

System Shock: The Archetype of Operational Shock

A Monograph

by

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Abstract

System Shock: The Archetype of Operational Shock, by MAJ Benjamin A. McDaniel, US Army, 47 pages.

The primary research question for this study is whether the US can use the concept of 'system shock' to better operate in the Grey Zone. 'System shock' combines ideas from systems theory, chaos theory, and complexity theory to link the ideas of bifurcation and operational shock. System shock is an archetype for military operations that focuses on bifurcating any opposing system to achieve operational shock. This monograph argues that system shock provides military leaders and planners with a framework to fight and win in Grey Zone environments and that this concept nests within Unified Land Operations (ULO) doctrine by testing three claims. The first claim is that system shock is a useful framework to interpret and affect system behavior. The second claim is that the Grey Zone is a complex adaptive system, which allows the system shock framework to apply. The final claim is that system shock nests within current US Army ULO doctrine. The theory of system shock does not dictate specific action. Instead, it proposes a conceptual framework to interpret and understand how operations progress and to train the military planner's mind to look for connections in more places and with a greater purpose behind short-term gains. The theory of system shock can help leaders and planners best identify and address the correct problem in the Gray Zone and other military operations. Therefore, this monograph provides operational artists and military practitioners with an additional lens to use when planning and executing operations.

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Acronyms

| | |
|---------|-------------------------------------|
| ADP | Army Doctrine Publication |
| ADRP | Army Doctrine Reference Publication |
| FM | Field Manual |
| FORSCOM | US Army Forces Command |
| MOE | Measure of Effectiveness |
| MOP | Measure of Performance |
| ULO | Unified Land Operations |

Introduction

Prior to and including the Second World War, most wars consisted of nations fighting each other with their conventional forces with relatively clear outcomes. Even outside of relatively symmetric battles, the more powerful military won the majority of conflicts. Since 1945, the character of war has seemingly changed and weaker opponents have won more battles.¹ In the current operational environment, the United States military usually operates outside of a clear first grammar environment, with no more force-on-force battles focused on overmatching a comparable force. This new, different operating environment leads to the need for a second grammar of war to address the differences in fighting irregular warfare such as insurgent or guerilla warfare.²

A problem with the current set of military operations planning tools is not their inherent usefulness, but the foundational logic planners and leaders use when they implement them. Currently, the predominant logic comes from the first grammar of war, which focuses on simply overthrowing the enemy's forces. The combination of complexity and systems theories, with a focus on operational shock, provides practitioners with a set of tools that allows them to operate independently of either grammar, but which may offer new insights into planning for second grammar warfare. By focusing on the opposing system as a whole versus simply overthrowing the enemy force, leaders and planners can develop operational approaches which address an opposing system or systems based on their unique environment. When developing operational approaches, this logic offers a real benefit by encouraging a different focus for operations.

Another benefit of an operational shock focus is the ability for a military force using limited means to successfully oppose an opponent fighting an existential crisis with all means

¹ Ivan Arreguín-Toft, "How the Weak Win Wars," *International Security* 26, no. 1 (Summer 2001): 97.

² Antulio J. Echevarria II, "American Operational Art, 1917-2008", in *The Evolution of Operational Art: From Napoleon to the Present*, eds. John A. Olsen and Martin van Creveld (New York: Oxford University Press, 2011), 137.

available. This type of conflict, where one side is fully committed, and the other is not, relates most closely to second grammar operations. One of the biggest potential problems with these conflicts is that the United States military engages in limited war against opponents fighting an absolute war. Such a mismatch in means can be linked to Clausewitz's idea that war is a duel on a bigger scale. This idea, Clausewitz argued, means that an enemy's will to fight and continue fighting should be matched by the will of friendly forces, otherwise friendly forces will lose.³ Since the end of the Second World War, large, advanced armies fighting limited wars on foreign soil against local forces do not usually fare well.⁴ Given the potential disadvantage noted by Clausewitz, and supported by the historical record, the US would appear to be in an unfavorable position in second grammar conflicts. However, this monograph argues that by focusing on the opponent's system—versus only their fighters—an advanced military fighting a limited war can still achieve victory, if they use complex adaptive system analysis focusing on shocking the opposing system. To clarify, this monograph does not dispute Clausewitz's description of war's nature as a clash of wills. Instead, it simply allows for the clash of wills to be fought outside of direct conflict, through a more indirect, holistic approach.

Systems and complexity theories provide planners with new ways to interpret the environment. These theories provide the ability to better analyze friendly and enemy capabilities within the battle space. They can also facilitate a much greater understanding of the variables involved in each party's decision-making process. However, being able to see the problem in a new light does not guarantee success in the new environment. This is where the concept of operational shock enters the picture. Operational shock is the premise that an opposing force is no longer able

³ Carl von Clausewitz, *On War*, ed. Michael Howard and Peter Paret (United States: Princeton University Press, 1989), 75.

⁴ Arreguín-Toft, 97; Andrew Mack, "Why Big Nations Lose Small Wars: The Politics of Asymmetric Conflict," *World Politics* 27, no. 02 (1975): 175-7. Jeffery Record, "Why the Strong Lose", *Parameters* (Winter 2005-06): 16-7.

to operate as a coherent organization due to the amount of pressure friendly forces put on it. Operational shock combines ideas from systems, chaos, and complexity theories, but focuses on conventional fighting. Using these same ideas and focusing on bifurcation allows planners to have a system-focused goal when they develop plans of action. The idea is to analyze both friendly and enemy systems holistically and build a course of action that shocks the opposing force.

The primary research question for this study is whether the US can use the concept of system shock to better operate in the Grey Zone. Throughout the monograph, ‘system shock’ refers to the theoretical framework that links bifurcation and operational shock. Bifurcation is a chaos theory idea that refers to a how system changes far-from-equilibrium can result in the evolution or devolution of the system. This monograph defines ‘operational shock’ as the state where the opposing force is in a position where it is no longer able to cognitively or physically react due to friendly actions.⁵ System shock is an archetype for military operations that focuses on bifurcating any opposing system to achieve operational shock. This monograph will argue that system shock provides military leaders and planners with a framework to fight and win in Grey Zone environments and that this new concept can be nested within Unified Land Operations (ULO) doctrine. To support this argument, this monograph will test three claims. The first claim is that system shock is a useful framework to interpret system behavior over time. The second claim is that the Grey Zone is a complex adaptive system, which allows the system shock framework to apply. The final claim is that system shock nests within current US Army Unified Land Operations doctrine.

In order to test the utility of system shock theory to Gray Zone conflicts, this monograph first describes how systems theory, complexity theory and chaos theory all feed into the concept of operational shock and bifurcation. Then, the monograph discusses the Gray Zone concept and

⁵ Ryan Bulger, *Combining Concepts Operational Shock in Counterinsurgencies* (Fort Leavenworth: US Command and General Staff College, 2013), 3.

identifies where concepts of bifurcation could help planners as they craft plans for operations in such conflicts. Finally, it shows how system shock reflects the major tenets of Unified Land Operations.

The theory of system shock can help leaders and planners best identify the correct problem. Once the state gives political guidance to the military, military planners start interpreting it in order to best meet the policy maker's intent. Every level in the military needs to ensure that it addresses the correct problem, otherwise, by the time it filters down to the tactical level, the soldier on the ground may be unable to meet the political intent of the operation. The advantage of system shock is that the inclusive analysis allows planners and leaders to identify the correct problem, which may be more complicated than, or not even include, prioritizing opposing forces.

This monograph intentionally remains somewhat theoretical in order to provide a descriptive approach to viewing operational planning and execution. Every campaign or operation is unique; this means any historical example could potentially anchor thinking about the theory to that particular circumstance. Instead, this monograph describes and analyzes the Gray Zone conflict type, and applies a bifurcation model to that conflict. Thus, the monograph offers and analyzes overarching precepts, which may then be applied to a range of similar-style conflicts.

Literature Review

This monograph will focus on the viability of system shock as a focus for military operations. The literature review begins by discussing major ideas from systems, chaos, and complexity theories. Specific concepts from these ideas work together to help explain and estimate system behavior and lay the foundation for system shock. Next, the monograph introduces the idea

of operational shock, focusing on its development and major tenets. Finally, the literature review introduces the last major concept, the Gray Zone.

Systems Theory

This section explains systems theory, its practical importance, interdisciplinary idea application, the difference between closed and open systems, and entropy. Systems theory, at its most basic level, is simply the idea that people can explain phenomena better by looking at the interactions and relationships of individual units within an organization, organism, or structure, rather than by examining the discrete units in isolation. There are many different types of systems, and it is up to the person doing the analysis to determine what system, or model, works best for the desired observation.

Systems theory developed out of the need to counter the continual refinement of science. The different disciplines, chemistry, physics, biology, etc., were doing great work within their respective fields. Unfortunately, this refinement essentially separated the extremes of each discipline further and further from each other, making it difficult for each discipline to communicate or interact with the others.

Ludwig von Bertalanffy began developing systems theory in the early twentieth century, and his work culminated in 1968 when he published his seminal work, *General System Theory*.⁶ Von Bertalanffy described three main aspects to systems theory: systems science, systems technology, and systems philosophy. Before von Bertalanffy, the main scientific fields subdivided elements under study into their smallest parts in order to better understand them. However, this subdivision prevented practitioners from understanding the whole. Systems science, as described by von Bertalanffy, is the application of systems thinking onto the traditional sciences, allowing the same practitioners to look at the interactions of the subdivided parts to achieve a much better

⁶ Ludwig von Bertalanffy, *General System Theory: Foundations, Development, Applications* (New York: Braziller, George, 1993).

understanding of the whole. Systems technology is the application of systems thinking to the hardware and software of modern machines and society. Systems philosophy is the “reorientation of thought and world view... in contrast to the analytic, mechanistic, one-way causal paradigm of classical science.”⁷ Each of these aspects of systems theory has a different intention with separate application. This monograph will focus on systems philosophy, because it reflects the fundamental shift in how practitioners view the world and its parts, and is therefore most useful to military planners facing the changing character of war.

In order to begin understanding any particular system, systems philosophy starts with three steps. The first is the system ontology, the nature of the system. A system can be real, conceptual, or abstract. Real systems involve physical interactions such as machines or living organisms. Conceptual systems are symbolic constructs such as organizational hierarchies or social structures. Abstract systems are a subclass of conceptual systems which correspond with reality. The system ontology focuses on the ‘matter’ of the system, the types of elements involved.⁸ The second parameter is developing a system epistemology, a knowledge of the system. Classical science looked for enhanced resolution of component parts and linear relationships. Systems thinking investigates wholes and the respective “interaction, transaction, organization, teleology, etc.....” of the involved variables.⁹ Functionally, this is a new perspective to analyze the same problems. This is also a way to analyze the quantitative aspects of the system, looking at how many elements compose the system.¹⁰ The third parameter is the system’s values. If reality is more than just linear actions between varying hierarchies of interacting particles, systems philosophy inherently changes the relationship between people and their environment. The new relationship becomes more than

⁷ Von Bertalanffy, xxi.

⁸ Shimon Naveh, *In Pursuit of Military Excellence: Evolution of Operational Theory* (Portland, OR: Frank Cass Publishers, 1997), 4.

⁹ Von Bertalanffy, xxii.

¹⁰ Naveh, 4.

just the mechanistic, linear perspective inherent to Newtonian thinking.¹¹ These interactions compose the system's quantitative properties, how the system's elements relate to each other and the environment.¹² These three steps provide an in-depth framework to look at and better understand systems.

Building off these overarching system properties, Von Bertalanffy believed there are specific principles or systems that crossed disciplinary boundaries. He wanted to develop unifying principles that ran vertically through individual sciences.¹³ Identifying vertical principles that applied to different types of systems was the cornerstone to his general systems theory. He believed the unique properties of the physical or chemical system would not limit the discussion of the system's general nature and allow a more complete understanding of the world.¹⁴ In *The Fifth Discipline*, Peter Senge argued "the greatest promise of the systems perspective is the unification of knowledge across all fields...."¹⁵ Senge used the term 'archetypes' to describe the patterns that regularly occur in system structures. These archetypes allow practitioners to realize that not all problems are unique.¹⁶ Researchers have identified about a dozen different system archetypes. Each of these systems contains reinforcing processes, balancing processes, and delays in different combinations to help explain how the different actors in each archetype interact with each other and

¹¹ Von Bertalanffy, xxiii.

¹² Naveh, 4.

¹³ Von Bertalanffy, 38.

¹⁴ Ibid., 149.

¹⁵ Peter M. Senge, *The Fifth Discipline: The Art and Practice of the Learning Organization* (New York, NY: Crown Publishing Group, 2006), 93.

¹⁶ Ibid.

the system itself.¹⁷ The idea of archetypes and universal system structures reinforces the idea of interdisciplinary application of system ideas.

A key aspect of systems thinking is understanding the difference between closed and open system. Closed systems, with discrete boundaries and linear internal relationships served as the foundation for much of Newtonian thinking.¹⁸ One way to describe closed systems is ‘equifinality,’ meaning initial conditions determine a system’s final state.¹⁹ Closed, linear systems served as the basis for the majority of the science that Von Bertalanffy wanted to expand. Unfortunately, focusing on closed systems prevented science from understanding the true nature of reality.²⁰ Real systems are not isolated with boundaries that ensure a constant number of particles and energy.²¹ Real systems are open, meaning they do not have those limiting boundaries and interact with their environment. In fact, open systems feed on “...a continual flux of matter and energy from their environment to stay alive.”²² Closed systems are easier to predict than open systems due to their linearity, but due to their simplicity, they are unrealistic and ill-suited for practical application. Focusing on closed systems simplifies analysis by closing the observed system from the world and

¹⁷ Senge, 94, 389 – 400.

¹⁸ Frans P. B. Osinga, *Science, Strategy and War: The Strategic Theory of John Boyd* (New York, NY: Routledge, 2007), 65.

¹⁹ Von Bertalanffy, 40.

²⁰ Fritoj Capra, *The Tao of Physics* (Boston: Shambala, 3rd Edition, 1991), 101.

²¹ Ilya Prigogine and Isabelle Stengers, *Order Out of Chaos: Man’s New Dialogue with Nature* (New York, NY: Bantam Books, 1984), 125.

²² Osinga, 73.

assuming it does not exchange energy or interact with other systems.²³ For systems thinking to be viable to military practitioners, it must revolve around open systems.

Another way to understand the difference between closed and open systems is the idea of entropy. The idea of entropy stems from Newton's Second Law of Thermodynamics which states that "while the total energy involved in a process is always constant, the amount of useful energy in a system is constantly diminishing to heat, friction, and so on."²⁴ The lost energy is entropy. Within closed and open systems, entropy has different effects and implications. For closed systems, entropy continues to increase and eventually reaches a maximum level for the system depending on the amount of energy in the initial condition. A closed system's maximum level of entropy determines its equilibrium.²⁵ Since open systems interact with their environment, their total energy is not constant. They can counter the effects of entropy by increasing how much energy it takes from the environment around it. In fact, for open systems to continue existing, they must constantly consume energy to counter the effects of entropy.²⁶ If an open system failed to address the effects of entropy, it would eventually cease to exist because it would eventually consume all of the available useful energy.

In sum, systems theory provides military practitioners with a valuable lens to begin understanding how systems work and interact with the world. Systems theory is flexible, drawing from multiple academic disciplines. Systems may be either closed or open, but while closed systems helped scientists better understand discrete processes they lack realistic application to the real world. Open systems provide a more realistic representation of organic systems and are a much

²³ Neil E. Harrison, "Thinking about the World We Make" in *Chaos Theory in the Social Sciences: Foundations and Applications*, ed. Douglas L. Kiel and Euel W. Elliott (Ann Arbor, MI, United States: The University of Michigan Press, 1997), 4.

²⁴ Osinga, 66.

²⁵ Von Bertalanffy, 39.

²⁶ *Ibid.*, 144.

more useful lens when viewing human organizations as systems. Understanding entropy and its effects reinforces the need to focus on open systems because the requirement to constantly acquire energy for survival adds a crucial element to how a system continues to operate.

Chaos Theory

Similar to complexity theory, chaos theory developed from the scientific need to explain nonlinear dynamics. Complexity deals with systems composed of many interacting agents while chaos theory deals with turbulence that drives systems to disorder.²⁷ In nonlinear systems, relationships between variables are unstable, and changes to these relationships develop from feedback from the system. This feedback can amplify systemic changes, break up existing structures, and generate new structures and behaviors in the system.²⁸ Analyzing these nonlinear behaviors in nature forced researchers to develop new ideas, one of which was chaos theory.²⁹ Chaos theory provided scientists and researchers with a new paradigm that replaced Newtonian linear thinking to address nonlinearity in nature.³⁰ There are several aspects of chaos theory which are relevant to military planners, specifically phase space, 'butterfly effect,' far-from-equilibrium interactions, and bifurcation.

Phase space is a conceptual multi-dimensional space that encapsulates all possible actions of a system in time. The notion of phase space formed from the need to understand dynamic systems independently of any particular initial conditions in order to compensate for the disproportional effect that initial conditions can have in nonlinear systems. Phase space focuses on the 'arrow of time', the irreversible increase of entropy, and how this trajectory is an irreducible

²⁷ Robert M. Axelrod and Michael D. Cohen, *Harnessing Complexity: Organizational Implications of a Scientific Frontier* (New York: Basic Books, 2001), xv.

²⁸ Douglas L. Kiel and Euel W. Elliott, eds., *Chaos Theory in the Social Sciences: Foundations and Applications* (Ann Arbor, MI: The University of Michigan Press, 1997), 2.

²⁹ Prigogine and Stengers, 1-23.

³⁰ Kiel and Elliot, 2.

element of reality.³¹ Any point particle over time has both a position and momentum, each with three vectors in the phase space. This means any definition of a point needs either two three-dimensional or a single six-dimensional representation to accurately represent the point and its possible behaviors.³² These six vectors become the phase space for that point particle. In the next instant, the point moves and changes the system's available options. Charting the point's past positions allows observers to trace its history.³³ In this sense, phase space represents both the point's past as well as all of its possible futures. The probability of different actions shapes the phase space of available options. Going further, the singular point can represent an entire system at any particular time. For a system in equilibrium, all trajectories are equal.³⁴ For other systems, behavioral tendencies weight the phase space towards particular future outcomes. Understanding phase space allows practitioners to understand system behavior and develop an understanding of the current system's capabilities.

Expanding the idea of phase space leads to the concept of far-from-equilibrium. Over time, internal system friction and feedback dissipates a system's energy and behavior. This dissipation brings the system nearer to the center of its phase space.³⁵ In other words, the system inherently attempts to stabilize itself and stay near its equilibrium, the center of its phase space. Logically, this means that operating away from this center equilibrium increases system instability. At increasing

³¹ Prigogine and Stigler, 261.

³² Ibid., 247.

³³ James Gleick, *Chaos: Making a New Science* (New York, NY: Penguin Books, 1988), 134.

³⁴ Prigogine and Stigler, 265.

³⁵ Gleick, 134.

distances from equilibrium, fluctuations can lead to new behavior that is different from the expected stable behavior of systems at or near equilibrium.³⁶

Reaching back to systems thinking, open systems need to address increasing entropy in order to survive. The system is constantly consuming energy to remain near its equilibrium. Countering the increasing entropy leads to the notion of self-organization, as systems adjust themselves to best address environmental stresses and increasing entropy.³⁷ This same search for and use of external energy allows open systems to maintain operations far-from-equilibrium.³⁸ Additionally, they will self-organize to operate effectively away from its equilibrium. This does not mean that a system can remain stable at or near its far-from-equilibrium state. It simply means it will try to adjust to the new environment. The entropy and disorder are still present, but the inflow of external energy can allow the system to continue to exist despite its distance from equilibrium. Understanding how far-from-equilibrium operations affect a system's behavior provides practitioners with a much clearer concept of how systems tend to behave.

Building off of far-from-equilibrium interactions, the Butterfly Effect is another major aspect of chaos theory. One of the key tenets of chaos theory is "...that the fate of the system is determined by small factors, which become magnified over time."³⁹ Additionally, cause and effect relationships may not be proportional or easy to discern.⁴⁰ The Butterfly Effect's technical definition is "...a sensitive dependence on initial conditions."⁴¹ The term itself comes from the idea that "...a butterfly in stirring the air in Peking today can transform storm systems next week in New

³⁶ Prigogine and Stengers, 141.

³⁷ Ben Ramalingham, *Aid on the Edge of Chaos*, 1st ed. (Oxford: Oxford University Press, 2015), 188.

³⁸ Osinga, 73.

³⁹ *Ibid.*, 90.

⁴⁰ Kiel and Elliot, 3.

⁴¹ Gleick, 23.

York.”⁴² Another way to look at this is that similar systems with similar initial conditions can exhibit dramatically different end states over time.⁴³ While the Butterfly Effect is more metaphor than reality, its application combines the ideas of nonlinear systems, phase space, and far-from-equilibrium interactions. As a system gets further from equilibrium, the initial conditions have a greater effect on a system’s behavior because each movement of the system through its phase space is dependent on its previous positions. The end state is always in the system’s phase space, but the exact end state is unpredictable based on the initial amount of information.

Bifurcation is simply a branching or forking within a system.⁴⁴ Each of a system’s choices is essentially an internal bifurcation of the system. Bifurcations have different effects depending on how far a system is from equilibrium.⁴⁵ Near equilibrium bifurcations can stabilize the system by bringing it closer to its phase space center, or they can destabilize it by pushing it further away from its equilibrium. As the system begins to operate near the edge of its phase space, bifurcation’s effects become magnified. Here, stabilizing bifurcations can actually become a systemic evolution that develop a new phase space construct for the system or take it back towards its equilibrium within the same phase space it started. Destabilizing bifurcations in this region cause the entire system to devolve and potentially cease to exist. Regardless of how the bifurcation affects the system, it has much greater effects as the system gets further from its equilibrium.

In sum, chaos theory provides practitioners with a valuable lens to conceptualize and understand complex adaptive system behavior. The ideas of phase space, the Butterfly Effect, far-from-equilibrium, and bifurcation overlay onto the ideas of systems theories to help build a

⁴² Gleick, 8.

⁴³ Kiel and Elliot, 6.

⁴⁴ John P. Briggs and David F Peat, *The Turbulent Mirror: Illustrated Guide to Chaos Theory and the Science of Wholeness* (New York: HarperPerennial, 1990), 143.

⁴⁵ *Ibid.*, 145.

comprehensive understanding of how a system interacts with its environment and other systems, as well as a preliminary path to estimating where and how a system may adapt or evolve.

Complexity Theory

Similar to chaos theory, complexity theory developed from the scientific need to explain nonlinear dynamics amongst and between system. Complexity deals with systems composed of many interacting agents while chaos theory focuses on the turbulence that drives systems to disorder.⁴⁶ Von Bertalanffy's ideas about systems changed the way that people looked at the world, but it did not help them explain it any better.⁴⁷ Analyzing open systems and their interactions with the environment requires more tools than simply looking through a systems lens. Trying to understand, explain, and anticipate these interactions led to complexity theory. Complexity theory helps fill some of the gaps in systems thinking by focusing on how a system's behavior cannot be reduced to the properties of the individual components.⁴⁸ There is no single definition of complexity theory, but each variation attempts to address the "sizable number of factors which are interrelated into an organic whole."⁴⁹ This section will describe the relevant terms of complexity theory, complex adaptive systems, and emergent properties.

Understanding complexity first requires understanding the popular terms used within the theory. The first of these is 'agents.' Agents are the system's components and interact with each other and their environment.⁵⁰ The scope of the system determines the nature of the agent. In this sense, agents could be components, people, or even entire organizations. This means that there can

⁴⁶ Axelrod and Cohen, xv.

⁴⁷ Von Bertalanffy, 36.

⁴⁸ James Moffat, *Complexity Theory and Network Centric Warfare (Information Age Transformation Series)* (DoD Command and Control Research Program Publication Series, 2003), xi.

⁴⁹ Ramalingham, 134.

⁵⁰ Axelrod and Cohen, 4.

be a hierarchy of complex systems within a single observed system, exponentially expanding the complexity of interactions. Agent types and population are other key aspects. The type of agent determines its strategy when it interacts with other agents and the environment. The population of agents determines the available interactions each agent has available.⁵¹

Agent interactions have different effects on the system through ‘feedback.’ Positive feedback strengthens an agent’s future interactions while negative feedback has the opposite effect.⁵² There are three considerations from feedback’s effects. The first is that individual agents can learn from the feedback, adapt themselves, and thus change the system as a whole through their adaptations. The second is that agents may not heed the feedback and maintain their current state.⁵³ The interactions of different agent types within their population combined with the different feedback mechanisms lead to complex adaptive systems. The third effect relates to the Heisenberg Uncertainty Principle, in that it is impossible to know both the location and velocity of any object.⁵⁴ This came from the difficulty of measuring atomic particles in quantum physics, but it applies to any system. Measuring or observing a system changes it, affecting the environment and every future choice.⁵⁵ Observing and measuring a system to get feedback inherently changes every system involved in the observation process.

Complex adaptive systems contain “agents or populations that *seek* to adapt.”⁵⁶ This adaptation is a direct result of the feedback from interactions between agents amongst themselves and agents and the external environment. Each agent or system adaptation has ripple effects through

⁵¹ Axelrod and Cohen, 4-5.

⁵² Harrison, 4-5.

⁵³ Axelrod and Cohen, 8-9.

⁵⁴ Everett Carl C. Dolman, *Pure Strategy: Power and Principle in The Space and Information Age* (London: Frank Cass, 2007), 99.

⁵⁵ *Ibid.*, 101.

⁵⁶ Axelrod and Cohen, 7.

the system since everything within the system is tied through interactions. This term is ‘co-evolution.’⁵⁷ Another way to view co-evolution would be that agents and systems adapt to changes elsewhere.⁵⁸ As more variables and agents shape a system, the more difficult it becomes to anticipate how individual adaptations and evolutions will occur or affect others.⁵⁹

Another integral characteristic of complex adaptive systems is the presence of ‘emergent properties.’ These are system attributes that the separate agents, components, and environment do not have.⁶⁰ They emerge from the numerous interactions amongst the independent agents pursuing individual strategies.⁶¹ They can be understood as the sum of interactions within a system versus the sum of the parts.⁶² Understanding emergent properties is vital to complexity theory because it both separates and joins the agents and the system. For complexity theory to be useful, it must allow an understanding of where these emergent properties come from, versus simply observing them.⁶³ Understanding emergent properties provides the greatest amount of insight into how a system operates. Just like open systems theories better reflect reality, complex adaptive systems theories better explain how systems change and adapt over time.

The tenets of complexity theory allow practitioners to better understand how complex systems behave internally and interact with their environment. Agents within a complex adaptive

⁵⁷ Walter C. Clemens, “Ethnic Conflict and Development,” in *Chaos Theory in the Social Sciences: Foundations and Applications*, ed. Douglas L. Kiel and Euel W. Elliott (Ann Arbor, MI: The University of Michigan Press, 1997), 74.

⁵⁸ Axelrod and Cohen, 8.

⁵⁹ Clemens, 74.

⁶⁰ Axelrod and Cohen, 15.

⁶¹ David C. Earnest and James N. Rosenau, “Signifying Nothing?,” in *Chaos Theory in the Social Sciences: Foundations and Applications*, ed. Douglas L. Kiel and Euel W. Elliott (Ann Arbor, MI: The University of Michigan Press, 1997), 147.

⁶² Jamshid Gharajedaghi, *Systems Thinking: Managing Chaos and Complexity - A Platform for Designing Business Architecture*, 2nd ed. (Boston, MA: Butterworth-Heinemann, 2005), 46.

⁶³ Moffat, 3.

system take feedback from each other and the environment to learn and adapt to their environment. Through this period of adaptation, emergent properties develop as a result of the numerous interactions within the system. Combined with chaos theory, these ideas provide an understanding of how slight changes to initial conditions could affect how the various agents within a system could respond differently and set conditions for vastly different resulting systems.

Operational Shock

The term operational shock refers to the state where the opposing force is in a position where it is no longer able to cognitively or physically react due to friendly actions.⁶⁴ Soviet military theorists first described this concept in the early twentieth century, within their larger development of a theory of ‘deep battle.’ In the early twentieth century, Russian military theorists developed the idea of deep battle to counter the increasing mechanization and size of the modern battlefield they observed in the First World War.⁶⁵ These Soviet ideas were later incorporated into US military thinking. This section will discuss the history of deep battle, the major tenets of deep battle, and how deep battle corresponds with the major tenets of modern complexity and chaos theories.

The seeds of deep battle formed with Napoleon’s invasion of Russia in 1812. This invasion forced Russian military theorists to develop a different idea of depth from Western military theorists. Western theorists considered depth in the context of limited battlefields and tactical situations, but Napoleon’s invasion drove Soviet theorists to think about depth in the context of the politic-strategic aim and the logical aspects of military maneuver. Systems and complexity theories did not formally exist yet, but the Russian approach to depth reflected both of these theories. By

⁶⁴ Bulger, 3.

⁶⁵ Shimon Naveh, *In Pursuit of Military Excellence: Evolution of Operational Theory* (Portland, OR: Frank Cass Publishers, 1997), 229.

focusing on the link between the tactical and strategic enemy behaviors, the Russian view of depth suggests a seminal approach to thinking about battlefield operations.⁶⁶

The intense fighting of the Russian Civil War between 1917 and 1922, combined with the lessons from the First World War, forced the Russian military to adapt while directly informing the resulting adaptations.⁶⁷ Both of these situations showed how the mechanization of warfare caused protracted struggles and staggering attrition rates.⁶⁸ During their Civil War, Russian forces fought over spaces measuring between 700 and 1,800 kilometers to attain objectives 600 to 3,000 kilometers deep.⁶⁹ The significant sizes of the operation invalidated the predominant linear form of military operations and forced Russian leaders to adopt new ideas and techniques to be victorious. Over the next decade, Russian theorists like Gai, Isserson, Tukhachevskii, and Primakov built on their idea of depth and their observations of recent conflicts to develop Deep Operation theory or ‘deep battle’.⁷⁰ These theorists identified that the depth of the conflict as a whole encapsulated much more than the limited battlefields, and that they needed a way to attack the opponent’s depth while defending their own.

The intricacy and novelty of deep battle stems from the goal not from the components. The components are all tactical means, while the goal focused on the opponent’s holistic system. Their solution involved three major components operating in unison. The first is the leading echelon which breaks through the enemy’s tactical depth. This is followed by an operational maneuvering echelon to disrupt and destroy the opponent’s depth. The third component is the *desant*, a deep

⁶⁶ Naveh, 169-70.

⁶⁷ Ibid., 166-9.

⁶⁸ Azar Gat, *A History of Military Thought: From the Enlightenment to the Cold War* (New York: Oxford University Press, 2001), 637.

⁶⁹ Naveh, 168.

⁷⁰ Ibid., 165-9.

airborne echelon. The *desant* allowed the Russian military to maximize their reach into the opponent's depth to disrupt opponent operations as fully as possible.

The ultimate goal of deep operations was operational shock, *udar*. To do this they focused on the engagement encounter, *vstrechnyi boi*.⁷¹ The random nature of the individual encounter could not be a reliable step towards winning the entire campaign. Based on the experiences of Russian Civil War and the First World War, the individual battle was no longer decisive, and only the final battle determined the fate of a campaign. The idea was to accumulate tactical success while attacking the opponent's depth.⁷² The leading echelon focused on the *vstrechnyi boi*, allowing the operational maneuvering element and *desant* to engage the opponent's depth directly. The goal became linking the mechanical aspects of the tactical level of war to the abstract definition of depth that linked everything together on the battlefield.⁷³ Russian forces accomplished the operational shock, *udar*, by a succession of blows against the opponent's depth in order to prevent them from achieving their aim, instead of focusing on the simple destruction of the opponent's forces.⁷⁴

The best example of *udar* was the *obkhod*, loosely translated as a turning movement. This was the exact maneuver which strained the limits of the enemy system. The *obkhod* was the "...the swift application of a maneuvering mass in the defensive operational depth...[and] invalidates the relevance of the defender's strategic aim."⁷⁵ With such a turning movement, the enemy has to address the maneuvering force within their operational depth and can no longer focus simply on the front lines. This provides the friendly force with the entirety of the initiative and the ability to

⁷¹ Naveh, 172.

⁷² Ibid., 182.

⁷³ Ibid., 183.

⁷⁴ Ibid., 184.

⁷⁵ Ibid., 191.

completely destroy the enemy force. The destruction occurs at the tactical level, but it happens because of the operational level influence of the shock and turning maneuver.

While developing the ideas behind deep battle theory, Russian theorists were using ideas that relate directly to systems, complexity, and chaos theories. The systems view starts with the unique understanding of depth. Their definition of depth reveals how they viewed the entire system of the conflict, looking at how the tactics, politics, and strategy interacted to define the environment in which their military needed to succeed. Defining depth as they did also changed how they targeted the enemy. The goal for deep battle is to maintain friendly depth while successfully attacking enemy depth. Looking at the entire enemy system led them to thinking about the enemy's ability to adapt to new situations instead of focusing primarily on force destruction. In this manner, they were looking at the enemy as a complex adaptive system, a key idea from complexity theory. If the enemy could adapt on the battlefield, Russia needed to be able to address the entire enemy system in order to emerge victorious. Seeing the enemy as a complex adaptive system meant Russia needed to figure out how to influence the entire system versus just the tactical periphery. The real target was the enemy's operational level, which was much more conceptual than simple attrition.

Since they started with a systems approach to define the problem, they continued to use these ideas to develop the solution. Defeating enemy tactical units was not the end state but a step in the process of address the whole enemy system. Starting with the engagement encounter, they developed an approach that allowed them to influence the entire enemy system. This relates to the chaos theory idea of far-from-equilibrium operations. Each engagement served as an effort to push the enemy away from its equilibrium, which in turn would eventually allow for the penetration action. Once the enemy system allowed the penetration, Russian forces began executing the *obkhod*, capitalizing on the enemy's distance from its equilibrium. This approach revolved around

putting the enemy into a state where they would be unable to act further, when they would achieve *udar*, operational shock.

Furthermore, the systems approach to warfare allowed Russian theorists to devise a doctrine that allowed them to operate in any environment. This idea of interchangeability reflects the idea of system archetypes. They identified the desired system effects for their operations and used it for all operations. Additionally, the unique structure allowed them to operate with the same tactics for both offense and defense operations. Russians believed there were significant amounts of interchangeability between the offense and defense at the operational level. At the tactical level, this meant they would simply have to reverse the flow of offensive operations in order to maintain a successful defense.⁷⁶ This inherent flexibility allowed them to focus on training the same tactics for any operation while preparing for the complex environment facing them.

Starting with Napoleon's invasion, the Russian approach to thinking about and waging war was quite different than the predominant Western approach at the time. They developed a holistic doctrine to address the entirety of their enemy. They took concepts similar to those from modern systems, chaos, and complexity theories and combined these ideas to address a thinking and adaptive enemy. This monograph builds on these Russian ideas to develop the idea of system shock, which attempts to take the major ideas behind deep battle and *udar* and develop an archetype that can be used in the modern Gray Zone.

The System Shock Framework

Systems and complexity theory provide practitioners with new lenses to observe the world. While lenses are helpful at understanding different aspects of a phenomenon, they may not lead directly to action. Complex adaptive systems interact with the environment and adapt over time to varying degrees of success. Applying these concepts to military operations means focusing on

⁷⁶ Naveh, 226.

changing the opposing system in the desired manner, either positively or negatively. This positive or negative change is a bifurcation of the system and relates directly to operational shock. This section describes how operational shock is a specific form of bifurcation, and then outlines the monograph's specific theory for the application of system shock in military planning.

Operational shock is a form of bifurcation. The leading echelon begins pushing the opposing system away from equilibrium before the operational maneuver element and *desant* pushed it to eventual bifurcation and devolution. As described above, the Russians developed operational shock to address the new style of warfare in the First and Second World Wars. Russian leaders understood the enemy system's capabilities and the links between its strategic and tactical levels. They directly attacked the opposing forces, its agents, in multiple places to push the system away from its equilibrium. Once it reached a far-from-equilibrium state, the opposing line of defense would buckle, allowing for penetration. The penetrating force would operate behind enemy lines and operationally shock the opponent. At this point, the intent was for the opposing systems to bifurcate towards destabilization and cease operating as a coherent system. This is where Russian capitalized on the bifurcation to attack the entire enemy system while it was in disarray. However, the Russians were limited in their view of operational shock, in that they saw it as primarily applying to force-on-force altercations. This monograph argues that the concepts of bifurcation and operational shock can be applied to any system of conflict, even when force-on-force altercations are not present. The advantage of the system shock framework is that it offers military planners a way to operate in uncertain environments where conflict may be a possibility, but is not currently ongoing.

Within this monograph, system shock is the entire process that spans identifying the opposing system, successfully inducing its transition to far-from-equilibrium operations, and managing it towards evolution or devolution as it bifurcates in the far-from-equilibrium state. The first step is to conduct a system analysis of the three major systems involved: friendly, enemy, and

the conflict environment. The friendly and enemy system analysis should focus on system capabilities, the agents involved, and internal and external agent relationships. The friendly and enemy systems interact within the higher conflict system. The conflict environment, itself a system, defines and limits how friendly and enemy systems behave and interact. The conflict system analysis is vital to understanding where friendly and enemy systems can interact as well as the potential consequences of those interactions. Additionally, understanding the conflict system helps planners identify what other systems require analysis to affect the targeted opposing system. Another crucial aspect of this system analysis is defining the desired end state of the conflict system. This determines the direction of future efforts for friendly forces.

Closely related to the first step, the second step is conducting a bifurcation, or shock, analysis. Focusing on how the friendly and enemy systems can bifurcate builds on the system analysis. The understanding from system analysis allows planners to determine what a far-from-equilibrium looks like for the opposing system. Once friendly planners understand what the far-from-equilibrium looks like, they can determine what actions could cause the opposing system to bifurcate in the desired fashion. The preferred bifurcation links directly back to the desired future state. The bifurcation does not have to result immediately in the desired future state, but it needs to allow friendly forces to act on the system in a manner that gets them closer to it.

The third step focuses on defining the relevant feedback from the opposing system to know where it is at within its phase space regarding its transition to being far-from-equilibrium. Planners take the enhanced system understanding from the first two steps and develop indicators to monitor the opposing system's state and progress. These indicators could relate directly to agent behavior, but could also link to emergent properties in the opposing system. Planners would begin defining emergent properties in the first step, but emergent properties are most useful in determining system indicators. Once planners determine the appropriate indicators, they can link these indicators to measures of effectiveness (MOEs). Measures of effectiveness are "criterion used to assess changes

in system behavior, capability, or operational environment that is tied to measuring the attainment of an end state, achievement of an objective, or creation of an effect.”⁷⁷ Measures of effectiveness monitor changes in the system, but leaders and planners need to figure out how to manage resources to balance monitoring for the correct indicators and executing the mission.

The next step is developing a course of action that builds on the first three steps to comprehensively address the opposing system and achieve the desired future state. The first step gave planners an understanding of all the involved systems as well as the options those systems have to act on each other and the environment. The second step provided planners with a goal, linked to the desired future state and focusing on the opposing system’s bifurcation. The third step enabled planners and leaders to have the situational awareness on how the involved systems behave. The fourth step combines all of this knowledge to build a plan of action to achieve the desired future state. The opposing system will adapt to friendly actions and constantly attempt to remain near equilibrium. This means that the plan must involve branches and sequels linked to the measures of effectiveness in order to maintain pressure on the opposing system. The plan needs to link decision points to each measure of effectiveness based on certain criteria. The key is incorporating the opposing system’s bifurcation in the plan. The entire goal of system shock is forcing the targeted system to bifurcate, but it is only useful if friendly forces know how to behave when it does.

The last step is mission execution. Within system shock, this means engaging the targeted system to drive it towards bifurcation. The easiest part of system shock is starting to execute the mission because it simply follows the initial course of action from step four.. The hard part of this step is managing the system feedback and adjusting the execution to address the changes that result from the friendly actions on the system. Mission execution rapidly becomes much more difficult

⁷⁷ Army Doctrinal Reference Publication (ADRP) 5-0, *The Operations Process* (Washington, DC: Government Printing Office, 2012), 5-2.

because the conflict system behavior may negate major aspects of the initial course of action. This involves continuing to update the information from the first four steps even though friendly forces are conducting the mission. Changing mission and course of action requires an organizational flexibility to do whatever is needed to shift focus as required to continue pushing the targeted system towards bifurcation and achieve the desired future state.

The Gray Zone

The literature review explained the valuable ideas to the system shock framework. Next, the monograph explained the theory to clarify the steps involved. This section of the monograph will explore what the Gray Zone is and how it can be understood as a complex adaptive system.

Clausewitz declared that war has its own grammar, but not its own logic.⁷⁸ To build on this idea, Dr. Antulio Echevarria developed the idea that the US Army operates primarily in two different grammars. The first grammar involves overthrowing an enemy using armed force, while the second grammar involves irregular warfare akin to insurgent or guerilla operations.⁷⁹ He went on to propose that many of the US Army's recent struggles in Afghanistan and Iraq stem from trying to use first grammar and superior force in situations where the second grammar would be more effective. Military leaders attempted to explain the difficulties of operating in second grammar environments with doctrinal updates, but one of the best explanations was from Marine General Charles Krulak. He described a metaphorical 'three block war' to show the complexity of the modern battlefield. On one block, soldiers conduct humanitarian assistance by helping the local population. On the second block, they conduct peacekeeping operations amongst local power brokers. On the third block, soldiers actively combat opposing forces.⁸⁰ Of these, only the third

⁷⁸ Clausewitz, 605.

⁷⁹ Echevarria II, 137.

⁸⁰ Field Manual (FM) 3-06, *Urban Operations* (Washington, DC: Government Printing Office, 2006), 1-7.

block works well with the American military's preference for the first grammar. When operating in such a complex environment, the US military has struggled to find regular success.⁸¹

In an effort to help clarify the complexity, Philip Kapusta coined the term, 'Gray Zone', and defined it as "competitive interactions among and within state and non-state actors that fall between the traditional war and peace duality."⁸² These conflicts involve "ambiguity about their nature, opacity of involved party's involvement and intent, and uncertainty of the relevant legal and policy framework."⁸³ They are not peace time operations. While the term is new to the military lexicon, Gray Zone operations are not.⁸⁴ Arguably, they are closer to the political warfare of the Cold War, aiming to "to influence, to persuade, even to co-opt" populations.⁸⁵ Indeed, Kapusta argued that the majority of American military actions in the last century fit the Gray Zone definition. The Gray Zone is much closer to the historic nature of war than its new definition would indicate.⁸⁶ Despite this history of involvement in ambiguous conflicts, where large-scale, conventional conflicts like the World Wars or the Gulf War are the outlier, the conventional conflicts, not Gray Zone style scenarios, are currently the model for most training events.⁸⁷

Similar to the 'three block war', Gray Zone operations can transcend both grammars and force military leaders to deal with a fluid environment requiring significantly more than the first

⁸¹ Record, 16-7.

⁸² Philip Kapusta, "The Gray Zone," *Special Warfare*, Vol 28, Issue 4 (October – December 2015): 20.

⁸³ Ibid.

⁸⁴ Michael Mazarr, *Mastering the Gray Zone: Understanding a Changing Era of Conflict* (Carlisle, PA: US Army War College Press, 2015): 3.

⁸⁵ Joseph L. Votel et al., "Unconventional Warfare in the Gray Zone", *Joint Forces Quarterly* 80 (2016): 102.

⁸⁶ Kapusta, 20-1; Adam Elkus, "50 Shades of Gray: Why the Gray Wars Concept Lacks Strategic Sense", *War on the Rocks*, last modified 2017, accessed March 30, 2017, <https://warontherocks.com/2015/12/50-shades-of-gray-why-the-gray-wars-concept-lacks-strategic-sense/>.

⁸⁷ *Forces Command (FORSCOM) Training Guidance, Fiscal Year 2014* (Fort Bragg, NC, 2013), 3.

grammar fluency the American military knows so well. Within any conflict, there are multiple actors, and the Gray Zone is no exception. The various actors work in their own self-interest but also form alliances to further those interests. These alliances further complicate the conflict environment. Actors include states, non-state actors, and the local population.⁸⁸ State actors are those people or organizations acting on behalf of a country. Involved state actors could be from the state hosting the Gray Zone conflict, bordering states, or more distant but interested parties. This definition includes everything from local government officials to militaries to state dignitaries. Non-state actors are people or organizations acting in their self-interest without recognized allegiances to particular countries. They have a vested interest in the outcome of the conflict and behave in a manner to achieve their ends.

Another actor in the Gray Zone is the local population, observing the conflict firsthand with its culture and traditions.⁸⁹ The requirement to include the local population as an actor makes the environment significantly more complex than purely battlefield operations with clearly defined forces. Considering the population's point of view is a key aspect of second grammar interactions, but it is something most first grammar conflicts typically ignore or treat as secondary concern. In many cases, concern for the population takes the guise of collateral damage planning efforts. Destroying fewer homes and infrastructure is a key to successful second grammar operations, but that is a very limited point of view, which could potentially hinder successful operations among a population. The local population is a Gray Zone actor that is just as important as the state and non-state actors fighting the actual conflict. The population itself is a complex adaptive system, composed of multiple sub-adaptive systems that influence each other, and the overarching Gray

⁸⁸ Votel, et al., 103.

⁸⁹ Ibid; Army Techniques Publication (ATP) 2-01.3 Change 1, *Intelligence Preparation of the Battlefield* (Washington, DC: Government Printing Office, 2015), 3-6.

Zone system. The importance of this actor relies not only in its ability to influence the state actors, but also because it is a key recruiting pool for many of the non-state actors opposing US interests.⁹⁰

In addition to the actors' interactions, the location of the conflict directly adds to the complexity of the environment. In this sense, the terrain is another actor in Gray Zone conflicts. Military leaders learn about the importance of terrain starting from the first moment of training. Terrain affects tactical military options in a conflict, with advantages going to those who possess high ground and avenues of approach.⁹¹ Additionally, the terrain interacts with the population and affects how the area's culture develops and interacts with itself and outsiders.⁹² For example, the mountains of Afghanistan limit how the central government interacts with its territories and people. The open desert of the Middle East is just as influential to the peoples and cultures of that region. In both cases, the terrain directly affects how the complex adaptive systems behave. Each of these terrains affects how the individuals in each area interact with each other to communicate ideas. The resulting culture is a conceptual actor in the Gray Zone that further complicates the conflict's environment.

Terrain is not limited to the geography of the landscape but includes the manmade physical infrastructure. Terrain influences how the fighting actors interact with each on the military level, but just as importantly, it influences how the population interacts with all of the actively fighting actors. The terrain is a key actor to the Gray Zone because it shapes the Gray Zone as a complex adaptive system. It shapes how often and where the different actors interact to pass on the various ideas and narrative each actor is trying to popularize. In addition to terrain, modern technology is another key factor in how the various actors interact with each other.⁹³ Many of the various

⁹⁰ Votel et al., 103.

⁹¹ ATP 2-01.3, 3-6.

⁹² Charles Tilly, *Coercion, Capital, And European States*, 1st ed. (Malden, MA: Blackwell, 1992), 125-6, 187-8.

⁹³ Axelrod and Cohen, 68 – 70.

locations do not have the same modern technological infrastructure as the United States, but what is present still holds significant sway over how the actors relate to each other.⁹⁴

The interactions between state actors, non-state actors, the population, and the terrain combine to make the Gray Zone a complex environment, but they do not define it. The Gray Zone is “aggressive, perspective dependent, and ambiguous.”⁹⁵ The aggressive aspect of the Gray Zone should be self-evident. For there to be a conflict, there needs to be a disagreement that is so egregious at least one party is willing to pursue their goals militarily with either their organic forces or through a proxy. This aggressiveness is key to the Gray Zone because if it was not present, the issues could be solved diplomatically. This relates to Clausewitz’s proclamation that war is politics by other means.⁹⁶ The aggressiveness does not have to be violent, but if the ability to suppress or control the environment requires US military assets, the environment begins to become the Gray Zone.

The Gray Zone is perspective dependent because each actor has its own point of view that sets the foundation for how they approach the conflict.⁹⁷ The respective points of view also influence how the various actors respond to other actors’ behavior. In addition to the actors involved directly with the conflict, the international community has direct influence on the proceedings.⁹⁸ Each of the different perspectives changes the interactions and the potential options of the state actors in the conflict. The international community’s perspective is a key target for the

⁹⁴ ATP 2-01.3, 4-32.

⁹⁵ Kapusta, 20.

⁹⁶ Clausewitz, 87.

⁹⁷ Kapusta, 20, 22.

⁹⁸ Ibid., 22.

non-state actors in the conflict because of how much sway the community can hold over the state actors in the Gray Zone.

By definition, the Gray Zone lies between the clear lines of war and peace, making the entire environment ambiguous to the militaries involved. The clear nature of first grammar operations makes it easy for military commanders to make decisions about planning and executing operations. Even second grammar operations are clearer than the Gray Zone because there are clearer lines about who is fighting for what.⁹⁹ The second grammar involves counterinsurgencies and guerilla warfare where the combatants are relatively well defined even if they blend well with the populace. In the Gray Zone, many of the actors are similar to those found in second grammar operations, but there is a difference in the nature of the conflict. The biggest difference is the politically charged nature of the situation, meaning each friendly action has layers of consideration beyond tactical effectiveness.¹⁰⁰ In the Gray Zone, each actor sees the conflict through their own lens which drives them to approach the conflict in whatever way they think will help achieve their goals. This desire pushes each actor to approach the situation asymmetrically to attain their goals. The asymmetric approach makes these actors difficult to predict and makes the Gray Zone conflict even more complicated for military leaders because other actors become willing to behave outside of accepted norms for the current environment.

The complex Gray Zone environment is more difficult than either first or second grammar conflicts because it can involve both of these grammars in a combination that can constantly fluctuate. The various agents and their interactions causing these fluctuations make the Gray Zone a complex adaptive system. Planners and leaders need to “analyze what the enemy is trying to do, how he will do it, what we are willing to do to thwart him, and how we think we can thwart

⁹⁹ Echevarria II, 137.

¹⁰⁰ Kapusta, 22.

him.”¹⁰¹ Using systems shock can give military leaders the ability to handle this complex environment as well as possible.

System Shock in the Gray Zone

After establishing the Gray Zone as a complex system, the monograph will now apply the system shock framework to the Gray Zone. This section builds on the previous one and goes through each step of the system shock framework.

System shock’s first step is conducting a system analysis of the three major systems involved in the conflict: the friendly system, the enemy system, and the conflict system. The first two systems are very clear and part of the natural process. The addition of focusing on the entirety of the Gray Zone system forces planners to analyze all of the involved agents in the conflict. This includes the civilian population, the culture, the neighboring countries, and any proximate non-state actors. By widening the lens of analysis, planners are able to expand the commander’s options for actions because indirect approaches may be the best way to influence the targeted opposing system. This step is also the first time planners address the perspective dependent nature of the Gray Zone. A comprehensive analysis of the Gray Zone system would identify and allow for the differing perspectives of the involved actors and sub-systems. By incorporating all of the different perspectives, this step can also help clarify the ambiguity of the Gray Zone by better defining agent interests and the links between all of the different agents within the conflict system.

The second step is conducting a bifurcation, or shock, analysis of the involved systems, focusing on the enemy system. This step builds on the previous steps because it takes a holistic system understanding to anticipate what shock, the inability to respond as a system to external actions, looks like in any of the systems involved in the Gray Zone conflict. The initial system analysis mainly focuses on pre-conflict systems, which, depending on the conflict system, are close

¹⁰¹ Elkus.

to their equilibriums. Planners need to understand how both the friendly and enemy systems might behave as they approach their respective far-from-equilibrium states. Understanding what this state looks like allows planners to anticipate how to push the opposing system to shock, in order to achieve the desired future state. Additionally, understanding what the friendly system looks like at far-from-equilibrium, and eventually shock, gives planners the ability to establish mitigation measures in the plan to keep the friendly system operating near equilibrium.

The third step is defining the relevant feedback from the opposing system that will inform friendly planner and leaders of how the enemy system is progressing towards bifurcation. This step should come naturally during the first two steps, but needs special attention within the system shock framework because it provides leaders and planners with the ability to monitor for the desired changes within the involved systems. The key to this step is to focus on emergent system properties versus simply system properties. Feedback needs to focus on changes in the system, reflected in emergent properties, versus the system's simple characteristics. These emergent properties will be different for each type of system involved; state-sponsored systems will have different emergent properties from non-state or population systems. Given the politically-charged nature of the Gray Zone, friendly forces will most likely have limited freedom of action. Looking for and gathering feedback from any of the involved systems take time and resources away from the conflict. Therefore, focusing on the most relevant feedback, the emergent properties, allows planners to conserve resources to be available to act on the system.

The fourth step in the system shock framework is developing a course of action that builds from the first three steps to address the opposing system to achieve the desired future state. The key part to this step, especially in the Gray Zone, is to understand that every involved system will adapt to friendly actions. Friendly forces cannot act without anticipating and adjusting to the new behaviors in all of the related systems. In this sense, the course of action should involve numerous, simultaneous efforts to affect the targeted system as well as branches and sequels for anticipated

changes. These actions and planning options should link specifically to the defined feedback from step three in order to induce the desired shock state and thus achieve the desired future state.

Planners should ensure that there is a plan of action for when the targeted system reaches its state of shock, as well as for the potential effect this shock would have on adjacent systems.

The final step is executing the mission and managing friendly forces to push the enemy system to bifurcation. The initial deployment and action within the Gray Zone would be the easiest part of this process because it would be rehearsed prior to implementation. The difficulty comes from adjusting the plan and execution while forces are engaging with all of the different agents in the Gray Zone system. The politically charged nature of the Gray Zone means that the friendly higher system, as well as the international community, will be looking at friendly actions. This is an additional consideration in how friendly forces in the Gray Zone plan and execute operations. As the system adjusts to friendly actions, the friendly system needs to modify its approach as well. Additionally, the friendly system needs to be constantly ready for the Gray Zone conflict to shift towards a first grammar conflict involving more overt, conventional action. Considering all of this, executing operations in the Gray Zone requires constant vigilance on system feedback, as well as the organizational flexibility to change approaches as needed, to keep moving towards the desired future state.

Unified Land Operations

To this point, this monograph proposed the system shock theory, explained the complexity inherent to Gray Zone operations, and described how system shock could work in the Gray Zone.

This section actively applies system shock to Unified Land Operations and suggests various ways it can help operational artists in the current operational environment.

The military's duty is to fight and win the nation's wars.¹⁰² This is also the most traditional use of operational shock since it involves two fighting forces. Current Army doctrine focuses on unified land operations. ADRP 3-0 defines unified land operations as:

“...the simultaneous offensive, defensive, and stability or defense support of civil authorities tasks to seize, retain, and exploit the initiative and consolidate gains to prevent conflict, shape the operational environment, and win our Nation's wars as part of unified action.”¹⁰³

This definition breaks down into three components. The Army consolidates the first part under the term decisive action. Decisive action encompasses the “...the continuous, simultaneous combinations of offensive, defensive, and stability or defense support of civil authorities tasks.”¹⁰⁴ The second component is the seizure, retention, and exploitation of the initiative. The third is consolidating the gains from the second step. These three ideas are sequential in theory but become simultaneous in execution. The theory of bifurcation overlays very well onto the three major aspects of unified land operations and provides practitioners with a conceptual framework to approach any environment, especially the Gray Zone.

System shock involves driving a system far from its equilibrium to a point where it either devolves or evolves. In order to do this, planners need to understand both the friendly system's capabilities and limitations as well as the intricacies of the other system. This understanding is crucial to unified land operations because it allows military leaders and planners to determine what decisive action tasks need to happen; how to best seize, retain, and exploit the initiative; and how to most effectively consolidate gains. For Gray Zone operations, this means planners need to know

¹⁰² "Organization | The United States Army", *Organization | The United States Army*, last modified 2017, accessed March 9, 2017, <https://www.army.mil/info/organization/>.

¹⁰³ ADRP 3-0, 3-1.

¹⁰⁴ *Ibid.*, 3-1.

where they are going, who the major actors are, and the history of the area. The focus of this system analysis should be on the interactions between the different actors and their potential motivations. Since the Gray Zone is politically charged, the systems analysis should emphasize the conceptual system where the actors and the motivations operate. This overarching system may not be the same system the operation is to focus on, but it will certainly influence friendly forces' ability to influence the targeted system. The whole process of achieving victory starts with the holistic systems analysis of the actors involved in the operation.

Due to its nature, the Army focuses primarily on the land domain, but this is not the only way to influence an opposing system. Systems thinking emphasizes the importance of not limiting analysis to any particular discipline. This idea relates to decisive action because the Army does not fight alone. Current Army doctrine incorporates “not only joint and multinational, but also interagency, intergovernmental, and nongovernmental partners as critical to the conduct of operations.”¹⁰⁵ Additionally, ADRP 3-0 states “...Army commanders must seize opportunities across multiple domains to enable their own land operations, as well as the operations of our unified actions partners in the other domains.”¹⁰⁶ A successful plan most likely, but not always, incorporates other domains. This means being able to integrate the Air Force, the Navy, and more importantly, other government agencies. As a military organization, the Army trains to operate in a joint environment with its sister services, but other government organizations can also provide effective tools to influence the opposing system. The theory of system shock calls for a plan of action that interacts with the opposing system in multiple ways in order to get the best effect. Within the acceptable rules of engagement, there should be few if any limits on where friendly forces look to influence the opposing system. It is in this multi-domain approach that the best plan can occur,

¹⁰⁵ Army Doctrine Publication (ADP) 1-01 *Doctrine Primer* (Washington, DC: Government Printing Office, 2014), 3-5.

¹⁰⁶ Army Doctrinal Reference Publication (ADRP) 3-0, *Unified Land Operations* (Washington, DC: Government Printing Office, 2011), 1-1.

because such an approach provides the greatest flexibility to present the opposing system with multiple dilemmas.

The diverse nature of decisive action includes any action the Army trains to execute offensive, defensive, stability, or defense support of civil authorities operations.¹⁰⁷ This range provides operational artists with a multitude of military tasks or tactics to bring to bear in any operation. The challenge becomes knowing which ones should work, where to employ them, and how to organize their employment. The challenge only becomes greater when trying to combine these three ideas in time, space, and purpose to meet the continuous and simultaneous aspect of decisive action. Overcoming these challenges requires understanding the systems involved in the conflict.

Decisive action is the way that operational artists push opposing systems away from their stable equilibrium towards the edge of their respective phase space. This relates to the idea of the system's entropy. The opposing, open system needs to constantly absorb energy from the environment. Friendly decisive action adds to the energy the opposing system absorbs. There are two implications of this idea. The first is that decisive action can overwhelm the opposing system's ability to manage the amount of energy it absorbs from the environment. The second is that the nature of dissipating useful energy could lead to the system evolving into the desired end state over time. Arguably, the second idea is far-fetched since if it could reach the desired end state without stimulus, military forces would not be needed to intervene. The point is more that simply overwhelming the system may not be the best plan for the system. The second aspect relates to the opposing system as a complex adaptive system. In this sense, it will eventually adapt to the addition of decisive action to its environment. This means constantly doing the same thing will simply allow the other system to attain a new equilibrium. The need for simultaneity and continuous action to

¹⁰⁷ ADRP 3-0, 3-1.

overcome the opposing system's ability to adapt requires relevant and constant feedback from the different systems.

Since system shock theory means pushing a system to its breaking point, military planners need to be aware of how operations are affecting the systems and whether or not those effects put it closer or further away from its equilibrium. The Army uses the joint terminology of measures of performance and effectiveness to evaluate operations. Measures of performance (MOPs) are "...criterion used to assess friendly actions that is tied to measuring task accomplishment."¹⁰⁸ Measures of performance simply evaluate how well friendly forces execute the assigned tasks. Measures of effectiveness (MOEs) are "...criterion used to assess changes in system behavior, capability, or operational environment that is tied to measuring the attainment of an end state, achievement of an objective, or creation of an effect."¹⁰⁹ Measures of effectiveness have the most bearing on the theory of bifurcation because they, by definition, serve to monitor changes in the system. Within the theory of bifurcation, measures of effectiveness allow military personnel to refine their systems analysis and the plan for success. This refinement relates directly to the feedback principles from complexity theory because it changes the way the friendly system operates within its environment.

This feedback from decisive action leads directly to the next phase both unified land operations and system shock theory. Successful decisive action pushes the opposing system away from its equilibrium, allowing friendly forces to seize the initiative. In this sense, unified land operations are a complex system itself. Both the initiative phase and the gains consolidation phase require continued decisive action. The holistic nature of the tasks covered by decisive action include all of the tools leaders and planners can use to seize, retain, and exploit the initiative and to consolidate the gains from exploitation. Within bifurcation theory, the initiative is the conceptual

¹⁰⁸ ADRP 5-0, 5-2.

¹⁰⁹ Ibid., 5-2.

place where the opposing system is bifurcating. Seizing the initiative occurs when the opposing system is nearing or occupying the conceptual far-from-equilibrium state. Retaining it occurs by keeping the system in the same space. Exploiting the initiative happens when the opposing system actually bifurcates. As stated previously, this all relies on the idea of a complete and constant system analysis to know what far-from-equilibrium looks like for the opposing system and whether it is there or not.

This all leads to the goal of unified land operations, consolidating gains. To consolidate gains, friendly forces continue using decisive action to set conditions for future operations. Successfully consolidating gains requires the same in-depth systems analysis and meaningful feedback mechanisms mentioned previously. This step mirrors the final step in the bifurcation theory. Since exploiting the initiative equates to bifurcating the opposing system, consolidating gains is controlling the opposing system's bifurcations in the desired manner.

Since unified land operations are a complex system, a single gains consolidation may not be the final step in a successful operation. It could simply serve as a push towards far-from-equilibrium to seize the initiative in a larger system. Much like a single patrol or battle will not win a war, a single operation may not accomplish the end state. It is the weaving of multiple operations and bifurcation iterations that allows friendly forces to achieve the desired end state. This is another place where thinking about the problem with a systems lens is beneficial. Each environment is a system of systems. The desired future state revolves around the entire opposing system, which is made up of many smaller systems.

This relates directly to military planners. Not everything works well through a first grammar lens, especially in the modern battlefield. Analysis through a first grammar lens is a type of systems theory, just a rudimentary version. Since first grammar focuses on conventional forces, the systems analysis would be limited to just the military forces versus the entire opposing system. Using a more complete systems framework, military planners can choose the best lens to observe

the environment instead of using the most popular lens available. There is no singular best lens, rather, the determination of the best lens for an environment should result from the system analysis. For the military, this may require bold thinking and leadership, because the best lens and eventual solution may mean something that does not involve the application of violence, or even the subservience of the military arm to a different arm of government. If the goal is truly success in terms of meeting the political aims, the military should be comfortable with these kinds of situations. This is where a systems mentality is beneficial to military planners and leaders.

For the military planner, everything is focused on changing the opposing system through external means. This can limit the means available to change the opposing system. Even internal changes to a military organization should be focused on better addressing the organization's ability to induce change in the opposing system. This idea gets more complicated though if planners choose to look at the friendly and enemy complex systems as a system of itself. In this case, even the external stimulus on the opposing system is technically an internal stimulus within the context of the battlespace. In each of these cases, the validity and importance of the perspective is reliant on the planner's ability to use the perspective to meet the commander's and the political intent of the operation.

Analysis

For any military theory to be useful, planners and leaders must be able to apply it to the current battle space. For the case of system shock, this applicability brings strengths and weaknesses. The first strength is that system shock can apply to any environment involving military forces. In first grammar situations, system shock looks just like operational shock. In second grammar situations, it provides a framework to shock the opposing system, rather than focusing on the opposing forces. For the Gray Zone and its blurring of grammars, it allows practitioners to focus on the relevant system, whatever it is, and execute actions to push it away from its equilibrium by enabling whatever action is needed to shock the system. The equal applicability leads to the second

strength of the systems shock approach, flexibility. Following the steps of system shock enables incredibly flexible plans constantly focused on achieving the desired future state. Not only can the framework apply to any environment, but it supports any action needed to succeed. All of the framework steps apply equally in all environments. The style of conflict simply dictates the available options, not the viability of systems analyses or bifurcation.

The last major strength of this framework is its ability to address the human nature of war. War is a human endeavor, “a fundamentally human clash of wills and emotions.”¹¹⁰ This means that for any framework or theory to be useful in application, it must address the human aspect of warfare. The complexity of human interactions means the conflict system is nonlinear, leading to Butterfly Effects and limited predictability. System shock addresses these elements through its use of complexity theory and emphasis on system analyses. For Gray Zone conflicts, there are numerous interested actors serving as agents within the conflict system. Each actor adjusts and learns within the system in order to continue pursuing its ends. System shock allows planners and leaders to stay abreast of these changes and to continue addressing the targeted system’s changing behavior. This is vital to system shock’s successful implementation. As the opposing system continues to pursue its own objectives with an unwavering will, friendly forces need to address the opponent’s stubborn pursuit of its interest. Adhering to the steps and spirit of the system shock framework brings a flexibility and capability to execute operations in any military environment.

However, war’s human element also leads to system shock’s weaknesses. The first weakness relates to the amount of organizational flexibility in the friendly system required to execute system shock effectively. System shock briefs well, but it is difficult to implement a comprehensive, flexible plan. Moltke famously said that “no plan of operation extends with

¹¹⁰ ADP 1-01, 3-1.

certainty beyond the first encounter with the enemy's main strength."¹¹¹ Despite this reality, militaries have to fight the plan they develop. In fluid Gray Zone conflicts, friendly forces need to constantly adjust the plan to attack the opposing system effectively. System shock calls for operational flexibility, but in an action- and result-oriented organization, shifting course during mission execution is difficult for all but the most flexible of organizations.

Organizational limitations also reflect two more weaknesses to the system shock framework. The first of these weaknesses is that every military operation happens at the tactical level, regardless of the resultant effects. System shock does not solve the operational difficulties of linking tactical means to the strategic or operational ends. It is the soldier on the front lines that has to execute the plan. For many units, the available, executable tasks are kinetic in nature. The American soldier and junior leaders are incredibly resourceful and creative, but with the majority of the training they receive focused on conventional fights, the applicability of these kinetic tasks depends heavily on this creativity to be successful in Gray Zone environments. Each of the unit's actions has an effect on the opposing system and on the entire conflict system, therefore the unit's understanding of how their actions affect the system is critical to creating constant effective pressure on the opposing system. However, soldiers and junior leaders may struggle to create this effective pressure if there is no kinetic action they can grasp to achieve it.

Expanding on this, the ability to attack an opposing system almost certainly requires additional, external assets. This need for external support is another potential weakness of the system shock framework. Attacking the enemy system requires at most a whole-of-government approach and at least a whole-of-service approach. Due to interservice or interagency rivalries and friction, this requirement makes attacking the entire enemy system more difficult. The political sensitivity of Gray Zone environments means that available assets will most likely be limited,

¹¹¹ Helmuth Graf von Moltke, *Moltke on the Art of War*, ed. Daniel J. Hughes, trans. Daniel J. Hughes and Harry Bell. (New York, NY: Ballantine Books, 1993), 45.

further restricting available assets. This compounds the difficulty of actions happening at the lowest level. Not only do friendly forces have to nest everything with the higher purpose, but they have to execute the mission with limited resources.

The last major weakness of the system shock framework is the need for accurate and specific feedback. There are two aspects to this weakness. The first is knowing what the right feedback is to understand the targeted system. This requires intimate knowledge of how the system operates. What changes to the system indicate the changes friendly forces want to see in the system? There are numerous agents and systems interacting within a Gray Zone conflict. Each of these can provide relevant and irrelevant feedback to the friendly plan of action. It takes a mixture of expertise and luck to know which aspects of which systems are relevant or will become relevant to friendly decisions.

This leads to the other aspect of this weakness, which is the need to measure the viable feedback. Measuring the feedback happens at the tactical level, by those lowest level soldiers or external support assets. Not only do friendly forces have to know what feedback is relevant, but they have to know how to observe and measure it in a meaningful manner. Unfortunately, knowing what to do is only part of the problem. Observing, measuring, and reporting on the feedback requires manpower and assets that are not directly affecting the system. In fact, measuring the feedback inherently changes both the friendly and targeted systems. The friendly system shifts manpower and focus, and the targeted system changes to adapt to the new behavior within the overarching conflict system. Friendly forces need to continuously monitor these changes to maintain its pursuit of pushing the targeted system towards bifurcation. This costs resources at the expense of mission execution, while also changing the overarching system.

Conclusion

This monograph showed how system shock combines systems, chaos, and complexity theories to explain operational shock in a way that allows it to serve as an archetype for military

operations in the Gray Zone. The possibilities do not end there. The Gray Zone encompasses both of war's grammars, but the military's mission is not always combat against a resisting foe. There are many missions where military forces are conducting humanitarian assistance or training other country's militaries. The same system shock ideas could easily apply to these situations. It is easy to think about being far from equilibrium as a negative event, but this is not always the case. For non-combat related missions, military planners can still focus on shocking the targeted system. Instead of trying to disrupt a system towards unorganized chaos, however, planners can focus on disrupting it towards evolution. Positive aims and goals can drive a system from equilibrium as much as negative ones. Similar to how a systems lens allows planners to use the same framework in both combat grammars, a systems lens can also work in non-combat related situations.

System shock theory begins with the combination of major ideas from systems, complexity, and chaos theories. Systems theory provides the foundation of the theory with the ideas of interdisciplinary applicability of ideas and best interpreting the world as systems of varying size and complexity. Systems theory leads into the idea of complexity theory, with the need to understand the nature of system interactions within the environment. Complexity theory provides the idea of complex adaptive systems that work within the environment. Systems adapt through interactions within their own components, the environment, and other complex adaptive systems. Complexity theory also provides the idea that an input on the system can have unpredictable results within a range of possibilities. Chaos theory provides the idea of phase space to describe a system's operations and stability. As the conceptual range of a system's options, phase space becomes a framework to understand far-from-equilibrium operations and the resultant consequences of bifurcations in this conceptual space.

For leaders and planners, system shock provides a model for how to think about enemy responses and the desired effect of friendly actions. How can the organization drive the opponent away from its phase space equilibrium? Once the opponent gets to the point of bifurcation, how can

friendly forces shape the evolution or devolution depending on the mission? These rhetorical questions show the validity of this construct while emphasizing other key tenets, specifically multi-domain and whole-of-government operations. Violence and force alone struggle to be sufficient in accomplishing systemic change in any external organization. Economic and social actions need to go hand in hand with military action to exert lasting change. This means that politicians, State Department, and other government organizations need to be active participants in and around the battlefield to address the complexities of the Gray Zone.

In conclusion, this monograph intended to provide operational artists and military practitioners with an additional lens to use when planning and executing operations. The theory of system shock does not dictate specific action. Instead, it proposes a conceptual framework to interpret and understand how operations progress. There is no such thing as the perfect plan, and no amount of systems analysis can predict the exact course of future events. The intent of this theory is to train the military planner's mind to look for connections in more places and with a greater purpose behind short term gains. The current battlefield is complex, and the military needs to do everything it can to prepare itself to operate and excel in this environment. The ideas of first and second grammar describe some of the major categories of military operations. One hope of this theory is that it encompasses both without negating either. A true systems approach is not limited to either grammar and does not suffer from any preconceived notions on how to handle a particular mission. System shock theory can help operational artists develop a more complete plan to achieve the political end state, but this theory only useful if it helps achieve victory. Ideas about how to plan and execute are one thing. Executing and winning are something else. Hopefully, the ideas from system shock help to close that gap.

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