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The Conceptagon

A Framework for Systems Thinking and Systems Practice

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***Abstract*—For the myriad scientific, technological, and socio-politico-economic specialties to be better integrated, the term *system* must add to its ubiquity a precision that facilitates communion among specialists. This paper, building on the body of Systems Thinking knowledge and cognizant of the key problem-solving systems methodologies, presents a new framework, the Conceptagon, and illustrates its use by describing its application to a case study drawing on the United States Department of Defense Biometrics Enterprise.**

***Keywords*—conceptagon, Systems Thinking, frameworks**

I. Introduction: A Systems Road Map

General Systems Theory (GST) has been with us in one form or another for more than half a century [1]. In the minds of its originators GST was intended to be a rigorous body of knowledge that brought together the ideas associated with specific systems of interest from many disciplines; it would then evolve into a set of unified theorems under a single roof. In this way, the term system could maintain its ubiquity whilst having a precision and form per se that would permit practitioners from any discipline to better share their findings and understandings of particular phenomena and thereby advance the underlying theory that governed all systems. Regrettably, perhaps inevitably, GST has over time become increasingly remote and remains largely unaccessed by specialists in the sciences and technology. Instead what has evolved is a collection of separate practices by which systems in their particular domain, e.g. engineering, social science, and life science, are better understood and manipulated for improved performance. This in itself does not present a problem provided that these various endeavors can somehow be tied together with some cohesiveness, which, if not exactly rooted firmly in GST, gives something that at least provides pathways for a communion of systems-oriented specialists.

Figure 1 suggests that Systems Thinking has taken the place of GST as the underlying support mechanism for systems practice in various fields of endeavor. We define Systems Thinking to be a body of knowledge, both principled and pragmatic, that serves systems professionals, irrespective of domain, in conducting analysis, synthesis and inquiry into identified "systems of interest." In this paper we present one specific tool, the Conceptagon, illustrating its application to a case study that draws on the United States (US) Department of Defense (DoD) Biometrics Enterprise. By so doing we hope to offer a framework for applied Systems Thinking to a diverse range of practitioners.

As we inspect Figure 1, we first notice in the top left corner Systems Engineering. This is both a body of scientific knowledge and a rational practice emerging from craft that many argue is the principal delivery vehicle for our contemporary technology systems. And not merely delivery; Systems Engineering also takes care of maintenance, refreshment, renewal and timely retirement or recycling of these same systems. It is endemic to Systems Engineering to take care of systems from cradle to grave, or, as we are discovering from the energy-climate era, to learn to take care of systems from cradle to cradle.

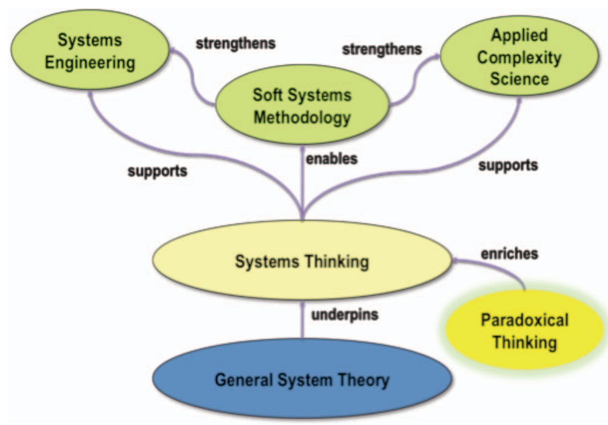

Figure 1. A Systems Roadmap

In the top right corner is the science of complexity [2], which embraces diverse worlds such as the human brain, colonies of red harvester ants, sexual attraction mechanisms of Papua New Guinea fireflies, weather, climate change, biodiversity, and urbanization. The remoteness of these two sciences in Figure 1 is symbolic of their lack of communion and a spur to forming, if not a more perfect union of the two, at least a necessary unison of distinct harmonics.

Soft Systems Methodology (SSM), occupying the middle ground, is both a migration of Systems Engineering, its developer Peter Checkland argued as such [3], and a precursor to the application of complexity science to the most challenging of all systems – communities of ourselves, what Checkland termed human activity systems (HAS) and what some are referring to latterly as socio-technological enterprises. These three major endeavors, Systems Engineering, SSM and Applied Complexity Science, we argue, are underpinned by Systems Thinking, which is itself underpinned by GST. Thus while each micro-discipline of science supports and informs specific scientific endeavors, it is Systems Thinking that provides a specialism in breadth or a horizontal integration for worlds of systems. The final noteworthy piece of Figure 1 sits unobtrusively to one side. It is Paradoxical Thinking. Symbolically marginalized, this piece of the landscape is neither innocent nor innocuous. It represents both the winds of change and a source of steering the scientific movement towards fresh discoveries, helping us to create systems better suited to purposeful communities [4].

II. The Conceptagon

The motivation for the Conceptagon was to make an important addition to the Systems Thinking toolkit. People are becoming increasingly aware that many problems are systemic, that is to say the problem that is first expressed is connected to a variety of others and attempts to treat the problem as it first appears can backfire. A holistic approach is required as opposed to piecemeal efforts. This is why Systems Thinking is being seen as a much more valuable resource – because it gives analysts and problem solvers a vantage point to see the bigger picture. Many have added to the Systems Thinking toolkit over a long period of time, with perhaps the most notable contributions coming from MIT, in the persons of Jay Forrester, John Sterman and Peter Senge. In Europe leading contributors have been Peter Checkland, Derek Hitchins and Philip McPherson to name a few. The work of all these pioneers was predicated on the holistic approach; it has provided us with systems languages with which to articulate and visualize the bigger picture, and has given us modes of analysis to address the systemic problem and guide us to satisficing improvements, remedial changes and cultural shifts.

The major contribution the Conceptagon makes is to distill the essence of these systems languages into a set of concepts that are familiar to a wide variety of domain specialists who can then organize them into a tailored system of inquiry into their particular 'system of interest – SoI.' Domain experts are thereby enabled to think about this SoI at an abstract level in a way that supports lateral thinking, thinking outside of the box, creative thinking, and big picture envisioning. Domain specialists who use the Conceptagon find themselves in surprisingly comfortable and productive communion with unfamiliar colleagues, an association which is ready made for treatment of systemic problems.

At the heart of Figure 2, an expression of the Conceptagon, is a specific system of interest. This can be captured initially in a variety of ways: block diagram, flow chart, process map, or prosaic system description. Wrapped around this center are seven triples. The notion of collecting concepts together as triples seems natural given the powerful notions of interior, exterior and system boundary, the latter denoting, if nothing else, a locus of demarcation. Other classical triples reinforce this line of thinking. For example, transformations, inputs, and outputs are fundamental terms to engineers and scientists. Similarly, wholes, parts and relationships convey ideas that inspire inquiry, analysis and synthesis in terms of both a system's technical detail and its suitedness to operating environments.

The idea of a minimal set of seven such triples is inspired not only by George Miller [5] but renders a convenient title. Not only do these 21 concepts aid the systems professional in their personal efforts, they represent a bridge to other systems communities for whom the very same terms also bear much relevance, albeit with each discipline interpreting them differently through their respective domain lenses.

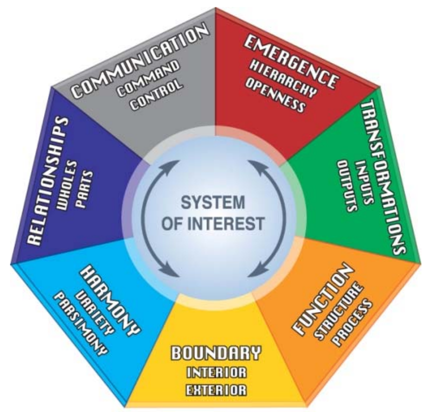

Figure 2. The (Boardman) Conceptagon

Because there are no prescriptive methods for using the Conceptagon, domain experts enjoy the freedom to think in new ways about the SoI, choosing their own navigation of the set of triples as it becomes obvious and intuitive so to do. The linkages across triples form naturally, steering the expert into new lines of inquiry as to what the SoI really is in essence and how its detailed design and/or analysis must take account of new insights the use of the Conceptagon reveals. We believe that the Conceptagon achieves two goals: first it forms a basis for intelligent debate and effective collaboration between systems people of all walks of life; and, secondly it provides a holistic view of the entire mission ensuring that whatever specific pieces the specialists provide, the whole itself is coherent, efficient, and suited for purpose. This collection of ideas is both scale-free, covering multiple levels of systems effort, and horizontally integrative, uniting multi-disciplinary labors at any given scale. So now we will explain some of the triplets in more detail.

A. Boundary, Interior and Exterior

If we argue that the name of the SoI is the system boundary, e.g. an iPhone, then the inside of the system ought to be obvious, e.g. integrated circuits and the Apple OS X software, or some variant thereof. A crucial element of the exterior would be iTunes with which the iPhone might connect in order to enrich the interior. One would like to argue that the iPhone was systems engineered. What if Systems Engineering was the name of the SoI? What then is on the inside? What exactly is Systems Engineering, and what is on the outside, in the exterior? In other words, in what environments does this SoI, Systems Engineering, prosper and where does it do less well?

What if the SoI appeared as a question, e.g. "Who came after Harry Truman?" It is relatively simple to guide the person being asked this question along a line of reasoning that strongly suggests the pattern to be succession of US Presidents (Harry Truman was 33rd in the list). Doing so makes it obvious that the answer is Dwight D. Eisenhower, 34th US President. However, a valid response is Doris Day, who was never US President, but her name comes immediately after that of Harry Truman in Bill Joel's hit record *We didn't start the fire*. We turned the question into a system boundary, and now we see how the SoI interior, the answer to a question in this case, adapts to the SoI exterior, the context of the question. This responsiveness is basic to natural systems, and increasingly demonstrated by designed systems purported to be agile.

At first sight it would appear that boundary is merely a demarcation between the interior and exterior, a concept of little consequence. But then one observes that the interior is what the system is and like all systems it needs to be protected, it needs to be preserved, it needs to prosper. The boundary has a role in all three functions. The exterior may be hostile or docile; it may contain elements that would injure the system, especially if they got into the interior, or it may contain elements that would be good for the system. Likewise the system may produce waste that may need to be ejected, or recycled, possibly by some other system. Paradoxically, the boundary must permit the ingress and egress of elements in both interior and exterior. And it must do so intelligently. This makes the boundary a part of the system, a part of the exterior, and a system in its own right even.

B. *Communication, Command and Control*

When Thomas Stallkamp, former VP of Chrysler, asked his line managers, "How many people and how many firms do you think are involved in the end-to-end process of conceiving, making and selling a Jeep Grand Cherokee?" it took them a while to find the numbers. The answer: 100,000 firms and 2 million people from initial product concept through to a satisfied customer driving her new purchase off a dealer's lot [6]. This answer is startling to most people who have never been involved with the entire life cycle of a product. But once he recovered from the shock of that answer, Stallkamp posed a telling follow-on question, "Who is managing this enterprise?" Paradoxically – no one is and lots of people are!

We must accept the fact that no one sits atop the Chrysler Jeep Grand Cherokee "experience." Perhaps in a titular sense someone does, but in no way can they be said to be its manager. Whoever occupies that office, they are neither a Washington nor a Napoleon commanding thousands and controlling affairs according to their grand strategy. Littered throughout the management hierarchy, or network, are hundreds of people, each with their individual spans of influence and concern. But in what ways can this diverse collective be said to be in control of the whole experience when it is probably the case that they are largely unknown to one another? Do these managers perform like ants, somehow supporting excellent behavior for the Cherokee colony? Can control be just as effective, if not more so, if it is distributed rather than precisely located in a central commander? Can we really trust distributing control to a constituency that is largely unaware of the affairs and actions of its neighbors and upon whom a mighty burden of communication must fall to rescue order from the prospective grip of chaos?

It is critical to understand whether when we ask "can we really trust distributing control to …?" we are even asking a useful question. When Stallkamp asked who (singular rather than plural) is in control of this vast extended enterprise, he was doing what any experienced executive or manager would have done—attempting to establish organizational accountability. A different question, however, may have proved both more illuminating and more useful. The questions we ask are largely a function of our mindset, and the purpose and benefit of paradox is to confront that mindset—to make us challenge our reliance upon the "conventional" questions and position us to change our mindsets. In so doing, we can release the tension revealed by the paradox and move to the kind of breakthrough thinking that can offer solutions to problems long thought intractable.

Control is to engineers (and managers) what power is to politicians—the ability to influence actions, whether in hard systems or soft ones. Current theory includes two poles: "command and control," by which authority "at the top" issues directives that get resolved into executive action by a large group of people; and the "self-organizing" notion of an idea that infects (from the bottom), propagates and galvanizes a group of people who then take action as though they were a unit and had been commanded by a governing authority [7]. The trick for both leaders and managers is to figure out how to embrace and resolve this paradox. Horatio Lord Nelson understood and leveraged it well using, it seems, only three heuristics: ordered liberty, creative disobedience, and reciprocal loyalty [8].

C. *Harmony, Variety and Parsimony*

A big motivation for the Conceptagon is to better understand the term system and to understand specific systems not just from the perspective of the domain in which they serve, so that we can better suit them to that domain, but as systems in their own right. What we mean by this is to understand a system in terms of its essence, its togetherness. In other words, how well the parts of the system relate together and in so doing ensure a healthy whole. Considering the triple variety, parsimony, harmony we could not be more reminded of this motivation. What this does is combine opposing forces in a dynamic balance reminiscent of the term system itself.

Parsimony is not meanness for its own sake. It has a meanness to it, for sure, but it is deliberate and purposeful. In its meanness more is said than could be said by more. That takes thought and skill and possibly even genius. Pink Floyd had a hit single *Another Brick in the Wall, Pt 2* in which the opening line is "We don't need no education." Now just imagine a bunch of middle school kids singing that line as if they meant it. What would you riposte as their class teacher? Using parsimony, you might think to say 'Precisely!' You leverage their double negative which betrays the fact that they do indeed suffer from a lack of education with which you wish to concur! Parsimony is not wanton disregard summed up in brevity. It is thoughtful regard encapsulated by poignancy. Recall, it takes longer to write a short letter than a long one [8]. Parsimony is a powerful force not easily controlled yet hugely impactful if understood. Parsimony produces a complex piece of electronics using four integrated circuits rather than 14. Time spent in design is plentifully repaid in maintenance.

The 'opposing' force to parsimony is variety. Logically, if you are striving for meanness in a purposeful way, you have to counter this with a search for a richness found in plentiful diversity. Then again variety must be purposeful. The search is not random, a case of collecting objects merely because they are different. In a curious way diversity adds to difference whilst making sameness more meaningful. That's the point. Neither parsimony nor variety work in isolation; they work together and this togetherness results in harmony.

All will agree that the world is a pretty big place, rich in diversity. Similarly, world events are incredibly varied, ranging from tsunamis to political coups, from stock market crashes to film stars falling from grace. So to write a hit song that draws upon world events in your own lifetime is pretty limitless, and *We didn't start the fire* exhibits much variety, mentioning notable personages such as Richard Nixon, Marilyn Monroe, Elvis Presley and Charles De Gaulle, and noteworthy events such as the fall of Dien Bien Phu, the Russian invasion of Afghanistan, the failure of the Edsel automobile, and Cola wars. That is diverse. The song has the requisite variety to cover the world's affairs, at least from the perspective of this great musical entertainer. But just as parsimony condenses richness, so variety must constrain diversity; parsimony is purposeful meanness and variety is considered richness, and these two work as opposites and as partners in search of an elegance we call harmony, which is more than musical in its scope. Consider, how would you compose a song that is memorable and memorizable, that takes a broad sweep of world affairs and yet meets certain criteria of rhymes and rhythms? It's not easy. That's why there's just one Billy Joel, a hugely acclaimed artist yet unrecognized as a systems thinker!

III. Case Study: The DoD Biometrics Enterprise

This case study approaches systems thinking largely articulated through the vantage point of Systems Engineering—specifically, systems analysis of an extended enterprise, a "chain of organizations, … technologies, and … capabilities" [6]—to explore what the Conceptagon can reveal about the US DoD Biometrics Enterprise. We do not cover all of the systems vantage points presented in Figure 1, in most part due to the restrictive scope of this paper. Thus, the authors are currently developing this case further as part of ongoing research.

Biometrics provides information that links a human being to one or more identities. Over twenty years after their introduction, biometrics have become very popular with DoD leaders [11,12] and key to personnel recovery, maritime interdiction, disaster relief, physical and logical access control, and targeting [13]. To DoD, "biometrics" is both a characteristic (a measurable biological and behavioral characteristic that can be used for automated recognition) and a process (automated methods of recognizing a biometric subject based on [biometrics]) [14]. They use several modalities and more are on the way [15].

A. Boundary, Interior and Exterior

When considering a SoI's boundaries, applying the Conceptagon makes it clear that the system's operational and institutional aspects and its environment affect the problem and solution spaces in ways both profound and subtle, and are grist for the systems engineer's mill. DoD is a hierarchy [16]; operationally, the biometrics enterprise should have clearly defined boundaries, but the appropriate Departmental Directive [17] appears to do an inadequate job of scoping. It begins by spreading the enterprise across the entire DoD, and mentions both "military operations and business functions," and information sharing across "the interagency" (i.e. "the rest of the Government"). But if we transcend the doctrine to view the core of the Enterprise, the Biometric Enterprise Capability (BEC), as the SoI, we gain a window into helping understand both the system and its stakeholders. We can treat some initially as "black boxes" that exchange inputs and outputs with the BEC, knowing we can develop deeper understanding later to improve coordination for inputs and outputs critical to system performance and risk management.

Institutionally, most of DoD's current biometrics capabilities came from inadequately defined acquisitions and pilots funded by supplemental monies rather than through the formal systems, e.g. DoD Acquisition Policy and Procedures and Joint Capabilities Integration and Development. They must transition to the formal processes to be folded into the Services' "programs of record," subject to more competition for resources. Each DoD organization's value network makes its own resource allocation decisions that the Enterprise may wish to influence. Are these value networks in or out? In practice, the answer may depend upon how badly biometrics programs need the resources they control.

B. Communication, Command and Control

"Command and control" alludes to hierarchical structures that historically have been key in the DoD Enterprise. The Directive puts senior officers from each US Service (e.g. Navy, Army, Air Force, and Marines) on the Biometrics Executive Committee, names the Secretary of the Army as the Executive Agent for Biometrics, creates the Director of the Biometrics Task Force and Executive Manager for Biometrics as a part of the Army's Executive Staff, and places a Program Management Officer "under the authority of the Army Acquisition Executive." The chart detailing the entire governance structure can be found at [18].

Additively, institutional control hinges on Budget Authority—the ability to make and enforce decisions about money—so who controls Budget Authority for DoD Biometrics? Actually, no one, unless you count the Secretary of Defense and the President, and even they have to bow to the will of Congress. But, in practice, the Service Secretaries (and the Commander of US Special Operations Command (USSOCOM)) wield Budget Authority on a day-to-day basis by weighing the recommendations of the Service Chiefs and executives like the Biometrics Task Force (BTF) Director. The Army, Navy, Air Force and Special Operations Command "organize, train and equip" forces, while the Combatant Commands use those forces to conduct operations; the Army's size and "boots on the ground" mission argue for it to be executive agent and program management, but will they adequately represent the other Services' needs?

The theater commanders have neither acquisition authority nor funds to provide access control for US forces, so it makes sense to let the Services do the job, but who will make them agree on an access control program or standards? The Defense Manpower Data Center (DMDC), part of the Under Secretary of Defense (Personnel & Readiness) organization, has the mission to be "the DoD enterprise human resource information source, providing secure services and solutions [with strategic goals that include being] the central source to identify, authenticate, authorize and provide information on DoD affiliated personnel" [19]—providing biometrically-enabled physical and logical access control systems to all DoD units. But what about the Director of the BTF, or the Biometrics Principal Staff Assistant, or even the Executive Agent? Who's really in charge here, and who has the muscle to actually make and enforce decisions? Do they all talk with each other to coordinate goals, strategies, plans and budgets? If so, how, why, how often, and, most importantly, how well?

The Services and USSOCOM have shown a tendency to do pretty much what they think they need to—if someone wants to cooperate with them, that's great, but if not, they're not afraid to go their own way. This has led to a proliferation of collection systems and significant differences in concepts of operations and requirements that surely complicate operational and support planning and execution. The transition to Base funding could be rocky. While it doesn't guarantee quick answers, the Conceptagon can illuminate areas holding critical Systems Engineering questions about communications and command and control. Knowing his way around the structural complexity can help focus the system engineer's efforts; not knowing could prove fatal to success. For example, the systems engineer must consider the points of influence and command structures the SoI must either accept or leverage to convey the right picture for all the players in the budget process.

C. *Transformations, Inputs and Outputs*

The Conceptagon serves to broaden our horizons while helping sharpen our focus, helping ensure we think not only about the job at hand but making that job possible in terms of the job at hand. This can provide a better design—more in sync with what's really needed and how the system gets it.

Consider an activity model of the Enterprise's end-to-end operational process. Activities transform inputs (often information) into outputs (also information). Controls contain rules governing transformations, while mechanisms represent the assets that carry them out. Models like this enable the systems engineer to answer the critical questions about what the system is supposed to do and how it will go about doing it. Doing so requires the systems engineer to understand where each transformation fits in the overall process; what it consumes, produces and hands off; where useful feedback occurs; how and why things begin to happen, and who and what is involved in the process of doing them. The Conceptagon both challenges systems engineers to find and recognize the importance of this type of information, and offers a very useful "bin" for it.

D. *Function, Structure and Process*

The Conceptagon helps ensure that while we focus on the system, we don't stick with just the obvious parts, but look at the soft underbelly—what's really needed for the system to do what it has to do. Nothing useful happens without the right combination of resources, policy, people, materiel, and, most importantly, understanding of what's needed—DoD calls these requirements. In any resource-constrained system the root causes of many problems can lie in the structures and processes around it. If structure "defines components and their relationships … function defines the outcome … or behaviors … [and] process explicitly defines the sequence of activities …[20]" the effective systems engineer must understand all of the functions, structures and processes within and affecting the SoI.

For instance, a model of the Enterprise's functions (collect, process, analyze, store and disseminate information) would be incomplete if it contained only the operational functions. It should also contain the key customer and supplier functions (in this case, Intelligence, Law Enforcement, Military Operations), and the enabling functions (requirements development, acquisition, logistics and sustainment, etc.) that make it all possible. We need the more complicated model because no man, and precious few systems, are islands. The DoD Biometrics Enterprise could not do its job without a clear understanding of the size and frequency of required communications. Information has to go in, move around inside and go out. This requires communications systems and infrastructure—high-speed equipment and processes to make sure that highly mobile bad guys cannot move faster than the knowledge that they are bad guys.

E. *Relationships, Wholes and Parts*

Concepts such as belonging and autonomy [21] can further describe this dimension of the Conceptagon. To be effective systemically (as a whole), the many members of the Enterprise must recognize and subjugate their partness as they recognize and embrace their togetherness—they must work together as a collective entity, especially as they are transitioning to a more constrained financial environment. This process begins with the recognition that some relationships already exist; turning them into conduits for honest, effective communications both within and among the parts to lay out and harmonize operational objectives, requirements and priorities. It continues with creative research into options and courses of action (both technical and not) and to laying plans and determining schedules that will do the best job of balancing the whole and its parts. The Conceptagon inspires the systems engineer to investigate and understand "complexing" issues, to create not just an operational system but a system of thinking about the problem at hand—both parts and whole.

F. *Harmony, Variety and Parsimony*

DoD's Biometrics Enterprise exhibits all three of these qualities—some more than others. There's lots of variety at the "collect" end of things, with no less than eight data collection systems linked by a variety of communications mechanisms (manual interfaces, and unclassified and classified links using both terrestrial and satellite capabilities). Multi-modal and standoff systems are on the way. Concepts of operation also vary. Some commands give forward commanders the ability to match biometric signatures can be matched quickly against their own "watchlists" (limited data sets)—adding risk—while others insist on very rapid queries against only the "authoritative" national-level stores.

Parsimony seeks to emerge in the "Match, Store and Analyze Biometrics" areas, though more slowly for "friendlies" than "bad guys." DoD's adversary collection systems all send their data to the National Ground Intelligence Center (NGIC) and the Automated Biometrics Identification System (ABIS) for matching and storage, but despite DMDC's vision, several of the Services seem intent on creating their own access control systems; some host nations will tolerate one but not another. The Conceptagon challenges the systems engineer to recognize the strengths and weaknesses inherent in each solution concept and the risks that flow from them. This fulsome understanding means the systems engineer is better equipped to find a useful balance of approaches, costs, risks and benefits.

G. Emergence, Hierarchy and Openness

Few institutions understand the need for adaptation better than the military. "No plan survives first contact with the enemy" is a condition for adaptive thinking and emergent behavior that also demands openness to new ideas—both ours and others'. The DoD Biometrics Enterprise is both a hierarchy and a matrix—is it open to new ideas? Does it adapt? The answer to both questions is "yes, subject to reasonable controls." DoD has a strong conservative streak—not politically, but operationally. They don't change what works without good reason, but they know that the other guys are always looking for new ways to outfox them. The Enterprise emerged very quickly during operations in Bosnia in 2001. Of the systems in the field, most are essentially prototypes or technology demonstrators—and the processes for using them cannot be much different. What's critical to the systems engineer, though, is the idea of where to place the capability for emergence and where to rule it out. Because what of command and control architectures where life and death hang in the balance? Because data latency and false identifications *can* cost lives, engineers in the Biometrics Enterprise must consider carefully where and how much emergence to permit in systems and processes. In this case, the Conceptagon serves to both inform and temper the engineer's judgment, enabling them to be both opportunistic and watchful.

IV. The Road Ahead

In our limited use thus far, the Conceptagon has inspired, challenged, focused, broadened, illuminated, and clarified understanding, and tempered judgment to help ensure that the engineer makes good, fact-based decisions. Applying the Conceptagon clearly demonstrates that, like all systems, the whole is greater than the sum of the parts. Indeed, in many cases it was difficult to decide exactly which items to address in which order. This is because there really are no boundaries among the triples - they, and the ideas they were designed to contain, are interdependent and synergistic. The implications of information contained in one area permeate the others to create systemic effects that may be far greater than is obvious at first blush. Our case study shows that the Conceptagon, like all good frameworks (systems of thinking), helps the system engineer simultaneously order, bound and liberate both his thought processes and the ideas they produce. In our future researches we plan to explore ways in which the Conceptagon can become a system in its own right, making its use less like that of a checklist, yet more obvious to prospective users as to how it can be tailored to their specific system of interest.

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