis of the legacy state by claiming, “The truthfulness of any historical document can never be verified, it can only be corroborated.”<sup>56</sup> If historical analysis cannot avoid value-laden processes, discrimination, and institutional bias, then how can design effectively achieve deep understanding for a military organization? U.S. Army design doctrine cannot without abandoning its propensity for teleological methods, tacticization of operational processes, and categorization of phenomena into value-laden codification.

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<sup>50</sup> Ibid, 1-5. PMESII-PT stands for: political, military, economic, social, information, infrastructure, physical environment, and time. METT-TC stands for: mission, enemy, terrain, and weather, troops and support available, time available, and civil considerations.

<sup>51</sup> Nassim Nicholas Taleb, *The Black Swan*. (New York: Random House, 2007), 16.

<sup>52</sup> Shimon Naveh, Jim Schneider, Timothy Challans, *The Structure of Operational Revolution; A Prolegomena* (Booz, Allen, Hamilton, 2009) 79.

<sup>53</sup> Peter Novick, *That Noble Dream* (New York: Cambridge University Press, 1988) 252.

<sup>54</sup> Ervin Laszlo, *The Systems View of the World; a Holistic Vision for Our Time*. (New Jersey, Hampton Press, 1996) 75-76.

<sup>55</sup> Hayden White, *The Content of the Form* (Baltimore: The John Hopkins University Press, 1987) 57. “One can produce an imaginary discourse about real events that may not be less “true” for being imaginary. It all depends upon how one construes the function of the faculty of the imagination in human nature.”

<sup>56</sup> Shimon Naveh, Jim Schneider, Timothy Challans, *The Structure of Operational Revolution; A Prolegomena* (Booz, Allen, Hamilton, 2009) 24.

The fourth of this six article series on Army Design addresses how problematization leads to non-linear approaches to transform the system into the desired state. Although design products must ultimately be transferred into linear processes with concise and clear narratives to support tactical level operations and detailed planning, this does not mean that design theory should accept the overt tacticization and teleological methodologies that the military institution generally expects at all levels of planning. The term ‘non-linear’ is now so overused that it has lost contextual meaning. ‘To Design or Not to Design’ proposes in this series that ontological approaches to design work more effectively when embracing true non-linearity over traditional linear causality.

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