Complexity Leadership

in Military Command and Control

by Valiant Haller

The current military environment is complex and characterized by rapid technological change, dispersed decision-making requirements, and an increasingly interconnected battlefield. The advent of uncrewed aircraft systems (UAS), increased access to information sources, and artificial intelligence-enabled analysis tools compress commander's decision-making cycles and require the exercise of prudent initiative at the point of need. As Dr. Forsyth noted, technological advancements, such as increased drone use and artificial intelligence processing, are widely available and changing the character of warfare and shifting traditional domain boundaries.[1] The U.S. Army doctrinal approach, *Mission Command,* which is taught throughout professional military education (PME) and specialized schools such as the School of Advanced Military Studies (SAMS), emphasizes adaptation and the ability to operate within uncertainty.[2] This implies the well-established professional understanding of complexity must be addressed directly in planning and execution to address the challenges presented by the current environment.

While doctrine and PME promote decentralized execution, they may not always offer a clear theoretical explanation for how commanders can structure the boundaries that enable subordinate leaders to exploit complexity without fracturing coherence. The emphasis Uhl-Bien et al.'s Complexity Leadership Theory (CLT) places on adaptive and emergent leadership within complex adaptive systems may offer a unifying framework.[3] CLT clarifies the leadership mechanisms, such as intent, authorities, limitations, and risk, that allow commanders to shape conditions, establish boundaries, and create the adaptive space needed for innovation. This results in enabling subordinate

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leaders to sense, interpret, and act on emerging opportunities.

Making sense of the environment requires careful consideration of the relevant factors and relational contexts. Research by Boulton et al., Davis, Stacey, and Yarger demonstrated the need for executive leaders to view each environment as an interconnected system that uses various processes to sense current relationships and tensions and to identify opportunities to shift toward desired goals.[4] The result of their research shows that understanding current environmental factors begins the process of identifying opportunities for actions that enable future success and must be done at each decision-making level. Contextual sensemaking empowers organizational structures to take advantage of presented opportunities at every level.

Future military successes depend on balancing organizational structures and understanding complexity in dynamic military environments. CLT sets conditions for complex adaptive systems (CAS) to mitigate the limitations of traditional military leadership models in military operations.[5] Therefore, CLT through CAS enables military leaders to adapt to changing environments and situations. Integration of CLT as an interpretive lens strengthens the Army's existing approach by explaining how decentralized action, continuous learning, and emergent problem solving occur within defined parameters and the traditionally hierarchical military structure.

Purpose of the Study

This paper aims to contribute to the body of knowledge on how applying CLT within military command and control (C2) enhances adaptability and effectiveness. In 2024, Dr. Forsyth issued the challenge to conduct a deliberate analysis, using the Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities, and Policy (DOTMLPF-P) framework, to identify the skills, behaviors, and competencies required to succeed in dynamic and complex military environments.[6] The critical components of CLT include adaptive leadership, emergent leadership, strategic thinking, data literacy, and decentralized leadership. Examination of CLT components informs the analysis within the Leadership and Education domain of the DOTMLPF-P framework.

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There is an opportunity to explore the familiarity with CLT required by military leaders to succeed in dynamic, complex environments and to build a comparative advantage on the modern battlefield. This examination of two CLT components, adaptive and emergent leadership styles, informs the discussion seeking solutions to address the complexities of military command. Consideration of ways to integrate CLT into existing leadership development programs and methods is essential for full implementation across the military.

Applying the two concepts of CLT addressed here requires integration into existing leadership development processes. The three elements of military leadership development—institutional, operational, and self-development—present unique opportunities for incorporating CLT into military leadership programs.[7] Operational-level opportunities for cultivating adaptive, decentralized, and emergent leadership exist in current training and military operations simulations, multinational security cooperation activities, and real-time exercises. Continuous development and learning empower successful military leaders to face the complexities of modern battlefields consistently.

Thesis Statement

Integrating CLT into military command and control provides a coherent framework for how commanders can set adaptive boundaries, through intent, limitations, authorities, and priorities, which enable subordinate leaders to effectively exploit complexity. While the U.S. Army's doctrine and professional military education already emphasize decentralized execution, CLT clarifies the mechanisms through which adaptive and emergent leadership enhance operational effectiveness across dynamic, technologically advanced environments.

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Complexity Leadership Theory (CLT) Overview

Defining CLT

Mary Uhl-Bien et al. describe leadership within CLT as a dynamic interaction "learning, creativity, and adaptive capacity of complex adaptive systems (CAS) in knowledge-producing organizations or organizational units."[8] Rather than relying solely on linear, prediction-based planning models, CLT views organizations as interconnected systems where outcomes emerge from relationships, interactions, and environmental shifts. This perspective aligns with the military understanding that leaders must continually make sense of evolving conditions. New or updated knowledge increases situational awareness and reveals opportunities for novel solutions adapted to the evolving environment. Integration of operational-level organizations with higher strategic goals and lower tactical-level actions creates a more cohesive military system.

A key contribution of CLT is its clear distinction between control and command. Traditional hierarchical command structures rely on deterministic cause-and-effect assumptions which expect leaders to predict future conditions, plan responses, and direct organizations to execute. The basis of the mechanical, also known as Newtonian, worldview is the assumption of control, leading to planning for known, predictable reactions to military action.[9] In contrast, CLT recognizes that uncertainty limits prediction and leaders must shape conditions rather than prescribe detailed actions.[10] These contrasts suggest that empowering subordinate commanders for distributed, situation-dependent decision-making may be possible through the establishment of boundaries within their areas of responsibility.

CLT encourages continuous learning and adaptation by focusing on how organizations and individuals respond to changing conditions. Sensing the environment and seeking a new understanding of relationships enable progress beyond managerial task-based controls.[11] In this way, CLT complements existing concepts such as Mission Command and systems thinking empowering leaders to continue examining the environment to find new understanding and create conditions for innovative solutions in dynamic and unpredictable situations. CLT enhances existing frameworks like Political, Military, Economic, Social, Information and Infrastructure (PMESII) and the Joint Planning Process, which encourage iterative sensemaking and adaptation.[12] CLT focuses on influencing directional changes in the operating environment through nonlinear approaches, in contrast to traditional strategy, which specifies the conditions required to achieve the end state or transition point.

The relationship between strategy and planning is a frequent topic of debate and

discussion. Mintzberg describes strategy as the plan, pattern, position, and perspective organizations can use to outline their methods, behaviors, relationship with others in the environment, and view of the environment.[13] Yarger describes strategy as providing the "direction for the state, seeking to maximize positive outcomes and minimize negative outcomes, as the state moves through a complex and rapidly changing environment into the future."[14]

The transition point between strategy and planning is provided by operational design step in the Joint Planning Process.[15] Additionally, Mintzberg et al. describe the need for a situation-derived effect on deliberate strategies and planning, leading to emergent strategies.[16] Generally, strategy relates to planning as an overarching approach to problem framing and options or conditions which describe a desired future condition. A risk inherent in the transition to planning is a rigid adherence to higher-level approaches which hamper innovation. Integration of CLT into military C2 strengthens strategy development and planning by providing commanders with mechanisms to integrate current information into their decision-making processes.

CLT aligns with a systems perspective understanding of the modern world. Researchers like Snowden complement military strategists like Yarger and Eikmeier in developing analytical frameworks for understanding the interrelatedness of systems within the environment.[17] The systems analysis results in an understanding of current conditions nations and militaries face and helps show the changes needed to transition toward future conditions.[18] Complicated ways of addressing these conditions at the national and strategic levels constrain lower-level leaders and organizations into rigid mechanical responses. The prescriptive responses to hierarchical situational understanding hamper innovation and centralize leadership structures.

Core Questions CLT Answers

CLT addresses two recurring challenges for military leaders: how to lead in unpredictable environments when not physically present and how to make decisions without clear direction in uncertainty. The inability to rely on traditional threat warning systems requires military organizations to function as CAS, empowered to find innovative solutions at the moment of need.[19] CLT emphasizes nonlinear interactions, reflective feedback processes, and support for emergent solutions that arise from distributed expertise.[20] In complex environments, commanders cannot rely on detailed guidance or centralized approval processes. Instead, they must cultivate organizations capable of generating solutions at the point of need.

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These concepts reinforce the U.S. Army's doctrinal emphasis on disciplined initiative. CLT provides the theoretical underpinnings for understanding how decentralized decision-making unfolds within coherent command structures. Clearly established boundaries empower subordinate leaders to interpret their environments, find opportunities, and act aligned with higher intent.

Distinctions from Traditional Leadership Models

Traditional hierarchical decision-making models consolidate control at upper echelons, which can inhibit innovation when used exclusively in dynamic environments. Hierarchical organizations sustain their centralized control by restricting decision-making and requiring subordinate elements to adopt leader- and task-focused processes and behaviors, as well as transactional leadership

styles.[21] This shows that rational responses limit innovation through constrained and unsustainable processes and personality-based leadership. CLT, by contrast, emphasizes the relational and adaptive processes that enable organizations to respond creatively in ambiguity thereby encouraging collaborative ownership of decision-making processes.

Transformational leadership complements CLT by strengthening the interpersonal foundations of trust, vision, and collaboration. Transformational skills equip ethical, innovative executive leaders to inspire and propel individuals and organizations beyond their previously known limits while maintaining organizational effectiveness.[22] Influential military leaders apply transformational processes, like Kotter's 8-stage change model, to improve commitment and organizational effectiveness.[23] Military executive leaders demonstrate and foster transformational leadership by learning new skills and observing behavioral responses to challenging situations that reveal observable and measurable vertical development progress. Transformational leadership styles complement CLT and shift processes toward more authorization of distributed and adaptive approaches in the face of complexity.

> **Executive leaders with an adaptive leadership style go beyond transactional leadership and show mental flexibility...**

Adaptive Leadership in Military Operations

Definition of Adaptive Leadership

Adaptive leadership equips military leaders to quickly adapt to unforeseen challenges in modern warfare, including changing battle conditions and technological disruptions. Shortened decision-response processes, increased technological proficiencies, and distributed data-delivery systems describe the new terrain of warfare.[24] The complexities of the modern battlefield challenge traditional hierarchical models and highlight the need for decentralized leadership able to rapidly interpret new information and adjust plans. Adaptive leadership bridges the gap between conventional models and navigation of dynamic environments emphasizing doctrine's call for critical thinking, systems analysis, and iterative planning.

Adaptive leaders continually assess current conditions rather than relying on earlier successes which may limit understanding and can mask potential opportunities. Heifetz et al. and Stacey explored how adaptive leadership builds on earlier successes by continuously assessing those processes against current situational knowledge to find new ways of achieving objectives.[25] This continuous process of questioning assumptions and exploring alternative pathways demonstrates the capacity of adaptive leadership to offer new options in response to ongoing challenges to existing paradigms. Successful implementation of adaptive leadership on the modern battlefield depends on the boundaries set by commanders, including risk tolerance, intent, and priorities, which guide subordinate leaders' decisions.

Executive leaders with an adaptive leadership style go beyond transactional leadership and show mental flexibility to navigate complex, dynamic environments. Vertically developed leaders focus on collaborative achievements rather than personal ones and emphasize distributed capacities.[26] These leaders apply learned cognitive problem-solving processes to understand situations and reflect on previous experiences to determine new and flexible ways of adapting to changing, complex, and ambiguous environments.[27] The adaptive leadership style does not rely on previous knowledge to prescribe approaches to future situations. Instead, it is a process for understanding situations and determining

situation-based approaches. Adaptive leadership is critical for maintaining operational effectiveness in the modern battlefield.

Connection with Military Doctrine

Inherent in U.S. military doctrine and joint operations is the goal of effectively applying available resources to the complexities of the international system. Current doctrine requires adaptive leadership, as demonstrated by *Joint Publication (JP) 5-0: Joint Planning*, which requires staffs to test each course of action for its validity in accomplishing the desired.[28] In addition, systems thinking methodologies for environmental analysis, such as PMESII, reveal opportunities that enable the practice of adaptive leadership.[29] These two examples demonstrate current linkages between adaptive leadership and existing military doctrine, emphasizing flexibility and disciplined initiative toward common goals. Despite recent examples demonstrating military leaders' application of adaptive leadership in unpredictable environments, challenges still hinder full implementation.

Challenges in Developing Adaptive Leadership

Institutional and cultural barriers prevent the development of adaptive military organizations and leaders. Studies by Siew et al. and Singh et al. show that the institutional requirement of continual achievement prevents leaders from exercising critical thinking in high-stakes decision-making environments, reducing their willingness to innovate beyond established processes and norms.[30] These researchers show that the culture of evaluating achievement from higher levels dampens creativity and innovation, thereby preventing the full implementation of adaptive leadership.

The culture created by rigid organizational structures reduces the military's ability to reorganize effectively and challenges the full implementation of adaptive leadership. Hierarchical control is a traditional characteristic of military culture, creating structures that rely on subordinate compliance. This structure emphasizes established processes and therefore struggles to allow for innovative adaptation and experimentation with new ways of approaching complex situations due to the uncertainty of results.[31] Providing organizational military leaders with the authority to tailor organizational structures by integrating feedback mechanisms into established processes to face unique environments enables innovation. Relevant measures of effectiveness must be established to evaluate the successful implementation of adaptive leadership within military structures.

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Ethical Considerations for Adaptive Leadership

The future implementation of ethical adaptive leadership is essential for the military's management of emergent technologies such as autonomous systems and AI-driven warfare. Adaptive military leaders must balance decision-making and flexibility in unpredictable environments with a foundational understanding of organizational values and ethical standards.[32] This means that military leaders must clearly understand strategic goals and professional standards and temper the risk of practical adaptation to the presented circumstances. Adaptive leadership and emergent leadership, discussed in the next section, are vital components of CLT that inform the future of military operations.

Emergent Leadership in Military Operations

Definition of Emergent Leadership

Emergent leadership, characterized by its informal nature and belief that knowledge does not reside in traditional power structures, creates the conditions for complexity leadership to thrive. Emergent leadership arises when individuals or groups address challenges based on expertise rather than rank or authority enables ownership and problem solving in dynamic conditions.[33] This emphasizes the importance for learning organizations to maintain open lines of communication across the structure, encouraging collective approaches and viewpoints, and developing emergent strategies which hierarchical processes may overlook. The modern, dynamic, and interconnected world requires executive leaders to find novel approaches rather than rely on traditional methods.

> **Emergent leadership...creates the conditions for complexity leadership to thrive.**

Emergent strategies require input from non-traditional leaders within the decision-making structure to make timely decisions at the point of need in unpredictable environments. The interconnected, complex environment creates unpredictable reactions across the system from local interactions.[34] Leaders of CAS organizations encourage collaboration that does not rely on formal leadership structures, enabling self-organization into influential groups with the knowledge, background, and ability to address unique situations.[35] Therefore, CLT highlights the importance of creating conditions for emergence through open communication, shared understanding, and flexible structures which allow expertise to surface. The systems analysis methodologies existent within military doctrine enables the development of emergent strategies.

Connection to Military Doctrine

Military doctrine supports emergent ideas through iterative planning, environmental framing, and the emphasis on decentralized execution. The Joint Planning Process enables operational military leaders, commanders, and staff to analyze their environments and develop innovative approaches in complex situations.[36] The availability of strategic guidance from national to operational levels establishes the purpose of military action along the "competition continuum" and drives planning.[37] Emergent strategies develop when subordinate leaders interpret their environment, gaining fresh situational analysis, and devise creative approaches within the boundaries set by command. at each level —from strategic to tactical —enable creative solutions to complex situations. Iterative systems analysis reveals cross-domain opportunities and enables emergent strategies.

Military leaders foster a climate for learning that creates conditions for emergent strategies through trust-building, clear communication of objectives, and organizational alignment. The physical domains of cyberspace, space, air, land, and sea each have unique capabilities that provide opportunities for emergent solutions. Understanding the capabilities enabled by a systems analysis of each physical domain creates opportunities for innovative solutions that achieve operational objectives.[38] Understanding goal pathways instead of specific end states allows CLT to use systems analysis and an echelon-level understanding of strategic objectives to develop emergent strategies toward their achievement. Although there are alignments between emergent leadership and military doctrine, the challenge posed by hierarchical command and control structures

hampers its full implementation. Therefore, the key to overcoming traditional hierarchical and fixed-structure challenges is empowering transformative leaders to set the conditions for emergent strategies and innovative solutions.

Challenges and Enablers of Emergence

The mission command concept of centralized control and decentralized execution within military structures both enables and challenges the conditions needed for developing emergent strategies. However, as Raisio and Kuorikoski explain, each echelon must have the authority to understand and react to its operational environment to enable emergence.[39] This means the military structure must balance oversight and control of subordinate organizations with the decentralized decision-making to increase coherence with strategic objectives. Planning for future events as part of mission command should provide the necessary resources to accommodate dynamic changes rather than restricting subordinate units' ability to react.[40] Executive military leaders must underwrite their subordinate leaders' authority to act within the bounds of their area of responsibility to mitigate the fear of failure from innovative actions and overcome hard-power cultural paradigms. At the same time, subordinate leaders must maintain vertical and horizontal feedback mechanisms to ensure a clear understanding of priorities, environmental changes, and positional conditions in relation to desired objectives.

Challenges to emergence include risk aversion, rigid structures, and misalignments between espoused values and actual behavior. Raisio and Kuorikoski describe the correlation between the leader's responsibility for assigned tasks and their authority to make situation-based decisions supporting common objectives in unique crises.[41] The psychological safety, a key requirement for critical thinking, inherent in these situations, enables the emergent thinking needed to address high-stress environments. Professional advancement based on operational results challenges emergent leadership due to the risk of unacceptable operational failure. Examining the cultural phenomenon of risk-averse military leadership at operational levels through Schein's cultural lens may reveal a disconnect between espoused values and behaviors in crisis.[42] Technological advancements, like uncrewed systems and artificial intelligence information processors, offer the opportunity to enable the implementation of emergent leadership across the military.

> **While technological advancements pose challenges and require new military processes, they can also enable emergent strategies.**

While technological advancements pose challenges and require new military processes, they can also enable emergent strategies. Artificial intelligence, real-time data processing, and autonomous systems empower leaders to detect and respond to emerging patterns on the modern battlefield.[43] Enablers derived from technological advancements offer military leaders at every echelon opportunity to develop emergent strategies toward common goals. At the same time, the speed at which information changes can overwhelm military leaders and encourage greater control over decision-making processes at higher organizational levels, counteracting the benefits of emergent leadership. Emergent leadership does not eliminate ethical and moral dilemmas that military leaders must navigate.

Ethical Considerations for Emergence

Military leaders looking to foster emergence must ensure that the options developed align with national values and ethical standards of conduct. Strategic and command guidance

provide clear boundaries grounded in values, legal frameworks, and professional standards which ensure decentralized decision-making stays ethically aligned in pursuit of national interests.[44] Adaptive and emergent behavior must remain grounded in ethical principles, particularly as technological capabilities expand.

> **Rather than introducing new doctrine, CLT illuminates the mechanisms that already underpin successful mission command...**

Conclusion

CLT aligns with and expands on existing doctrinal concepts, the Joint Planning Process and Mission Command.[45] Both concepts emphasize and blend centralized intent with decentralized execution. CLT may provide a theoretical explanation for how this blend functions in practice and why it may be effective in complex environments. Professional Military Education presents opportunities to integrate CLT concepts more deliberately across leader's career.

Military education institutions like the U.S. Army Command and General Staff College (CGSC), including the SAMS, educate military leaders on leading in complexity. For example, see the recent addition of the Complexity Toolkit to the Command and General Staff Officer Course curriculum.[46] Continued emphasis on leadership competencies that enhance adaptability, like complexity thinking, systems analysis, data literacy, and reflective practices, across PME levels may increase both operational effectiveness and long-term organizational learning.

Integrating CLT into military leadership methodologies strengthens existing doctrine by offering a cohesive framework for understanding how decentralized action unfolds within the boundaries set by command. CLT clarifies how adaptive and emergent leadership contribute to operational effectiveness and provides language for articulating the leadership processes required in complex environments. The challenges presented by technological advancements, including UAS, have transformed the battlefield. These technological innovations challenge traditional military structures that rigidly respond to dynamic situations. The increasing interconnectedness of the global environment requires reinforcement of flexible and adaptive leadership methodologies like CLT.

The CLT method explains how commanders set boundaries and how subordinate leaders exploit complexity to achieve shared objectives. These leaders set conditions for flexibility, innovation, and disciplined initiative needed to face the complexities of modern warfare, from technological advances to cross-domain interdependence. Transitions between strategy and planning relies on operational design bridges to create plans that adapt to shifting perspectives and situations.[47] CLT fosters decentralized initiative by setting boundaries and feedback mechanisms which enable innovative solutions through sense-making at the level of need.[48] Rather than introducing new doctrine, CLT illuminates the mechanisms that already underpin successful mission command and deepens the profession's understanding of leadership in a dynamic world.

Implications for Future Research

Future research on CLT as an operational method may continue to explore and inform the Leadership and Education domain of DOTMLPF-P. Specific evaluation of distributed decision-making, decentralized leadership, and data literacy could further inform the discussion. Consideration of doctrine and policy revisions includes updated command protocols and analytical frameworks to incorporate CLT. Aligning performance metrics that value

adaptability and innovation incentivize flexible and adaptable leaders. Applying CLT concepts enables the implementation of innovative solutions using available resources and capabilities across the physical domains.[49] Finally, lessons learned from a comprehensive examination of complexity leadership theory create a cohesive framework for application within military command and control contexts. *IAJ*

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