By: Nevin "Mustang" Taylor

Webster defines Cyber as the act of relating to or involving computers or computer networks. In more specific terms, it speaks to our ongoing efforts to leverage technology to manage data effectively and meaningfully. Whether in the manner that we store, make visible, or share information through a spider web of networks, ultimately it is within our ability to apply technology in a meaningful way that effectively evolves knowledge to understanding, which enlightens our ability to strategically operate in today's volatile, uncertain, complex, and ambiguous (*VUCA*) environment.

As we transition from the industrial to the information age, we are quickly transforming our environments into the age of knowledge, effectively shifting from a war of attrition to a war of cognition. Today's growing demand for data surpasses our ability to supply in our 24/7 interconnected world. Given the advent of the digital domain just 50 short years ago, with ARPANET's use of IP protocols to interconnect our systems, the growing demand for data is currently doubling every 18 months. As such, we are reliant upon the man-made domain to leverage our technological tools to store, disseminate, and process copious amounts of data. Thus, this paper will address the need to understand:

- ***Information Objectives*** *– our ability to communicate and raise awareness*
- ***Information Operations*** *– the ability to coordinate and collaborate at all phases of operation to assure the ability to direct, influence and effect operations*
- ***Information Outcomes*** *– analytical assessments to facilitate the cognitive efforts to full those strategic objectives that ensure vital interest and growing need to model and operationalize the digital domain to effectively and efficiently ACE operations in this ever-changing information environment.*

INFORMATION OUTCOMES

As the world becomes increasingly interconnected, every aspect of our daily lives is monitored, recorded, and assessed by the Internet of Things. The plethora of operations and the strategic advantage derived from accurate, reliable, and timely (*ART*) information are the keys to victory in this high-stakes environment. Elevating awareness, the ability to communicate with and coordinate forces effectively, and the ability to synchronize in a collaborative effort assure mission success. Thus, with an ever-increasing reliance on technology to facilitate enlightened understanding in this VUCA environment, we must strive to operationalize data effectively to make it visible, accessible, understandable, linked, and trustworthy (*VAULT*). It is only through this approach that we will be able to unlock the *VAULT* of understanding.

Given the growing reliance on these capabilities to adjust and adapt at the speed of light, the ability for it to inform and enlighten organizations as to the multitude of options available to capitalize on unlimited opportunities in today's interconnected world will be the key to deriving competitive advantage in this dynamic environment. Thus, our ability to support communication, enhance awareness, and evolve understanding is greatly enhanced by the application of today's technological tools.

INFORMATION OBJECTIVES

The requisite information to know from where you came to understand where you are, which informs you where your current momentum will carry you, is vital to our ability to operate. Thus, we must provide the historical Frame of Reference (FOR) to operationalize the digital domain to enlighten the cognitive process in this ever-changing information environment. The strategic trade space illuminates opportunities and risks inherent in information warfare.

INFORMATION MANAGEMENT

The ever-growing mass of data and complexity of the relationships attune to a devolved science experiment. Recent examples lend themselves to IBM's Big Blue computer to supplant cognitive abilities in the strategic game of Chess. However, given the complexities and indeterminacy of human dynamics, they do not lend themselves to even the best probabilistic modeling, for we cannot always predict behavioral outcomes, given the irrationality of human interactions in even a controlled environment.

An interactive process that validates the veracity of data and, in turn, characterizes it is presented in this dynamic environment. Thus, through adaptive modeling, we believe that the information environment as it pertains to military operations would be helpful to for assessing expectations and characterizing the intent and motivation of the operation, thereby determining the COA necessary to execute military operations. For this, the finality of things ascribes those actions today and second, and their order of effects tomorrow of those activities which are a direct result of the causality of actions and their impending consequence.

Ultimately, strategic opportunities in military operations are revealed by prudent planning and programming. The National Defense University's Joint Advanced Warfighting School (JAWS) provides a robust framework for adaptive planning to address the uncertainty in the *VUCA* information environment. Their approach is adaptive, taking into consideration the current state and the presumptions and assumptions that illuminate our current understanding of our situations and impending circumstances. Thus, we propose a framework for cyber campaign planning which identifies options to manage evolving risk while maintaining a focus upon those opportunities to garner strategic advantage by leveraging flexibility developed through an iterative approach to assess, adapt and act (*A3*) in a manner that provides fluidity of operation in this highly dynamic and constantly evolving domain.

KNOWLEDGE OPERATIONS

To accomplish this, the operational commander must have systems that verify data, assess information reliability, ensure the dependability of relationships, and measure time to ascertain and elevate situational awareness of the environment in which they operate. Given the growing scale and resulting complexity of this task, leveraging technological tools to manage the scale and operationalize the complexity is critical to gaining and maintaining a strategic advantage. The resulting reliance on these systems creates inherent vulnerabilities that must be handled.

Notwithstanding, our ability to communicate within this environment is crucial, given the extensive efforts to implement security precautions that ensure mission

assurance. That said, significant effort must be made to understand the purpose of these systems as to the ability to facilitate the elevation of awareness that informs knowledge to aid in the cognitive process of understanding. The resulting cause-and-effect informs the implications of those strategic trade-offs within the mental process, ensuring decision-makers can maximize their propensity to make wise choices. Thus, the growing need for knowledge operations to assess the environment and provide analytical analysis is vital to understanding the causality and potential consequences of actions taken, measured against results to be achieved in this *VUCA* environment.

Today's technological tools offer many opportunities to increase the capacity to manage information in meaningful ways. The growing desire to establish netcentric systems provides increased timeliness and accuracy through autonomous transactions that generate analytical information, *which most misconstrue as artificial intelligence*. The increased acceptance and widespread popularity of these new capabilities have elevated our cognitive capacity, enabling greater awareness and serving as a common conduit for collective coordination and collaboration to synchronize operations. The increased application of these technological systems allows working smarter through a synergistic approach. However, we must be mindful of the quality (*correct… known and complete) and the resulting dependencies* derived from this new approach. Additionally, we must be aware of not only those things that are unknown to us but the propensity of the unknowable in our efforts to paint a holistic picture upon which to evolve our understanding of the VUCA environment.

Within this complex, interdependent environment, one must be aware of paradigms and perceptions to make informed decisions that yield outcomes that meet expectations. It is through these cognitive endeavors that one becomes aware of the implications and influences of prescriptive modeling, and of the effects these have on the environment. Given the unpredictability of this evolving domain, we can leverage predictive modeling to identify probable outcomes based on our current level of understanding. Thus, it becomes essential that we master this rapidly expanding digital domain to assure the proper application of data that informs knowledge upon which our cognitive capacity struggles within the complexity of the second and third order of effects of our influence upon this highly dynamic and continually evolving interdependent environment.

With an ever-growing reliance of the digital domain and an unending quest for data, the need to effectively and expeditiously coordinate to establish collaboration and consensus has never been greater. Past Command and Control Centers preclude the essential aggregation of information, thereby hindering situational awareness and the understanding of causalities that influence consequences. Therefore, the project "*CHESS Match*" is an

effort to address the quintessential framework to effectively assess, characterize and enlighten/empower/evolve (*ACE*) operationalization of data to support, enhance, and execute (*SEE*) mission necessities in a way that meets operational imperatives by leveraging the following understanding model (*UM*).

INFORMATION OPERATIONS

Ultimately, operational endeavors are a strategic endeavor to leverage resources (*mass*) and the synchronized alignment of capabilities (*maneuver*) to overcome an adversary on the field of battle. Like chess, the diverse capabilities and capacities of each piece on the board serve different functions and are assigned various point values. Military planners likewise *ACE* tactical endeavors in order to obtain strategic objectives. However, as is the case in military operations, the result of winning the battle not aligned to strategic objectives all too often provides a short-lived victory at the potential sacrifice to the overall aim of winning the war. Like chess, we must ensure we take a holistic and strategically focused approach to why we engage in operations, like capturing the king, to garner victory on the field of battle. Thus, a holistic approach to operations enhances situational awareness, enabling communication and coordination to foster a collaborative, synchronized engagement and support informed decision-making through a sound cognitive framework.