ABSTRACT

MARTIN, GRANT M. Designing Doctrine Between Failures: The Role Knowledge Creation Plays in Mega Bureaucracies When the Environment is Complex (Under the direction of Dr. Branda Nowell).

Despite the many studies looking into how knowledge is created by organizations (Nonaka and Takeuchi, 1995; Argote, 1999), the literature suffers from three major limitations. First, much of it is a-contextual in that it is written as if organizational learning can be generalized across different contexts. Second, the literature assumes linearity-- that is, that the process of learning follows a linear path from experience to knowledge gain to learning. Last, the current literature does not sufficiently cover the role sensemaking plays in the process of turning experiences into knowledge, especially in mega bureaucracies within complex environments.

This dissertation seeks to inquire into the processes through which organizations learn when those organizations are very large public organizations operating in complex environments. There are challenges with learning for any organization, but I argue these challenges are unique in these examples. Specifically, this research will focus on the codification of knowledge with respect to organizational learning, called doctrine in some professions. Thus, this dissertation will focus on the role doctrine plays in various circumstances within a large, public organization involved in complex situations. The U.S. Army is an information-rich case of just such an organization. The Army codifies its knowledge in the form of what it calls “doctrine.” For the purposes of this dissertation, a mega-bureaucracy is defined as a rules-following organization that is relatively large compared with others. The Army is also a public organization and one involved in complex situations. The process by which the Army turns its experiences into knowledge and thus, in theory, learns from those experiences, potentially provides insights into the nuances of public organizations and their learning process.

This dissertation examined how the U.S. Army constructed knowledge during the height of the Afghanistan and Iraq wars using a hermeneutical method. The study qualitatively analyzed U.S. Army doctrine from the 1990s to 2019 that dealt with the U.S. Army's operations process. Specifically, this research addressed the question of what role doctrine plays in the knowledge creation process of a mega-bureaucracy like the U.S. Army. This research's major findings were, 1) espoused knowledge in mega bureaucracies is dynamic and responsive to perceived or real complex environmental change, 2) espoused knowledge development in mega bureaucracies can be non-linear and may be iterative as changes become mixed with and/or co-opted by older thinking, and 3) due to the dynamic interaction of old and new thinking, espoused knowledge in mega-bureaucracies can be contradictory in terms of mis-aligning ontological, epistemological and methodological beliefs and approaches.

This makes knowledge creation part of a host of actions that a mega-bureaucracy might undertake. Some of these actions might be to look like they are doing something. Others to secure resources. Still others attempt to apply different, even potentially better methods. The bottom line is that they are part of a set of complex reactions to the perceived new environment, not simply part of a linear process of rational learning. They are also likely to be at least partially, if not highly contingent on the specific context. I found within the data signs of a cycle with respect to knowledge creation: of searching for new ideas to address a complex situation followed by a co-option of the new ideas into older ideas, and finally, a resolution that can include a return to the status quo due to the inherent cultural dominance of an organization's pre-existing ontology.

Designing Doctrine Between Failures: The Role Knowledge Creation Plays in Organizational Learning When the Environment is Complex

by
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DEDICATION

I dedicate this to all of the U.S. and allied service members and their families who struggled to make sense of Afghanistan and Iraq from 2001 to 2021, and the Afghans and Iraqis whose lives we affected.

BIOGRAPHY

Grant M. Martin received his MBA from George Mason University, his MMAS from the U.S. Army School of Advanced Military Studies and his undergraduate degree from The Citadel. His research focuses on organizational learning, organizational transformation, and knowledge creation. He retired from active-duty in the U.S. Army on 30 April 2023 as an officer assigned to U.S. Special Operations Command.

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This research would not have been possible without many, many people. First, I have to thank the officers and NCOs I have worked with throughout my career in the Army, as they have always inspired me to keep asking the question, “why?” They are great people and it was a joy to work with them and I hope this research in some way is a reflection of their professionalism. I especially have to thank Dr. Christopher Paparone and Dr. Ben Zweibelson for helping me through my intellectual journey which began in many ways in 2009 with you both.

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PREFACE

In January of 2010 I deployed to Afghanistan from Fort Leavenworth, Kansas, armed with the latest intellectual U.S. Army tools from two years of mid-career schooling at the Command and General Staff College (CGSC) and the School of Advanced Military Studies (SAMS). One of those tools, called *design*, had been one of the main foci of my study at SAMS, a masters-degree-producing school that required a second year of study at Fort Leavenworth. Design was, according to the U.S. Army, a result of learning gleaned from the perceived failure in Iraq in the aftermath of the toppling of Saddam Hussein's government. Apparently, the commanders, staff, and planners of U.S. Central Command, the headquarters responsible for everything within the Middle East, had not defined the problem correctly, focused, as most military headquarters are, on the solution. Instead of focusing on Hussein and his army, we should have been focused on the chaos that erupted afterwards.

In short, design was a set of critical thinking tools that attempted to offer a more creative approach to meeting strategic objectives through tactical action. The overarching construct was one of describing the environment, defining a problem, and brainstorming some solutions and stemmed from ideas taken from the Stanford School of Design and the Santa Fe Institute's complexity theory studies.

Imagine my surprise when I arrived in Afghanistan and attempted to put the intellectual tool of design to work right away and was told by the NATO Training Mission-Afghanistan (NTM-A) Commanding General's Executive Officer: "Do not use the word *design* in this headquarters. The general doesn't like it." My surprise mainly stemmed from the fact that a few short months prior to my arrival, the Commanding General of NTM-A had been the

Commanding General of Fort Leavenworth, the U.S. Army command that had approved the teaching and dissemination of the design concept and the higher headquarters of SAMS.

Upon returning to the U.S. in 2011, I found further signs that the U.S. Army did not agree that we had defined the problem wrong prior to *Operation Iraqi Freedom* or that design was a better way with which to deal with complex situations. U.S. Army Special Operations Command (USASOC) did not use design, nor did its subordinate commands, Civil Affairs, Psychological Operations, Special Forces, Rangers, or Special Operations Aviation. The U.S. Army JFK Special Warfare Center and School did not teach it. Doctrine kept getting produced, and with each publication, design seemed to come out different than it had in the past. Confusion reigned on what it really was or if it was really useful.

A few years later USASOC published their own handbook, followed up by a second one a year later. Both publications were contentious and neither provided clarity to the force. U.S. Special Operations Command, in charge of USASOC as well as the SEALs, Marine Special Operations, and Air Force Special Operations, began to teach design, but without any doctrinal publications associated with it. The U.S. Army, going in a different direction, published a manual specifically for design, codifying the 3-step process mentioned above. Some headquarters used it. Most did not. Still others developed their own proprietary concepts. Contractors were paid tidy sums to teach their own versions to deploying units.

All of these paradoxical examples kept forcing me to ask questions about how the Army learns, how it develops doctrine and why, and what it means when it does not use its own doctrine. Could doctrine be playing a different role than the one the Army espoused, that is, offering up the most up-to-date lessons learned and knowledge gleaned? What happens when doctrine is seen to fail, or fails to play the role it is intended to play? All of these questions and

more are central to this dissertation, an attempt to make sense of a situation in which I could not. I hope to uncover some insights into the challenges organizations have with creating knowledge and learning in general.

This is especially prescient to me and the institution of the U.S. Army today. To myself since I have contributed to five doctrinal efforts in my career: the *Army Design Methodology* manual, the *Joint Concept for Integrated Campaigning*, the *Mission Command* Capabilities Based Assessment, USASOC's *Design* Handbooks, and the *Counterinsurgency* manual. To the institution because I believe the U.S. Army continues to struggle with learning and improving upon its experiences.

CHAPTER 1: The Research Question

I. Introduction

Organizations must learn, that much seems straightforward. Just like humans, if an organization continues to repeat mistakes or loses the confidence of those who depend on them, it does not bode well for their future (Pfeffer, J., & Salancik, 2003). For for-profit organizations, many times the feedback on whether they are learning or not is hard to miss: the business is either profitable or it is not.

For public organizations, however, feedback is oftentimes complex because profit is not the only indicator of success. Usually there are multiple stakeholders involved and those stakeholders' expectations can be contradictory, paradoxical, and dynamically changing over time (Goss, 1996, 590-594, and Stone, 2012, 13, 33-34, 36, 381). The feedback loops for public organizations are much less linear and daily actions are not directly linked to objectives, especially over time and considering their multiple stakeholders (Cohen, et al, 1972, 1; Batras, et al, 2014, and Dekker and Hansen, 2004).

While there is extensive literature on organizational learning, the literature suffers from three major limitations. First, much of it is a-contextual in that it is written as if organizational learning can be generalized across different contexts. For example, the diffusion of innovation literature describes a generic cycle with respect to knowledge consisting of 'creation-transfer- and retention' as the process by which all organizations learn (Argote, 1999). The existing literature fails to appreciate how learning processes might be unique to specific organizational contexts. As this dissertation argues, there is reason to believe mega-bureaucracies operating in complex environments have different and greater challenges with learning than does the average organization.

Second, the literature assumes linearity-- that is, that the process of learning follows a linear path from experience to knowledge gain to learning. It does not sufficiently capture the nuanced and complex path that observations take once they are acknowledged, recorded, and finally, promulgated throughout an organization. Cohen, et al (1972), note that solutions that organizations adopt often have nothing to do with the immediate problems they face.

Last, the current literature does not sufficiently cover the role sensemaking plays in the process of turning experiences into knowledge, especially in mega bureaucracies within complex environments. Some researchers have noted the role sensemaking plays in the act of observation and translation of those observations into knowing, knowledge, and facts (Akgun, et al, 2003 and Calvard, 2016, 66). This literature also notes how sensemaking works within organizations in a generic manner; for instance, asserting that sensemaking establishes rules that attempt to protect the status quo (Paparone, 2017). However, this research does little to address how those rules may be different when the environment is complex and when the organization is exceptionally large.

This dissertation seeks to inquire into the processes through which organizations learn when those organizations are very large public organizations operating in complex environments. There are challenges with learning for any organization, but I argue these challenges are unique in these examples. Specifically, this research will focus on the codification of knowledge with respect to organizational learning, called doctrine in some professions. Thus, this dissertation will focus on the role doctrine plays in various circumstances within a large, public organization involved in complex situations. The U.S. Army is an information-rich case of just such an organization. The Army codifies its knowledge in the form of what it calls “doctrine.” This doctrine is, according to its own publications, an authoritative source of knowledge based on the

experiences of its members (HQDA, 2014, 2-4). The Army, with over 1 million uniformed members and over three-hundred thousand civilians can be described as a "mega bureaucracy." For the purposes of this dissertation, a mega-bureaucracy is defined as a rules-following organization that is relatively large compared with others. The Army is also a public organization and one involved in complex situations. The process by which the Army turns its experiences into knowledge and thus, in theory, learns from those experiences, potentially provides insights into the nuances of public organizations and their learning process. It is how it learns, and more specifically, the role doctrine plays in its learning, that is of interest here.

II. Arguments in detail

I will show in this section that there is a gap in the literature related to knowledge creation space. The current state of the research literature related to organizational learning and knowledge creation more specifically focuses on mainly for-profit businesses and organizations that have clear technology, that is they have concrete products or services that provide them with a linear and simple relationship between the organization's activities and its outcomes (causes and effects). The literature does not touch on mega-bureaucracies operating in complex environments that suffer from unclear technologies. This causes learning to seem to be a linear process and knowledge creation to be rational and positivist. It is my assertion that mega-bureaucracies, or organizations that are so large that they serve multiple, competing interests are different in kind and this affects their learning and thus their knowledge creation is different. In addition, the mega-bureaucracies that operate in complex environments wherein effects are delayed substantially from their causes, no effect can be traced to one cause, and often it is difficult to even determine causality are that much more affected by these conditions. For these

reasons, as I will show, the extant literature is not sufficient for the problem I am attempting to study.

a. What is organizational learning?

Individuals learn, that seems intuitive. They learn to walk and talk when they are young. They learn to add up numbers and write in school. As part of organizations, individuals can learn how the organization functions: standard operating procedures and the like. What is "organizational learning," however? Do organizations "learn" or is perceived learning an aggregate of its individual members learning? Are organizations monolithic enough to do anything close to the word that describes individual learning?

Fiol and Lyles (1985) described the lack of agreement on what constitutes organizational learning. Pedler, et al (1989) and Morgan (1986) define learning as a metaphorical activity similar to individual learning. Milway and Saxton (2011, 44) depict learning as a set of steps that groups of people engage in: collecting information, reflecting on it, and sharing findings, all with the intention to improve the performance of an organization. Dodgson (1993, 376) notes that different disciplines view organizational learning differently: economists as quantifiable improvements or a vague notion of a positive outcome, management researchers as sustainable efficiency, and innovation literature as efficiency with respect to innovation. Thus, as Dodgson points out (377), most of the literature describes the outcomes of learning versus the processes. Dodgson proposes a definition: "the ways firms build, supplement, and organize knowledge and routines around their activities and within their cultures, and adapt and develop organizational efficiency by improving the use of the broad skills of their workforces." This definition follows some assumptions he makes: this activity of learning has "positive consequences," firms can learn as an aggregation of individuals learning, and learning occurs during all activities of an

organization (377). Friedman, et al (2005, 22-23) assert that researchers make the mistake of anthropomorphizing learning and that learning by organizations is much more complex than can be explained by metaphorically referring to what organizations do as "learning." Lipshitz, et al (2002, 82-83) recommend a nonmetaphorical approach to organizational learning that reflects a mechanism, such as after-action reviews, strategic planning, or quality control that all purport to study the past and change future behavior from the conclusions of said studies. They further assert that organizational learning "involves the collection, analysis, storage and use of information", but, unlike individual learning, is a complex process that occurs through structural mechanisms. Additionally, organizational learning results in changes in norms, doctrines, procedures, and structures, thus requiring social, political, cultural, and cognitive lenses to understand (93).

The literature, as stated above, offers a plethora of ideas for what organizational learning is. At the organizational level there can be an aggregate of individual learning reflecting the combined learning from all or a portion of its members. This combined learning could be a simple sum or a more emergent phenomenon that is greater than the sum of its parts. There can also be something occurring that is more focused on the organization itself than its members. The first idea might be an emergent concept because it is one that suggests the aggregation of individuals learning leads to learning that is greater than the sum of the individuals' learning, or at least different enough to be more complex than simply understanding individuals learning. The second idea might be even more complex, imagining all the activities that take place within an organization that might lead to some form of change. If the world is seen as a constantly changing environment, then change is inevitable as groups of individuals attempt to remain relevant within that changing environment. Conscious learning, however, might be less useful

than unconscious and emergent adaptation in terms of how organizations change to become better. As was stated above, Lipshitz, et al, (2002) note that it may be more useful to study learning through a specific mechanism instead of through metaphors, as metaphors would imply that learning by organizations is similar to learning by individuals or represents an aggregation of individual learning activity.

One way to address the issue of pinning down organizational learning as a concept that can be studied would be to call any innovation within an organization that is meant to address the changing environment as "learning." Another way would be to attempt to determine if the innovation came from a valid system of learning or not. Still another would be to determine if the innovation resulted in positive effects. The challenge with the first option is that labeling any change as "learning," seems a very shallow phenomenon. The second description suffers from the complication of having to isolate the system of learning from all the other potential causes of the change. The final choice would be problematic in the sense of determining whether a change was positive or not, potentially picking an arbitrary point in time to make such a determination. This is all to illustrate that the literature on innovation is problematic in terms of its use to describe how organizations learn.

For the purposes of this research, I will assume that organizational learning must involve some kind of process of knowledge gain, whether it is a formal system of learning, or a more emergent behavioral change forced on the participants. I will further assume that the outcomes of learning will not simply reflect the learning process but will become influenced by a variety of different phenomena. Lastly, I will assume that organizations learn in several ways: first, they learn as a result of individuals within the organization learning (Mehrizi, et al, 2022); second, they learn in an aggregate manner that is more than the sum of its individuals' learning

(Goldkind and Pardasani, 2012); and third, that they learn based on collective behavior that is triggered by multiple causes within their environment, and that this collective behavior is complex and non-linear in nature (Bocanet, et al, 2012). I do not assume that the learning must result in something positive, due to the challenge of determining whether the result was positive past a proximate and narrow determination.

In terms of the three types of learning mentioned in the previous paragraph, some description is warranted. First, the overarching idea about learning from an organizational view is that an organization, through an individually conscious, systematic or emergent process, synthesizes new information about its environment in such a way as to change the activities of the organization, presumably for the betterment of the organization (Bratianu, 2018). Based upon this, the individual learning method would be either when a leader or influential individual contemplates information and institutes a change in organizational behavior or when multiple individuals do the same and the resultant behavior is simply the sum of the efforts made to change (Schon and Argyris, 1974). An example would be when a leader learns that back injuries are more common when not using a back brace, and then instituting a rule to wear back braces at all times. A different mode of learning would be wherein multiple individuals from across the organization, based on taking in new information, change their own behavior and this results in an initial change that results in further changes across the organization that are greater than simply the aggregation of the individual changes (Chase and Hatschek, 2010 and Tsoukas and Vladimirou, 2001 and Schon and Argyris, 1978). For instance, multiple individuals notice that back injuries are more common when employees do not wear back braces, and this results in multiple efforts to decrease back injuries which includes wearing back braces, attempting to lighten loads, and encourage exercise, resulting in less back injuries, more efficient packing and

processing, and healthier employees. Finally, the third example would be wherein multiple efforts to improve working conditions and efficiencies results in the wearing of back braces, more efficient packing and processing, and healthier employees (Snowden and Boone, 2007 and Schon and Argyris, 1996).

Much of the literature that advises organizations on how to learn focuses on the outcomes and not the process of learning itself (Dodgson, 1993). Within their description of the process of learning, Nelson and Winter (1982) argue that the establishment of routines is the best signal of organizational learning. Levitt and March (1988) include the creation of such things as frameworks, paradigms, codes, and knowledge that includes buttressing formal routines, and thus could signal organizational learning. Much of the rest of the literature deals with what the goals of learning are and the ways that learning can be supported or hindered. Other than the establishment of routines, most of the literature that advises organizations on what to do limits its discussion of learning to how individuals learn on a micro level or simply categorizes different types of learning (for example, Argyris and Schon's single and double loop learning). One other area of research on how organizations learn focuses more specifically on innovation and technologically-backed learning, such as research and development (Dodgson, 1993).

Within the literature on organizational learning, much seems to overlap the organizational change literature. It may be difficult to differentiate between an organization learning and an organization changing. Argyris and Schon (1978) define learning as a process in which a mistake is corrected by using a different strategy or method that is expected to yield a different and successful outcome, also known as "the detection and correction of error" (303). They describe different types of learning that individuals can do, and then extrapolate those types- single loop and double loop- as activities that organizations can do. Before them, Herbert Simon (1947)

articulated a framework in which learning meant adapting means to ends, but that this learning suffered from "bounded rationality," and thus organizations' learning was far from perfect. Similarly, Dewey (1922) suggested that organizations, filled with humans, might struggle with learning as decision making. Dewey's idea was that humans used three things to make decisions: intuition, emotion, and habit, and that those three things, while resulting in decisions, were in turn affected by those decisions in a circular way. The implication was that the variables associated with learning could not be isolated as independent variables. Cyert and March (1963) describe organizational learning as adaptive behavior by the organization using and changing its "search rules". Search rules referred to the organization's decisions about which criteria it should be searching for in its quest to solve problems. Dutton and Thomas (1984) assert that learning occurs when an organization acquires information from external sources (exogenous), from employees within the organization (endogenous), as well as learning from formal learning efforts (induced) and more emergent forms over time (autonomous). Garvin, et al, (2008) contends that learning has to do with creating, acquiring, and transferring knowledge and that to do so requires curiosity, information sharing, and psychological safety. Dodgson (1993) defines organizational learning as the ways in which organizations gather, add to, and organize knowledge and procedures around activities that allow them to adapt and become more efficient by improving skills.

Within this and most other organizational literature, two items thus take up most of the focus: the role of organizations and the role of managers. Whether it is a study on what characteristics an organization might have that would create an environment more or less conducive to learning, or what effects an organization's environment might have on its learning, the emphasis for much of the literature is on the organization itself. For example, Kurt Lewin

(1936 and 1943) posits that in order to learn organizations had to go through a process of unfreezing, changing, and then refreezing. More recently, Desai, et al, (2018) describe the challenges of learning in complex environments. For those studies that focus on the organization, much of it implies steps that managers can take to make the environment within the organization more conducive to learning. Ahern and Byrne (2008) recommend managers adopt different methods of project management to learn in complex environments. McCalman and Potter (2015) point out a paradox of learning within organizations linked to managers engaging in incremental learning which then support the established identity of the manager, in other words, supporting the status quo. What few of these studies cover is the learning itself, choosing instead to focus on managers or the organization as keys to how to learn as opposed to advancing theory concerning the process of learning, which is presented as relatively straightforward, linear, and universal.

From the literature on organizational learning, it appears that there are three types mentioned: individuals within the organization learning, which comprises the vast majority of the literature, emergent learning as adaptations to the environment, and systematic learning processes such as lessons learned, strategic planning, and the like. Of all of these, much of the literature refers to organizational learning as if the organization is an individual, what can be called the “anthropomorphic metaphor.” Of the rest, much of it uses other types of metaphors, such as the evolutionary organism metaphor. Before delving further into these types of learning, it is worthwhile to explore the major impacts certain characteristics have on learning in general. Specifically, how does being a large bureaucracy and operating in complex environments affect the transition between experience and knowledge creation and what roles do sensemaking and doctrine play? Organizational learning, while universal in some respects, is potentially affected in drastically different ways depending on things like the distance between activities and

decision-making (large bureaucracies) and between cause and effect (complexity). Likewise, the ways in which individuals make sense in certain environments, as well as the ways in which their behavior results in emergent phenomena as they adapt to the environment, can reflect different mechanisms at work in the learning processes. First, the literature on how learning might be impacted by the size of a bureaucracy is worth reviewing.

b. Organizational learning in the context of a mega bureaucracy

There is very little in the research literature on "mega-bureaucracies." The only article that mentions the concept comes from an article in Parameters, a military journal, that uses the term to describe the large growth in the Department of Defense during and after the Korean War circa 1954 (Warren 2015). Bureaucracy and its effect on learning is similarly a rare topic. There are, however, many articles on bureaucracy and the challenges inherent to public organizations versus private ones. From these two kinds of articles, it is possible to extrapolate, first, the challenges of learning for public organizations, and, further, to assume that the larger the organization is, of the more these challenges will be exacerbated.

For instance, Argote and Miron-Spektor (2011) note the importance of context for learning and that context includes an organization's internal structure and its external environment. A complex internal structure, especially one that is relatively static, can make learning more difficult. This is the case for multiple reasons: the breaking up of responsibilities that can impact learning into multiple departments that often have competing interests, the layers of management that can influence learning between those actively doing and experiencing things and those in charge of establishing policies to take advantage of or produce knowledge, and the difficulty in large and complex organizations in directing the activities of the organization and the resultant goal displacement that often results (Bohte and Meier 2000, 174 and Stillman 1987,

177-178). Bunderson and Sutcliffe (2003) discuss whether an organization focuses on learning or performance, asserting that a performance-oriented organization will struggle to learn, especially in more complex situations. Dekker and Hansén (2004) note that political involvement can negatively affect learning, and, paradoxically, it is precisely during moments of high political involvement that learning is the most important. Wise (2002) also points out that when policy is in crisis mode, organizational learning is a very difficult undertaking due to accompanying high degrees of uncertainty and ambiguity inherent in crises. In addition, as Herman (1963) finds, politicians looking to gain political capital from crises can cause defensiveness and introversion, leading to greater challenges to learning. Dekker and Hansen (2004) further describe public sector organizational learning as complex and although they identify four theoretical processes with respect to learning-- information production, lesson-drawing, knowledge dissemination, and institutionalization—they contend that these processes were difficult to separate in the real world:

> *The way information was translated into lessons could not always easily be disentangled from the process of information production, and knowledge dissemination was generally an integral part of a process of institutionalization*. (141)

Part of the challenge with public organizations is described in the concept of "pluralism." Pluralism is the idea that public agencies must juggle multiple, often competing interests (Cohen, et al, 1972) and that can lead to organizational drift from strategic direction and dishonesty, which can cause reports that should lead to knowledge creation to be compromised (Stone 1988, 141 and Lynn 1996, 116-117). Dahl (1961) and Truman (1951) both provide evidence that multiple groups control policy and that each policy comes with its own set of interested parties, thus making it difficult, as noted in Stone (1988) and Lynn (1996) above, for public organizations to be honest with themselves. Relatedly, network theory offers insights into how a

social system's connectedness can affect organizational learning, those networks including multiple stakeholders as described in pluralistic theory (Rogers, 2003). Thus, the more parties and interests that public organizations must contend with, the more difficult it will be to learn in any one situation and the larger the organization, the more parties and interests their network will contain. This is due to the same factors described above, in that the more interests involved, the more challenging it is for a public organization to understand how to solve the multi-variate problems it is charged to take on (Goodsell 1994, 92).

The U.S. military is a prominent example of a "mega bureaucracy." That is, a public organization that is so large that its network of interested parties is immense, it is very difficult to manage and meet all these interested parties' divergent expectations (Weick 1979, 222), and its regulatory overseers have saddled it with a vast, often competing, set of rules that govern its behavior (Beck and Keiser 2003, 811). It is difficult to align the different elements of a large bureaucracy towards a consensus on making sense of situations. The number of stakeholders guarantees disagreement on shared values and meaning. The learning processes themselves are complex and difficult to ascertain, covering many different departments and individuals (Rahmandad 2008, 1308). In addition, politics, especially in times of crisis, can interfere with public organizations attempting to draw lessons from situations and learn (Dekker and Hansen 2004, 211-230).

In addition, the U.S. military is made up of many sub-organizations as well, each with its own unique characteristics: the services (Army, Navy, Air Force and Marines), the civilian appointee side (Office of the Secretary of Defense), the military side (the Joint Chiefs of Staff), and the different subordinate divisions within the department and the services (Combatant

Commands and the U.S.-based commands and, within the Army: its branches, i.e. infantry, special forces, armor, aviation, and the like).

While the military is a prominent mega bureaucracy, it is not the only one. Large health system networks of health care organizations and hospitals, state and federal governments and their agencies, large crisis efforts that involve multiple agencies, and professional groups that, although separate in functionality, are still influenced by the actions of their constituents and also meet the key characteristics of mega-bureaucracies; namely multiple stakeholders, unclear technologies, and competing values. All these types of organizations, institutions, professions, or networks of organizations bound together through a common effort are challenged in different manners with respect to learning in several ways.

Unfortunately, none of the literature covers the differences between mega bureaucracies and regular public organizations, effectively assuming that learning faces the same obstacles as they do in all bureaucracies. The literature on bureaucracy does cover bureaucracy's drawbacks, but very little covers learning for bureaucracies and none cover the characteristics of the learning itself within those bureaucracies and what happens if the characteristics are different. The complexity inherent in large bureaucracies according to what little does exist on large bureaucracies suggests that one must understand how organizational learning is affected by complexity.

c. Organizational learning in the context of complexity

Among the great many different theoretical approaches to studying organizational learning, it is useful to ask which one or ones might be more conducive to looking at the learning itself as opposed to the organization or the manager, since so much of the research covers obstacles to learning or what managers should do instead of the learning process itself.

Complexity theory is one such area of study. If a certain situation is more complex, it might follow that the learning inherent within would come with its own unique set of obstacles. Complexity in this case could refer to cause and effect relationships being non-linear, multi-variate, or emergent. Thus, intuitively, it follows that if an organization cannot determine cause and effect easily, then its ability to learn may be affected (Tsoukas 2004, 165-180). Rahmandad (2008) asserts that organizational learning is suboptimal in the presence of delays and links delays between cause and related effects to complexity. Cousins (2018) likewise described organizational learning in environments that are highly volatile, uncertain, complex and ambiguous (VUCA) requiring organizations to approach things in unique ways. Tangentially related to complexity, Weick and Westley even point out a paradox in the concept of learning for organizations in that to organize is to "forget and reduce variety," which is the opposite of learning: "to disorganize and increase variety" (1999: 190).

Complex situations for the military, according to Anna Simons (2010), result in the military developing cultural-based mythologies captured in doctrine, which rests on the flawed assumption that experiential learning and tacit knowledge are not required to execute complex military interventions. The Lawrence Paradox, as she calls it, named after T.E. Lawrence of Lawrence of Arabia fame, "refers to our propensity to turn unduplicable lessons into generic principles as if anyone should be able to apply them."

Kurt Lewin (1936) described a process of unfreezing, changing, and then refreezing with respect to organizational change. For change to take place, Lewin believed that the total context of any one given situation had to be considered. It follows, then, that the more complex a situation, the less likely the total situation will be able to be examined.

Desai, et all (2018), identified the issues with org learning in complex environments: feedback is ambiguous and attribution biases being two of the most prominent. These include adapting past structures, focusing on collaborative learning versus only internal learning, structuring for learning, engaging with stakeholders across external boundaries, structuring for agility, seeking knowledge outside existing networks, data sources and analytic processes to gain knowledge from new partners, restructuring based upon the situation, and shifting paradigms from continual improvement to being proactive in learning new knowledge.

Ahern, et al (2015), described complex projects as those that cannot be fully specified and planned in advance, thus goals in these situations can only be specified as initial assumptions and the means of achieving the goals only specified in outline or in part. Further, the learning associated with complex projects is described as "discovery driven," requiring continuous learning and the ability to develop a learning capability for complex projects, implying a different capability than for traditional, linear projects. Additionally, instead of the 'plan then execute' (planning, leading, organizing, and controlling) process of traditional project management, organizations in complex environments would require a more emergent, "craft" approach that would entail "complex strategy being formed over time under the influence of different contextual processes."

Complex situations also arise from paradoxical relationships and crises and can affect learning. Dekker and Hansen (2004) identified a paradox for public bureaucracies: learning is more important in those conditions in which it is also the most difficult. External threats create disincentives to learning and the distance between cause and effect make that learning more difficult and easier to get wrong (and get away with it being wrong). They also envisioned four

steps in organizational learning: information production, lesson-drawing, knowledge dissemination, and institutionalization, which are very similar to Argote's steps.

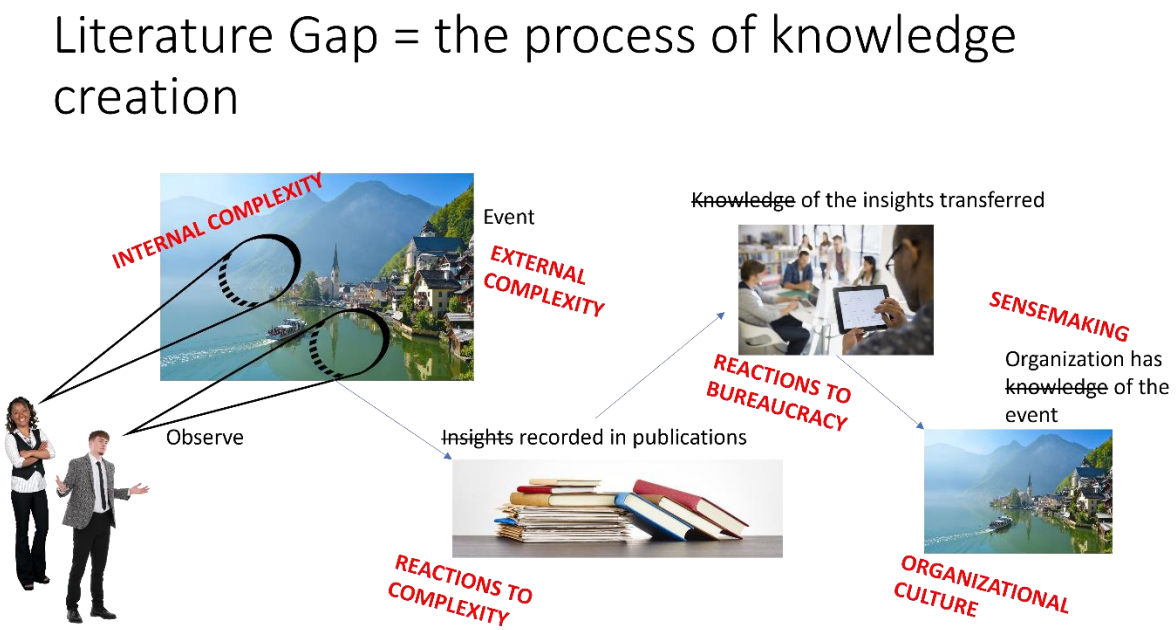
Lastly, the Snowden Cynefin framework (Kurtz and Snowden, 2003) posited that organizations are situated in one of several situations: simple, complicated, complex, and chaotic, further asserting that there are decision-making cycles best fit for each. Unfortunately, the authors concluded that most organizations assume they are in either simple or complicated situations even when they are in complex situations or about to slip into the chaotic, and thus most usually rely on their normal tools and processes.

All the literature thus looks in one of two directions: either it identifies the obstacles to learning that complexity causes organizations, or it recommends steps to overcome those obstacles. What none of them do is to investigate the different characteristics of learning within complex environments for organizations and what then happens to that learning.

d. The translation of experience to knowledge

There is a gap in the literature related to knowledge creation space and particularly with respect to mega bureaucracies. This process of knowledge creation might not be as straightforward as most theories suggest. While most theories paint a linear process from experience of the individual to the dispersal of knowledge useful to an organization throughout its members in a very rational manner, this ignores many of the other theories in different areas of research that hint that many other variables can and do affect what an organization goes through from the point of observation at the individual level to the dispersal of organizational knowledge throughout the organization.

Figure 1.1: Identifying the Literature Gap



This diagram shows a process that starts with individuals within an organization observing an event (affected by both internal and external complexity), these observations are labeled insights and recorded in publications as reactions to the complexity, the observations are transferred by some means (in the Army's case, doctrine and training on the doctrine) as reactions within the bureaucracy to the recorded observations, and then the organization makes sense of the observations through sensemaking and the prism of organizational culture. The gap identified here is the first blue arrow- the translation of observations that are labeled insights into some form of record or means of transference.

Organizational learning, as noted previously, is a very wide body of literature. Most of it deals with either how managers can effectively get their organizations to learn or detailing the characteristics of organizations that effectively learn (and, conversely, obstacles to learning). Less is understood about the process of learning itself. In terms of the process of learning described by Argote (1999), knowledge creation, transfer, and retention, there appears to be an opportunity to zero in on the actual creation of the knowledge itself in terms of its capture in explicit form; however, there currently exists very little information about the actual

transformation of experience into knowledge creation. According to Argote (1999 and 2011), knowledge creation is the first step in organizational learning. Thus, organizational learning is presumed to be fundamentally rooted in the experiences of the organization. In this generic model of organizational learning, the organization experiences something that is translated into insight. Then the organization captures the explicit knowledge in a codified form of information capture and the tacit knowledge in a social manner, both of which can become reinforced and contextualized through transfer of the knowledge. This comprehensive knowledge informs processes and potentially changes how the organization behaves.

There are many factors that intercede between experience and knowledge creation: the degree of separation between the organization and the experience (Levitt and March, 1988), variety of the experience (Haunschild and Sullivan, 2002), the physical distribution of the experience (Argote, et al, 2012), the uncertainty of the situation in which the experience happened (Repenning and Sterman, 2002), the temporal relationship between the experience and the actions which led to the experience (Herriott, et al, 1985), the degree to which the organization has suffered from recognized failure (counterintuitively making it easier to learn) (Denrell and March, 2001), and how rare the experience was (March, J.G., et al, 1991). These are all related, however, to the experience itself, not to the method of knowledge capture, i.e.- doctrine.

Doctrine is not knowledge transfer, as that is what happens once the doctrine is published and then taught in schools or otherwise disseminated and read by members of the organization. The creation of the doctrine, the actual writing down of words, is the explicit, not the tacit, capture of knowledge. Not only has the focus of organizational learning been on knowledge

transfer and retention and not on knowledge creation (Antonacopoulou, 2009), but none of what has been researched on creation has been on the actual capture of the knowledge.

Next, for learning to occur, organizations must codify knowledge so that it can be used to inform decision making and action (Argyris and Schon, 1978). Organizations transfer that knowledge by means of publishing the knowledge, disseminating it, and aligning it with whatever learning opportunities members in the organization's field use for circulation. This transfer of knowledge is by no means a settled area of the research. As Ringberg and Reihlen (2008) point out, knowledge transfer is not as simple as being taught what is in a book or even the more complex idea of a socially constructed process, but that knowledge transfer also encompasses a socio-cognitive process that includes sense making. For many large organizations, this might be solved by means of "typification" (Berger and Luckmann, 1967), meaning that for students in school or in internally-run learning experiences, there may be very little, if any, critical investigation into where the habitual procedures come from and thus students are institutionalized into thinking they are objective, tried and proven-true truths (DiMaggio and Powell, 1983). Thus, by the time most members of an organization have become mid-level careerists, they are institutionalized into viewing doctrine as conventional wisdom and acculturated into not questioning it. For many public servants, sense making is limited to an uncritical acceptance of doctrine. It is how most of them make sense of the world inside their organization.

Much research exists on how innovations are accepted and spread across organizations. Meyer and Goes (1988), for instance, discuss their findings that forty percent of the variance between acceptance of an innovation and rejection depends on three factors: perceived risk of the use of the innovation, degree of specialized training required, and degree of proximate effects

able to be observed by decision makers. Greenhalgh, et al, (2004) noted more factors in relation to whether or not the organization would adopt an innovation: relative advantage, compatibility, low complexity, trialability, observability, potential for reinvention, fuzzy boundaries, risk, task issues, nature of knowledge required (tacit or explicit), and technical support available.

Lastly, knowledge is retained by the organization (or not). Just as in other research areas of organizational learning, the focus is on the organization itself. Studies like Fiedler and Welpe (2010) examine how the structure of the organization affects knowledge retention. Argote (2013) studied how retention is affected by high personnel turnover.

Looking at the U.S. Army, knowledge is retained by enforcing the testing of its doctrine in its schools, during training exercises, and during routine operations. The way in which U.S. Army schools and training centers are structured makes it relatively easy to retain the knowledge captured in doctrine. Knowledge retention and its transfer are well-understood. In the case of the U.S. Army it is composed of the distribution and teaching of its doctrine and the use of the doctrinal methods during training exercises and operations. Thus, if there is a disconnect between what is being taught and what is being used, or if what is being taught changes for unknown reasons, it begs the question as to what role doctrine plays in knowledge creation. If, for instance, doctrine is not simply the capture of knowledge, then what role is it playing? This warrants further investigation.

This process, then, describes the relationship that knowledge creation has with organizational learning. It is the step just after observed or analyzed experience (or deduction for those things that cannot be directly experienced, although they may be pseudo-experienced in simulations and exercises) and ultimately knowledge transfer and retention. It is the resulting action and organizational philosophy that comes after observed or analyzed experience,

knowledge transfer, and retention. Doctrine, in this case, is created by the knowledge creation step. It is transferred through its distribution and teaching, and is retained through its use in training, education, exercises, routine functions, and actual operations. There are many obstacles to learning referenced in the literature, but the ones I will concentrate on are those found in the second chapter: isomorphic tendencies found within institutional theory, sensemaking, and cultural impacts on learning. It is worth noting before moving forward that organizational learning- the creation, transfer, and retention- of knowledge also influences doctrine. Doctrine is not created in a vacuum that ignores how it is used in application. The causal arrows go both ways, which simply reinforces the complexity of learning itself, as Weick and Westley noted (1999: 190).

e. The role of doctrine in the U.S. Army

> *These images [of sensemaking] imply three important points about the quest for meaning in organizational life. First, sensemaking occurs when a flow of organizational circumstances is turned into words and salient categories. Second, organizing itself is embodied in written and spoken texts. Third, reading, writing, conversing, and editing are crucial actions that serve as the media through which the invisible hand of institutions shapes conduct.* (Gioia et al. 1994, 365, cited in Weick, 2001, 131).

The term "doctrine" in this case is defined as "that which is taught," and the knowledge implicit within that concept. Further, included within this definition are the publications in which that knowledge is kept. A literature search shows most uses of the term refer to religious dogma, legal concepts, or foreign policies. Suffice it to say that there are only a few disciplines that use it in the same manner as the military. One of those groups are firefighters (Baajj, 2016 and Jahn, 2019). Other fields are marketing (Challagalla, 2014), education (Malley, 1996), medical care (Ross, 2018), and neuroscience (Bullock, et al, 2005). Within this definition, however, should be included any body of knowledge that is taught by public organizations, public professions, or any

other organization or discipline that produces a written body of knowledge that is then taught in some fashion to its members. Not included within this definition are legal concepts, religious doctrine, or foreign policy. What is of interest in this study are those public organizations or disciplines made up of public servants that produce a body of knowledge that they then disseminate to their members.

The literature on doctrine or knowledge creation as a concept in and of itself is scarce. As mentioned earlier, the literature only covers different aspects of experiences and its effect on knowledge creation (Argote, 2011). For instance, if the organization does not directly experience the instance leading to knowledge creation, it will be more difficult to create that knowledge and have it accepted. What the literature does not capture, however, is the method of creation. This runs the entire gamut from how the knowledge is observed and by whom, how it is decided to be put into doctrine and by whom, who actually writes the knowledge and into what type of manual and who makes that decision, and, just as important, what knowledge is left out of manuals and who makes that decision. Finally, the "why"- why all of that happened, what the logic was or reasoning behind the decisions that were made. These ideas are missing in the literature now and largely within internal military literature as well. One good example of something that hints at how "messy" the reality of doctrine writing within the U.S. Army is General DePuy's comments about doctrine:

> *There were at that time several points of view about doctrine. One point was that it is driven by weapons and weapons' capabilities- that was the CD point of view. There was a point of view that doctrine is driven by experience and accumulated wisdom, principles of war, and so on. That was CGSC's view. There was a point of view that doctrine provides operators manuals which become the basis for training. That was TRADOC. Then came Yom Kippur and some of us thought we needed to refocus from Vietnam to heavy armored mech in Europe. The training guys wanted how to fight manuals with tasks, conditions, and standards. CD wanted O&O concepts that could be related to weapons systems. CGSC wanted principles of war*

> - *accumulated wisdom. So we had a kind of donnybrook. (Incidentally, I suspect that curses of all of that still exist).* (DePuy, 1973)

Geoffrey Sloan (2012) makes the case that as historical examples "recede into the past," it becomes easier for militaries to develop doctrine that meets the needs of peacetime efficiency as opposed to the complexity of the wartime examples. This seems to mirror the findings in the sensemaking literature that situations themselves present the most influence on why organizations go through the motions (or not) of producing new knowledge and how that knowledge creation is affected. Again, however, the literature on the actual process, especially with respect to mega-bureaucracies in complex environments, is largely missing.

A good example of explicit knowledge within the U.S. Army would be the manual on logistics, called *Sustainment,* Army Doctrinal Publication 4-0 (HQDA, 2012), that describes such things as establishing and opening ports of debarkation for air, sea, or rail traffic. More abstract forms of knowledge are also created and captured by means of doctrine. An example of this is Army Doctrinal Publication 3-07, entitled, *Stability Operations* (HQDA, 2012), which describes such things as "a safe and secure environment, targeting the root causes of instability, social well-being, legitimate governance, and a sustainable economy."

Thus, for organizations wishing to transfer knowledge to their members, a process of knowledge creation is required. This process is not linear and differs between different types of organizations. It is affected heavily by the presence of complexity and whether the organization or discipline has the characteristics of a mega-bureaucracy. The sensemaking that these types of organizations go through are unique and they further affect their knowledge creation. Thus, the role in which doctrine plays for an organization, and especially a mega-bureaucracy within a complex environment is not well understood nor easily grasped.

III. Research Questions and Contributions

This research seeks to bridge a gap in the existing literature on knowledge creation by mega-bureaucracies in complex environments by investigating the process by which the U.S. Army instituted an effort to create knowledge, how that process worked, what happened, and why. The literature does not describe a learning process that is dynamic, non-linear in nature, or focused on concerns other than learning. It would not be right to assume that in all examples this process is linear in nature, relatively static, and focused on learning, based upon what the literature says about complexity, bureaucracy, and sensemaking. The example of the Army's adoption of design into its doctrine provides an information-rich case to which my research questions are applied. This effort is unique in several ways. First, it attempted to adopt several very complex concepts into the organization's processes and systems. Second, it attempted to do so at first by only changing the core doctrine incrementally and slowly. Third, it relied mostly at first on publications that were not official doctrine and on instruction at the mid-career rank only. Lastly, it was intended to be immediately applicable to two ongoing war efforts, as it was supposed to address shortfalls observed in one of them.

That this effort resulted in some very interesting phenomena, most of which has never been told, reinforces that this example is one of significance. For instance: the founder of the School of Advanced Military Studies (SAMS) as well as several past directors, were persona non grata at SAMS for several years related to the concept of design. Former students of SAMS have been blacklisted and SAMS faculty were unwilling to work with other agencies and foreign schools with respect to design. The Commanding General of the school that taught design later told a subsequent command to not use the word "design" around him. USSOCOM formed its own design course after SAMS published a doctrinal publication renaming design the "Army

Design Methodology," limiting it to one method. The SAMS Director at the time reportedly told multiple people his goal was to "kill design." US Army Special Operations Command created its own series of design handbooks, borrowing some of the Army doctrine, but also creating its own concepts. Most units do not use design today and there is tremendous disagreement across the institution about what design is, when it should be used- if at all- and why there was a problem to begin with.

It is in this environment that I wish to make sense of all the above, as the conventional wisdom about doctrine, knowledge creation, and organizational learning do not seem to be able to explain these events. Further, the same kinds of effects seen for the U.S. Army may apply to all mega-bureaucracies operating in complex environments. Some that come to mind: firefighters fighting seasonal wildfires, police and public safety organizations, hospitals, health maintenance organizations, state and federal governmental agencies and departments, other military and paramilitary branches, and even some very large private organizations.

This dissertation offers insights into these questions:

General question: What role does doctrine play in the knowledge creation process of a mega-bureaucracy like the U.S. Army?

Sub-questions:

- *How did U.S. Army doctrine concerning decision-making and operational planning evolve over the period of 1997 to 2019?*
- *What explains this variation over time?*
- *When new ideas are incorporated, are there inconsistencies between ontological assumptions, epistemological assumptions, and preferred methods? Are there consistencies?*

I will use a qualitative analysis of the doctrine related to design to observe its evolution (the "what"). I will then analyze the doctrine to deduce where any changes reflected internal contradictions either between its ontological and epistemological assumptions and its

methodologies or the change itself. Lastly, I will offer some ideas for why the doctrine might have changed in the way in which it changed. I will attempt to fit my findings within the typology I have described here in terms of organizational learning, knowledge creation, and the role doctrine plays within the U.S. Army.

This study breaks new ground in several ways. First, I address knowledge creation from the point of view of the actual methodology by which it is captured.

Second, this is one of few studies that approaches U.S. Army doctrine in a critical manner. Most studies, as will be shown, of U.S. Army doctrine assume the doctrine comes from a robust process of objective observation and analysis of historical experience and wargaming (experimentation, modelling, and simulations) that is then captured perfectly in print. I do not, however, assume anything similar about U.S. Army doctrine. I attempt to avoid what Berger and Luckmann noted is a problem: that is, not knowing from whence the doctrine comes from, assuming it to be true in a process of typification.

Finally, I attempt to close the gap in the literature by applying an example to what the literature already says about organizational learning, teasing out possible insights in the knowledge creation and the method of that creation itself. Addressing this theoretical gap helps to advance the discipline's conceptualization of how knowledge is created and what influences the environment, culture, isomorphic pressures, and organizational learning itself have on that knowledge creation, in addition to the role that knowledge plays within the organization. I aim to shine a critical light onto the Army's process for creating knowledge, publishing doctrine, and the roles both play in overall organizational learning.

CHAPTER 2: Literature Review

In Chapter One it was proposed that the organizational learning research literature to date contains a gap reference the creation of knowledge. Most of the research with respect to organizational learning focuses on how managers can encourage learning or those characteristics of organizations in which learning best occurs. Of the literature that covers the characteristics of the learning process, either the processes of retaining knowledge or transferring knowledge are the only ones addressed. Knowledge creation, specifically the process itself, is less well addressed.

In reviewing the relevant literature, I will explore how institutional theory, organizational culture theory, sensemaking, and boundary objects might play roles in organizational learning and knowledge creation. First, however, I will review in-depth the extant literature on knowledge creation and the process by which observations turn into knowledge as well as the topic of how organizations sense-make. As noted in Chapter One, there is a gap in the literature with respect to the transfer between observations/experience and the creation of knowledge.

I. Review of the literature on knowledge creation, knowledge creation theory, and turning observations into knowledge

Of the relevant literature involving knowledge creation, Ikujiro Nonaka and his collaborators dominate the research with their knowledge creation theory (Song and Chermak, 2008 and Yoon, et al, 2009). In short, the theory describes a framework by which organizations can determine whether they have the right processes in place to facilitate knowledge creation and organizational learning as well as a theory by which further research can build upon the original

framework. Nonaka's ideas describe a linear and positivist process by which knowledge is created and rational process by which it is tested and adopted. This may not apply to examples wherein the organization is dealing with an abstraction, the process of learning and knowledge creation is not a positivist and rationalist process, or the environment is complex.

Nonaka describes knowledge creation as starting with tacit knowledge at the individual level from experience. This knowledge is then enlarged within an organization through social interactions. This then becomes explicit knowledge through this process, called externalization. This explicit knowledge is then transferred to something concrete, such as doctrine, in a process he calls "crystallization," and which are tested by the organization before they are "internalized," the internalization marked by some kind of product, again, such as doctrine (1994: 21-27). This framework has done both: the vast majority of all research in this area uses Nonaka's construct as a given.

The basic ideas within the theory are very linear and positivist/rationalist. Individuals start with tacit knowledge that is then turned into explicit knowledge through discourse with others, apparently unaffected by social phenomena, but instead are communicated perfectly. This explicit knowledge is then proved justified through organizational processes which test the knowledge, again, presumably rationally, and, assuming it survives, again, objectively determined, is then communicated out to the organization (also in a positivist manner) to be adopted by (rationally), theoretically all members of the organization (Nonaka and Takeuchi, 1995). I will cover each of these steps below, in addition to the focus of them all to be in keeping with Nonaka's positivist, rationalist, and objectivist assumptions about organizational learning, the environment of all organizations, and knowledge creation. This will be especially problematic if organizational learning happens for some organizations in a non-linear or complex

fashion, if knowledge creation is deeply intertwined with sensemaking, and if the environment is complex.

In 2006, Nonaka teamed with Voelpel to discuss knowledge creation theory research and posited that knowledge is created through a four-stage process of socialization, externalization, combination, and internalization. This process describes a set of activities that appear to have ample room for goal displacement and other forms of influence that would interfere in any kind of rationally derived, objectively tested form of knowledge. As will be described in the second section, a mega-bureaucracy suffers from multiple obstacles to a linear process for turning observations into knowledge. Thus, while knowledge may be created in something similar to this four-stage process, it may be that only a very narrow meaning of knowledge is ever created through this process (something like how to change a tread on a tank) or it is also possible that the process is not as straightforward as Nonaka describes.

They describe "externalization" as turning tacit knowledge into explicit concepts and, the topic of knowledge-conversion as subjective knowledge being validated and synthesized with others (1182). For example, a soldier discovers that if he cleans his rifle as per the manual the rifle becomes difficult to shoot and maintain, however a little less cleaning, counterintuitively resulting in a little amount of dirt leads to a better shooting weapon. That knowledge is tacit knowledge. Once he shares that with others around a meal, for example, this is externalization. Further, they describe a concept called *ba*, a Japanese word roughly translating to the English word, "space." This concept describes a conceptual space (experience, project, meeting, etc.) in which ideas are shared. They argue this is where knowledge is created. (1185) An example of *ba* in my example would be the mess hall where the soldiers share the meal.

Nonaka, in a more foundational work in 1994 describes a process of "spiraling" in which members of an organization hold a dialogue between tacit and explicit knowledge, which, over time develops into valued insights which are then incorporated into organizational knowledge. The activity of individuals in an organization interacting is described as "the "ontological" dimension of knowledge creation" (1994, 15). The process by which this activity builds towards justifiable beliefs, or, as the author notes, "a dynamic human process of justifying personal beliefs as part of an aspiration for the "truth," is labeled as the epistemological dimension of knowledge creation (1994, 15). Nonaka further describes knowledge creation as starting with tacit knowledge at the individual level from experience. This knowledge is then enlarged within an organization through social interactions. This then becomes explicit knowledge through this process, called externalization. This explicit knowledge is then transferred to something concrete, such as doctrine, in a process he calls "crystallization," and which are tested by the organization before they are "internalized," the internalization marked by some kind of product, again, such as doctrine (1994: 21-27). This is further conceptualized as a flow chart between individuals with tacit knowledge who then share that knowledge, the knowledge is then conceptualized and crystalized, then justified, before finally networking the knowledge out to all individuals (1994: 27).

In 2009 Nonaka and von Krogh applied Nonaka's framework to Japanese businesses. These, like most other research efforts into the subject of knowledge creation focused on concrete objects- for instance, the development of a bread-making machine. Learning, in this case had to do with making the bread taste good and transferring the tacit knowledge of a chef to the machine developers in such a way that it became explicit enough to program the machine and then justified enough throughout the company to then use that at an organization-wide level with

respect to the bread-making machine project. Thus, his research may only offer insight into the realm of knowledge about concrete things, thus lacking insight into knowledge about abstractions. For instance, Army doctrine covering strategy, would be more of an abstract concept. Army doctrine covering changing parts on a tank would perhaps be more in-line with Nonaka's research (635-652).

Nonaka and von Krogh go on to assert that organizational knowledge creation theory is more concerned with "explaining organizational creativity, change, and innovation…" (644). Thus, an organization that writes down things in manuals and calls it knowledge that is not able to be objectively deigned as creative, leading to change or innovation would presumably not be covered under this theory. Further, the theory deals with "justified true beliefs" of an organization, even though it further defines truth as simply a process by which individuals and groups justify beliefs. Thus, concepts that might be more associated with assertions, theories, or hypotheses, even while being labeled as knowledge in an organization's manuals, would not be covered under knowledge creation theory (640). Lastly, the theory asserts that knowledge starts with individuals and tacit knowledge. Thus, this theory would not cover those examples wherein an organization's leadership might have ordered concepts to be inserted into its manuals without it originating in member's learning from experience and capturing that experience in tacit knowledge before being captured explicitly in manuals (635-52). It also calls into question how this process might work in a very large organization like a mega-bureaucracy.

Contemporary Advancements in Knowledge Creation Theory

Since Nonaka's original research, others have offered more insight into both his foundational theory as well as other directions, however they all likewise suffer from the

presumption of linear and proximate linkages between experience and knowledge creation. This is problematic in at least mega-bureaucracies due to experience being distributed across a massive organization and knowledge creation being significantly removed from those who directly experience front-line activity. It follows that as the structural and/or hierarchical distance between those experiencing phenomena and those codifying said phenomena into "lessons" increases, there would be more opportunities for other things to affect the final product. Likewise, it is intuitively logical that the more individuals observing activities in an organization, the more organizing those observations into a synthesized knowledge product would be different in degree (and perhaps kind), more difficult, and open to more influences tangential (or wholly divorced) from the original observation.

These other examples, using Nonaka's foundational theory, further emphasize the possibility that Knowledge Creation Theory would at the least need to be broadened past its current focus. As Lyles (2014) reiterates, knowledge creation theory focuses "on processes by which individuals and groups create knowledge," further, it is knowledge that helps organizations solve "messy problems" and learn from experience. Her own research used the theory to investigate how organizations used knowledge creation to innovate and improve performance (133). Like Nonaka, Lyles describes an organization using a rationalist and objectivist method to improve operations.

Hoon and Chermack (2008) note Nonaka and Takeuchi's emphasis on organizational knowledge creation as the "capability of a company to create new knowledge, disseminate it throughout the organization, and embody it in products, services, and systems" (58). Thus, organizational knowledge creation is about taking knowledge and extending it to its internal functions and outputs. They assume, as does Nonaka, that organizations create knowledge in a

positivist manner, oriented on improvement and that it is then inserted into its internal systems in a linear and rational manner. This might explain a small concrete portion of a large company, for example, an assembly line and one product on that line, but it might not cover an organization that deals in unclear technologies, and which aims for more abstract ends than a physical product.

Brix (2017) lays out an argument that organizational learning and knowledge creation have been artificially bifurcated by researchers, pointing out that Argote (2011 and 2021) and Crossan (2003) both note that the two are rarely studied, and that Nonaka and others with the development of knowledge creation theory made the separation explicit for purposes of study and ease of theory conceptualization. He then asserts that knowledge is created by way of a learning process and that the learning is influenced by that knowledge (133). Brix goes on to make two important assertions: 1) that knowledge creation begins at the individual level, taking that from Nonaka, Argote, and others, and 2) that organizational learning and knowledge creation, even if studied together still leaves other things out that are important in understanding the phenomena of organizational learning, knowledge creation, and organizational behavior. In short, if his point is that studying organizational learning and knowledge creation separately is problematic, then I would take it further and say that if organizational learning and knowledge creation are studied separate from other subjects, they likewise would not be sufficient in understanding organizational behavior.

Although Brix acknowledges the part that sensemaking plays in knowledge creation (115), for instance, sensemaking could be viewed as both a cause and effect of knowledge creation, organizational learning, and the sensemaking itself (through culture, etc.)- all three, instead of simply something that describes what really composes knowledge creation (“Through

interpersonal interaction, collective knowledge is created as a collective sensemaking process." (115). Thus, it is important to note the absence in the literature of knowledge creation of sensemaking as an over-arching influence on the entire organization- learning, knowledge creation, and the like being parts of what the organization does that is influenced by sensemaking, both at the individual and collective levels. It is also a possibility that sensemaking is both a product of these phenomena as well as a phenomenon itself that then has a self-reinforcing influence on all the above. This is not found within the knowledge creation literature.

Camisón and Forés (2011) assert that knowledge creation is all the abilities that enable a system of continuous learning within an organization, which could include education, experience, training, and skills of individuals, but "fundamentally" comes from R&D investment and internal problem solving. Thus, again, knowledge creation is seen as a positivist and linear subject: it starts with purposeful and concrete actions that then enable learning. This further uses Nonaka's fundamental assumptions about knowledge and its use in organizations: in this case as a mechanism by which organizations learn and improve. In this work, knowledge creation is deemed a product of R&D and solving problems and not something that emerges, is created through other means, and is not tied to solving problems or the deterministic notion of research and development.

Song and Kolb (2012) also echo positivist assumptions in their study of Korean firms by constructing a chain of learning that improves organizational performance: individual learning (as the basis for knowledge creation) and learning processes that allow for collaboration. The process ends with individual learning experiences being dispersed and converted to "actionable" knowledge within the organization (253), although they assert that little research has been undertaken into how "individuals create more explicit and applicable knowledge" (261). Here

again this assumes a positivist connection between individuals learning and that learning being dispersed and "converted" to knowledge with no apparent possibility for that individual learning to be corrupted along the way or, worse, being based on something that is wrong and still making its way into "actionable knowledge."

Kilic and Uludag (2021) apply Nonaka's SECI model to the study of military institutions, further reinforcing the idea that knowledge creation is used and developed through a process aimed explicitly at accomplishing organizational goals (4) and, by extension, nothing else. This research used a survey and asked questions about very concrete goal realization within a military institution. This is worth noting, because there are areas in the U.S. Army that would be conducive to Nonaka's framework since there are areas that have linear causal relationships, clear technology, etc. It would be worth investigating if the U.S. Army applies that same construct to all situations (clear technology methods to unclear technology subjects), as does the rest of the knowledge creation literature. In other words, the focus is still on positivist assumptions about knowledge creation and organizational learning.

Seo, et al, (2016), also building on Nonaka, offer a study that suggests that knowledge creation influences quality circles (an organizational concept that supports solving workplace problems), but assumes that knowledge creation is a process that objectively leads to useful information that can solve workplace problems. The creation portion only involves that which helps to solve problems, assuming, therefore, that knowledge creation in organizations is a positivist, objective, and deterministic subject (432). Ramirez, et al, (2011) also assert that knowledge creation within organizations plays a utilitarian role, it is only a part of organizational learning and learning that is tied to improvement and improving performance (309). Again, these studies do not address issues with creating knowledge wherein learning is not the ultimate focus

or the ultimate product and wherein there are other influences going on within the organization that affect in a primary way knowledge, its creation and its ties to learning.

Chatterjee, et al, (2018) are concerned with how organizations take knowledge and transfer it to others within the organization. Like others, they assume that knowledge is a product of single loop learning, that is, it is a linear type of effect from experience that, if transferred, can help the organization. All this research builds upon Nonaka and others in that they imply that an organization makes knowledge explicit by writing tacit knowledge down and then transferring it, but the research is lacking in cases wherein an organization produces knowledge that has not gone through a rigorous process prior to becoming knowledge. Additionally, this does not cover knowledge that an organization claims has come through a rigorous process but, has been corrupted in some manner, yet still makes it into an artifact that takes the form of knowledge. Similarly, to Chattterjee, et al, knowledge creation is an organizational activity, completed once the organization creates it by making it explicit. The product of this creation is, for example, a manual. Prior to that it is still "in creation." It is clear, however, that knowledge, in the literature's case, is justified, true, belief, and not something else (305-319). Knowledge that is not justified and true belief or that cannot be verified as justified and true belief is not addressed.

Sankowska (2013) posits that knowledge creation is the basic process for innovation and that knowledge creation is stimulated by trust (86). Again, this idea assumes knowledge creation deals only with those things that would be determined, at least after-the-fact, as having productive-to-ends (such as profit-making) characteristics. Trust within the organization may very well lead to innovation through knowledge creation, but that should not be what we assume all knowledge creation does. For instance, surely one can imagine that knowledge can be created within an organization through a social or top-down manner that is devoid of rigorous testing or

analysis, but then becomes common wisdom throughout the organization to the point that it becomes self-fulfilling: the organization restructures itself in a manner that makes following the knowledge created both successful in reaching interim goals as well as having nothing to do with continued organizational effectiveness outside of the new structure. Once the structure is established, not following the new knowledge could be detrimental to effectiveness (and even innovation, one could presume), however that truth could also be divorced from the actual structural change: the previous structure would have not allowed an effective use of the new knowledge. If the organization suffers from unclear technology, this could be even more the case and difficult to assess effectiveness claims after the knowledge is made explicit (transferred). This may be even more likely if an organization is attempting to create knowledge about abstractions and tacit ideas that deal with unclear technology, metaphors, and the like.

Lopez-Nicolas and Soto-Acosta (2010) assert that organizational learning "should be concerned with new knowledge creation" (521). This, similar to the rest of the literature, assumes a relationship between organizational learning and knowledge creation, that organizational learning is an objective type of thing (focused on organizational improvement), and that knowledge creation is linearly connected to organizational learning in that it supports it (it could very well be that knowledge creation (with or without other conditions) is a ritual that leads counterintuitively to organizational improvement and/or organizational learning, but not in any kind of direct causal manner). Again, if there is no linear linkage between knowledge creation and organizational learning for a reason, then making a normative argument towards that idea ignores the possibility that there is no linkage for a reason.

Lindblom and Tikkanen (2010) follow Nonaka's knowledge creation theory in looking at franchisees and the possibility of turning tacit knowledge into explicit knowledge. It is worth

noting that the researchers point out that franchisees wrestle with both tacit knowledge that needs communicating and tacit knowledge that can't be communicated- and either should not, or some other type of process or method must be utilized to share the knowledge. There might be issues if a franchise system did do this in a top-down manner, wherein the knowledge creation might serve another purpose. Thus, because the franchise system is a loosely aligned, potentially very large, organization, its learning and knowledge creation environment may have some similarities to the U.S. Army. This is the closest in the literature wherein the researchers note there may be rational reasons for parts of an organization to not want to communicate knowledge with other parts, however this "loosely aligned" concept is not fully addressed. In a mega-bureaucracy this may be more the rule than the exception.

Argote, et al, (2021) also continue in the positivist and rationalist line as they argue that learning begins with experience, the experience is interpreted by the organization, and that creates knowledge (5401). This creation of knowledge is at the core of organizational learning (5402). This follows the conventional knowledge creation theory in that knowledge is something that comes from experience and is the foundation of learning, further reinforcing the idea that knowledge must be something that results in something positive for the organization.

In the organizational learning literature, the portion that deals with knowledge creation is covered in the emerging Artificial Intelligence and machine learning research. This research touches on issues that machine learning has with certain types of knowledge creation, issues that are easily imagined as being potentially similar to mega-bureaucracies operating in complex environments. Argote, et al (2021) also make the point that machine learning is not suited for tasks in which the inputs and outputs are not well-defined, in which functions linking inputs to outputs change rapidly, tasks with unclear goals, with unclear performance metrics, that contain

ambiguous feedback, long chains of logic, taken-for-granted assumptions, or tasks involving explaining how decisions were made. This potentially would also apply in those areas in which tacit knowledge of those areas cannot be transferred to explicit knowledge, as they may be context-dependent, reliant on certain personalities, too abstract to deal with concretely, etc. They do not, however, offer anything as an alternative nor do they make the connection between all of these areas and organizational learning in general. These will be areas in which we unpack by looking at what sensemaking, institutional theory, organizational culture theory, and theory dealing with boundary objects might say about how organizations are impacted by different phenomena and especially those that would be exacerbated by all of the things they mention negatively affects machine learning.

Un and Cuervo-Cazurra (2004) start, as most researchers do, with the notion that an organization that has learned and improved or is improving did so through some learning based on knowledge- that helped it learn. It then uses that starting point to evaluate how firms create that kind of knowledge in a retroactive perspective, working backwards from the a priori assumption that knowledge led to the learning and the learning to the improvement (S28-S30). The problem with this is that the knowledge itself may not be the mechanism by which the learning happened or by which the improvement happened. It could be that the process of learning and/or knowledge creation provides an organization the mechanism, as of now unidentified, that provides the impetus for success. Thus, they assume a linear and univariate relationship between knowledge and learning.

Salmador and Florin (2013), in looking at how organizations learn in “turbulent environments” offers an updated model starting with Nonaka’s that assumes that knowledge- whether tacit or explicit or created by individuals or located in the organization- is a certain type

of information that is valuable to the organization in a very narrow manner: that which will help the organization (in almost all cases in the research- a for-profit organization) in an objective manner (to make money or solve a problem (that will then ostensibly make money)). Because Nonaka used the tacit and explicit knowledge concepts to craft his framework and draw a demarcation line between ideas that individuals have in their heads that was valuable to an organization and knowledge that is different in that it can be communicated to others, it might be useful to imagine a situation wherein tacit knowledge about a subject that either is so abstract as to be impossible to explicitly communicate or the nature of the knowledge itself is tacit: that is, to be incapable of further explication. Since the research focuses on examples of mostly for-profit companies wrestling with concrete problem examples and how to overcome them with knowledge and learning, perhaps the framework could be expanded to cover areas that are less concrete. Things like strategy, emergent effects, learning-in-action, pattern recognition based on contextual experience that elicits feelings, art, and war, perhaps, would require an even more expanded model that covers more than just information that helps an organization in an objective manner.

Søberg and Chaudhuri (2018) do go a little way towards identifying some gaps in knowledge creation theory by arguing that the ideas that not all things can be codified using language is a problem with the theory. They point out that Nonaka's SECI model as well as others like Crossan's 4I framework rely on the idea that language development is key to knowledge creation, thus leaving out nonlinguistic aspects of technical knowledge creation (89). This could be expanded by adding in the idea that not all knowledge can be explicit, not all things that potentially affect learning are linearly tied to knowledge, that learning is not always an objective and rational activity, that knowledge creation could be much more complex than a

simple positivist phenomenon, and knowledge itself could be ephemeral or highly contingent in complex environments.

Paavola and Hakkarainen (2005) describe Nonaka's knowledge creation theory as a metaphor, of which they compare to two others they call metaphors: the acquisition view of knowledge and the participation metaphor of learning. Of these, the participation metaphor may be the most useful to unpack in terms of some of the ways in which knowledge can be created in times of perceived crisis: the participation metaphor is less about objective truth and more about cultural practices and shared learning activities: acquiring the skills to communicate is part of the objective (537-538). As knowledge creation is unpacked in the instance of this research, we may be able to see what other activities are involved in knowledge creation beyond just the alternative to learning that building communication skills provides.

Also of interest is the idea that we must be able to understand what is meant by "knowledge" and "creation":

> *One question in the background of the knowledge-creation model is whether and to what extent students are able to create knowledge, and to what extent this is only a metaphorical way of emphasizing certain characteristics of learning. This depends, of course, on what we mean by 'creation' and what we mean by 'knowledge'. It appears that human activity is trans- formative in nature; people are very innovative in finding ways to achieve their desired goals and developing necessary means*. (554).

Thus, knowledge might in some cases of organizations in certain situations be more about ways of achieving desired goals and developing means through the process itself as opposed to being through the actual knowledge in and of itself. This could open the window up to more possible mechanisms of achieving desired goals beyond simplistic notions of "learning" and "knowledge" (and knowledge creation), as the concept can include multiple ways surrounding the processes and activities associated with those concepts. This would need to be expanded beyond just the

idea of achieving desired goals and developing means, it would need to include all the things that sensemaking would imply as well as how mega-bureaucracies respond to complex environments.

The purpose of surveying the relevant literature for knowledge creation is that the theory may explain portions of how knowledge is created in the U.S. Army. It certainly might explain how knowledge is created about more concrete subjects like logistics, missile trajectories, and the items in more technical manuals like airborne operations. It might also explain how other types of knowledge are created, or, at least, partially explain them. In analyzing the literature, there is a fundamental disconnect between the mechanisms found in the current literature and those that are in play in those situations that do not match what the literature emphasizes: specifically, those situations which do not enjoy concrete tasks with clear objectives and diffused experiences spread out across many different operating units and individuals in complex environments with unclear technologies. This suggests the need for more inductive theory development and consideration of alternative theoretical perspectives that can inform our understanding of knowledge creation in complex environments within mega-bureaucracies.

Before I touch on some key insights into how I approached the subject of knowledge creation, I think it is important to explain what I mean when I use the term knowledge, especially in the context of this research. There is a difference between knowledge that is the result of some form of learning and knowledge that is a normative claim. For instance, the sentence, “All things being equal, historical examples show that it is important to bring a significant number of troops to bear at a decisive point to win the battle,” can be viewed as knowledge gained from the study of battles. This could be viewed as knowledge and would be different than the sentence, “Mass is a principle of war and captures the idea that a significant force should be brought to bear on the decisive point in all times and places.” In the latter example, a claim is made with no justification

as to where it comes from (such as a study of history, as in the former example) nor does it give the caveat that context is important ("all things being equal"). Thus, in the former statement, it is implied that a study of history has led to the observation that, given the context, massing at "a" decisive point can be important. In the latter statement it is implied that there is a decisive point in all contexts and that massing at that point is key. I make the distinction between knowledge in the first sense and portions of doctrine that imply a normative claim that cannot be labeled knowledge in the same vein as in the first example. Simply put, there is a difference between normative prescriptions and knowledge that comes from experience. It is also important, however, to note that that distinction is not made clear in Army doctrine, in fact the two seem to be conflated quite often.

The key, I assert, is to not assume that knowledge creation starts with the presumption that an organizational improvement or success or even learning event came directly from knowledge. What the organization calls knowledge could have resulted from many different sources and still might, even if not technically "justified, true belief" play a part in learning and/or organizational improvement. Second, knowledge creation also is very likely to be influenced heavily by many other different influences and the more complex an environment and the larger an organization is, the more these influences will mold how knowledge is created and what form that knowledge takes. The following two sections will explore what the literature on institutional theory, organizational culture theory, sensemaking, and the concept of boundary objects says about how knowledge creation might be impacted in the process from member experience and observation and codification into a knowledge product. As we will see, however, none of these theories cover explicitly the aforementioned effects on knowledge creation itself,

preferring instead to focus on learning in general and environments that do not necessarily reflect complexity and unclear technology.

II. Potential explanatory theories that would explain knowledge creation outside the conventional knowledge creation theory

Institutional theory, organizational culture theory, sensemaking, and boundary objects may offer something unique to the study of knowledge creation, specifically as it relates to the role of doctrine in knowledge creation within the U.S. Army. The previous portion of this chapter noted the gap in the literature on knowledge creation. In this section I will cover how mechanisms described in these theories may hold insight into how knowledge is created within mega-bureaucracies operating in complex environments.

Institutional theory holds that organizations copy others when resources are centrally and externally controlled, where there is ambiguity about objectives, where technology is unclear (uncertainty between causes and effects of individuals' efforts), structures are rigidly hierarchical, and the field is professionalized (DiMaggio and Powell, 1983). These characteristics both describe the U.S. Army and are not covered in the literature, as noted previously, in the knowledge creation literature. For example, an organization without technological clarity could insert something into its doctrine that is conventional wisdom in the greater environment because it is safer to do so than not, as opposed to it being the result of a rigorous process related to capturing true belief through objective observations based on experience, as the knowledge creation literature assumes.

Organizational culture theory holds that organizations display their culture through the behavior of groups and that that culture is reflective of its beliefs, values and assumptions

(Schein, 1992) and that different cultural types affect learning. Denison and Spreitzer posited cultural archetypes within organizations: group, developmental, hierarchical, and rational (1991). If an organization is forced, for example, to mimic others due to a chasing of resources as described in Institutional Theory and its innate cultural proclivities (maybe a risk averse nature), and this affects its knowledge creation and thus its learning, and that learning then is reflected in its behavior, then this explanatory theory seems to describe a system wherein the variables are mutually affecting each other. This potential circular pattern between culture (in this example, risk averseness) and knowledge creation could explain knowledge that is created outside of a linear and clear technological process, as is described in the conventional literature on knowledge creation.

Sensemaking describes how organizations take in information through a process by which they filter that information through their members' values, beliefs, and assumptions (thus linking it to culture) to make sense of their environment. Thus, sensemaking could be thought of as the process by which culture is reinforced and by which an organization's culture might be reified. That process, naturally, would affect knowledge creation, as it would filter observations and experience prior to them becoming knowledge. Although describing much of its effect on organizations and especially learning, the literature on knowledge creation, as noted previously, does not include sensemaking. Thus, it is important to understand what the literature says that might affect knowledge creation and present a different take on knowledge creation outside of the conventional literature framework for knowledge creation.

Boundary objects, the fourth subject, is the idea that different groups use certain types of artifacts to support collaboration across diverse sets of members. These artifacts could include knowledge and, thus, the products of knowledge creation: doctrine. (Cook and Brown, 1999).

Thus, if an organization uses knowledge creation for, among other things, to allow for collaboration, then it ceases to be just a product of rational and objective experience and analysis of that experience.

Each of these four theories is covered below in more detail and their implications on knowledge creation made explicit.

A. Institutional Theory: Isomorphic Implications on Knowledge Creation

> Argyris and Schon: *…individuals are unaware of a discrepancy between their espoused theories of behavior and their theories-in-use, and this leads them to blame others for problems they have unwittingly helped create.* (Easterby-Smith, et al, 2004)

Isomorphic pressures to look the same as other agencies or disciplines to build legitimacy and gain resources could have profound impact on knowledge creation, organizational learning, and, thus on doctrine. As Argyris and Schon point out in the quote above, individuals rarely see themselves as they behave, rather, they see themselves as they think they are, thus they are blind to why problems happen and how isomorphic pressures cause them to act. This is also true with respect to organizations, as organizations are made up of people, but, also because of various emergent effects related to organizational behavior. Institutional Theory describes one such phenomena: the example of organizations seeking legitimacy by copying others (Meyer and Rowan, 1977). This might take the form of the Army attempting to copy the approaches of the physical sciences in terms of an empirical approach to warfare, not unlike the social sciences in general. Doctrine might take the form of an attempt to legitimize the military profession through the attempt to copy how the physical sciences approach their subjects. (DiMaggio and Powell, 1983). Additionally, the Army copies heavily from the R&D world in terms of technology procurement, all its management systems and thinking come from commercial “best practices” and general knowledge from business schools. Many leaders boast Lean Six Sigma and other

kinds of certificates and many of the latest AI and other types of efforts are borrowed and adopted within the Army as well.

DiMaggio and Powell (1983) further posited that rationalization and bureaucratization cause organizations that emerge as a field (or, a profession), to realize a paradox: rational actors make their organizations increasingly similar as they try to change them. This isomorphism is heightened in fields chasing centralized resources and reliant on centralized dependency, where there is ambiguity about objectives in the field, where technical uncertainty exists (uncertainty between causes and effects of individuals' efforts), structures are rigidly hierarchical, and the field is professionalized. This characterizes many public agencies and the U.S. Army closely.

Tolbert and Zucker (1996) string together various researchers of institutional theory to arrive at the idea of "sedimentation." Sedimentation is the end-result of a process they identify as starting with innovation, changing to habituation, becoming objectified, and, lastly sedimented. Habituation is when innovative practices become more formally adopted across an organization. Objectification describes the adoption of the habits found within habituation into the structure of an organization. Lastly, sedimentation occurs once the original innovation becomes a long-term structural change retention. Tolbert and Zucker (1996, 184)) note that low resistance by natural opponents, support from advocates, and positively correlated outcomes added to the likelihood of this sedimentation. They also note that a weak link between preferred outcomes and the original innovation can happen during the sedimentation period and lead to a stronger sedimentation. This is intuitive: if a group that opposes a change cannot easily show a relationship between outcomes and activities related to innovation, it follows that it would be difficult to justify change. Strang (1994) found that institutional theory tied structural changes to the resources gained from that structural change vice the structural change resulting in more effectiveness or

efficiency. He insightfully observed that adopting formal programs or structures that served as symbols and signals were often established even in the face of widespread knowledge that their effect on individuals' behavior was negligible.

Through an organization's learning processes, doctrine might be seen as needing to serve as the recorded knowledge of the organization. Assuming, for a moment, that not everything an organization records in its doctrine is rationally derived and objectively tested conclusions, then it begs the question what other things an organization might be recording if it is not what traditionally might be thought of as knowledge. Thus, if an organization is recording knowledge that really is not knowledge (not rationally-derived/objectively tested information), but something else in its doctrine, then one possibility that the information could be is a form of an obstacle that Argyris and Crossan (2003) refers to as a "Model I" routine in which humans develop defensive postures that create a circular logic that is not testable. This possible barrier to learning or improving is juxtaposed with a "Model II" situation wherein an organization is comfortable with "going meta," learning to critically reflect. The organization may be doing relying on a Model I routine due to isomorphic pressures, which, as Tolbert and Zucker (1996) describe, can happen when innovations become sedimented: out of a defense to resist change obstacles are created that make it difficult to further innovate. It is logical to imagine this happening to doctrine, as in doctrine produced during these organizational reactions are used as Model I situations that simply support sedimentation. This is as opposed to serving as rationally derived, objectively tested knowledge.

These isomorphic pressures to look the same as other agencies or disciplines is more likely to happen within environments that suffer from unclear technology. As DiMaggio and Powell (1983) noted, for just one example, isomorphism may more likely exist in an agency that

that is characterized by very unclear objectives. It follows that if the Army were attempting to build a case for more funds or to retain a certain level of funding, yet was very hard pressed to articulate what those funds would lead to, it might attempt to focus its knowledge creation on things that were more clear, ignore the opaqueness of military operations, or attempt to create doctrine that treated tacit subjects as if they were explicit. Simply put, selling politicians and the press on stability operations might be easier if the doctrine on how to do them were stated simply, ignored paradox and complexity, and offered up an intuitive, even if very general, recipe for those types of operations.

This is all to say that the complexity inherent in public agencies and in the U.S. Army in particular, may have some profound effects on learning and knowledge creation. The environmental complexity makes it more likely that the organization will suffer isomorphic pressures. The environment will make it very difficult to deduce what new knowledge is required or even if new knowledge is required. The Army's culture is affected by that complex environment, and that in turn affects its isomorphic tendencies as well as its knowledge creation, organizational learning, and, thus, doctrine. A mega bureaucracy, serving multiple stakeholders, and especially one in which the technology is unclear makes a Model I (Argyris and Crossan, 2003) context much more likely according to Institutional Theory. That is because if an organization is under the pressures associated with complex cause and effect relationships and the need to please multiple stakeholders (mega-bureaucracy), and thus the near impossibility or impossibility to prove effectiveness, copying others (isomorphism) is safer and using artifacts within the organization to defend existing structures (Model I) makes rational sense. The mega bureaucracy is challenged to utilize Model II types of approaches, since Model II types of approaches are inherently risky. They involve questioning established structures and any changes

related to the approach, if they fail or seem to fail in the short-term, can be easily attributed to the changes as opposed to some other cause, especially in unclear technology environments (complex).

B. Organizational Culture: Cultural Impacts on Isomorphism, Knowledge Creation, and Knowledge Transfer

Organizational culture also may provide insight into what role doctrine plays in knowledge creation. Is doctrine merely providing documentation that reflects a changing culture based on organizational learning as suggested by the linear frameworks of knowledge creation reviewed previously? Or is the doctrine itself leading change efforts as an agent of change? Or is doctrine the antidote to organizational change and learning, re-affirming old ideas to stabilize and create continuity? This may be a chicken and the egg kind of question, but it is also worthwhile to consider research on how culture affects organizations in general. It is difficult to understand the absolute role doctrine plays. In some contexts, it can be more of an artifact of the culture instead of a tool that supports learning. (Milway and Saxton, 2011). Others have asserted that organizational culture was the key to military change after 9/11, but that still leaves open the possibility that the doctrine did not drive the change, but simply reflected the culture in the enablement of the change (Rottman, et al, 2009). In addition, if organizational culture provides stability, consistency, and meaning (Schein, 1992), then doctrine may serve as a reinforcement mechanism of the process of meaning-making (Tuck, 2016). Many see the military as a rationalist, problem-solving organization, thus doctrine could simply reinforce this identity (Paparone, 2017). This dovetails with the previous section on isomorphic pressures in complex environments and within mega bureaucracies who have entered a sedimentation period with its structures (and related doctrine).

McCalman and Potter (2015) note that there is a learning paradox in organizations. Managers that engage in incremental learning encourage a reproduction of the established culture that is tied to the identity of the manager. This is especially prevalent in professions wherein subject matter experts hold a monopoly on knowledge. This keeps the organization from learning, because learning requires questioning the conventional knowledge. The inability of an organization to encourage its members to dialogue prevents learning that involves knowledge that is unknown to the organization.

Argyris and Schon (1996) describe organizations in which a culture of learning is juxtaposed with a culture of defending existing norms and that the culture of learning requires organizations that are open and reflective. Schein asserts that culture can be observed and studied through the behavior of groups and their beliefs, values and assumptions. Its behavior is determined by the organization's culture. Culture, further, takes time to form, it is not changed overnight, but is the result of successive failures and successes that lead to beliefs about what values and behaviors are important. An organization's culture in complex settings that are characterized by uncertainty and volatility, some research has suggested an emergent "craft" approach is more effective, as opposed to the plan-led construct of traditional strategy (Mintzberg, 1990).

A mega-bureaucracy can be thought of as a group of organizations that operate as one organization in some form or fashion or even just in name only. For instance, all of the different General Motors divisions were widely known to work against each other in the Seventies and Eighties (Womack and Jones, 1990) and, being in the Army and Special Operations, there are many instances I can recall in my career in which sections of the Federal government, different branches and units within the military, and different units within the Army and Special

Operations clashed with each other and were unable to work together. Thus, it makes sense to view mega-bureaucracies or even very large organizations in general as entities with multiple cultures. This would make these organizations even more complex from the cultural aspect, whether looking at what they collectively assume or the different types inherent therein. Thus, it is important to look at what the literature says in terms how culture drives knowledge.

Schein (1992) perceived organizational culture as a pattern of basic assumptions—invented, discovered or developed by a given group as it learns to cope with its problems of external adaptation and internal integration. Such a pattern has worked well enough to be considered valuable and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems. Wiener claimed that 'most researchers of organizational culture agree that shared values are a key element in the definition of culture' (1988, p. 534). Organizational culture has many dimensions and variations. According to Denison and Spreitzer, 1991) there are four types of organizational culture in imagining a competing values framework: group, developmental, hierarchical, and rational. Group culture is internally focused and flexible and is focused on concern, commitment, morale, participation and other values that are associated with groups or in-group dynamics. Developmental is externally focused and flexible and involves things like innovation, adaptation, and growth. Hierarchy is internal and characterized by control and is concerned with things like documentation, stability, measurement, and continuity. Lastly, rational culture is external and focused on control and includes things like accomplishment, productivity, profits or impact, and goals. It follows, then, that a mega-bureaucracy would potentially be made up of multiple types of organizational culture, further making things more complex. These examples show that culture within any large organization with multiple subordinate sections will be made up of several groups that

potentially have different cultures and thus, different assumptions that bring them together as a group and that within even these sections, there are complexities within the shared culture-culture that has different purposes and locations. All of this is to suggest that culture, and its impact on knowledge creation within organizations, would be both very influential and adding to the overall complexity of the organization, the organization's learning process, and its process of knowledge creation.

For example, in reflecting on my own career, in my last unit I felt a group culture emanating from the section within which I was assigned that was very much centered on morale and participation and concern for one another and commitment to the mission and the reputation of the section. We also had a developmental culture that was more of a loose network within multiple sections of not only the Command, but also the Army and Special Operations writ large that was very interested in innovation and adaptation. I also am reminded of the hierarchical culture that came from the Army, SOCOM, and the higher HQs that demanded we measure things, provide documentation (we even had the doctrine division for Special Forces within our group), attempt to control things (we set policy rules for the SF Branch), and provide stability. Lastly, within a rational culture, we attempted to make an impact on SF students and the force as a whole with our actions to assist in the production of personnel from the schoolhouse, articulate goals for the wider force, and accomplish goals. This culture was probably more of a Regimental culture, coming from the reputation of the Green Beret, the 1st Special Forces Regiment, the legacy personnel, and a sense of duty to the Army and country writ large. I can easily see the competing values and mechanisms within my own experience when looking at the culture through those prisms and reinforces the notion that in a mega-bureaucracy with competing values, stakeholders, and cultures in this case, that this can exacerbate the pressures and

influences noted in the previous section on Institutional Theory, making things even more complex and adding to the very interesting and often paradoxical effects of these phenomena.

Garvin (1993) posits that organizations must have a strong learning culture, which means they are good at creating, acquiring, and transferring knowledge, and at changing behavior when new knowledge suggests doing so. This links learning and culture with knowledge, something the previous section on knowledge creation noted can be problematic in certain situations. Knowledge creation, if not justified true belief as Garvin implies here, may not have much do to with learning per se, or at least not in the linear way in which Garvin describes. As Denison and Spreitzer (1991) noted, a learning culture might be only one facet of the developmental part of an organization's culture, and thus be at odds with the other types of culture. Garvin's points, however, do represent the bulk of the literature, as noted before, on organizational learning: that it is (or should be) a linear, one-dimensional and focused phenomenon.

Argyris and Schön (1996) assert that organizational learning emerges when organizations acquire information, defined as knowledge, understandings, know-how, techniques and procedures and that a performance culture is an obstacle to acquiring that information. This is juxtaposed with a learning culture that would not view doctrine as supporting performance goals or the performance culture. This reinforces Denison and Spreitzer (1991) in noting different cultures working at cross purposes based on their values. A performance culture would fit into their rational culture whereas a learning culture might fit more in the developmental culture area. Their insight may be that all organizations have these multiple cultures, and it is not possible (nor perhaps preferred) to attempt to focus only on one culture. All the cultures represent needed values, and the trick may be to balance these values in such a way as to collectively allow holistic learning as opposed to prioritizing only learning based on performance. Performance and

learning about one's performance is important, just as learning in a more developmental manner. A focus on Argyris and Schon's double loop learning (1978) would potentially allow an organization to appreciate these different ways of learning.

In conclusion, extant literature argues that culture is seen through the behavior of members of a group that reflect the group's values, however those values are not necessarily conscious within members or even the group. This culture affects how an organization makes sense of their environment and is reinforced by that sensemaking. When that environment contains unclear technology, and when the organization is a mega-bureaucracy, that cultural influence can become one of the main influencers on knowledge creation, even more so than other organizations due to the cultural pluralism involved in the said organization. Organizations that exist in complex environments and are themselves complex, such as is found within mega-bureaucracies, find obstacles to learning from knowledge created in rational, objective, and linear manners if they are performance-focused as opposed to learning-focused, and most organizations are performance-focused. In addition, Western culture is performance-focused and the military, from my experience, is hyper performance-focused.

This culture that an organization has, whether performance-focused or not, is perceived by members to have worked in the past and is thus taught to other members, inculcating new members and old in the way to perceive of the world and act. Thus, culture can be thought of as the soup within which the organization's doctrine floats. The artifact of its knowledge creation, its doctrine, both emerges from the culture and, in turn, could play a role in shaping the culture. As culture is perceived through its behavior, and knowledge creation is an action, doctrine production is one of the actions in which the organization's culture can be discerned. Additionally, if the dining room (in this case its environment) in which the soup bowl sits is

complex, the pressures on the cooks to make the soup within the bowl to look like other soups, other foods, or even other things in the room become greater, since to look too unique could confuse guests and other outsiders and risk the loss of resources and/or legitimacy. If a customer (Congress in the military's case?) orders chicken (what one would expect from following the doctrine) as part of its soup, it better not come out with squid in it. In other words, if there are too many chefs stirring the soup pot (as in a mega-bureaucracy) and adding their own ingredients in, the resulting knowledge and knowledge creation process could become largely divorced from any kind of rational, make-the-best objectively determined soup through a linear process- which is not what the literature on knowledge creation assumes.

C. The Role of Sensemaking

> *Order, interruption, recovery. That is sensemaking in a nutshell. And organizing is the act of trying to hold things together by such means as text and conversation, justification, faith, mutual effort (heedful interrelating), transactive memory, resilience, vocabulary, and by seeing what we say in order to assign it to familiar categories.*
>
> - Weick, 2001, 39

There are paradoxes involved in the interchange between sensemaking and learning (Calvard 2016). Organizations attempt to process new information in a continued effort to make sense of the world, and that sensemaking is both informed by learning and informs its learning processes (Calvard, 2016, 66, 77-78). As sensemaking also includes identity, values, culture, and paradigms, it is a complex topic. This complexity, inherent in how an organization's members individually and aggregately process information as they observe the world and try to make sense of it, affects everything that an organization does, to include learning, and, thus, knowledge creation. How knowledge creation might be affected by this sensemaking is important to understand.

The concept of learning itself is ambiguous and "poses an antithetical, oxymoronic challenge to the organizing aspects of sensemaking: to learn is to disorganize and increase variety. To organize is to forget and reduce variety" (Weick and Westley, 1999: 190). The works of Karl Weick further note the role that sensemaking plays in organizations and it is not all about learning. Individuals and organizations use information to justify decisions already made and the rationality of those decisions is inferred afterwards in order to make sense of things that have already happened. This is all within the context of different interests vying for control over organizations that are themselves made up at least partly of ceremonial designs. Ceremony is, in this case, a very important part of the social nature of organizations and individuals (Johnson and Kruse, 2019). In short, when something new happens that does not make immediate sense, individuals look for reasons that will allow them to continue with their normal routines. Reasons come from frameworks built by "institutional constraints, organizational premises, plans, expectations, acceptable justifications, and inherited traditions." (Weick, 2001, 131-132).

Moreover, sensemaking is a process organizations and individuals go through when confronted with new things. "… people make sense of prior actions in ways that constrain subsequent actions" (Weick, 2001, 5). Further, Weick describes how this process unfolds: things do not happen to people, people observe things and attempt to make sense of them. They are anchored by their past experiences (sensemaking), are triggered to sense-make by the doubt of uncertain situations, and sense-make based off the overload of information during complex situations; in doing so, they create more information than needed and thus affect the sensemaking process (2001, 6).

Sensemaking can also be affected by different organizational types. Those organizations that are so-called "higher reliability" organizations (HROs) are constantly looking for failures.

Further, the counter example of an HRO is a traditional organization, one in which the mindset is focused on successes, simplifying assumptions, refining strategies, pouring resources into planning and anticipation, and deferment to authorities at higher levels. HROs, on the other hand, "tend to pay more attention to failures than success, avoid simplicity, are just as sensitive to operations as they are to strategy, organize for resilience rather than anticipation, and allow decisions to migrate to experts wherever they are located" (Weick, 2001, 117). Thus, sensemaking in organizations that are HROs is different than within organizations that are more traditional. Sensemaking in more traditional organizations would be less likely to understand a new and unique situation as the process and focus is different. "To summarize, in a culture that is less mindful and more willing to simplify, abstracting is done superficially in a more coarse-grained manner that confirms expectations, suppresses detail, overstates familiarity, and postpones the recognition of persistent anomalies" (2001, 121). Additionally, organizations loosely tied to operations impair situational awareness of problems about to turn into crises. In terms of anticipation, those organizations that focus on anticipation reinforce reliance on past success, simplification, and strategy, making it harder to be skeptical about situational understanding.

In Weick's epilogue, he summarizes his main idea that individuals in organizations tend to oversimplify explanations and generalize due to the need to communicate. As he states here:

> *…organizing creates organization out of generalizations, hindsight, and the conversion of knowledge by acquaintance into shared knowledge by description. We generalize in the interest of cohesion, but that generalizing is costly. Selective perception and editing are inevitable and substantial. People, however, often remain unaware of just how much goes unnoticed because they presume that their central position (everyone is central in some hierarchy) gives them a comprehensive picture. This fallacy of centrality undercuts both the presumption that things could be otherwise and the curiosity to see just what that 'otherwise'*

> *might be. Unconstrained abstracting leads to a condition where people know less and less about more and more.* (274)

In short, Weick describes the process of sensemaking to result in a contradiction: to make sense as part of a group, communication is one key requirement, but in order to communicate, nuance is often lost in favor of ease of communication. The more complex the environment, the more likely the communication will be characterized by "unconstrained abstracting," resulting in knowing "less about more and more."

In Weick's 2015 work with Kathleen Sutcliffe, they further elaborate on organizations' difficulty with the unexpected. For instance, Weick and Sutcliffe go into detail on several cases that show that an organization that is focused on its failings, not prone to trying to simplify sensemaking, concentrates on its operations as much as its strategy, builds resilience more than anticipatory abilities, and relies on expertise as opposed to authority is likely to do better in unique circumstances. In more complex situations, a "spirit of contradiction" allows for more learning. If, however, one's organization is more traditional, making sense of situations usually entails a "spirit of accord," where "sensitive topics are avoided, people use tactics of polite conversation, and arguers are motivated to present favorable imagines of themselves" (52).

Tsoukas (2004) describes sensemaking in terms of an organization's process of abstraction and generalizing to that abstraction. In order to generalize, he claims, activities are organized (not structured); worded differently, to organize is to do something and that doing is the organization. Further, that action is governed by concepts, categories, and generalizations. This is related to sensemaking because the process of generalizing is part of an organization's sensemaking. Additionally, Tsoukas' explanation of the process of how action emerges from concepts, categories, and generalizations is that it comes from knowledge preserved in texts and then is distributed by the organization (2005).

The gap in the literature is less obvious in reference to mega-bureaucracies in complex environments. Since sensemaking results in organizations trying to make sense of their environment, and that is more difficult in complex environments, not only does that result in more difficult learning, but the sensemaking includes many things other than learning: identity, values, culture and paradigms. Where the literature still seems to miss, however, is in centering on the conditions of the change, decision, learning, and knowledge creation itself. Knowledge creation in the context of the sensemaking literature is contained within the idea of it being an emergent phenomenon as part of a sensemaking process that results in text that guides action. This action, due to the focus of the organization, could be conducive to operating in situations of uncertainty or not. But the text itself, its creation, the conditions therein, and finally the effects of the conditions of those texts on the learning of the organization are not the focus of the literature. This connection between sensemaking and texts, however, begs the question of the role doctrine plays in organizational learning and knowledge creation.

D. Boundary Objects:

In addition to behavior, culture can also be observed through objects. Things in a culture are its objects, also known as artifacts (Patton, 2015, 376). Artifacts are things that a culture makes and uses, and these artifacts can show tensions within the culture's activities and values (Creswell, 2013, 95). Doctrine, as an artifact of the U.S. Army, thus can be thought of as an artifact and one clue to its culture. Some objects within an organization also serve as what are called "boundary objects." One of the key ideas within the literature on boundary objects that I will discuss below is that boundary objects - like doctrine - are not created divorced from the environment in which it is created. More specifically, knowledge is created in an environment that includes how it is created and how it will be used by the organization. This environment

includes many different things other than just the simplistic idea of a linear, rational, and objective process to discover knowledge that will assist the organization in solving problems. Boundary objects, as we will see, serve other purposes than just objective and rational problem-solving knowledge constructs.

The idea of boundary objects is that different groups use certain types of artifacts to support the creation of shared meaning and collaboration across diverse sets of members. Doctrine can be thought of as a boundary object, since all artifacts are potential objects meant to provide shared meaning. Doctrine, for instance, provides a common vocabulary for its members. The way the Marines define and use the term design is different than the way the Army does, for instance. In looking at doctrine as a boundary object, this may provide some insight into its usefulness and how it might serve a different function than providing an organization a learning platform solely limited to the transfer of knowledge as much as at least partially as an object that builds collaborative capacity. (Cook and Brown, 1999).

If doctrine can be an object that plays a role in cross-functional coordination, then doctrine gets its meaning from the activity around how it is used in collaboration and not necessarily from its role as a product of knowledge creation, although it could serve both functions as well (Nicolini, et al, 2012).

> *The same object can thus take center stage or shift into the background at different times. The key finding here is that the type of work objects perform in conditions of collaboration derives not only from their inherent nature but also from the nature and unfolding of the activity itself.* (612)

Thus, boundary objects serve as bridges between intersecting social and cultural worlds. A common uniform, for instance, could provide the function of assisting in collaboration between different branches within the Army. A common hat might provide the same between different members of the same unit, but from different sections of the unit. The scrubbing ritual prior to

surgery may provide the same for medical care professionals. The standing up for the entrance of the judge during a court procedure, and so on. These artifacts may provide more in terms of providing for collaboration than they do of their original or explicit purpose. (Akkerman and Bakker (2011).

Boundary objects also may require certain characteristics to facilitate collaboration. According to Harrison, et al (2018), these may include facilitating current interactions, foretelling future patterns and roles, calculating costs and visualizing ways forward, and shaping power relations. In terms of the products of knowledge creation, doctrine, they may facilitate current interactions by giving a common language. Future patterns and roles are literally defined in the U.S. Army by doctrine; thus it can definitely play that role. At least in the U.S. Army there are portions of doctrine that relate to calculating costs such as risk, but there are also procedures within regulations that get towards monetary calculations of costs as well for the organization. Lastly, doctrine also shapes power relations in that, at least in the U.S. Army, doctrine defines how power is distributed and what the roles and responsibilities are of those in power.

In talking about doctrine as a boundary object, Cook and Brown (1999, 388) note that knowledge should not be seen as a thing to possess, but as a tool "at the service of knowing." Again, this gets to the idea that doctrine does not exist in a vacuum, separate from how it is created and used in real life. Further, Spee and Jarzabkowski (2009) highlight the idea that meanings and actions are attributed to boundary objects during interactions within an organization. These tools of collaboration also serve sociopolitical purposes and provide, as noted previously, a common language (but not necessarily shared meanings as those across hierarchical levels may derive difference in meanings to the same artifacts and language usage). Boundary objects can make information sharing difficult between hierarchical levels due to the

differences in the usage of information. For instance, a report that shows a savings if an investment is made might be valuable for one level of headquarters, but very dangerous for a higher level if it was relying on justifying future outlays by not showing a savings.

This is all to say that doctrine, if it serves as a boundary object, can play a different role than just the vessel of knowledge created that may seem intuitive. Since knowledge is created and placed into doctrine, it follows that all of the influences previously noted, complexity of the environment, the size of the bureaucracy, the culture, the organizational sensemaking, and its pressure to look like others will have an effect on the knowledge creation. The doctrine itself, potentially a widely known publication, serves at least partly as a way to collaborate across different groups within or even outside of the organization.

As the organization attempts to collaborate, the doctrine may provide a common language, then guide future roles and cost calculations of different options, and, finally, serve to reinforce the hierarchical structure of the organization. In times of complexity, this boundary object function may be perceived as more important, either consciously or not, than actually changing the way the organization thinks or acts. Tying this into sensemaking, an organization faced with complexity under certain conditions could potentially value a reinforcement of what the organization already believes, a comfort in strengthening status quo hierarchies, and fall back onto previous sensemakings. Doctrine, as a boundary object can play the part that sensemaking by mega-bureaucracies and especially in complex environments prefers.

III. Conclusion

There are many theories about organizational learning and change, but the ones most pertinent to this study are those that most likely explain differences in how mega-bureaucracies

in complex environments use doctrine. The conventional wisdom is that these types of organizations will use doctrine to capture knowledge in a linear fashion that leads to knowledge dissemination and then to knowledge retention. A rational and positivist paradigmatic assumption about knowledge thus paints this picture, using the U.S. Army as an example of how this might work:

> 1. Members of the U.S. Army and units experience operations (war), conduct exercises (training), and study war (education).
>
> 2. These experiences are captured mostly objectively by different methods like "Lessons Learned" and unit situation reports.
>
> 3. These captured experiences are codified into doctrine after thorough analysis, review, and approval.
>
> 4. The doctrine is disseminated throughout the force, taught in the schools, used to guide exercises, and put into practice during war.
>
> 5. The cycle is then repeated and knowledge about war proceeds linearly in a continuous "positive" direction, building on itself.

Adding in the similar notion that organizational knowledge creation theory posits, in step One, above, members of the Army would hold knowledge from these experiences tacitly. They would then share this knowledge through some mechanism wherein the tacit becomes explicit, roughly related to step 2. In step 3, through a justification process, the Army would verify this knowledge as justified and true, or at least towards truth. Lastly it would be disseminated out to all members of the Army in step four.

However, instead of these similar linear examples, however, the broader literatures related to institutional theory, organizational culture, sensemaking, and boundary objects suggests that organizations, and mega-bureaucracies especially, may create knowledge through mechanisms that include processes related to organizational mimicry, the balancing of competing

values, retrospective sensemaking, and strategic convenience. Additionally, the creation of knowledge within these mechanisms may be affected by numerous other highly contextual influences. Lastly, if the organization is a mega-bureaucracy operating in a complex environment, all of these influences could combine to result in doctrine- the output of knowledge creation- as playing a very different role than simply the codification of knowledge. From the outset, organizations in complex environments will attempt to make sense of the situation for reasons that have more to do with human nature and needs than rational improvement and learning. The attempt to show improvement through learning can be further influenced away from learning through pressures to copy others, especially if the organization's culture is one focused on performance and not learning. Finally, the doctrine may play a more important role in assisting in collaboration across different groups within the organization.

The literature, however, presents a gap in that the ways in which doctrine might be used by mega-bureaucracies in complex environments has not been considered. There are areas in which it can be intuited and deduced, however no one study puts it all together coherently. In addition, none of the literature addresses the issue of the role of doctrinal change from the role of the doctrine itself. Lastly, there is very little on doctrine as a concept. Instead, most researchers refer to the concept as knowledge creation and spend little time on the creation itself and even less on the output of said creation, except as to say that knowledge is justified true belief that goes through a rational process of tacit knowledge at the individual level to eventually be codified into explicit knowledge on its way to becoming organizational knowledge.

IV. The Case Study

In the aftermath of the invasion of Iraq in 2003, the U.S. Army found itself in what it defined as a complex situation. After toppling Saddam Hussein's government and Army in a

very short timeframe, long-simmering sectarian fault lines appeared, and civil war broke out. The School of Advanced Military Studies (SAMS) at Fort Leavenworth, Kansas, was tasked to send a team to U.S. Central Command, the senior command in charge of operations in the Middle East. Their charge was to figure out what had gone wrong in the lead-up to the war. The suspicion at the highest levels was that something was missing from the Army's planning process. (Jackson, 2019).

The team was made up of some systems thinkers, historians, and some familiar with complexity theory. This group concluded that the planning process had indeed been insufficient but went further: the way in which the U.S. Amy "thinks" was insufficient. To fix this, the team took its cues from complexity theory, systems thinking, Soviet and Israeli military operational design and art, and the Stanford School of Design. They created a new model of military planning and decision making that was branded as simply, "design" and it suggested there was no cookie-cutter approach to warfare and that military operations could not be thought of as formulaic- only requiring a recipe (Ryan, 2016).

The design concept started out attempting to break the Army away from a linear and rational planning construct. Today design enjoys a very convoluted existence. Many think it refers to operational level planning of military campaigns for very large forces. Others couple it with the Israeli's Systemic Operational Design concept that was blamed for the embarrassment during the Second Intifada. Still others think the old system is sufficient and even the new codified method is not required. Different commands have presented their own versions and many units do not use anything different than they did prior to Operation Iraqi Freedom (OIF) (Zweibelson, 2011).

It is the purpose of this research to investigate the evolution of the doctrine surrounding the concept of design to inquire into what happened and why. The doctrinal record should show the *what*: how the design concept evolved over time as the U.S. Army struggled with attempting to figure out what happened prior to OIF. The interpretation of the doctrine and the overlay of different theories on organizational change, learning, and knowledge creation should offer some hints at what possibly happened as the U.S. Army was at war in multiple countries and increasingly described the environment as more and more complex. This doctrinal record is what the U.S. Army taught in its schools, evaluated its units on at its training centers, and expected its members to use in operations. It is the institutional record of the collected knowledge at the time of its publishing and any changes over time reflect how the institution reacted to changes in its environment. Based on the literature review there seems to be many different possibilities for what might influence a mega-bureaucracy like the U.S. Army in its knowledge creation. Additionally, the conventional wisdom narrative of a linear and rational process seems to be highly unlikely and evidence to the contrary would potentially be observable in paradoxes, contradictions, and incongruencies in the record.

CHAPTER 3: Methodology

I. Introduction: *Focus on Design*

My focus on design comes from three areas. One, it is one example in which I saw the doctrine change, almost one-hundred and eighty degrees from where it started, and yet I could not explain why it changed. Additionally, there was behavior I witnessed, such as being told by the Executive Officer to my Commanding General in Afghanistan not to use design or say the term around him, even though he was the former commander at Fort Leavenworth of the command that wrote the design doctrine. These and other strange and unexplainable phenomena led me to want to understand what role doctrine played that I did not know about, nor could I explain. Two, design was an attempt by a large organization to deal with complexity. I reasoned that this was a similar situation experienced by many other public organizations of the same size and thought that this would be applicable beyond just the scope of the Army. Three, design has followed me personally throughout my career since first being exposed to it at Fort Leavenworth in 2009. Thus, I have been privy to the emotion, confusion, personalities, and very interesting backstory with respect to the concept for some time. It follows that I am very interested in why large organizations that are struggling with complex environments may go through something similar when they attempt to create knowledge to address said complexity.

This study uses hermeneutical methods to investigate research questions regarding what role doctrine plays in knowledge creation. I use an inductive qualitative hermeneutical investigation of U.S. Army doctrine. The sample frame for this study was doctrine publications produced by the US Army between 1993 and 2019 that specifically address issues of strategic planning and decision making, and, in the words of the military, the “operational level” (that

planning that occurs between strategy (larger end-states to reach policy objectives) and tactical action (explicit military unit action usually tied to those units that are in direct contact with "the enemy," usually division level and below).

I selected the below doctrinal publications as they represented the main publications that strategic and operational planning and decision-making would be found. After analyzing all the publications, I decided to limit further analysis to the 101-5 and later 5-0 series of manuals, as those manuals focused on staff and commander planning and decision-making and those two were the areas in which I wanted to focus so that I could discover the story of design as the doctrine would reveal. I did, however, use portions of FM 100-5 in 1993, the manual titled *Operations*, since for the post-1997 manuals dealing with planning, there were sections that were only covered in FM 100-5 instead of covering it in 101-5. I used the manuals in bold for my final analysis.

Table 3.1: List of doctrinal publications aligned with planning from 1993 to 2019

Year	Doctrine	Publication title
1993	***Field Manual (FM) 100-5***	***Operations***
1997	**FM 101-5**	**Staff Organization and Operations**
2003	FM 3-0	Operations
2005	**FM 5-0**	**The Operations Process**
2008	FM 3-0 & TRADOC Pam 525-5-500	Operations & Commander's Appreciation and Campaign Design
2009	ST 2.0, Interim FMI 5-2, USJFC Memo Design	Design: Tools of the Trade, Design, & Vision for a Joint Approach to Operational Design
2010	**FM 5-0**	**The Operations Process**
2011	FM 3-0, update to FM 5-0, USASOC HB	Operations, Update to the Operations Process, Planner's Handbook for Operational Design
2012	**ADP 5-0, ADRP 5-0, Commander's Resource**	**The Operations Process, The Operations Process,** Army Design Methodology
2015	ATP 5-0.1	Army Design Methodology
2019	**ADP 5-0**	**The Operations Process**

The reason I did not decide to code the non-bolded doctrinal manuals was two-fold. One, the portions in *Operations* that were not reflected in *Staff Organization and Operations* in the Nineties was reflected in *The Operations Process* in 2005, thus I did not need, beginning in 2003, to code *FM 3-0* or the other versions of *3-0*, since those portions with respect to planning, problem-solving, and design were reflected in the *5-0* series. This also reflects the reason to not

code the update to *5-0* in 2011. Second, the manuals that specifically addressed design, 2008's TRADOC *Pamphlet 525-5-500, Student Text 2.0, Interim FMI 5-2,* and USJFC *Memo on Design* were not on the same level as the 5-0 series of doctrinal manuals. These publications were not categorized or viewed as having the same level of institutionalization as the main series of doctrinal publications. For instance, *Student Text 2.0* was only used by students in the School of Advanced Military Studies and rarely, if ever, used by units. Similarly, none of these publications were used to grade units or leadership within the training centers and during training events. Lastly, these publications were used as initial concept development that was then later incorporated into the higher-level doctrine after having been exposed to the force, commented on, and changed as seen fit from further discussion or experimentation. Thus, to have incorporated these publications into the analysis portion would have been both redundant and would not have reflected what the force was actually using nor what the institution necessarily viewed as knowledge-based doctrine.

This research will employ a technique of coding to the doctrinal manuals to attempt to discover if there are themes within the doctrine and, ultimately, if there are themes, how those themes evolved over time. The aim for this is to craft a narrative, a story, describing the U.S. Army's evolution, as told through its recorded doctrine, as it attempted to confront the messiness, frustration, and complexity of the war in Iraq through its subsequent drawdown in Iraq and current focus on the "near-peer" challenges of Russia and China.

II. Situating the method in hermeneutics

The attempt to gain access to what an organization wants it members to believe through the writings of said organization requires access to the writings, an analysis of said writings, and an interpretation of those writings in light of the questions in which the researcher is interested.

Thus, in the case of the U.S. Army's doctrine being the text, it remains to connect the research questions to a particular method. To review, my research questions are:

> *What role does doctrine play in the knowledge creation process of a mega-bureaucracy like the U.S. Army?*
> *- Sub question 1: how did the U.S. military doctrine concerning decision-making and strategy evolve over the period of 1997 to 2019?*
> *- Sub question 2: What explains variations over this time period?*
> *- Sub question 3: When new ideas are incorporated are their inconsistencies between ontological assumptions, epistemological assumptions, and preferred methods? Are there consistencies?*

My analytical focus will be on congruency or incongruency of changes over time, specifically:

- changes in doctrine that were incongruent within the methodology or with stated epistemological and ontological assumptions
- changes that showed a blend between a previous concept merged with a new change due to attempts to remain congruent between ontological, epistemological and/or methodological assumptions, but that are incongruent with the new assumptions
- changes that were congruent *with stated assumptions*

Thus, it is necessary to situate this research within a method that can assist in uncovering these changes, which would then assist in answering how the doctrine changed (sub-question 1) and what varied (sub-question 2), and, further, how to make sense of those changes in an interpretive way that considers context and the whole of the doctrine.

Hermeneutic inquiry is one such method. The core inquiry question that hermeneutics assists in addressing is, "What are the conditions and context under which a human act took place or a product was produced that makes it possible to interpret its meanings?" (Patton, 2015, 136). Hermeneutics views written records as artifacts of human interpretation and seeks to gain insight into the interpretative stance that produced said artifact.

Inductive Analytic Approach

To understand phenomena like what I have described that are captured at least partially in texts, Patton mentions reducing the trivial data from what is important and "identifying

significant patterns and constructing a framework for communicating the essence of what the data reveal…" (2015, 521). The inductive method of analyzing the content through hermeneutical inquiry further involves "identifying, coding, categorizing, classifying, and labeling the primary patterns in the data." (Patton, 2015, 551). It is finding things that seem to go together and putting them into categories for sorting (Patton, 2015, 553). "The analyst then works back and forth between the data and the classification system" to test the categories (Patton 2015, 555). Again, an iterative approach is emphasized, but it is not a linear approach: after converging, then the researcher should see what does not fit- what deviates. "This sequence should not be followed mechanistically, linearly, or rigidly" (Patton, 2015, 556).

Lastly, the hermeneutic circle relates the parts of the data to the whole through a detailed analysis structured towards the whole of the data. "It becomes hermeneutical when its method becomes interpretive rather than purely descriptive" (Mills and Burks, 2014, 184). Schwartz-Shea and Yanow (2012, 30) state that there is no standard starting point for a hermeneutic inquiry, the process of sense-making begins depending on where the researcher is in terms of appreciating the subject, wherever that is at the time of the start of the inquiry. As more analysis progresses through the "circles" of hermeneutic inquiry, the context becomes wider in terms of what makes up that context, past what the researcher brings with them. (Schwartz-Shea and Yanow, 2012, 31)

Having situated this research in the hermeneutical tradition, this analysis focuses on telling the story of how the U.S. Army's fundamental views evolved immediately after confronting the aftermath of the war in Iraq. The previous chapter delved into a broad survey of the literature on culture, mimicry, and communication and how those might affect learning and, specifically knowledge creation. In doing so, it revealed theoretical gaps in how knowledge is

created in organizations. These gaps point to a need for inductive analyses to begin to build a framework with which to understand the role doctrine plays in organizations, especially if this role is beyond simply learning. Prior to addressing the role doctrine plays, however, my goal was to establish what the major themes were in the U.S. Army's doctrine as a way to best describe its doctrinal evolution just after the invasion in Iraq and over the time since. As Schwartz-Shea and Yanow (2012, 42-46) note, humans use artifacts like language in texts, to confer meaning, or, how they make sense of the world around them. Additionally, this language helps to socially construct their world towards some meaning. As such, I think it important to start with how the U.S. Army attempted to pass on new knowledge to its members about how the organization viewed the world fundamentally while it suspected that their traditional view was not helping.

To avoid confirmation bias, I plan to employ what Schwartz-Shea and Yanow recommend: reflexivity, data analysis strategies and techniques (2012, 100), and through peer checking or review (Mills & Birks, 2014, 224-233). In terms of reflexivity, I reflect below on my position within the military, how my relationship with many of the interviewees and doctrine in general might affect the data, and how my own characteristics may affect particular interactions. In terms of data analysis strategies and techniques, I incorporated a class on qualitative methods with Merriam and Tisdell's (2015) and Mills and Birks (2014) texts forming the core of the course in the Spring of 2020 into my methods and prepared myself through research and other collaborators to incorporate different techniques, such as mapping for exposure and intertextuality (Schwartz-Shea & Yanow, 2012, 84-89). For the latter, for instance, I mapped for exposure across the various publications the U.S. Army put out between 1997 and 2019 on design, even though in the end I only analyzed in the final phase predominantly the 5-0 Field Manual series. Through mapping out all the various texts that had the concept of design or the

concepts that design addressed prior to it becoming a named concept helped me to both make sure I analyzed a sufficient amount of the doctrine and understand the overall context of the concept within the overarching Army publication hierarchy. Thus, I was exposed to all the various texts and different views and interpretations of what different organizations within the Army viewed this new concept of design, which allowed me to approach the final analysis of the narrower set of publications with those other views in mind. The ability, as Schwartz-Shea and Yanow describe, to "read across" the different kinds of texts to interpret meaning allows a more contextual insight into the overarching subject (2012, 86).

Lastly, I have or will have used some or all these practices as outlined by Maxwell (2005, 110-113) for rigor in a qualitative context: intensive and long-term involvement, rich data, reflexivity (described by Schwartz-Shea and Yanow above), intervention, searching for discrepant evidence, triangulation, and comparison. In terms of intensive and long-term involvement, I have been in the U.S. military since 1992, have been taught and have studied military design since 2009, and was, from 2019 to 2020, in charge of the U.S. Army JFK Special Warfare Center and School's Special Forces Proponent division, of which Special Forces doctrine is one of the sections. In addition to the rich data found in the doctrine manuals, I have found sufficient data in other forms of communication like listserve email chains discussing design and articles on military design and related change and, as part of my mapping for exposure and intertextuality, these other sources, of which I have been steeped in since 2009, have added to a qualitative form of rigor.

Positionality

As hermeneutics is concerned with context, both the researcher's connection to the research and the research materials context itself to properly address the context (Merriam and

Tisdale, 2016, 34 and Patton, 2015, 138). I have both a temporal connection to the doctrine in concern and a professional one. On the temporal side, I was on the receiving end of the doctrine produced between 1997 and 2019. On the professional side, I was the Proponent for Special Forces from 2019-2020, of which one of the three sections in my purview was Special Forces doctrine. Thus, I understand the context of the doctrine in an in-depth manner: how it is made in at least one headquarters in the Army and how we used it in the specific case of the doctrine in question.

Further, Patton (2015, 138) makes the point that hermeneutic theory asserts that a researcher "can only interpret the meaning of something from some perspective, a certain standpoint, a praxis, or a situational context." The situational context in this case was the use of the concept of design within military operations. From the first appearance of design in the doctrine I have been involved in attempts to incorporate it into operations and thus have a very intimate connection to the situational context of the subject of study. To re-phrase a quote from Patton on page 139 (2015): I want to place the story of design within U.S. Army doctrine into the context of the implied and explicit ontological and epistemological assumptions and preferred methods found within the doctrine to determine its (design's) meaning contextually. Patton further describes the method as involving "playing the strange parts of a text off against the integrity of the narrative as a whole until the meaning of the strange passes and the meaning of the whole are worked out or accounted for." (2015, 578). This implies that there may be strange parts, and that is essentially what I would be looking for when looking for incongruencies.

Patton also refers to the purpose of hermeneutic inquiry in terms of inductive qualitative analysis: that it leads to generating new "concepts, explanations, results, and/or theories from the specific data of a qualitative study (2015, 541). The texts are read and re-read, multiple times,

leading to an iterative "spiral" of interpretations that lead to a greater understanding of meaning. (578). Further, in the vein of context, Patton points out that researchers must state their a priori interpretations of what is being examined, while at the same time reflexively reviewing the multiple circles of interpretation by reflecting how the a priori perspective encounters whatever perspectives are met during the inquiry. Considering that, I have already stated in the first two chapters my own experience with design and the doctrine. Perhaps luckily, I am more of a learn-by-doing practitioner and, as the U.S. Army is less of a doctrinaire institution than perhaps compared to historically doctrinaire armies, the doctrine was less familiar to me than the actual concept itself. I had briefly interacted with the doctrine prior to this research and mostly used other publications, external-to-the-military concepts, and practical exercises in school to build my knowledge of design. I came at this research with the perspective that the doctrine on design would be hard to intuitively grasp and often contradictory. One of the memories that still sticks out in my mind is reading in our doctrine that war is complex, thus implying in my mind complexity theory, and then something about simplifying the complexity, which ran counter to what I knew about complexity theory. The other main idea I bring to this research on the subject of design was that the General in charge of the doctrine between 2005 and 2010 and largely was responsible for the 2010 doctrine was also the general who told us in Afghanistan in 2010 not to use the term "design." This made me very curious about the concept in general and cynical about how doctrine might be used, or, at least, doubtful it was used in the popular view of how doctrine is used.

I come at this topic from a position best framed as Creswell (2013, 216) recommends: stating my experiences with the phenomena I am investigating and then discussing how that experience shapes my interpretation of the phenomena. In terms of my knowledge of design,

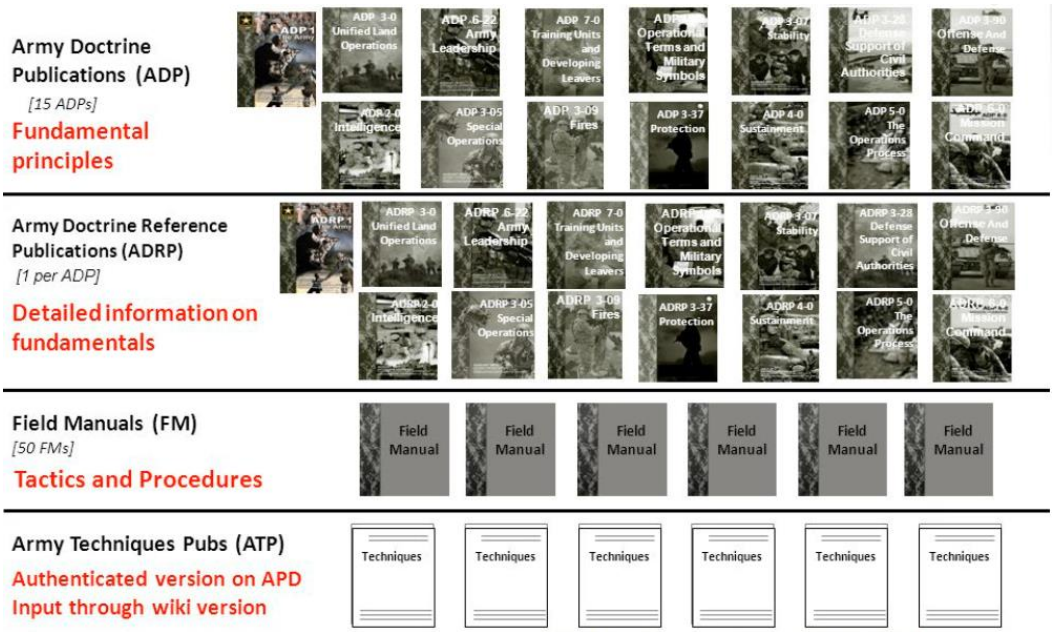
military doctrine, and the U.S. Army, my position is fully immersed and tainted. I have been in the U.S. Army as an officer since being commissioned in 1993 and, since then I have developed what I think is a healthy skepticism towards most doctrine, a disdain for those manuals that do not use clear language, but instead resort to ambiguous generalizations, and a suspicion that most officers are comfortable with using traditional methods like rational decision making and deterministic planning unreflexively. This attitude made me welcome the design curriculum in the School of Advanced Military Studies (SAMS) at first, however that same attitude turned me against what design later turned into: namely a three step "problematization" process that feeds the traditional rational decision-making process that the military preferred prior to attempting to adopt design. I attempted to use what I had been taught about design in Afghanistan, publishing a paper in the *Small Wars Journal* about my experiences, and the experience led me to believe that the military required more structural changes to allow for what design in the beginning had promised: namely the ability to approach complex situations critically without using uncritical metaphorical constructs or predetermined and linear processes. I assume today that design had been an attempt to break the Army away from rationalist, empiricist, and positivist approaches and methods and incorporate more interpretivist, postpositivist, and post-modern approaches. I further assume that that change was viewed as anathema to Army culture, and thus the institution co-opted the concept, mainly turning it into a systems theory add-on to the previously preferred positivist approach. This is all to say that I will most likely look for data to back up these views, but, having said that, knowing that this is my bias, and knowing that the truth is often surprising, as our individual ability to know is very limited, I planned on incorporating this knowledge about my biases along with the steps in the prior paragraph as well as the following one to mitigate my bias.

III. Method of Analysis: Inductive Analysis of *the What,* a Hermeneutical Approach to Uncover How Knowledge Was Created

Description of the Data

The U.S. Army publishes doctrine, updating the doctrine every five years. Since 2012, the Army has organized its doctrine as to the following chart:

Figure 3.1: U.S. Army Doctrinal Publications



Note the categories for the "fundamental principles" found in the Army Doctrine Publications (ADPs): operations, leadership, training, definitions, stability, civil support, offense and defense, intelligence, special operations, fires (artillery), protection, sustainment (logistics), the operations process (planning), mission command (formerly command and control, currently it is back to command and control). Each ADP has a more detailed manual associated with it called an Army Doctrine Reference Publication (ADRP). There are then fifty field manuals (FMs) aimed at

tactical units and Army Techniques Publications (ATPs) as needed that go into details on specific techniques.

Prior to 2010, the topics design was meant to cover were found in the discussions on decision-making, planning, and problem-solving. After 2008, design is found within multiple manuals, but mostly it is found in ADP and ADRP 5-0, the Operations Process, as that manual details how to conduct planning. The Army now, since 2015, has its own ATP designated for design, ATP 5-0.1, the Army Design Methodology. The ATP is associated with the 5-0, or operations process series. Within the manuals, there are chapters that deal with portions of the topic and the topic of design normally has had a few paragraphs or pages associated with it and not too many examples of the topic sprinkled elsewhere. For example, here is the description of the activities of the Army Design Methodology found in *The Operations Process* (HQDA 2012, 2-11):

> *ACTIVITIES OF THE ARMY DESIGN METHODOLOGY*
>
> 2-30. *Army design methodology entails framing an operational environment, framing a problem, and developing an operational approach to solve the problem. Army design methodology results in an improved understanding of the operational environment, a problem statement, initial commander's intent, and an operational approach that serves as the link between conceptual and detailed planning. Based on their understanding and learning gained during Army design methodology, commanders issue planning guidance…*
>
> 2-31. *The understanding developed through Army design methodology continues through preparation and execution in the form of continuous assessment.*

As noted above, these doctrinal publications are planned to be updated every 5 years, thus we can see what the changes were over the years with respect to those publications that dealt with design, namely Field Manuals 5-0 and 3-0, but also the various publications that the Army printed periodically to support the manuals in terms of design from 2003 to 2015.

A. Phase I: Initial Review

The first thing I did was to survey all of the publications that have included the design concept. These publications are captured in the chart at the beginning of this chapter, but only those from 2008 and on, reproduced here:

Table 3.2: Doctrine that mentions design

2008	FM 3-0 & TRADOC Pam 525-5-500	Operations & Commander's Appreciation and Campaign Design
2009	ST 2.0, Interim FMI 5-2, USJFC Memo Design	Design: Tools of the Trade, Design, & Vision for a Joint Approach to Operational Design
2010	**FM 5-0**	**The Operations Process**
2011	FM 3-0, update to FM 5-0, USASOC HB	Operations, Update to the Operations Process, Planner's Handbook for Operational Design
2012	**ADP 5-0, ADRP 5-0, Commander's Resource**	**The Operations Process, The Operations Process, Army Design Methodology**
2015	ATP 5-0.1	Army Design Methodology
2019	**ADP 5-0**	**The Operations Process**

I read every publication's portion on design, which included all the publications written in 2008 and beyond. I also read every section that might potentially have portions related to design. I took notes as I read, noting areas that mentioned design specifically, areas that contained subjects tangential to design, and those areas that had very little to nothing to do with design. I then extended my initial review to include the 2005 and earlier doctrine. Although 2005 had some of the same language, such as "complexity" and "problem," it did not mention "design" as a new concept. I did, however, notice a big difference between the Nineties versions of the doctrine and the 2005 version- the Nineties had almost zero of the kind of language that I found in 2005 and that was then expanded into the concept of design from 2008 and on.

During these initial readings I memoed where I saw things changing and where I saw consistency across the years. I really focused in on what design was supposed to address: the area between strategy and tactics (called "operational") in terms of planning and decision-making. Prior to starting this research, I had practiced coding portions of the doctrine for a class I was taking on qualitative methods and found Norma Riccucci's categories of philosophical

inquiry to be useful, coding paragraph or sentence-length portions with a code of PO for positivist ontological assumption, PPO for postpositivist ontological assumption, etc., using the categories of interpretivism, rationalism, empiricism, positivism, postpositivism, and postmodernism and an O for ontological assumptions and an E for epistemological assumptions.

After reading the relevant doctrine I decided on two changes initially. One change was that I would concentrate on just the Operations Process (FMs 101-5 and later 5-0) versions of the doctrine. This was due to two things I found: one, the non-numbered doctrinal publications preceded changes in the more foundational document, the field manuals, and, thus, there weren't any remarkable differences between those publications and the foundational manuals. Second, the Operations manual did not contain much that was related to design, if anything. I did, however, have to use a portion of the *Operations* manual (FM 100-5 and later 3-0) in the Nineties due to a shift in some of the language later in the 5-0 series that was reflected in the 100-5 manual but not captured in later 3-0 manuals. This allowed me to both concentrate my focus on one set of doctrinal manuals and the changes therein throughout the years and look at that one manual as to how the portions changed, allowing a longitudinal analysis.

The second change I incorporated was that my initial coding of using the Riccucci categories did not allow me to easily see the changes in the doctrine from year to year on the subject of design. Thus, after reading the doctrines' sections on design or design-related areas multiple times, and coding them according to the Riccucci categories, I then decided to start over and re-read the sections on design to identify themes that might come out of the raw data itself, as opposed to forcing the Riccucci categories on the data. One of the main reasons I found it difficult to utilize the Riccucci categories was that no one sentence or section seemed to clearly fit into only one of those categories.

B. Phase II: Lower order coding

After reviewing the raw data again and putting the sentences and sections into themes, some slowly emerged. Over time and through several iterations I identified five sensitizing concepts I wanted to pursue in more detail. These were how the doctrine described: 1- the nature of war, 2- how to visualize war, 3- how to think about how to solve problems, 4- methods for solving problems, and 5- how to assess those methods. These concepts were influenced by my initial focus on Riccucci's categories in that they involved things that I saw as loosely translatable into ontology, epistemology, and methodology and then further identified as one of the philosophical traditions Riccucci uses. For instance, the "nature of war" theme seemed to me to be comparable to an ontological view. How to visualize and think about how to solve problems were epistemological in nature. Methods were, obviously, methodological practice, but I did struggle with whether assessing methods was methodological or epistemological, ultimately thinking they were more epistemological in nature than having to do with describing a method per se. I then went about categorizing portions- usually multiple sentences at a time- in the areas in which design or design-related topics were discussed into those categories. Thus, I was able to start seeing changes more explicitly over time in these areas, areas in which I wanted to note the changes.

C. Phase III: The Second Iteration

Once I accomplished the first iteration of coding by category, I did not think I had enough with just those categories to perform an analysis on. I then coded further topics within those categories relying on, again, an emergent process. I used the Nvivo software to then use the codes to compare and contrast things like the prevalence and priority of the different coded

topics between different years. For instance, I coded these sub-categories within the "what to do about war" category:

- *Connection between thinking and understanding and making decisions*
- *Decision making scope*
- *how an organization learns during war*
- *how problems are solved through planning*
- *how problems are solved through thinking*
- *how to accomplish objectives in war through planning*
- *how to assess in war*
- *how to think about the conduct of warfare*
- *normative description of planning*
- *normative description of thinking during war*

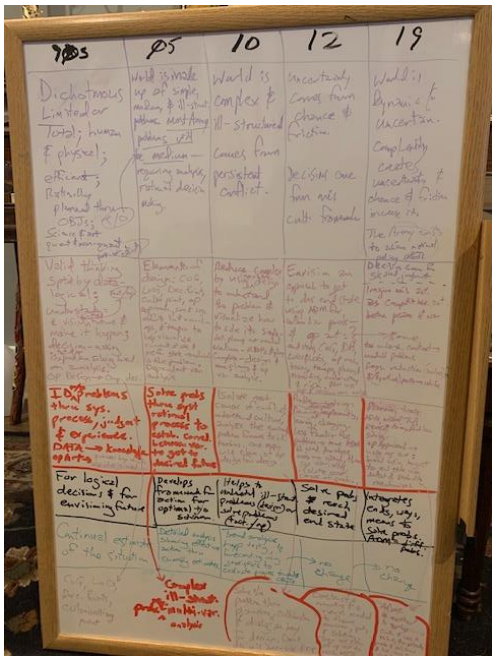
I ended up keeping and simply adding to these sub-categories throughout the different higher-level category analysis. This allowed insights, for instance, into the fact that the coded raw data for "how problems are solved through planning" went from the #2 spot in the Nineties to the #7 spot in 2019, and "how problems are solved through thinking" went from not being mentioned in the Nineties to #2 in 2019.

D. Phase IV: The Third Iteration

What I found, however, after the second iteration, was that my coded sections were not allowing me enough of a framework to compare what I wanted to compare, which was the changing ideas with respect to design. I was looking at a large amount of very interesting data that I had generated from the raw data, but it was not helping me visualize what I thought I needed to. Nothing was jumping out at me from this analysis. Further, the amount of secondary categories was becoming unwieldly. At eighteen and counting sub-categories, it was becoming more difficult for me to decide where a certain section belonged, often putting it into one, but knowing it could belong in another. I stopped and, using a dry-erase board, I sketched out what I thought were the major themes in the Nineties version of the doctrine, creating five major subjects, but not labeling them at first. I then noted the changes over time from the Nineties to

2005, 2010, 2012, and 2019. This exercise assisted me in seeing what I had come up with so far and how I might proceed.

Figure 3.2: Picture of dry-erase board analysis



E. Phase V: The Fourth Iteration

This was the eventual analysis that I concluded with, after the first three iterations. I took a step back from all the coding I had done up until that time and I tried to see if I could detect any themes or categories that I could use that would help me see a narrative. Some way of making sense of the changes that I could see within the raw data and my further coding that would allow me to see a story more clearly. The more I looked at the sections dealing with design or design-related topics, my initial and then later coding, and a search for some kind of narrative, I started to see that there were some themes within the raw data, when looked at from different perspectives that allowed some meaning that the data did not explicitly reveal. Those

themes were descriptions of how the Army viewed the world, how the Army viewed thinking about the world, how the Army viewed the best methodology for handling the phenomena in the world, the purpose of the methodology, and how to tell if the methodology was useful. The Army structured its 5-0 series doctrine loosely using these themes and that is what seemed to change- how those themes were described- over time. These themes also harkened back to my initial attempt to find themes after using Riccucci's categories and showed to me that I had detected this structure early on as I started to try and note what was changing within the doctrine.

As I coded these sections with "ontology," "epistemology," "methodology," "purpose of the method," and "how to assess the method" I started to notice more of what was changing and how. I still was struggling with how to put the data into a format that I could then more structurally identify change over time and I ended up, after collecting the different raw data from the doctrine into separate Word documents for each theme, pasting those portions into an excel document which was separated by year in columns and by theme in the rows. I then summarized the raw data into smaller portions that captured the essence of the major changes across the different updates to the doctrine across time. This was my analysis between each update. At the end of each row I had the actual raw data itself, copied from the doctrine into the Excel spreadsheet for easy reference for purposes of citing any specific areas or quoting directly the text.

Figure 3.3: Picture of analysis row

Research Questions	Sub-questions	Related sub-questions	One change	Where does this change occur?	Macro codes	Intermediate Codes	Explanations	Tie-in to Design	Microcodes	
									1993/97	2005
1. What role does doctrine play in an organization?	Why did U.S. Army doctrine change (or not) in the way that it did after 9/11?	Did U.S. Army doctrine change after 9/11?	Design was a big change in U.S. Army doctrine between the 90s and 2019	Design is captured mainly in The field manuals that deal with "the Operations Process" (FMs and ADPs/ADRPs 5-0)	2) Epistemological Assumptions	1) Epistemological Assumptions: How to Think	The Army describes its assumptions about how to think in more detail than it does in the fundamentals section, this is more praxis, and provides a view to the assumptions the Army makes about how knowledge is gained.	Design was introduced because of changes that were reflected in the way the Army instructed its members to think.	- Valid thinking is objective, supported by data, and logical.	- Thinking takes contextual planning methods that then structure that thinking commanders and staffs. - Thinking should visualize how to get from the current state of the environment to the preferred state. - Thinking requires looking at a problem from several viewpoints and then interpreting, analyzing, evaluating, and inferring the solution to the problem. - The elements of design are the framework to think about operations: desired end state, center of gravity, decisive points, lines of operation, culminating point, operational approach, simultaneous and sequential efforts, linear and nonlinear operations, and tempo.

> This shows the research question on the left, a sub-question that this portion will address, and how these were connected all the way through macro-codes, intermediate codes, the tie to design, and the microcodes I distilled from the raw data, which is located at the far right of the row, if I had extended it out. Of note- the yellow portion was the analysis capturing the changes between 1993/1997 and 2005. Other years were further right on each row.

I ended up, after further analysis, combining the purpose of the methodology into the methodology section as well as the last section, how to tell if the methodology was useful, into the thinking section. I further simplified the category names to the following: the Army's ontology (assumptions about the world and war), the Army's epistemology (assumptions about how members can know about the world and war), and the Army's preferred methodology (what to do and why). First order analysis sought to understand and categorize the major shifts in the military doctrine that reflected an evolution in thought and/or organizational learning. Findings from this phase of analysis revealed significant shifts in the military's way of understanding the nature of the task environment that defined its identity as an agency as well as related changes in how it prescribed its members to engage with this task environment. I discuss these three major families below.

The Ontological view

The Ontology of an organization can be thought of as the stories an organization's members tell themselves about the nature of the task environment in which the organization sees itself.

> *Stories are how we learn. Stories tell what we know. The stories a group shares define the group. The stories the group's members tell to newcomers and retell to each other are windows into the essence of the group. Without shared stories, there is no group. (Patton, 2015, 217)*

Specifically, an organization's stories about reality and existence reveal an organization's ontology; that is, what an organization assumes about what is real and what exists (Riccucci,

2010, 3). In the reviewed doctrine, there were three main subjects to the Army's ontological story I identified that shifted over time: the task environment, the over-riding concern, and the view of human nature.

Task Environment

Descriptions of the task environment have to do with phrases aimed at educating the Army's members about what kind of reality they will confront in which they will have to act. If the task environment is one of building things, for example, then tasks associated with construction would be important for concrete things, institutional development for more abstract things. If, however, the task environment is one of destroying things, then tasks associated with finding the enemy, engaging with the enemy, and assessing the enemy's capability to conduct operations would be important. This understanding for its environment and the tasks related to that environment make up the Army's story for what exists that creates the institutional logic for why the Army exists.

The Over-Riding Concern

Another aspect of the Army's ontological narrative concerned descriptions of, given the task environment, what the Army faces in terms of its reality, or its over-riding concern. If building abstract things like foreign armed forces is its task environment, for example, then its over-riding concern might be building strong institutions or establishing institutions from scratch. If, however, projecting force across the globe is its task environment, then its over-riding concern might be logistics-related as well as tasks concerned with defeating a near-peer threat in a relatively quick timeframe. The over-riding concern of the Army is that part of its reality that focuses it within its task environment.

View of human nature

The last part of the Army's ontology is its view of human nature. This deals with the Army's story to itself about the fundamental nature of humans. Specifically, in this case, the Army's assumptions about decision-making, problem-solving, and the like. Essentially, if epistemology is viewed as a set of assumptions related to how knowledge is gained, then the ontology here would be the assumptions behind how humans behave. For instance, one view of human nature with respect to problem-solving is to view problems in a positivist manner, being solved and then moving on to other problems, collectively building on each other in a positive direction of more problems being solved over time. Another way to view problems would be in an interpretivist manner, which is to say that problems are not objective and independent subjects, but, instead, are interpretations of reality that show more insight into current social context as opposed to any objective kind of "problem" or reality.

The Epistemological view

If an organization's stories that it tells itself about what is real are its ontology, then the stories it tells itself about how to know or learn about what is real reflect its epistemology. In the case of the U.S. Army, the doctrine revealed that there were meaningful shifts over time in the stories the U.S. Army told itself concerning three areas: how to imagine (or "visualize" in the Army's language) the world (or, in this case, "the battlefield" or, later, "the situation"), its view of knowability, and, lastly, the over-riding concern with respect to this knowledge. This last subject is further reflected in the Army's view of problem solving, as that is ultimately how knowledge is seen as useful: for the purposes of solving problems. It is useful, therefore to view the Army's epistemology through these three subordinate subjects.

How to best visualize

A prominent theme that evolved in analysis of U.S. Army doctrine with respect to decision-making, problem-solving, and thinking is how best to "visualize." For example, how best to visualize the situation or battlefield. The doctrine instructs the Commander and/or the staff of a unit in a specific and explicit way to imagine the situation, normally using the term "visualization" and implicitly describing how the Army views knowledge gain with respect to Army operations.

> *Collectively, this is known as the commander's visualization—the mental process of developing situational understanding, determining a desired end state, and envisioning a broad concept on how the force may achieve the end state. The commander's visualization provides the basis for developing plans and orders. During execution, it helps commanders determine if, when, and what to decide as they adapt to changing conditions.* – FM 5-0, 1-10 (2010)

View of knowability

Within the Army's description of its preferred epistemology at any given timepoint, there was also evidence of an evolution in their view of "knowability" which I use here to describe specific assumptions with respect to how knowledge is gained. For instance, implying that valid conclusions must be objective, empirical, and the result of logic shows a preference for a positivist or logical positivist (or logical empiricist) epistemology (Godfrey-Smith, 342-343).

> *To be valid, conclusions must be relevant to the topic, objective, and supported by the data, and they must be arrived at through a logical thought process.* – FM 101-5, 4-8 (1997)

Similarly, if the situation requires context, multiple viewpoints, and interpretation among other things, one can surmise a preference for an interpretivist epistemology.

> *Critical reasoning is the purposeful, self-regulating judgment that includes interpretation, analysis, evaluation, and inference that leaders use to solve problems. …Critical reasoning means getting past the surface of the problem and thinking about the problem in depth. It means looking at a problem from several points of view*… – FM 5-0, 2-2 - 2-3 (2005)

The subjects, “what can we know” and “how do we know what we know,” provide the answer as to what makes up the epistemology (Godfrey-Smith, 342-343).

Over-riding concern

Finally, within the Army’s preferred epistemology, there was also evidence of variation over time in terms of the over-riding concern of that epistemology; rooted in assumptions about knowability. While analysis revealed a consistent narrative that the purpose of knowledge is to solve problems, therefore the over-riding concern with respect to epistemology is how the U.S. Army should think about solving problems. This might be seen as a tell-tale sign of a positivist organization, however, the language about what constitutes a problem and how to think about them did change between the Nineties and 2019, thus it is useful to note those changes within the Army’s view of knowledge.

The Recommended Methodology

Within the U.S. Army’s methodology with respect to conducting military operations, there are three areas that I focused on analyzing. The first was the over-riding concern. Similar to the U.S. Army’s ontology, the over-riding concern is that focus within the methodology that the organization wishes to emphasize, and which potentially sets the foundational logic for the rest of the methodology. The second area is how to make decisions and solve problems. Frequently identified as one and the same, the organization is first and foremost concerned with making decisions that then solve problems. How to do this and how this changes over time encompasses a large part of the Army’s processes doctrine. Lastly, how to conduct planning and how planning is connected to decision making is the second largest theme within the organization’s processes doctrine. When combined, it would be interesting to note how these three pieces of the Army’s

methodology either changed with changes in its ontology and/or epistemology or did not change at all.

Over-riding concern

Within the U.S. Army's preferred methodology for conducting military operations, it is useful to identify the over-riding concern described within its doctrine. My assumption going into this analysis is that the recommended methodology would, in theory, be linked to the Army's epistemology and ontology, so any kind of deviation from those was of interest. Likewise, I was also interested in understanding if the over-riding concern as it related to the U.S. Army's description of methods reinforced a change in epistemology or ontology.

How to make decisions/ solve problems

Within the U.S. Army's methodology, how to make decisions and solve problems were key areas of focus. This was found throughout the Nineties and up to the present day. It is important, therefore, to note how the Army wanted its members to change how it went about making decisions and solving problems, especially as it compared to its ontological and epistemological assumptions and as it changed over time.

How to plan

Finally, the doctrine focuses considerable attention on the process of planning operations and these process descriptions changed over time. This gives insight into changes within the U.S. Army's thinking about its preferred methodology. I was particularly interested in cases in which the methodology did not appear to align with its ontological and epistemological assumptions. Likewise, my analysis sought to uncover areas in which planning did change to incorporate changes within the ontological and epistemological narratives.

F. Last Phase

After creating the excel spreadsheets noted above which helped me to better organize the raw data and link it categorically to my research questions and sub-questions and position it all within my research focus, that being design, I then analyzed the changes in the microcoded portions of the raw data that I had created. I was then able to capture more easily what had changed from year to year, actually creating a column in-between each column of distilled and interpreted data noting the changes. I crafted the analysis of the changes (or no changes)- the yellow columns- into a narrative which I then was able to better see the changes year over year in a more contextual and rich manner:

Figure 3.4: Picture of analysis row showing by-year changes

Microcodes				
1993/97	2005	Changes	2010	Change
- Valid thinking is objective, supported by data, and logical.	- Thinking takes contextual planning methods that then structure that thinking commanders and staffs. - Thinking should visualize how to get from the current state of the environment to the preferred state. - Thinking requires looking at a problem from several viewpoints and then interpreting, analyzing, evaluating, and inferring the solution to the problem. - The elements of design are the framework to think about operations: desired end state, center of gravity, decisive points, lines of operation, culminating point, operational approach, simultaneous and sequential efforts, linear and nonlinear operations, and tempo.	How to think changed from a simple one sentence description of describing "valid thinking as objective ans supported by data and logic to a much longer description that requires contextual methods, visualizing how to get from the current state to the preferred state, looking at problems from multiple viewpoints, interpretation, and the elements of design.	- Thinking requires visualizing a broad concept on how to get from the current situation to the desired end state as the solution to the problem. - Thinking must be in terms of how the problem of the situation is structured: well structured, medium structured or ill structured. - Thinking for ill structured problems requires the design methodology to understand, visualize, and describe the problem and solution. - Complex and ill-structured problems requires operational art, through the design methodology, to link tactics and strategic aims.	From 2005 to 2010, thinking still required a visualization from the current situation to a desired state, but now the situation must be thought of as one of a tye of problem: well-structured, medium-structured, or ill-structured, and design methodology used to understand how to get to the desired state. Ill-structured problems are linked to complexity.

I then took the yellow columns of analysis, which included not just changes, but where things did not change or seemed incongruent with other changes. These yellow portions were then turned into a narrative that was organized by the above categories within the major three themes: ontology (task environment, overriding concern, view of human nature), epistemology (how to best visualize, view of knowability, overriding concern), and methodology (overriding concern, how to make decisions/problem solve, how to plan). That narrative formed the basis for my findings and captured changes longitudinally within these sub-categories.

CHAPTER 4: Findings

I. Introduction

This dissertation attempts to answer the question of what role doctrine plays in the knowledge creation process of a mega-bureaucracy like the U.S. Army. To answer that question, several subordinate research questions are focused specifically on Army doctrine during the period of 1997 to 2019 and how decision-making and operational planning evolved within the doctrine during that time. I was especially curious to find what might explain the variations in the doctrine over that time period as well as whether or not new ideas incorporated during this time period were consistent between their ontological and epistemological assumptions and their preferred methods. I will present the findings by addressing each of these areas in which I am looking for inconsistencies (and consistencies as well) and further analyzing the following subordinate areas: the U.S. Army's ontological assumptions, its epistemological assumptions, and its preferred methods.

I defined the Army's ontology as how the Army viewed how the world operated. More specifically, I further defined it as how the Army viewed things like the environment in which its tasks were situated in, the overriding concern with respect to how phenomena played themselves out, and the Army's view of human nature. These were identified during analysis as the fundamental areas that made up the Army's view of how the world operated, or its *ontology.* Further, the assumptions the Army made with respect to those three categories, were those that I also defined as encompassing its ontological assumptions.

The Army's epistemology was defined as how the Army viewed that its members and the organization as a whole gained knowledge. More specifically, I identified three areas within the doctrine that offered a more differentiated view of the Army's epistemology. These were: how

the Army recommended its members think about things or *visualize* phenomena, how the Army viewed how to know things or *knowability*, and what the overriding concern was with respect to epistemology. The Army explicitly referred to ways of visualizing the world that would assist in understanding, hinted at its assumptions about how its members could know things, and throughout these portions, I was able to discern an overriding concern with respect to assumptions about how knowledge was thought to be gained.

Finally, within the areas of the doctrine wherein the Army described the methods it preferred its members use, I observed three areas which allowed a more nuanced analysis of the changes over time. The first was a common theme or overriding concern with respect to methodology. The second was how decisions were made and problems solved, these two subjects often used interchangeably or in conjunction with each other. The third was how to plan.

It was by analyzing the doctrine within these three broad subjects as well as the described subordinate topics that I was able to note changes in the doctrine over the time period studied and noting any consistencies or inconsistencies between the three. These concepts sensitized me to the changes over time and allowed an examination which reflected changes in ontological and epistemological assumptions as well as methodological preferences. These changes were reflected across doctrinal updates during five periods: the Nineties, 2005, 2010, 2012, and 2019. In chapter five I will address environmental causes and theoretical insights from the research literature to offer reasons as to why the observations I made might have taken place.

II. Ontology

To reiterate, the U.S. Army's ontology was defined as explicit or implicit portions of the doctrine that reflected assumptions about how the world worked. These were further broken

down into the Army's task environment, the overriding concern with respect to ontological assumptions, and the view of human nature.

The Task Environment

Doctrine from the 1990s suggests that the Army's ontological view during that era included a task environment that might be conceptualized as conventional in terms of it being based on looking at the past to discover insight into two distinct task environments: limited war or general war. Limited war was described as anything short of general war, general war being "conflict among major powers in which the total resources are employed and survival is at stake." (HQDA, 1993, 2-1)

*War may be of a limited or general nature. (*FM 100-5, 1993, 2-1)

Analysis revealed that tasks were related to either limited war or conventional war. Limited war tasks might be things such as building a native armed force, dealing with humanitarian issues, establishing institutions, or fighting irregular forces or terrorists. General war, however, is described as "world war," or at least wars between major powers where all resources are marshalled for its use. This is insightful in that it allows for little nuance. The world, when at war, is either all-in or … not. Nuances between examples wherein major powers are not involved for survival are apparently not that important. Likewise, wars in which the threat of full resource use are ever-present can seem psychologically like general war, but not so according to this categorical description. This is significant because it suggests an institutional logic organized around preparedness for "general war" and everything else being an excuse to practice general war.

For instance, there would be no doctrinal difference between the current Russian-Ukrainian war and the operations within Afghanistan from 2002 until 2021 in which NATO

forces fought the Taliban: both would be “limited” war**.** This suggests an organization that, at the time, favored ease of analysis over nuanced insight into differences. Military engagements were thus described as one of only these two types with no nuance between the two and historical examples providing these clear-cut delineations.

> *Limited war is armed conflict short of general war as was conducted during Operation Just Cause in December 1989. General war, such as World Wars I and II, involves armed conflict among major powers in which the total resources of the belligerents are employed and survival is at stake. (*FM 100-5, 1993, 2-1)

This espoused ontological view of the task environment significantly changed in the doctrine produced in 2005. Whereas in the 1990s the task environment was viewed as a series of military engagements that could be sorted into either limited objectives or total engagement, in 2005, doctrine shifted to describing the task environment as one of a clash of human wills with an over-riding concern for “problems.”

> *Military operations are uncertain and unpredictable. They are complex endeavors—struggles between opposing human wills. (*FM 5-0, 2005, 1-1)

Such a massive shift deserves further comment. Although I will offer more explanation in Chapter Five, there are three interpretive points which come to mind. First, eight years had gone by since the 1997 doctrine update was published. This is three years longer than normal. The second insight is, it is logical to assume the Nineties doctrine still had elements of the Cold War and the Eighties doctrinal focus on the Soviet Union. This analysis did not look at the doctrine prior to 1997, however it would not be surprising if future analysis reflected many similarities as leftovers of that era. Lastly, further analysis below will show that 2005 reflected a significant change which would be carried into 2010 and would emphasize a world of increased complexity that descended on the Army’s psyche between 1997 and 2012. This perceived complexity will receive more attention and explanation in Chapter Five.

The 2010 doctrine revealed a further change in the U.S. Army's understanding of its task environment- from being focused mainly on the structure of problems to concepts revolving around complexity and things being even more complex than they seemed in 2005. Terms such as *complex, uncertain, dynamic, physical, cyber, information, systemic, contextually unique, unpredictable, indeterminate as to causality, chance, rapid change, crises*, and *persistent conflict* were all additions to the doctrine. Analysis revealed that *friction* and *problem structure* were retained as concepts, but instead of the term *problem structure* only referring to being ill-structured, the term *complex* was added as a descriptor. This could suggest that the term *ill-structured* was viewed as inadequate to capture conditions and phenomena between 2005 and 2010. For instance, the same description in 2005 which required 65 words:

> *In terms of structure, there are three types of problems: well structured, medium structured, and ill structured. Understanding the structure of a problem assists in determining the amount of time and resources required to develop a recommended solution to the problem. Perception of whether a problem is well, ill, or medium structured depends, in part, on the knowledge, skills, and ability of the problem solver.* (FM 5-0, 2005)

… needed 223 words in 2010:

> *…operations are conducted in complex, ever-changing, and uncertain operational environments. …includes physical areas (air, land, maritime, and space domains) and cyberspace. It also includes the information that shapes conditions in those areas… …both complex and continuously changing. …While aspects of an operational environment may be less complex than other aspects, an operational environment as a whole is both structurally and interactively complex. …is not static but continually evolves. …complex and ever-changing nature of an operational environment makes determining the relationship between cause and effect difficult and contributes to the uncertainty of military operations. …inherently uncertain. They realize that concrete answers or perfect solutions usually do not exist. …clearly discerning the motivations and reactions of various population groups with respect to the friendly force or the enemy often proves difficult. American ideas of what is normal or rational are not universal. Members of other societies often have different notions of rationality, appropriate behavior, levels of religious devotion, and cultural norms. These differences in perspectives and culture add to the uncertain nature of operations. …Chance and friction contribute to the uncertain nature of operations.*

> *... Within these complex, ever-changing, and uncertain operational environments.. …persistent conflict will characterize the next century. …Conflicts will erupt unpredictably, vary in intensity, and scope, and endure for extended periods. …a dynamic and multidimensional operational environment…*
> *In terms of structure, there are three types of problems: well structured, medium structured, and ill structured. Understanding the structure of a problem assists in determining the amount of time and resources required to develop a recommended solution to the problem. Perception of whether a problem is well, ill, or medium structured depends, in part, on the knowledge, skills, and ability of the problem solver.* (FM 5-0, 2005)

The U.S. Army's representation of the environment of war was significantly reframed again in 2012**.** Doctrine pivoted away from representation of the afore-mentioned multitude of categories, complexity, ill-structured problems, and cultural decision-making in 2010 to simply describing the task environment as one of chance and friction contributing to uncertainty in 2012. This suggests a return to a simpler Nineties-type frame.

What is interesting here is in just two years -- and only because of the chance of a change in structural doctrine -- we can observe a drastic difference in the way the U.S. Army viewed war ontologically. In 2010, it viewed war as extremely complex in its nature. It was so complex the doctrine exploded in its attempts to categorize and describe all the ways in which it was complex. It used the word "complex" in Field Manual 5-0 fifty-three times in 2010. In 2012, just two years later, it only used the word three times (These numbers come from only the raw data I studied. In the entire manual there were 98 in 2010 and 6 in 2012, a similar difference.

Table 4.1: Word analysis

YR	uncertain	complex	problems	Ill-structured	Chaos
90s	2	1	13	0	1
2005	5	13	113	2	1
2010	12	53	154	22	2
2012	7	3	71	0	0
2019	8	2	47	0	2

The data suggests a quite different ontological view of war in 2012 than in 2010. In 2012 we observe that problems are no longer "ill-structured." In fact, the term "ill-structured" is not used at all in 2012 (versus 22 times in 2010). In 2012, the nature of the task environment returned to being viewed as straightforward:

> *As commanders begin to understand their operational environment and the problem, they start visualizing a desired end state and potential solutions to solve the problem.* (ADRP 5-0, 2012)

This is vastly different than the 2010 view of the task environment, which was about understanding complex and ill-structured problems.

As previously noted, the task environment in 2012 changed dramatically from the 2010 environment to one which would be more recognizable to a member of the armed services in the Nineties**.** In 2019 this did not change, but it was clarified that complexity is what causes uncertainty. Moreover, complexity is identified as the source for uncertainty. Further, chance and friction increase this uncertainty as well as "chaos." This seems to mix a number of ideas together, which is curious, since 2012 seemed to be a return to the surety and simplicity of the Nineties. Not only that, but it is significant to note that uncertainty is viewed as a problem that can be solved so that the world becomes once again "knowable." This is juxtaposed with the ontological ideas of a world that is inherently uncertain, that problems are constructed socially by humans (and don't exist objectively), and that in attempting to make things less unknowable, we paradoxically make them less known, the latter idea being addressed, ironically, in complex adaptive systems theory.

Doctrine suggests that war in 2005 was understood to be more problematic, as indicated by the increasing use of the term "problem." The word problem is found 92 times in 1993, but 279 times in 2005. In the same period, there was a 23% increase in the number of pages,

however a 203% increase in the word "problem." Further, during this time period, doctrine focused on instructing its members how to delineate between various categories of problems which were described as ranging from the well-structured, medium-structured, and to the ill-structured. Especially in the case of the "ill-structured," this appears to be a wholly new phenomena for the Army, totally absent in the Nineties versions of doctrine.

> *In terms of structure, there are three types of problems: well structured, medium structured, and ill structured. Understanding the structure of a problem assists in determining the amount of time and resources required to develop a recommended solution to the problem. Perception of whether a problem is well, ill, or medium structured depends, in part, on the knowledge, skills, and ability of the problem solver.* (FM 5-0, 2005, 2-19)

Analysis revealed that the Army seemed to struggle with the concept of "ill-structured" problems, since the doctrine advocated that they be altered to more structured problems. For example, the doctrine states: "Problem solvers must sometimes reduce complex ill-structured problems into smaller problems" (HQDA, 2005. 2-5). This is contrary to the nature of ill-structured problems as described in complexity theory which asserts that, by definition, ill-structured problems cannot be reduced to smaller problems (Beinhocker, 2006. 45-50; Gell-Mann, 1995; Zimmerman, et al, 2001, 3-20; and Schneider, 2006, 351–365).

U.S. Army doctrine in 2019 asserted that complexity (which could be shorthand for multiple variables) creates uncertainty, which, when mixed with chance and friction, increases the uncertainty and something called chaos. It is interesting to note the differences between how the word "chaos" appears in the manuals. In the Nineties and in 2005 it is used in terms of the environment of combat. In 2010 it only appears in two titles of articles used as references for the term "complexity." In 2012 the term disappears, but it reappears in 2019 to explain the relationship between uncertainty and complexity.

> *War is inherently dynamic and uncertain. The complexity of friendly and enemy organizations, unique combinations of terrain and weather, and the dynamic interaction among all participants create uncertainty. Chance and friction increase the potential for chaos and uncertainty during operations. Chance pertains to unexpected events or changes beyond the control of friendly forces, while friction describes obstacles that make executing even simple tasks difficult. Both are always present for all sides during combat. (*ADP 5-0, 1-2)

It is worth drawing out the causal arrows the U.S. Army saw in 2019:

> Complexity→ uncertainty
> Chance + Friction → increases uncertainty and chaos
> Friction= obstacles

This suggests an institution trying to get back to something familiar – a problem that it can solve- so it goes back to Nineties-sounding language. But, in so doing, the U.S. Army confuses "friction" with a concrete thing like "obstacles" and it mixes some of its more recent terms like complexity, and even adding the term "chaos." Thus, the U.S. Army uses familiar terms- the language about simple tasks being difficult while mixing in some of the more recent terms that exploded in use in 2010 like complexity and the related concept of chaos. Chaos is not mentioned once in 2010 or 2012, but it is something related to complexity theory. This shows an organization in the midst of trying to find comfort in the traditional, the known, and the trusted, but still having to incorporate some of the more recent concepts it has used in the past.

The Over-riding Concern

Analysis revealed a heavy emphasis on logistics as the over-riding concern during the Nineties and this was consistent with the ontological narrative of the task environment at the time. Specifically, the prioritization of the physical rather than the human nature of the task environment was accompanied by an over-riding emphasis on manipulating and shaping the task environment. Logistics was described as the preferred technology through which to do this. Thus, the doctrine prioritized the physical dimension over the human and made the over-riding

concern of the task environment related to logistics. In the below quote, for instance, the ability to fight and win anywhere in the world "on short notice" in any environment implies the need to move materiel and personnel competently in a rapid manner and synchronize those movements in such a way as to support employing the materiel in a fight with an enemy.

> *The second dimension of this environment is physical. In accordance with the US National Military Strategy, US Army forces must be prepared to fight and win on short notice anywhere in the world, from blistering deserts to frigid wastelands, in rain forests, tundra, mountains, jungles and swamps, urban sprawl, and all types of terrain in between. (*FM 100-5, 1993, 14-1)

> *In a force-projection army, planning and conducting operations at both the tactical and operational levels have become more complex since the end of the Cold War. (*FM 100-5, 1993, 5-6)

The key concern here is how to be prepared to fight and win anywhere at short notice. The answer is logistics and thus, the task environment was focused on how to accomplish that feat (getting materiel and personnel to the necessary theater of operations).

In 2005 there was a major shift, as noted in the section above that viewed the task environment as quite different: complex and problematic. This shift towards an environment of complex problems was accompanied by a corresponding shift in the doctrine language away from an over-riding focus on logistics (“force projection”) and toward an over-riding concern in educating its members in how to think about problems. For example, doctrine advocated that members need to gain skills in being creative, thinking, and effectively solving problems: “Creativity by Army leaders is key to developing effective solutions to problems” (HQDA, 2005, 2-4). The nature of the task environment described was not just concerned with tactical and logistics problems, but appeared to grapple with an awareness of new types of problems that required a different method for solving.

The overriding concern in 2005 was the structure of problems. In 2010, the doctrine focus shifted to thinking about complexity; understanding that ill-structured problems were not just ill-structured, they were complex. The distinction is two-fold: problems that are ill-structured can be thought of as subjective phenomena and complexity implies applying components of complexity theory. If problems are ill-structured, then they are ill-structured due to those who are structuring them. If, however, problems are complex, then they are objective phenomena. In 2005 the Army appeared to embrace the concept that problems are socially constructed and, thus, could be viewed as structured in ways that were more or less conducive to contingent requirements. In 2010, however, by introducing the notion of complexity, problems become more of a positivist phenomenon, objectively complex (or not).

> *Perception of whether a problem is well, ill, or medium structured depends, in part, on the knowledge, skills, and ability of the problem solver.*
> - FM 5-0, 2005

> *Ultimately, understanding complex, ill-structured problems is essential to reducing the effects of complexity on full spectrum operations.*
> - FM 5-0, 2010

The over-riding concern in 2005 seems to be a focus on how planners and commanders perceive the situation at hand when juxtaposed with the 2010 focus of things being complex in an implicitly objective sense. In other words, since a problem was understood as a construction, viewing it as "ill-structured" simply means it is interpreted in a way that makes it confusing to the observer. In 2005 the military saw problems as being complex because of the observer. In 2010, however, problems were described as ill-structured *and* complex, which described the world more objectively, it *was* complex as opposed to just ill-structured (by the people doing the structuring). Problems in the new view of 2010 were seen as complex and interpreted incorrectly, versus the 2005 view which seemed to focus more on the interpretation itself. Notice, also, the

focus on “reducing” complexity in 2010. In 2005 one might imply that the perception of observers was the issue, however in 2010 the focus shifted to dealing with making the objective complexity of the situation less complex in the perception of the beholder.

The over-riding concern in 2012 was using planning and learning to problem-solve. Although this is similar to the Nineties, the Nineties were more focused on a force projection Army and the related problems, mainly logistical, with executing that projection of force across the globe. In 2012, the focus seemed to be more about getting back to the basics of imagining an objective, using planning, and learning to solve the problems related to objective accomplishment. The term “problem,” however, is sometimes used interchangeably with the over-arching term *objective*, or at least implied.

> *The object of problem solving is not just to solve near-term problems, but to do so in a way that forms the basis for long-term success.*
>
> *Commanders, staffs, and unified action partners construct a narrative to help understand and explain the operational environment, the problem, and the solutions.*
>
> *Army design methodology entails framing an operational environment, framing a problem, and developing an operational approach to solve the problem.*
>
> - ADRP 5-0, 2012

This is juxtaposed with the over-riding concern in 2010, which was understanding ill-structured and complex problems. As noted, before, the term “ill-structured” disappeared from the 2012 manual and the term “complex” almost disappeared. This is an organization that is in the midst of a drastic change in the way it views war. The view of war two years prior was overly complex and had elements of interpretive relativism and post-modernism, making it even more complex. In 2012, the mental model appears to shift back to viewing things as more rational in nature. Problems are related to getting to the desired objective or overcoming whatever obstacles are in the way of getting to an objective. It is implied that this process could be applied to any

environment, even to those environments that might sound a little like those depicted in 2012: those of chance and uncertainty leading to friction.

The over-riding concern in 2019 doctrine is using planning and operational art to solve problems and achieve the desired end-state. This is a wholesale return to the Nineties, as operational art is a term that the U.S. Army developed in the Nineties from Soviet and Israeli doctrine to think about how to match tactical action to strategic objectives. Operational art is a set of conceptual tools that help frame what to plan. Planning is a linear tool that uses linear causal constructs and reductive logic to accomplish more abstract or aggregated objectives.

> *Planning also helps leaders identify problems and develop solutions to solve or manage those problems. Not all problems require the same level of planning. Leaders often identify simple problems immediately and quickly decide on a solution—sometimes on the spot. Planning is critical, however, when a problem is actually a set of interrelated issues, and the solution to each affects the others. For unfamiliar situations, planning offers ways to solve the complete set of problems as a whole. In general, the more complex a situation is, the more important and involved the planning effort becomes.*
>
> *It is through operational art that commanders develop and translate their operational approach—a description of the broad actions required to achieve the end state —into a concept of operations. An operational approach is the result of the commander's visualization of what needs to be done in broad terms to solve identified problems.*
>
> - ADP 5-0, 2019

This shows an organization returning to past thinking frameworks in order to think about acting in the contemporary environment. It shows an organization that has been tested, become confused, tried new things, and is now ready to return to how things were before the testing and confusion.

View of Human Nature

Doctrine indicates that the US Army in the Nineties viewed human nature primarily through a rationalist assumptive base. For example,

> *The commander uses command and control, which includes the staff, to make effective decisions, to manage the uncertainty of combat, to employ military forces efficiently, and to direct the successful execution of military operations. In short, the goal of command and control is mission accomplishment, while the object of command and control is forces.*
>
> - FM 101-5, 1997, 1-1

There was, however, some recognition in the Nineties doctrine that everything involving humans might not be quantifiable.

> *Decision making is both science and art. Many aspects of military operations—movement rates, fuel consumption, weapons effects—are quantifiable and, therefore, part of the science of war. Other aspects—the impact of leadership, complexity of operations, and uncertainty regarding enemy intentions—belong to the art of war.*
>
> - FM 101-5, 1997, 5-1

However, analysis of the 2005 doctrine indicated a significant shift occurred in how the military viewed human decision-making. Of note, in FM 101-5 (1997) the word "creative" was used three times. In 2005, FM 5-0, which was the manual that replaced FM 101-5, the word "creative" is used thirteen times. In the Nineties the word "variables" is used only once. In 2005, in FM 5-0, the word "variables" is used eight times. Description of the decision-making process thus shifted from using measurement and more abstract concepts to make decisions to using a combination of subjective analysis (i.e., art) and quantitative analytical tools (i.e., science) to solve problems.

> *Problem solving is both an art and a science. It is a highly structured analytic process designed to ensure that all key factors relevant to the problem are considered, and that all relationships between variables are anticipated and accounted for in the solution. This ensures that the desired objective or end-state is achieved in the most effective and efficient manner.*
>
> - FM 5-0, 2005, 2-2

This kept human nature firmly within the positivist wheelhouse, assuming that, ontologically speaking, the world in which the observer was observing was separate from the observer (Riccucci, 2010, 47).

As noted previously, doctrine viewed decision-making in 2005 to be very variables-focused. Either variables were objective, and science could be performed to understand the world, or the variables were difficult to measure, which required an art approach to deal with subjective analysis. This language is totally new, the Nineties version of the doctrine had nothing about variable analysis in it. Decision-making, a key human activity in Army doctrine, is variously mentioned throughout 2005 Army doctrine as a way to solve problems:

> *Problem solving is both an art and a science. It is a highly structured analytic process designed to ensure that all key factors relevant to the problem are considered, and that all relationships between variables are anticipated and accounted for in the solution.*
>
> - FM 5-0, 2005

In 2010, however, something new was mentioned as having to do with decision making and how it is performed: "culture."

> *Culture is the shared beliefs, values, customs, behaviors, and artifacts members of a society use to cope with the world and each other. Culture influences how people make judgments about what is right and wrong and assess what is important and unimportant. Culture provides the framework for rational thought and decisions. What one culture considers rational another culture may consider irrational.*
>
> - FM 5-0, 2010

Whereas in 2005, human nature with respect to decision-making was represented in doctrine as very empirical-based and rational, in 2010 it is entirely post-modern in that there is no such thing as objective rationality: what one culture, for example, thinks is rational, another does not.

2010 appears to mark a pinnacle of sorts in the Army's ontological journey since 9/11 and 2001. Whereas the structure of problems in 2005 was framed ontologically as a subjective subject, in 2010 it is framed as an objective subject. The task environmental categories also exploded from mainly two ideas represented in 2005- uncertainty and the structure of problems - to a whole host of categories that took 243% more words to describe than they did in 2005.

Lastly, decision-making is presented for the first time in 2010 as wholly culturally based and by extension, even rational thought is acknowledged as entirely relative. If anything describes the Army's ontology in 2010, it is that war is confusing and difficult to describe.

> *An operational environment is both complex and continuously changing. Complexity describes things or situations with many parts and subparts (structural complexity), as well as the behaviors and resulting relationships among those parts and subparts (interactive complexity).*
>
> - FM 5-0, 2010, 1-1

The U.S. Army in 2012 viewed humans as capable of rational decision making, even if decision making was heavily influenced by one's culture. It is curious that complexity, described in the doctrine as a proxy for friction, is solved in 2010 by acknowledging the role culture plays. In 2012, it is about delegating to subordinates- another drastic change in how decision-making is viewed by the U.S. Army in only two years.

> *During operations leaders make decisions, develop plans, and direct actions under varying degrees of uncertainty. Commanders seek to counter the uncertainty of operations by empowering subordinates at the scene to make decisions, act, and quickly adapt to changing circumstances. As such, the philosophy of mission command guides commanders, staffs, and subordinates throughout the conduct of operations.*
>
> - ADRP 5-0, 2012

This concept of "mission command" goes back to the 2005 version of the manual, but only in 2012 is it explicitly tied to countering uncertainty. In 2005 and 2010, the term was about accepting uncertainty and allowing action.

> In 2005: *Mission command accepts the uncertainty of operations by reducing the amount of certainty needed to act.*
>
> - FM 5-0, 2005, 1-5

> in 2010: *Mission command fosters operational adaptability—a quality that Army leaders and forces exhibit based on critical thinking, comfort with ambiguity and decentralization, a willingness to accept prudent risk, and the ability to make rapid adjustments based on continuous assessment of the situation.*
>
> - ADRP 5-0, 2010, Vii)

In 2012 it is presented as a remedy to uncertainty- it helps to overcome uncertainty. Even though mission command as a term entered the manual in 2005, it is curious as to why it changed and became so prominent a fixture over that time, even eclipsing its supposed benefit in 2005 and 2010 to become a way to counter uncertainty.

Human decision making in 2012 was still about a cultural frame, but also used delegation and empowerment of subordinates to overcome uncertainty**.** In 2019 the change back to the old was solidly in place as decision making is put back into its traditional place as a product of the process and includes understanding the situation, developing courses of action, and producing a plan. This is back to the rationalist perspective that dominated the Nineties doctrine.

III. The Epistemological view

The Army's epistemology was defined as how it viewed its members gaining knowledge. Within that broad category, I further refined the topic to these three subordinate subjects: how to best visualize, the view of knowability, and the overriding concern with respect to knowledge gain.

How to Best Visualize

In the Nineties the data suggests that commanders were supposed to imagine the coming war (visualize the battlefield) through largely logical and objective thinking.

> *To be valid, conclusions must be relevant to the topic, objective, and supported by the data, and they must be arrived at through a logical thought process.*
>
> - FM 101-5, 1997, 4-8

From the Nineties to 2005, the data suggests that how the Army wished its members to understand things changed from visualizing everything on the battlefield using logic to visualizing the operation in terms of an analysis of the mission to get to the nature of the problem

at hand. Although this epistemological change matched the noted ontological change (from straightforward to more complex), key points of ambiguity were evident. For instance, interpretation is interspersed with a list of tools called the elements of design that are more reductive and positivist in nature. It also includes the idea of looking at the problem using multivariate analysis and the inference that for leaders to "solve problems" (2005: 2-2) requires using multiple viewpoints. Further, the doctrine suggests that to solve problems requires using critical reasoning, but also by looking at every situation as one in which the problem is pre-determined to be how get from the current situation to a more desired situation. If the ontology was seen as complex, the data suggests that the Army did not fully embrace complexity theory nor shed itself of legacy methods, instead attempting to fit new things that did have connections to complexity theory with old things that appear to be in contradiction. For instance, complexity theory would recommend using critical reasoning and multiple viewpoints, but not necessarily multivariate analysis only or viewing every problem as simply how to get from here to there.

In 2010, the Army went further into how to think about complex environments. In 2005 doctrinal advice on how to visualize was for members to use contextual methods, visualizing how to get from the current state to the preferred state, looking at problems from multiple viewpoints, interpretation, and the elements of design (a laundry list compared to the Nineties. In 2010, however, it changed to visualizing the situation as made up of one of three categories of problems: well-structured, medium-structured, or ill-structured, although this was still for the purpose of visualizing how to get from the current state to a more desired state. Thus, the laundry list of additional ways with which to visualize the situation increased in 2005, however in 2010 an additional visualization tool was introduced: the concept of distinct categories of problem.

> *Depending on the structure of the problem, leaders may take different approaches to both understanding problems and developing solutions. The degree of*

> *interactive complexity of a given situation is the primary factor that determines the problem's structure. In terms of structure, there are three types of problems: well structured, medium structured, and ill structured. Perception of the individual as to whether a problem is well, medium, or ill structured depends, in part, on the knowledge, skills, and ability of that individual.*
>
> - FM 5-0, 2010, 2-3

Of note, the term "ill-structured appeared four times in 2005, but 25 times in 2010. Further, in 2010 the type of thinking and methods associated were supposed to be different depending on the problem's category.

> *Well-structured problems are easy to identify, required information is available, and methods to solve them are fairly obvious.*
>
> *Success during execution requires not only learning to perfect a technique but also adjusting the solution based on changing conditions. Army problem solving, the military decision-making process (MDMP), and troop leading procedures (TLP) are methods to help leaders understand and develop solutions for medium-structured problems.*
>
> *Leaders use design to help them understand complex, ill-structured problems and to develop a broad operational approach to manage or solve them.*
>
> - FM 5-0, 2010, 2-4

The data suggests that in 2012 the Army changed the way it viewed as the best way to visualize the battlefield from one of using many methods and sources of knowledge to categorize types of problems- and then further visualize how to get from a current state to a more desired state- to one of that seemed more codified as well as noting a difference between art and science in the business of visualization. This shift to categorizing problems suggested the introduction of a contingency logic in which the best way to visualize about the situation depends… on the situation. Art and science were now a part of visualizing how to get to a more desired future:

> 2010: *Battle command is the art and science of understanding, visualizing, describing, directing, leading, and assessing operations to accomplish missions. All activities of battle command occur in planning, preparation, execution, and assessment, but vary in emphasis throughout the operations process.*
>
> - FM 5-0, vi

> 2012: *Planning is the art and science of understanding a situation, envisioning a desired future, and laying out effective ways of bringing that future about.*
> - ADRP 5-0, 2-1

Of note, art and science are only mentioned twice in 2012, and both to describe planning. In 2010 it had been mentioned seven times and it was used to describe both planning and the term *battle command*. The term *battle command* is totally missing from the 2012 manual. Although a new term appears called *mission command*, this term does not have the same connotation as *battle command*. In 2010 *battle command* is also a changed term. In 2005 *battle command* is described as the heart of the operations process and leans heavily on a commander's experience and skill. In 2010 *mission command* is a concept revolving around the commander issuing broad intent for operations and powering down to subordinates.

The data further suggests that the intellectual tools used to assist in visualizing a more desired future were those identified as the elements of design in 2005, but were more explicitly tied to visualization in 2012:

> *Commanders apply the Army design methodology and use the elements of operational art when developing and describing their commander's visualization.*
> - ADRP 5-0, 2012, 2-10

Note the different uses of the term "art":

Table 4.2: Use of the term "art"

Year	Art	Art and Science	Operational Art
1997	29	4	15
2005	21	3	1
2010	27	8	6
2012	27	2	18
2019	9	3	28

This data suggests several things: there is an increase in the use of the phrase "operational art" in 2012, although not much of an increase in the use of the word "art." It is, however, worthwhile to

note that the use of the term "art and science" was explicitly tied to visualization in 2012, even as it dropped to only being used twice. "Operational art," as the data suggests, is a term more heavily used in the Nineties, 2012, and, as will be discussed in the next section, 2019. In fact, the percentage of how the term "art" is used to mean "operational art" as opposed to art juxtaposed with science is also telling:

Table 4.3: The use of the term "op art" & art with science

Year	Art referred to as "op art"	Art juxtaposed with science
1997	52%	14%
2005	5%	14%
2010	22%	30%
2012	67%	7%
2019	48%	5%

This data shows that the Army returned to using the term "art" in the sense of "operational art" in 2012 and 2019 much like it did in the Nineties, with "art and science" more so in 2005 and 2010. This suggests a return to the Nineties in terms of the usage of the term "art." In 2012 this shift begins. In addition, the term "art and science" was used for visualization as opposed to what it was used for in 2010, 2005, and 1997. From my analysis coding:

> 1997: *Command and control is an essential element of the **art and science** of warfare.*
>
> 2005: *Effective planning is both **art and science**.*
>
> 2010*: At the center of the operations process is battle command—the **art and science** of understanding, visualizing, describing, directing, leading, and assessing forces to accomplish missions.*
>
> …and*: Planning is the **art and science** of understanding a situation, envisioning a desired future, and laying out effective ways of bringing that future about.*
>
> 2012*: Planning is the **art and science** of understanding a situation, envisioning a desired future, and laying out effective ways of bringing that future about.*

> 2019: *Planning is the **art and science** of understanding a situation, envisioning a desired future, and determining effective ways to bring that future about.*

It is also important to point out that the terms "elements of operational design" and "operational art" are conflated in the Army doctrine.

> In 2010: *To develop their commander's visualization, commanders draw on several sources of knowledge and relevant information. These include— The elements of operational design.* (2-10) These include: *end state, conditions, centers of gravity, operational approach, decisive points, lines of operations and lines of effort, operational reach, tempo, culmination,* etc. (D-1)

> In 2012: *The planning team uses the elements of operational art to help think through the operational environment and visualize and describe the operational approach*. (2-10) *These include: end state and conditions, center of gravity, decisive points, lines of operations and lines of effort, operational reach, basing, tempo, phasing, culmination,* etc. (2-4)

Thus, the data suggests that in 2012 the Army thought it important to decouple the term elements of operational design (or art) and yet retain the elements themselves as part of art and science as well as *operational art* in the business of visualizing how to get from the current situation to a more desired one.

In 2019 the data suggests a substantial change in the way in which the Army viewed visualizing the situation, environment, or, more specifically war. Now visualizing was about thinking about any given situation as an instance that existed along a continuum between peace and war, and anything in between these two extremes as "competition."

> *Military operations fall along a competition continuum that spans cooperation to war. Between these extremes, societies maintain relationships. These relationships include economic competition, political or ideological tension, and at times armed conflict. Violent power struggles in failed states, along with the emergence of major regional powers like Russia, China, Iran, and North Korea seeking to gain strategic positions of advantage, present challenges to the joint force. Army forces must be prepared to meet these challenges across the range of military operations during periods of competition and war.*
>
> - ADP 5-0, 2019, 1-1

The data suggests that visualization was still couched within the over-arching framework of how to get from the current situation to a more desired one, but the view was that this would best be visualized within something called the competition frame. The data further suggests that operational art is the key to this visualization.

> *Planning at the operational level requires operational art to integrate ends, ways, and means while balancing risk. Operational-level planners use operational design and the joint planning process to develop campaign plans, OPLANs, OPORDs, and supporting plans.*
> - 2-8

Note that *operational design* has made a reappearance, after having disappeared in 2012 and having been replaced by *operational art*, it now reappears in two places without definition.

View of Knowability

Doctrine in the Nineties suggests that the Army's view of knowability at that time was pre-occupied with rational decision-making. In other words, once the outcomes that flowed from the military decision-making process (MDMP) were realized, the Army held that its commanders would know what the situation was. The data suggests that in the Nineties knowing was entirely a rational exercise.

> *The MDMP helps the commander and his staff examine a battlefield situation and reach logical decisions. The process helps them apply thoroughness, clarity, sound judgment, logic, and professional knowledge to reach a decision.*
> – FM 101-5, 5-1 (1997)

Doctrine during this era reflected a belief that commanders can know things through logical analysis and this further matches what the data suggests about the Army's ontological assumptions: that the main focus for the Army was projecting force through logistics and predetermined training regimes overseas, and thus logical analytical processes were sufficient for how commanders needed to know. Thus, decision-making itself implies knowing:

> *Decision making is knowing if to decide, then when and what to decide.*

– FM 101-5, 5-1 (1997)

Knowability thus comes from the process of determining if and then when and what to decide, which comes from logical analysis of essentially a logistics problem and tactics execution.

From the Nineties to 2005, the data suggests that how to best make decisions changed to problem solving using the MDMP. Intuitive decision making was also added when time was short, which requires pattern recognition, experience, or simple situations, but MDMP is still the foundation for that kind of decision making.

> *Intuitive decision making is the act of reaching a conclusion that emphasizes pattern recognition based on knowledge, judgment, experience, education, intelligence, boldness, perception, and character. This approach focuses on assessment of the situation vice comparison of multiple options.*
>
> – FM 5-0, 1-6 (2005)

Thus, while the rational decision-making model was kept, Army doctrine expanded its view of what problem solving was: from a logistics and logical exercise to one that incorporated problems more holistically and to deal with the ontological aspect of complexity:

> *If the situation is very complex, planning may offer the only opportunity to deal with the complete set of problems as a whole.*
>
> – FM 5-0, 1-14 (2005)

The data suggest that knowability in 2005 had to expand to incorporate other forms of knowing besides simply following a rational decision-making process such as the MDMP and the logical analytic frame inherent within. Knowability, according to doctrine, had to include intuitive decision-making as well, which meant knowing came from other sources, namely pattern recognition. The sources of knowing that enabled pattern recognition were many: "knowledge, judgment, experience, education, intelligence, boldness, perception, and character." (2005: 1-6) Thus, wherein in the Nineties knowing came from logical analysis, in 2005 it included things such as "boldness." This data suggests that being bold, for example, allowed a

person to recognize certain patterns that then allowed them to understand more complex situations more than if they had used the Nineties version of knowing.

Again, these changes both align and do not align with the ontological changes between the Nineties and 2005. It aligns in asserting that sources of knowing are more than just objective analytics based on data (interestingly, the 2005 manual goes into depth about correlation analysis, something the Nineties manual does not, suggesting that even the objective analytical methods described in the Nineties were not sufficient for the objective analytical methods required for 2005). The complexity described in the 2005 ontology is reflected in the epistemological assumption of knowing coming from multiple sources. However, this epistemological frame of knowability does not follow complexity theory in terms of the properties of emergence wherein knowing is impossible a priori and thus knowability means different things depending on the situation (Goldstein, 2011, 65-78). The data suggests that the Army embraced the language of complexity theory in its ontology, but not wholeheartedly in its epistemology.

The data in the 2010 manual suggests that variable analysis was kept as the way in which "to know," as a way to gain pattern recognition.

> *…applying analysis to determine relationships among variables, which allows pattern recognition, reductive analysis thinking, synthesizing parts, analyzing eight variables against the six mission variables, appreciating cultural effects, collaboration, interaction, visualizing how to change to the desired state, appreciating contextual complexity, critical thinking, thinking about unintended consequences, using multiple perspectives and varied sources of knowledge…*
> - FM 5-0, 2010

Note the addition of "multiple perspectives and varied sources of knowledge." This is an addition to the 2005 additions of other sources like pattern recognition and those things that enabled pattern recognition: "knowledge, judgment, experience, education, intelligence, boldness, perception, and character." The data thus suggests that in 2010 the Army built upon the

2005 changes to incorporate more ways of knowing to deal with the ontological changes associated with increasing complexity.

Doctrine in 2010 asserted that this new and improved process of knowing allowed understanding, but now as a part of something called "design"- which was markedly different than the elements of design mentioned in 2005:

> *…part of design: critical thinking, understanding the operational environment, solving the right problem, adapting, and achieving desired goals.*
>
> - FM 5-0, 2010

Thus, design in 2005 was associated with the *elements of operational design*: end state, center of gravity, decisive points and objectives, lines of operation, culminating point, operational reach, simultaneous and sequential operations, linear and nonlinear operations, and tempo. These were all "tools that help commanders visualize operations and shape their intent. They provide commanders a framework to conceptually link ends, ways, and means." (HQDA, 2005, 3-5)

In 2010, however, design is a new term: "After receipt of or in anticipation of a mission, commanders may begin design to understand the operational environment, frame the problem, and develop an operational approach to solve the problem. The situation—to include the complexity of the problem—guides the commander's decision on whether to use design." (HQDA, 2010, 2-7)

The data suggests that knowing was thus linked to design, especially the more complex the situation. It was made up of critical thinking, understanding the operational environment through visualization, knowing what the "right" problem was, adapting, and thus achieving desired goals. In addition, it required collaboration and dialog (2-7). Knowability was about knowing what kind of problem one faced and that meant data analysis to assist in pattern recognition in addition to multiple perspectives and varied sources of knowledge.

In 2010, knowability, the data suggests, was thus linked to how the Army thought its members should approach complex situations. The 2005 manual did not go far enough, with the Army adding what looks like to be a more mixed methods approach to knowing.

The data suggests that knowability in 2012 became explicitly tied to planning and was situational. The process led to understanding, and a more explicit tie specifically to the process of visualization is found (in other words, knowing comes from the process of visualization). This is juxtaposed to 2010 wherein knowability came from both 2005's variable analysis as well as "multiple perspectives."

> *Leaders can gain this understanding by capitalizing on multiple perspectives and varied sources of knowledge.*
> - *ADRP 5-0, 2012, (3-5)*

> *Battle command is the art and science of understanding, visualizing, describing, directing, leading, and assessing operations to accomplish missions.*
> - *ADRP 5-0, 2012, (vi)*

> *Situational understanding is the product of applying analysis and judgment to relevant information to determine the relationships among the mission variables to facilitate decision-making*
> - *ADRP 5-0, 2012*

Note there is no mention of multiple perspectives for understanding. We can see the 2012 view of knowability here:

> *The commander's role is to drive the operations process through the activities of understanding, visualizing, describing, directing, leading, and assessing operations.*
> - ADRP 5-0, 2012, (1-2)

> *Analysis of the operational and mission variables provides the information used to develop understanding and frame the problem. In addition, conceptual and detailed planning assist commanders in developing their initial understanding of the operational environment and the problem*.
> - (1-3)

> *…this is known as commander's visualization—the mental process of developing situational understanding, determining a desired end state, and envisioning an operational approach by which the force will achieve that end state*.
> - (1-4)

Notice there is no similar segment as to the last portion above in the 2010 manual. The only mention of "multiple perspectives" in 2012 is in the context of describing the relationships between different actors in an environment (ADRP 5-0, 2012, 2-7).

Note that in the last section, understanding is a part of the process, specifically the first step in "visualization," followed by determining the "end state" and then envisioning a way to get to that state. It is contextual (i.e.- "situational"), however it is in service of determining one's objective. It could be described that in 2010 the Army viewed understanding as a messy process involving multiple methods and requiring determining what kind of situation one occupied. In 2012, however, understanding was in service of objective determination. In 2010, however, this understanding was broader, it was meant to facilitate decision making as well (note the absence of that portion in the 2012 version). *Battle Command* in 2010 is replaced with *the commander's visualization* in 2012, which means that how to know- knowability- is a product of visualization in 2012. Prior to 2012 it was broader and required more input.

From 2010 to 2012, how to understand changed from a large set of activities that included applying analysis to determine variable relationships and pattern recognition, reductive analysis, collaboration, visualizing how to change to the desired state, and using design-- to a smaller set of activities which kept applying variable analysis, analyzing operational against mission variables and cultural effects, and introduced understanding as situational and tied to the process of planning. A key component is that it also served to assist the commander in figuring out objectives, as opposed to in 2010 where the focus was on general decision making. This is a pivot away from the 2010 doctrinal focus on complexity: decision making is more simplistic now.

The view the Army had in 2019 about knowability as reflected in its doctrine, changed little from 2012 to 2019, although there was a greater linkage defined between understanding context to understanding problems and the need to create shared understanding between higher and lower headquarters. This was a new addition and seemed to be in line with 2010 themes, albeit added later (the idea that complexity must be dealt with through decentralizing authority). Thus, the data suggests the Army was still adding in complexity theory concepts at this point in time such as the idea that a higher echelon has difficulty knowing things in a complex, dynamically changing environment.

> *Creating shared understanding is a principle of mission command and requires communication and information sharing from higher to lower and lower to higher.*
>
> *- ADP 5-0, 2019, 1-12*

Note that *mission command* has been retained, and thus the importance, first seen in 2010, of subordinates being a part of how the organization knows things.

Over-riding Concern of Epistemology

It is difficult at times to detect the difference between the over-riding concern with respect to epistemology and *knowability*, especially as the Army doctrine often combines not just knowability and the main themes surrounding the assumptions the Army makes about how knowledge is gained, but even the preferred methodology and knowing. Thus, as shall be seen in the following section on methodology, knowing in some eras was thought of as coming from the method of decision-making itself. For the purposes of this section, however, the over-riding concern is which epistemological assumptions are the most focused upon. Knowability is more focused on what is knowable (or not). For clarity, here are the differences as captured in the findings between the two:

Table 4.4: Knowability vs Overriding concern within epistemology

Year	Knowability	Over-riding Concern WRT epistemology
90s	One knows thru rational decision-making	Concrete phenomena
2005	One knows thru rational decision-making & pattern recognition	The structure of problems
2010	One knows thru pattern recognition- variable analysis	Complex problems
2012	One knows thru planning and the visualization process	Art and science in problem solving
2019	One knows thru planning & visualization process, & shared understanding	Problem solving associated w/ competition

The epistemic over-riding concern in the Nineties, the data suggests, was viewing things focused on phenomena needed to solve problems of concrete objectives, like logistical problems. Fast forward to 2005 and the manual's data suggests that the over-riding concern was now what type of problem the Army was facing. Thus, the *structure* of the problem became the over-riding concern of the Army's epistemology in 2005:

> *In terms of structure, there are three types of problems: well structured, medium structured, and ill structured. Understanding the structure of a problem assists in determining the amount of time and resources required to develop a recommended solution to the problem. Perception of whether a problem is well, ill, or medium structured depends, in part, on the knowledge, skills, and ability of the problem solver.*
>
> – FM 5-0, 2-5 (2005)

This makes some sense, since the Army's ontology, as previously noted, contained the concept of complexity. The complexity theory literature includes many descriptions of the differences between simple, complicated, complex, and even chaotic systems or problems (Snowden & Boone, 2007).

The overriding concern in 2010 was still problem solving, but according to the data became much more linked to reducing complexity through something called design and achieving desired "end states." Older methods were included with the new method of design and

linked to specific classes of problems, all, according to the data, to reduce complexity and achieve the desired end state.

> *Ill-structured problems are the most interactive. They are also complex, nonlinear, and dynamic— and therefore the most challenging to solve. Unlike well- or medium-structured problems, leaders disagree about how to solve ill-structured problems, what the end state should be, and whether the desired end state is even achievable. At the root of this lack of consensus is the difficulty in agreeing on what is the problem. Unlike medium-structured problems, there is no clear action to take because the nature of the problem itself is not clear. This is often the case in operations involving multiple military (joint and multinational) and civilian organizations over extended periods. Leaders use design to help them understand complex, ill-structured problems and to develop a broad operational approach to manage or solve them.*
>
> - FM 5-0, 2010, 2-4

Thus, according to the data, the overriding concern with the Army's assumptions about knowledge revolved around how to solve problems, but those problems were increasingly seen as complex. In 2010 the Army saw a need to separate out problems that were less complex and assign diverse ways of visualizing, knowing, and acting on the different types of problems it faced.

The overriding concern in 2012 was much the same as it was with respect to problem solving in 2010, with the major change being an emphasis on art and science playing a role in problem solving, but the problem continuing to be how to get from the current situation to a more desired situation. Learning and culture were tied to solving problems and design was changed to the name *Army design methodology*, codifying the method for solving problems into a specific process and placing it before the decision-making process.

The overriding concern in 2019, the data suggests, is still problem solving, but in 2019 the focus within this overriding concern is how to solve problems dealing with the afore-mentioned *competition continuum*:

> *The range of military operations is a fundamental construct that helps relate military activities and operations in scope and purpose within a backdrop of the competition continuum. (1-1)*
>
> *Understanding an OE and associated problems is fundamental to establishing a situation's context and visualizing operations. (1-8)*

Specifically, solving problems is seen as dependent on where an organization within the Army might find itself along said continuum:

> *Military operations fall along a competition continuum that spans cooperation to war. Between these extremes, societies maintain relationships. These relationships include economic competition, political or ideological tension, and at times armed conflict. (1-1)*

This does seem to be similar to the Nineties ontology of war being a dichotomous phenomenon of either peace or war, the 2019 manual actually referring to "large scale" versus "counterinsurgency" operations:

> *Whether fighting terrorists as part of a limited contingency operation or defeating a peer threat in large-scale combat, the nature of operations is constant.*
> *Military operations are—*
> *- Human endeavors.*
> *- Conducted in dynamic and uncertain environments.*
> *- Designed to achieve a political purpose (1-1)*

In fact, the data shows that templates, matrices, and checklists have made a return, relics that never went away, but recalled more the Nineties than the interpretive turn of the 2010 doctrine (2-9):

Figure 4.1: Levels of Warfare

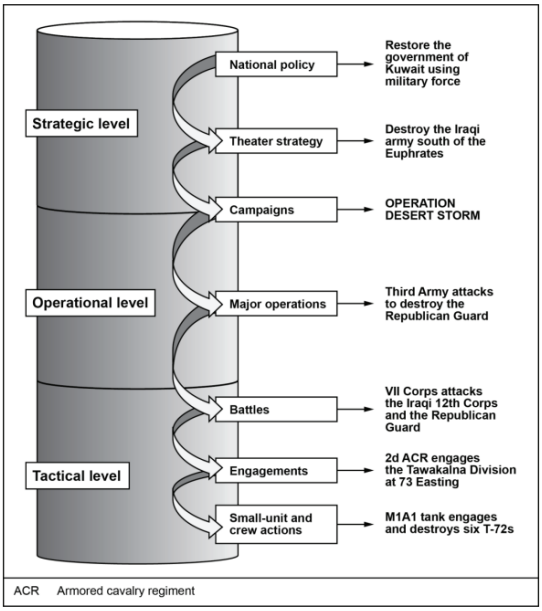


Figure 2-1. Levels of warfare

Although the checklists and matrices never went away, this figure shows a very reductive approach to visualizing how each subsequent subordinate unit's mission supports the highest strategic and political objectives. It is important that the example at the bottom was a tank engagement, noting a closer relationship to Nineties doctrine. In fact, *levels of warfare* are mentioned seventeen times in the 2019 manual. They are mentioned zero times in 2012 (20 in 2010, but the term is "levels of war", four in 2005- again "of war", and zero in 1997). Which begs the question, why did the term *levels of war* change both sporadically between the manuals and what prompted the change from war to warfare? Levels of warfare have been around the Army lexicon since my career began, so it was a bit of a surprise that I could not find levels of war very much outside of the 2010 and 2019 manuals. Why the sudden shift now, and not just one mention, but seventeen?

The data suggests additionally that thinking about how problems are solved changes in its framing of the operations process. Understanding, visualizing, and describing the environment- a

2010 concept- changed to planning, preparing, executing, and assessing- more of a nineties concept. Critical thinking is *reflective* (a term introduced with six references in 2010, down to one in 2012 and one in 2019) and helps to identify causes of problems. In previous years this was asserted to allow a matching of methods: ADM, MDMP, TLPs, RDMSP, and Army Problem Solving- to the problem. In 2019 these methods become more of a buffet from which to choose, based on the problem or situation, but not explicitly required for a certain problem type.

From 2012 to 2019, the data suggests that problem solving changed somewhat in its framing of the operations process. No longer was the framework *understand, visualize, and describe the environment to make decisions*, it was *planning, preparing, executing, and assessing*. The purpose of the operations process is to *understand, visualize the end state and how to get there, make decisions, direct, lead, and assess operations*. This is a turn back toward the Nineties in that planning is now the first step in problem-solving. Even the subsequent steps are about what happens subsequent to planning. The operations process- that which happens around planning- contains understanding, but problem-solving is now seen as something that happens due to planning. This puts problem-solving back into an activity that is wholly focused on the military operation, how to get from A to B to win over the enemy, as opposed to the overall situation. Interestingly, as the manual discusses more political activities with the competition framework, it also gets away somewhat from linking problem-solving directly to figuring out the overall situation. In 2019 the overall situation is not tied to planning, but to the operations process. This might seem trivial but making planning a discreet activity and linearly linking it to problem-solving changes its focus to be one of concrete military action.

> *The Army's framework for organizing and putting command and control into action is the operations process. The operations process consists of the major command and control activities performed during operations.*
>
> - ADP 5-0, 2019, v

IV. The recommended methodology

As noted above in the section on the overriding concern with respect to epistemological assumptions, the Army oftentimes conflated its method for knowing, and thus its epistemological assumptions, with its method for decision-making and problem-solving. This might have been reflected, for instance, in assuming that knowledge comes from the process of decision-making, and that that process solves problems. In other manuals, however, knowledge was said to come from intuition, seeking out multiple perspectives, or emergent shared understanding: activities separate from the process of decision-making. In still other years knowledge was purported to come from a socially constructed process. As such, I attempted to separate the process of knowledge gain and its incumbent assumptions from the process of decision-making and problem-solving. In some years this caused some instances of redundancy, but this was only reflecting the conflation in the Army manual for that year between the process of knowing and the method for decision-making.

Within the U.S. Army's methodology with respect to conducting military operations, there are three areas that I focused on analyzing. The first was the overriding concern. Similar to the U.S. Army's ontology, the over-riding concern is that focus within the methodology that the organization wishes to emphasize, and which potentially sets the foundational logic for the rest of the methodology. The second area is how to make decisions and solve problems. Frequently identified as one and the same, the organization has -- since at least as far back as 1997 -- according to the doctrine, been primarily concerned with making decisions that then solve problems. How to do this and how these change over time encompass a large part of the Army's organizational processes doctrine. Lastly, how to conduct planning and how planning is

connected to decision making is the second largest theme within the organization's processes doctrine. When combined, it would be interesting to note how these three pieces of the Army's methodology either changed with changes in its ontology and/or epistemology or did not change at all.

Within the U.S. Army's preferred methodology for conducting military operations, it is useful to identify the over-riding concern described within its doctrine. My assumption going into this analysis is that the recommended methodology should be linked to the Army's epistemology and ontology, so any kind of deviation from those was of interest. Likewise, I was also interested in understanding if the over-riding concern as it related to the U.S. Army's description of methods reinforced a change in epistemology or ontology.

Within the U.S. Army's methodology, how to make decisions and solve problems were key areas of focus. This was found throughout the Nineties and up to the present day. It is important, therefore, to note how the Army wanted its members to change how it went about making decisions and solving problems, especially as it compared to its ontological and epistemological assumptions and as it changed over time.

Finally, the doctrine focuses considerable attention on the process of planning operations. This gives insight into changes within the U.S. Army's thinking about its preferred methodology. I was particularly interested in cases in which the methodology did not appear to align with the Army's explicit or implicit ontological and epistemological assumptions. Likewise, my analysis sought to uncover areas in which planning did change to incorporate changes within the ontological and epistemological narratives.

Table 4.5: Main themes within the methodology

Year	Over-riding concern WRT method	How to Make decisions and solve problems	How to Plan
90s	Logical decisions	Analytical problem-solving techniques and rational decision-making	After decision, detailed steps of how to get from A to B
2005	Solve root problems of ill-structured and complex situations	Rational decision-making + multivariate analysis + intuition	After decision, detailed steps of how to get from A to B
2010	Complexity	Design and a systems approach to correctly frame the problem	As a part of problem solving, map out a way to get from A to B.
2012	How to get from a current to a preferred situation	Design- now tied to old operational design elements and as a part of rational decision-making	Contingent on amount of complexity, to solve problems, use visualization and design to detail how to get from A to B
2019	How to visualize getting to preferred ends within competition framework	Analytical problem-solving techniques and rational decision-making	Do analytical planning (rational decision-making) or systemic planning (design) to detail how to get from A to B

Over-riding concern of Army Method

In terms of the methodology, doctrine in the Nineties was concerned with the tools required to get resources transported overseas to defeat an enemy army. This implies an over-riding concern with logistics, as noted in the ontology. For the methodology we can see this same overriding concern. The manual states that to understand procedures it is necessary to understand how commanders command and to understand how commanders command, one must understand how the Army fights:

> *Therefore, to understand the staff and its organization, responsibilities, and procedures, it is first necessary to understand how commanders command. Since the Army exists to successfully fight and win the nation's wars, understanding command begins with understanding how the Army fights.*
>
> - FM 101-5, 1997, 1-1

In the Nineties, how the Army fought was by deploying forces anywhere in the world from the United States:

> *Decreases in forward-deployed Army forces necessitate an Army that is prepared to deploy forces anywhere in the world on short notice from the continental United States (CONUS) and from forward deployed locations. The Army is likely at any time to be involved in contingency operations at home and abroad. Force projection replaces forward defense as a more likely employment of Army elements.*
>
> - FM 100-5, 193, 1-2

Problem solving was focused on how to deploy forces overseas to destroy an enemy army. Prescribed methods for how to problem solve were likewise aligned with this focus, describing an analytical approach to reach logical decisions. This makes intuitive sense: problems related to logistics would seem to best be solved by methods that use logic and analytical deductive tools.

> *The military decision-making process (MDMP) is a single, established, and proven analytical process. The MDMP is an adaptation of the Army's analytical approach to problem solving.*
>
> *…The MDMP helps the commander and his staff examine a battlefield situation and reach logical decisions.*
>
> - FM 101-5, 1997, 5-1

Thus, the data suggests that in the Nineties, Army doctrine focused on prescribing methods for logical decisions based on analytical problem-solving techniques. Again, this is consistent with the over-riding concern of its ontology in the Nineties, as previously mentioned, being how to get resources to the war (logistics) and then how to defeat the enemy once there.

In 2005 the data suggests that doctrine writers changed their focus away from logistics. Instead, they focused on presenting methods for how to solve the root problem of an ill-structured and complex situation:

> *The object of problem solving is not just to solve near-term problems, but to also do so in a way that forms the basis for long-term success.*
> - FM 5-0, 2005, 2-1

> *In terms of structure, there are three types of problems: well structured, medium structured, and ill structured.*
> *…Ill-structured problems are at the opposite end of the spectrum since—*
> *• No clear formulation of the problem appears possible.*
> *• Not all required information is available.*
> *• They are complex involving many variables, making them difficult to analyze.*
> *• These are normally problems of prediction with no verifiable answer.*
> *• They may require multiple solutions applied concurrently or sequentially.*
> *Problem solvers must sometimes reduce complex ill structured problems into smaller problems.*
> - FM 5-0, 2005, 2-5

> *…When identifying the problem, leaders actively seek to identify its root cause, not merely the symptoms on the surface.*
> - FM 5-0, 2005, 2-7

This is congruent with its ontology of 2005, being that, as mentioned previously, the ontology in 2005 was that of ill-structured and complex situations. Thus, the data suggests that the Army's overriding concern with respect to its methodology went from the Nineties focus on how to best move resources to how to best solve root problems associated with complex situations. The analysis suggests this is consistent with its ontological frames, as discussed previously.

The over-riding concern in 2010, according to the data, shifted to the concept of design and a systemic approach to complexity. Whereas in 2005 complexity was introduced along with the notion of root causal analysis and the need to identify the structure of the problem, in 2010 complexity would be dealt with through the notion of systems thinking and complexity theory, although with this language was kept the legacy notions of rational decision-making. In addition,

new concepts like dialog, collaboration, and multiple perspectives were introduced. Since the new concept called design included all these new things, it makes sense to me to label the over-riding concern in 2010 as design, but more descriptively: how to handle complexity.

> *Successfully applying design seeks four concrete goals that, once achieved, provide the reasoning and logic that guide detailed planning processes. Each goal is an essential component to reshaping the conditions of the operational environment that constitute the desired end state. Collectively, they are fundamental to overcoming the complexities that characterize persistent conflict. The goals of design are—*
> *- Understanding ill-structured problems.*
> *- Anticipating change.*
> *- Creating opportunities.*
> *- Recognizing and managing transitions.*
> - FM 5-0, 2010, 3-2

Thus, although 2005 introduced the term of ill-structured problems, in 2010 doctrine suggests that the Army doctrine writers now had a much more explicit concept with which to apply to this situation of complexity, that concept being called *design*. The goals of design included understanding ill-structured problems.

The manual also explicitly declares that this need for design is directly tied to the lessons of "8 years of war" in which situations were "complex, ill-structured problems":

> *The introduction of design into Army doctrine seeks to secure the lessons of 8 years of war and provide a cognitive tool to commanders who will encounter complex, ill-structured problems in future operational environments.*
> - FM 5-0, 2010, 3-3

Moreover, design's idea is that the methods the Army uses must change:

> *Today's operational environment presents situations so complex that understanding them—let alone attempting to change them—is beyond the ability of a single individual. Moreover, significant risk occurs when assuming that commanders in the same campaign understand an implicit design concept or that their design concepts mutually support each other.*
> - FM 5-0, 2010, 3-4

These over-riding ideas are reflected in the way the Army talked about making decisions and solving problems, which as noted previously only had a limited amount of change within the Army's 2005 doctrine.

Two years later, the data suggests an explosion in concerns for how to deal with problems, but we can see that the methodological solution remains design, albeit now with a lessened focus on complexity and more of a focus on general problems. Design is re-labeled a method and the over-riding concern is to connect it more explicitly to the visualization process that previous doctrinal manuals prioritized so highly. Design, in 2012, becomes more than applying systems thinking and complexity theory to the issue of problems (note, not complex problems), however. In 2012 it becomes about tying the steps of design- now called the Army Design Methodology- more explicitly to the visualization process, which, as we have already shown, is key to the Army's epistemological process.

Further, an older concept called "operational design elements" is introduced as the one way to apply design. The *elements of operational art*, sometimes reframed as the *elements of operational design*, were a set of tools recommended to craft "operations." They included such things as the Center of Gravity analysis, defining the culminating point, and tying actions together through lines of effort or operation. In fact, the over-riding concern of design in 2012 according to the data was visualizing how to get from the current situation to a preferred situation (visualization) by using the steps of design as well as the old operational design elements to deal with problems. The steps of design are now codified as visualizing an environmental frame, then a problem frame, and then a solution frame. This seems to be the doctrine trying to incorporate old tools (operational design elements) with the new concept, design, but in a clearer and more explicit manner.

> *Army design methodology entails framing an operational environment, framing a problem, and developing an operational approach to solve the problem. Army design methodology results in an improved understanding of the operational environment, a problem statement, initial commander's intent, and an operational approach that serves as the link between conceptual and detailed planning. Based on their understanding and learning gained during Army design methodology, commanders issue planning guidance, to include an operational approach, to guide more detailed planning using the MDMP.*
>
> - ADRP 5-0, 2012, 2-6

In analyzing the 2012 manual, the old 2010 tools are explicitly tied to problem solving more generally, as opposed to solving complex problems. Learning in this process is described as hypothesis testing and modeling to frame environments as a part of the design process. This is a carryover from 2010, where modeling is first introduced- and shows that to understand the environment requires a new tool. Learning is only mentioned once in 2005, and only tied to experience. In 2010 and continuing into 2012, learning requires more than just experience. Visualizing still uses *narrative*, which is a new concept in 2010, and is central to *framing*, a new concept as well since 2010, and uses models that show logical inferences. The change in 2012 is that the 2010 concept of framing the environment is tied in 2012 more explicitly to the older concepts of mission and operational variables. Interestingly, the data suggests that design language is incorporated more into legacy systems and less towards things like complexity. As noted previously, the data shows that the term *ill-structured*, or any kind of structuring of problems, is gone.

> *In framing an operational environment, the planning team focuses on defining, analyzing, and synthesizing the characteristics of the operational and mission variables.*
>
> - ADRP 5-0, 2012, 2-7

In light of the fact that design was originally presented as a method to deal with unstructured problems, it is interesting to note that while the 2012 doctrine removed mention of the term ill-structured problems, design remained the dominant prescribed method. Further, the

design concept is codified into one method and older concepts are incorporated into the design concept like operational design elements. In other words, the Army's ontology has broken away from categorizing several types of problems to which different methods are prescribed and returns to a one-size-fits all method. 2012 represents a major change reflected in the doctrine and the data suggests a confusing point wherein older concepts come back, but with some of the newer concepts still present, albeit with the reasoning behind the newer concepts all but disappeared in the data.

In 2019, two new concerns with respect to methodology emerge: *competition* and *operational art*. Competition was a concept that was applied to all subjects in the 2019 data: from the operations process now focusing on planning, executing, and assessing to the process- and thus problem structure- being focused on the *competition continuum*. The word competition is mentioned once in 2012 in terms of a competition of ideas. The word is mentioned six times in 2019 and all in terms of a new focus.

> *Military operations fall along a competition continuum that spans cooperation to war. Between these extremes, societies maintain relationships. These relationships include economic competition, political or ideological tension, and at times armed conflict. Violent power struggles in failed states, along with the emergence of major regional powers like Russia, China, Iran, and North Korea seeking to gain strategic positions of advantage, present challenges to the joint force. Army forces must be prepared to meet these challenges across the range of military operations during periods of competition and war.*
>
> - ADP 5-0, 2019, 1-1

This matches the ontological change to more near-peer conflict and away from the complex focus of irregular warfare noted explicitly in 2012 and more implicitly in 2005 and 2010.

Doctrine writers in 2019 continued the retreat from complexity trend observed in 2012, dropping the focus on complexity to the point that it now almost drops the concept of design. Applying operational art, a term not receiving as much attention in the past few iterations, makes

a comeback, as a way to tie ends-ways-means logic to the new competition focus, or, as the manual mentions, the *competition continuum.* Whereas design, through the elements of operational art, was key, now operational art is separate from design. This shows design being less interpretivist and more objectivist. Different methods, so prominent in 2010, are now only mentioned implicitly in terms of the type of problem structure. The problem structure is tied to the epistemological emphasis and change on levels of warfare, mentioned here as the "operational level":

> *Planning at the operational level requires operational art to integrate ends, ways, and means while balancing risk.*
>
> - ADP 5-0, 2019, 2-8

It is worth noting that the term operational art was mentioned 18 times in 2012, but 28 times in 2019. This is compared to six times in 2010, once in 2005, and zero times in 1997.

Design at this point is mentioned as one tool, but the steps of this one tool- framing the environment, problem, and approach- still relying on some of the 2010 concepts- are codified explicitly. In other words, what is kept is much of the mechanisms for how to do design, but it is clarified as to where it fits in with planning more explicitly and is subordinated to planning.

2019 thus, as the data suggests, finishes the turn that the 2012 manual started, which is to come back to the Nineties over-riding concern of fighting at the extreme edge of the competition continuum that requires projecting force overseas at short notice. Some of the language incorporated within the 2005 and 2010 versions of the manual are still present, however they are subservient to the reframing of the over-riding concern, that of *competition*.

How to make decisions/ solve problems

In the Nineties, the data suggests that the Army's methodology for making decisions was a rational decision-making process ("the Military Decision Making Process, or "MDMP") which was also described as a problem-solving method.

> *The military decision-making process (MDMP) is a single, established, and proven analytical process. (See Figure 5-1, page 5-2.) The MDMP is an adaptation of the Army's analytical approach to problem solving.*
> - FM 101-5, 1997, 5-1

> *The Steps in the MDMP*
> *Step 1. Receipt of Mission.*
> *Step 2. Mission Analysis.*
> *Step 3. Course of Action Development.*
> *Step 4. Course of Action Analysis.*
> *Step 5. Course of Action Comparison.*
> *Step 6. Course of Action Approval.*
> *Step 7. Orders Production*
> - FM 101-5, 1997, 5-3

This makes sense as war was seen, as noted by the data in the ontological analysis, as an objective phenomenon, and, in the epistemological analysis, knowledge about war was seen as best gained through data analysis. Thus, the method for solving problems and making decisions in a realm of objective phenomena requiring data analysis would naturally follow to be a rational decision-making process that solves problems related to objective phenomena.

In 2005, even though war and how to know about this thing called war seemed to change based on the data from the Army's view (as noted above), the method prescribed for solving problems was largely still rational decision-making. For example, this 2005 excerpt could be lifted straight out of the 1997 manual:

> *The military decision-making process (MDMP) is an established and proven analytical planning process. It is an adaptation of Army problem solving…*
> - FM 5-0, 2005, 3-1

> Whereas in the Nineties the doctrine was more implicit about MDMP being a rational decision-making process, in 2005 it is spelled out relatively explicitly:
>
> *The military decision-making process is a planning model that establishes procedures for analyzing a mission, developing, analyzing, and comparing courses of action against criteria of success and each other, selecting the optimum course of action, and producing a plan or order.*
>
> - FM 5-0, 2005, 3-1

According to the data, in 2005 the Army did add a more detailed description of analytical data analysis into the doctrine by introducing dependent variable analysis as a way to find correlations that would then allow problems to be solved by acting on independent variables:

> *The science of problem solving involves the use of various quantitative analytical tools available to the staff. Quantitative analysis seeks to define and evaluate relevant factors or variables that can be measured or counted. Quantitative analysis can be useful for identifying trends in data sets, and sharp departures from expected norms or measurements. The results are often organized and displayed in the form of charts and graphs. Quantitative analysis requires measuring or counting the values of relevant variables and calculating changes in the observed effects on the problem or variable of interest. When a correlation can be established between two variables, it is possible to predict the effects on the dependent variable when changes occur in the value of the independent variable.*
>
> - FM 5-0, 2005, 2-2

This appears to suggest that empirical analysis and rational decision making was the remedy to simplify this new emphasis in the doctrine on complexity.

Prior to 2005, the only "analytical" part of the Army's decision-making process was the comparison between different courses of action, although no specific method is mentioned outside of war gaming, using historical examples, or using decision matrices. An example of a decision matrix is below, which assigns ranks to criteria that are important that, when multiplied by weighting and added up are asserted to give rigor to the best course of action. In this case, COA 2 is better, since it ranks lowest in weighted score (lower number meaning higher ranked).

Table 4.6: Example of COA weighting

Criteria	Weight	COA 1	COA 2	COA 3
Maneuver	3	2 (6)	3 (9)	1 (3)
Simplicity	3	3 (9)	1 (3)	2 (6)
Fires	4	2 (8)	1 (4)	3 (12)
Intelligence	1	3 (3)	2 (2)	1 (1)
Mobility	1	3 (3)	2 (2)	1 (1)
Risk	2	1 (2)	2 (4)	3 (6)
Total		31	24	29

- FM 101-5, 1997, 5-25

As demonstrated in the 2005 excerpt, however, quantitative analysis in the form of multivariate analysis is described in detail. This is a change in that prior to this the concept of the MDMP being analytical was only implicit. It is even arguable whether the above example from 1997 is analytical, as this example could easily be used to simply support biased a priori intuition. In 2005, however, the analytical part of the MDMP became explicit and consisted of multivariate analysis.

Thus, a key change between 1997 and 2005 was the inclusion of a more explicit and arguably more rigorous method of analysis within the decision-making process. Another change was the incorporation of non-quantitative methods for decision-making. In the nineties, problem solving was the only method the Army used to guide its approach to war, and that problem solving concept was linked to rational decision making. In 2005 many other things were added to problem solving to assist in the solving of *the* problem. Things like systems thinking, complexity, the concept of different structures of problems, standardization of visualizing the battlefield, elements of operational design, and more detailed descriptions of rational decision making were added to the process to make decisions.

> *In terms of structure, there are three types of problems: well structured, medium structured, and ill structured.*

> *Ill-structured problems are at the opposite end of the spectrum since—*
> *- No clear formulation of the problem appears possible.*
> *- They may require multiple solutions applied concurrently or sequentially.*
> *- Problem solvers must sometimes reduce complex ill-structured problems into smaller problems.*
> - FM 5-0, 2005, 2-5

> *Intuitive decision making, however, does not work well when the situation includes inexperienced leaders, complex or unfamiliar situations, or competing COAs.*
> - FM 5-0, 2005, 1-6 and 7

> *The elements of operational design are tools that help commanders visualize operations and shape their intent. They provide commanders a framework to conceptually link ends, ways, and means.*
> - FM 5-0, 2005, 3-5

Note that in 1997, the manual does not refer to intuitive decision making or using intuition much. There are only two mentions of the word intuition and one mention of the word intuitive. In 2005, however, the word intuitive is used 21 times and intuition four. Even more interestingly, in 1997 the mentions are simply descriptive. In 2005 they are detailed within the methodology.

Ultimately, even with all the changes and additions to decision-making, it was still about solving problems and a level of rationality, and the rational decision-making model still underlay the entire process.

> *The highly structured nature of the Army problem solving process depicted in Figure 2-1, page 2-6, helps inexperienced staff officers to identify and consider key factors relevant to the problem. It also provides the more intuitively gifted and experienced officer with a framework for analyzing and solving complex problems. The Army problem solving process helps to ensure that no key piece of information is overlooked in the analysis, thereby minimizing the risk of unforeseen developments or unintended consequences.*
> - FM 5-0, 2005, 2-2

Thus, in terms of how to make decisions and solve problems, the Army's ontology had changed in 2005 to embrace this concept of complexity, and many other things were added to the staff's

toolkit with which to address this new concept, In the end, however, the data suggests that the Army still relied wholly on rational decision making to solve problems.

How to make decisions and solve problems also changed in 2010. The method in 2005 prescribed 17 steps. In 2010, doctrine expanded these steps to include culture and using systems thinking to analyze the environment, isolating root causes via multi-variate analysis. In addition, in 2010 commanders were supposed to use hypotheses and models to assist in learning. The doctrine was more explicit in tying these activities to the process of visualization- the Army's epistemological framework: how to visualize was directly tied to the activities of planning and solving problems. Thus, visualization was critical, according to the data, to making decisions in 2010.

> Design supports and reinforces the application of battle command, supporting the commander's ability to understand and visualize the operational environment.
> - 3-6

> Three distinct elements collectively produce a design concept as depicted in figure 3-1. Together, they constitute an organizational learning methodology that corresponds to three basic questions that must be answered to produce an actionable design concept to guide detailed planning:
> - Framing the operational environment—what is the context in which design will be applied?
> - Framing the problem—what problem is the design intended to solve?
> - Considering operational approaches—what broad, general approach will solve the problem?
> - 3-7

Therefore, in 2005 visualization was about how the commander visualized- using variable analysis and intuition- getting from the current situation to the future preferred situation and is then updated through learning and assessments. In 2010 visualizing is supported by design, which also then guides detailed planning. This is even more of a change from the 1997 version of visualization where it was considered as being only an understanding of the current

situation, the preferred situation, and "the sequence of activities that will move his force from its current state to the end state" (FM 101-5, 1997, 1-3). Visualization has come a long way.

In addition, the fundamentals of design assisted in making decisions in complex environments in this way:

> *Commanders mitigate these risks with collaboration and by applying the design fundamentals:*
> *- Apply critical thinking.*
> *- Understand the operational environment.*
> *- Solve the right problem.*
> *- Adapt to dynamic conditions.*
> *- Achieve the designated goals.*
> - FM 5-0, 2010, 3-5

An entire chapter was added to the manual in 2010 to cover the subject of design and how it tied in with problem solving and decision-making.

In 2012 the only way to make decisions is returned to the rational decision-making of the Nineties. This is due to design being fully incorporated into the rational decision-making process. Prior to 2012 design is used only based on if the situation requires it (that being a complex situation). Now, in 2012, design is to be used no matter what, the only difference being where during the operations process it is used. Although rational decision-making made a significant presence in 2005 and 2010, in 2012, by making it a necessary link to design, it is the only method:

> *Depending on the situation—to include the familiarity of the problem—commanders conduct Army design methodology before, in parallel with, or after the MDMP.*
> - ADRP 5-0, 2012, 2-13

The data shows that the term *Mission Command*, however, is added and the operations process is simplified to planning, preparing, executing, and assessing. *Mission Command* is a new term meaning decentralized execution. Problems are solved through this process, with learning and

changing being explicitly assumed as naturally flowing from the assessment portion. Learning is also tied explicitly to hypothesis testing and modeling. Design, in 2012, is codified as framing the environment and the problem. Note that design, an entire chapter in 2010, is only a small section in 2012.

Noting the changes in the introduction, the manual states that design is one of the Army's planning methodologies. It even associates it with conceptual planning (as already noted) and operational art.

> *Chapter 2 defines planning and plans and lists the values of effective planning. Next, this chapter describes integrated planning and operational art. The chapter next describes the Army's planning methodologies: Army design methodology, the military decision-making process, and troop leading procedures. This chapter then describes key components of a plan or order. This chapter concludes by offering guidelines for effective planning and describes planning pitfalls that commanders and staffs guard against. The following are significant changes from FM 5-0. ADRP 5-0—*
> *- Retitles design to Army design methodology and modifies the definition.*
> *- Associates the Army design methodology with conceptual planning and operational art.*
> - ADRP 5-0, 2012, v

This shows internal inconsistencies within the 2012 manual, as it also states that the design methodology is conducted in conjunction with rational decision making, the only difference between when it is conducted, which is based on the situation. So, in the changes it notes that design is a planning methodology, just like rational decision making. Later, however, it states that the two are conducted no matter what, so it is no longer an alternative approach.

Thus, the analysis of the data suggests that 2012 marked a turning point in which the Army started to retreat away from an emphasis on design, and started to move back towards prior methods, tying in somewhat these newer concepts. These newer concepts were to be applied to figure out the situation and especially to address complex situations. They would now be tied explicitly to older methods. Whereas 2005 and 2010 showed areas of significant

difference from the Nineties in terms of decision-making, in 2012 the doctrine starts to reflect more Nineties ideas, even though some of the language is kept from the changes seen in 2005 and 2010, even when it seems to conflict with the Nineties ideas.

The data analysis of the 2019 manual shows a coming to a head on the tug and pull of the Nineties and the changes seen in the data in 2005 and 2010. The data suggests that the Army viewed problems during full-on war as being different than problems during peace and coincidentally these different scenarios matched up with one or more of the various methods developed leading up to 2019. Analysis largely returned to variable analysis, which was not as prevalent in the Nineties as it was in 2005, however the terms *collaboration* and *liaising* were carried over from more 2010/2012 era doctrine. Learning was done through "framing"- which was a 2010 concept, but learning is conducted within the "ends-ways-means" linear construct and through applying operational art (introduced in 2010 but copying the operational design term in 2005) which adds *defeat* and *stability mechanisms* (new) as language tied to the new "competition continuum." Design (2010) is just one tool among many that the Army offers its personnel for application to various situations, however decision making is somewhat back to the Nineties idea of rationality (the following excerpt about movement rates and the "science of decision making" sound very Nineties) and the end result a plan of action.

> *Decision making is both science and art. Many aspects of military operations—movement rates, fuel consumption, weapons effects—are quantifiable and, therefore, part of the science of war. Other aspects—the impact of leadership, complexity of operations, and uncertainty regarding enemy intentions—belong to the art of war.*
>
> - ADP 5-0, 2019, 5-1

Analysis was simplified to operational and mission variables- which was a carryover from the past, as well as collaboration and liaising- new things perhaps bleeding over from 2010/2012. Learning was contingent on "reframing"- a 2010 concept, and hypothesis testing- a 2010/2012

holdover. Analysis was also part of the cycle of environment-problem-desired state framing- a 2010 concept.

Decision making by 2019 is somewhat back to the Nineties focus of producing a plan (the reason to decide) through rational decision making. This is different than 2010, wherein planning was not the focus of the operations process. Thus, the data suggests that in 2019 the Army completed the turn that started in 2012 to return to much of the Ninety's methods and drop the methods that came into being in 2005 and 2010, or at least only retain the language, while rejecting the implications of the concepts.

How to Plan

The data suggests that the subject of *how to plan* largely went unchanged from the Nineties to 2005 in terms of its mechanisms, however in 2005 the process became much more detailed. For example, in 2005 the Army went into more than four times as much detail on how to plan than it did in the Nineties. It was as if the Army didn't think its Nineties version of how to plan was specific enough or its people needed more guidance on planning.

To expound, the Nineties doctrine of 267 pages mentioned the word *planning* 179 times and the word *pitfalls* (as in "pitfalls of planning") zero times. The 2005 doctrine of 328 pages mentions the word planning 815 times and the word pitfalls, eleven). This shows an increase in the word *planning* (mostly in describing how to do it) of 217% from the Nineties to 2005: .67 times per page in 1997 to 2.5 times per page in 2005. It follows, according to the data, that planning -- and how to plan -- were issues which needed more attention in the Army's eyes, in 2005 versus 1997.

The methodological changes in the doctrine between 1997 and 2005 mimicked, to a certain extent, the changes in the Army's ontology and epistemology. The Army's overriding

concern with respect to its methodology went from a focus on how to best solve basic physical problems associated with how to move resources to how to best solve root problems associated with complex situations. In terms of how to make decisions and solve problems, the Army's ontology had changed in 2005 to embrace the concept of complexity, and many other things were added to the staff's toolkit with which to address this new concept, but, in the end, the data suggests that the Army still relied wholly on rational decision making to solve problems. Planning changed little, with the only major change being that in 2005 the Army became much more detailed in how to plan in its doctrine. Thus, although the Army's ontology and epistemology changed, its methodology fundamentally did not change. There were, however, many additions to the methodology that, as we will see in the 2010 manual, did result later in some major changes.

The data suggest that the steps of planning were the same in 2010, however they were explicitly identified as a part of problem-solving and, further, that decision-making was about problem solving. Design is tied to this by way of identifying the problem through the design framework (the problem frame being a problem statement incorporating tensions within the system that must be overcome). Collaboration and dialog are keys to planning and decision-making in 2010, which incorporates portions of design more explicitly into planning.

> *Planning is the art and science of understanding a situation, envisioning a desired future, and laying out effective ways of bringing that future about. Planning is both conceptual and detailed. Conceptual planning includes developing an understanding of the operational environment, framing the problem, defining a desired end state, and developing an operational approach to achieve the desired end state.*
>
> FM 5-0, 2010, 1-11

> *Chapter 2 addresses the fundamentals of planning. Chapter 3 addresses design—a conceptual aspect of planning.*
>
> FM 5-0, 2010, 1-11

> *Planning is the process by which commanders (and the staff, if available) translate the commander's visualization into a specific course of action for preparation and execution, focusing on the expected results*
> FM 5-0, 2010, 2-1

> *Ill-structured problems are the most interactive. They are also complex, nonlinear, and dynamic— and therefore the most challenging to solve.*
> FM 5-0, 2010, 2-4

Thus, whereas in 2005 planning was how the unit would, in detail, execute the result of decision-making, in 2010 planning is a part of problem-solving, decision-making is the process by which problems are solved, and design is the way to identify the problem. The way to plan has also changed, in that collaboration and dialog are critical to planning.

> *Just as planning is only part of the operations process, planning is only part of problem solving. In addition to planning, problem solving includes implementing the planned solution (execution), learning from the implementation of the solution (assessment), and modifying or developing a new solution as required.*
> - FM 5-0, 2010, 2-3

Put another way, the operations process is fundamentally about problem solving and planning is a part of that process. Design assists in defining the problem and developing a solution when conceptual planning (due to complexity) is required. All of this is done through decision-making.

The 2010 manual fundamentally changed the methodology the Army used in that it developed more explicitly how to deal with complexity. Whereas ill-structured problems and complexity were introduced in 2005, it was unclear whether much had changed, as rational decision making and traditional planning (how to get from A to B) methodologies still underlay the doctrine. In 2010, however, a concept called *design* codified methods for how to deal with defining the problem, what to do if that problem was complex, and how decision-making, planning, and problem-solving would all change when having to incorporate conceptual planning into one's processes.

In 2012, planning is described in the doctrine as important in complex situations. This seems like an attempt to return at least partially to the Nineties while incorporating the new concepts that came in in 2010. This is because planning was central in the Nineties, wherein there were no such things as complex situations. Further, planning was key for commanders and staffs in the Nineties and planning became less of a focus in 2010. Here, in the 2012 manual, planning is remade as the central method to solve problems, even as it attempts to account for the new term, *complexity*, that 2005 and especially 2010 ushered in. This might be due to the manual being published just two years after the 2010 version: not long enough to get rid of the concept of complexity all together, but long enough to want to put planning back into the doctrine as the central tool.

> *For unfamiliar situations, planning offers ways to deal with the complete set of problems as a whole. In general, the more complex a situation is, the more important and involved the planning effort becomes.*
>
> - ADRP 5-0, 2012, 2-2

The 2012 manual reflects the notion of visualization as contingent on using narrative and that visualization is central to framing. This framing and narrative are depicted as a model showing logical inferences. This is almost verbatim from 2010, but, as noted, this narrative term did not exist prior to 2010.

> *Narrative construction—the conscious bounding of events and artifacts in time and space—is central to framing. Commanders, staffs, and unified action partners construct a narrative to help understand and explain the operational environment, the problem, and the solutions. Not only is the narrative useful in communicating to others, the act of constructing the narrative itself is a key learning event for the command.*
>
> - ADRP 5-0, 2012, 2-5

What is interesting about this is how it fits into planning. The narrative in 2010 was about problem framing so that one could understand ill-structured problems. In 2012, problem framing (a step in design)- and thus *narrative*- is key to supporting rational decision making. It is as if the

2010 tool of design, in which the connection to rational decision making was less clear, is now fully incorporated into the old tool of rational decision making.

Framing the environment, a 2010 addition, is tied to operational and mission variables, which were older concepts and were used in the past to understand the environment. Thus, this is another example in the data of a pre-2010 concept being incorporated into the 2012 manual, but also conflated with 2010 terms.

> *In framing an operational environment, the planning team focuses on defining, analyzing, and synthesizing the characteristics of the operational and mission variables.*
>
> - ADRP 5-0, 2012, 2-7

2012, according to the analysis, represents a turning-point with respect to method. While incorporating the design focus and the mixed method ideas of just two years ago, the 2012 manual also included an attempt to map out the connections more explicitly between the Army's preferred way of viewing reality and the way in which its forces were to plan for that reality. This would include any type of decision-making. Wherein in the past the Army might have made it more implicit as to how visualization was connected to decision making and, ultimately, to planning, in 2012 the doctrine clearly made the linkage in a very explicit way. Further, the Army was inconsistent in returning to a problem-solving focus in its ontology but keeping the different epistemological tool and the associated methodology implicit in design.

In 2019, the topic of planning returned to a very Nineties-sounding activity. Dropped were the ideas of learning and changing as part of the operations process. In 2019 the "Principles of the Operations Process" did not include collaboration and dialogue, which is where the operations process included learning and changing in 2012. In 2019 the principles were: *drive the operations process, build, and maintain situational understanding, and apply critical and creative thinking*. In 2012, however, they included "encourage collaboration and dialogue".

In 2012, the first chapter (*Fundamentals of the Operations Process*) includes learning as a part of encouraging collaboration and dialogue, which is a part of the principles of the operations process:

> *Through collaboration and dialogue, the commander creates a learning environment by allowing participants to think critically and creatively and share their ideas, opinions, and recommendations without fear of retribution.*
> - ADRP 5-0, 2012, 1-11

In 2019, learning is not a part of the principles of the operations process, as its higher-level component part, collaboration and dialogue are not either. It is mentioned as part of just collaboration (dialogue is gone), but it is buried in a list of add-ons under the header "Build and Maintain Situational Understanding":

> *Through collaboration, the commander creates a learning environment by allowing participants to think critically and creatively and share their ideas, opinions, and recommendations without fear of reproach.*
> - ADP 5-0, 2019, 1-13

Note that this completes a further change from the greater emphasis on learning in 2010:

> *Collaboration aids in critical and creative thinking and helps build learning organizations. The commander creates a learning environment by allowing participants to think critically and creatively and share their ideas, opinions, and recommendations without fear of retribution.*
> - FM 5-0, 2010, 1-6

The doctrine mentions that different methods can be used depending on the scope of the problem, but, unlike in 2005 and 2010, different scopes are not described, if by the scope of the problem what the Army is talking about is the structure of the problem. So, whereas the 2010 doctrine tied the need to do design to the complexity of the situation and 2012 did away with describing complex as "ill-structured," by 2019 complexity was simply to be handled by emphasizing planning:

> *Collaboration aids in critical and creative thinking and helps build learning organizations. The commander creates a learning environment by allowing*

> *participants to think critically and creatively and share their ideas, opinions, and recommendations without fear of retribution.*
> - ADP 5-0, 2019, 2-3

What is emphasized in the doctrine is a highly detailed description of the planning process itself, even more so than in the Nineties. There is some design language, such as the term *systemic methods*, which are carried over from the height of the design language in 2010, but there is a clear delineation, just like in the Nineties, between science and dealing with "the physical" and art dealing with "understanding." Note the language in this excerpt that focuses on logistics, which sounds very Nineties-like:

> *Detailed planning generally corresponds to the science of operations and encompasses the specifics of implementation. Detailed planning works out the scheduling, coordination, or technical issues involved with moving, sustaining, administering, and directing forces.*
> - ADP 5-0, 2019, 1-6

While this language was remarkably similar to the 2010 and 2012 versions of the doctrine, in 2019 planning was associated with handling complex problems:

> *In general, the more complex a situation is, the more important and involved the planning effort becomes.*
> - ADP 5-0, 2019, 2-3

> *Effective planning provides a disciplined framework for approaching and solving complex problems.*
> - ADP 5-0, 2019, 2-26

Whereas design was the method denoted for complex situations in the past manuals, now it focuses on a prescriptive planning process aimed at creating a standardized framework.

While this exact language matches the 2012 manual and maintains the changes from the 2010 manual, what is different between 2012 and 2019 is the method planners use and why. In 2012 design is a method to use to assist in framing complex environments before, after, or during the rational decision-making process:

> *Depending on the situation—to include the familiarity of the problem—commanders conduct Army design methodology before, in parallel with, or after the MDMP. When faced with an unfamiliar problem or when developing initial plans for extended operations, commanders often initiate the Army design methodology before the MDMP.*
>
> - ADP 5-0, 2019, 2-13

In 2019, however, the Army design methodology is a systemic planning method, separate from the rational decision-making method, MDMP, which is described as "analytical":

> *Planning methods may be analytical, as in the MDMP, or more systemic, as in the Army design methodology (ADM).*
>
> - ADP 5-0, 2019, 2-1

The takeaway here is that in 2012 the Army was trying to use design to deal with complexity. In 2019, it attempts to delineate design as a systemic method, versus the rational decision-making method, which it describes as analytical. This is confusing as it is unclear that a systemic method could not also be analytical and how a rational decision-making method is naturally (or only) analytical.

Thus, the data suggests that planning in 2019 continued the changes that first started taking place in 2012 and especially the connection to planning, design, rational decision-making, and complex situations. Whereas in 2010 complex situations were ill-structured problems that needed to be framed through design thinking, by 2019 design had changed to a systemic planning method, codified as the "Army design methodology." Further, design was not intended to deal with complexity in 2019 (as the manual notes, all war is complex (2019, 1-2)), as it was in 2010 and even 2012. By 2019, as noted, planning can deal with complexity if it is effective planning. Design is used when problems are of a more specific nature:

> *When problems are difficult to identify, the operation's end state is unclear, or a COA is not self-evident, commanders employ ADM.*
>
> - ADP 5-0, 2019, 2-17

Otherwise, commanders can use effective planning according to the 2019 manual to deal with situations that the 2005, 2010, and even 2012 manuals suggested must be dealt with through design.

Table 4.7: Methodological tools across the doctrinal updates

Year	Tools	What it accomplishes	Description	Science	Art
90s	MDMP (planning)	Vision of end state into action	Both science and art	Quantifiable	Leadership, complexity
2005	MDMP/ Planning/ TLP	Solves problems	Proven analytical planning process	Planning for the quantifiable	Planning for the choice of tactics
2010	Design/MDMP/TLP	Understand and solve problems	Conceptual and detailed planning methods	Detailed planning	Conceptual planning
2012	ADM/ MDMP/ TLP	Successful planning	Conceptual and detailed thinking	Control	Operational Art-cognition
2019	Planning (MDMP/ ADM/ TLP/ RDMSP/ APS)	Brings about effective futures	Nests with levels of warfare	Detailed planning	Conceptual planning

V. Conclusion on Findings

In reviewing the data and subsequent analyses, the U.S. Army took a trip from an objective view of the world with an epistemology equal parts rationalist and empirical in the Nineties to a mixture of objective and subjective ontological assumptions and interpretivist and post-positivist epistemological logics beginning in 2005 and increasing into 2010. Its methodology was decidedly deterministic and rationalist in the Nineties and, although its ontology and epistemology changed from 2005 to 2010, its methodologies stayed mostly deterministic, albeit with some attempts to incorporate a more post-positivist and interpretivist

set of tools with the previous rationalist and empiricist tools. Starting in 2012, however, and largely coming full circle in 2019, the ontology had returned to being objective, the epistemology mostly rationalist/empirical, and its methodology almost wholly back to being deterministic and rationalist in nature.

As mentioned in the introduction above, the U.S. Army's ontological assumptions changed from one of a rational and objectivist world in the Nineties to a mixture of interpretivist and more post-positivist-sounding language from 2005 to 2012, reaching its peak in 2010. In 2012, however, the language started to revert back to the Nineties language, and in 2019 had, with a few holdovers from the intervening years, returned to mostly assuming a rational and objective world fitting to a positivist ontology.

These findings thus reflect a trip, if you will, undertaken by the Army, which started with viewing the world as largely full of concrete phenomena requiring empirical thinking and resulting in rational decision-making. This trip then went into the forest of a subjective world requiring interpretivist methods of knowledge gain and collective and interpretivist methodologies with which to act and make decisions. Finally, at the end of the trip, the Army had returned to its objective, empirical, and rationalist set of assumptions and methods, but not entirely, as many of the new ideas and vocabulary were retained even though they were re-purposed to make them compatible with the retreat back to a positivist ideology.

CHAPTER 5: DISCUSSION

I. Introduction

This study focused on understanding doctrine as a reflection of the knowledge creation process. Knowledge in this case are those things that the institution states as true belief. (Dew and Foreman, 2014: 9-30) This knowledge can come from many sources, including the more conventional such as lessons learned in certain situations, leader experience, rational deductive logic, research and analysis, and experiments and testing. Knowledge can also come from less deterministic sources like conventional wisdom, cultural myths, or assertions that the knowledge has come from a more conventional source without the implied reference from which it came. (ibid, 31-46)

Despite the amount of research on organizational learning and knowledge creation specifically, little, if any, examined knowledge creation in mega-bureaucracies. The result is a growth in the amount of research with respect to knowledge creation, but gaps in the area of mega-bureaucracies still exist, especially with respect to mega-bureaucracies in complex environments with dynamical change.

The following table presents the core findings within the various categories of the broader ontology, epistemology, and methodology themes across the various doctrinal updates to the operations process set of manuals:

Figure 5.1: Summary of Findings

	90s	2005	2010	2012	2019
ONTOLOGY					
Task Env	Either general or limited war	Clash of Human Wills	Ill-structured and objectively complex problems	Chance and Friction	Complexity + chance and friction create uncertainty and chaos
Overriding Ontological Concern	Logistics and force projection	Categorical structured problems to include ill-structured ones	Complexity	Using Planning and Learning to Problem-solve	Using Planning and operational art to solve problems and achieve desired end-states
View of Human Nature	Rational	Positivist	Cultural-dominant: Post-modern or interpretivist	Post-Positivist: Subjective, thus requiring mixed methods	Rationalist
EPISTEMOLOGY					
How to visualize (to get from current state to desired state)	logical and objective thinking	Root causal logic, multiple perspectives, interpretation, elements of design, contextual methods	Situations are made up of one of three categories of problems: well, medium, or ill-structured, then use operational design elements	Using art and science through the creative use of operational art (operational design elements)	Existing on a continuum of competition--- then applying operational art through the elements of oeprational design
Knowability	Through reason (Rationality)	Pattern recognition coming from knowledge, judgment, experience, education, intellgience, boldness, perception, and character	Through design: using multiple perspectives and varied sources of knowledge, variable analysis, and pattern recognition	Comes from the process of visualization, decisin-making (using variable analysis), and planning	Comes from the process of visualization, decision-making (using variable analysis) and planning--AND understanding context and from shared understanding between levels of headquarters
Overriding Epistemological Concern	How to solve the problem of force projection (logistics) and similar problems associated with tactical maneuver	The structure of the problem	Reducing complexity to get to desired end-state	Reducing complexity using art and science to problem solve to get to desired end-state	How to solve problems dealing with competition
METHODOLOGY					
Overriding Methodological Concern	Logical decision-making based on analytical problem-solving techniques	Root causal analysis	design and a systemic approach to complexity	Using codified design steps to visualize approach	Operational art within the competition frame
How to make decisions/problem solve	Rational process (MDMP)	Rational process (MDMP) along with multivariate data analysis Empiricism and rationalism)	Ratoinal process (MDMP) along with multivariate data analysis (Empiricism and rationalism)- along with culture and using systems thinking and hypothesis testing and modelling to isolate root causes through the process of design	design within the rational decision making process (MDMP)	Rational process (MDMP) along with collaboration, liaising, and problem framing
Planning	Central to the operations process: MDMP	Planning is separate from MDMP and TLPs	a part of problem-solving that requires collaboration and dialog-includes design, MDMP, TLPs	Important in complex situations-ADM/ MDMP/TLPs	Systemic (ADM) or "analytical" (rational) (MDMP) or checklists: TLPs

This dissertation examined how the U.S. Army constructed knowledge before, during, and after the height of the Afghanistan and Iraq wars using a hermeneutical method. The study qualitatively analyzed U.S. Army doctrine from the 1990s to 2019 that dealt with the U.S. Army's operations process. The U.S. Army codifies how its headquarters' staffs conduct the process, which starts with receiving a mission and goes all the way to executing and learning from that mission. Specifically, this research addressed the question of what role doctrine plays in the knowledge creation process of a mega-bureaucracy like the U.S. Army. The following questions assist in answering that larger question:

- *How did decision-making and operational planning evolve within U.S. Army doctrine from the 1990s to 2019?*
- *What would explain the variations in the doctrine over that time period?*
- *To what extent are new ideas incorporated consistently across ontological and epistemological assumptions and methodological preferences?*

No existing theory or theories could answer the research questions, as knowledge creation theory and organizational learning theories focus on general learning and knowledge creation and the assumption that it is the same across all types of organizations. The vast majority deal with explicit learning in concrete tasks involving a small number of actors, such as how to improve effectiveness on an assembly line (Hoon and Chermack, 2008 and Nonaka and von Krogh, 2009). They do not deal with abstractions or complex environments that are changing rapidly, nor do they address differences with large ("mega") bureaucracies like government agencies or even learning across a large corporation. There are, however, theories about complexity, bureaucracy, and other types of phenomena that have explained effects on organizations that would make sense to assume they have some effect on learning and

knowledge creation (Cook and Brown, 1999, Tsoukas, 2004, Weick, 2001, Argyris and Schon, 1996, Meyer and Rowan, 1977, Schein, 1992 and DiMaggio and Powell, 1983).

In chapter four, my analysis offered a rich description of the changes in espoused knowledge of the U.S. Army. I will now turn my attention to these and other propositions to assist in explaining why the U.S. Army created knowledge in the manner in which it did for the last two decades. In so doing, I hope to assist in new understanding of how knowledge creation for mega-bureaucracies, especially those involving complex situations, is different than what is found in the current literature on knowledge creation and learning.

Due to a lack of existing theories offering explanatory power for this example, the abductive research method was appropriate. This allowed for me to engage with the data itself, attempting to tease out explanations from multiple, iterative interactions with the data, as opposed to looking for an a priori-identified explanation within the data. Using this abductive approach allowed for this more emergent strategy that offered a less structured and more exploratory effort. As Schwartz-Shea and Yahow (2012) note, abductive research starts with a surprising puzzle and then, over multiple, and non-linear forays into the data, begin to "tack" towards an explanation that makes the puzzle less surprising (26-34), whether using other theories or further observation, experience, or other methods to get closer to a less surprising point.

This chapter provides discussions around the major findings of the study, which include the following:

1) espoused knowledge in mega bureaucracies is dynamic and responsive to perceived or real complex environmental change,

2) espoused knowledge development in mega bureaucracies can be non-linear and may be iterative as changes become mixed with and/or co-opted by older thinking, and, lastly,

3) due to the dynamic interaction of old and new thinking, espoused knowledge in mega-bureaucracies can be contradictory in terms of mis-aligning ontological and epistemological assumptions, and methodological approaches.

This chapter will be organized around interpreting the historical context as well as extant theory to help gain insight into the "why" behind my research findings. I will then cover the major findings in depth taking into account the historical context and other potential reasons for the findings based on the research literature. After that I will offer some limitations to this research, my own position within the subject matter, and finish with recommendations for future research.

Historical Context of the U.S. Army: 1990s-2019

The U.S. Army in the Nineties was focused on the collective security of Europe, large-scale conflict, and the problem of projecting force across the world (Colby, 2019, Janes, 1997, and Johnsen, 1995). The organization took *Operation Desert Storm* in Iraq as a validation of this focus (Janes, 1997) and the doctrine reflected that concentration (Jensen, 2016). After 9/11, the U.S. Army largely stood on the sidelines as Special Operations and the Air Force took the lead in Afghanistan, winning a quick war over the Taliban and settling in for a protracted counterinsurgency and providing security assistance to a fledgling government. After invading Iraq, the U.S. Army found itself in the midst of a civil war after defeating the Army very quickly. Afghanistan, too, started to seem less of a win and more of a slow loss. There was an institutional-wide feeling that something was missing in the methods for planning, problem-

solving, and campaign design that presented obstacles to winning in Iraq and in Afghanistan by 2003 (Wrigley, et al, 2021, Jackson, 2019, Ryan, 2016).

Between 2004 and 2006 the Army attempted to adjust its methods by incorporating newer thinking methods from outside the Army: namely complexity theory, systems thinking, and design thinking. During 2009, the time when the 2010 doctrine was being written, General David Petraeus was attempting to sell, politically, that we were winning in Iraq and that two things had assisted us: the surge of troops and the Counterinsurgency manual (Bolger, 2015, 253-255). To a lesser extent design was caught up in that effort, for example, it was mentioned in the Counterinsurgency manual, published in 2006. By 2019 the efforts in Afghanistan and Iraq had drawn down drastically and the Army found itself struggling to justify maintaining the large expenditures it had enjoyed over the almost two past decades. One new concept the Army turned to at this point was called "the competition continuum" and stressed the importance of preparing for large scale conflict and more diplomatic, economic and influence competition with China and Russia (McCoy, 2018). Counterinsurgency moved to more of a footnote at this point.

Back in 2005, Design had become a hot topic in Fort Leavenworth, Kansas, the mid-career school for officers and the center for Army doctrine. Officers and professors travelled to Central Command headquarters in Tampa, The Santa Fe Institute for Complexity Theory, and Sanford's Design School to learn new methods. They even hired systems theorists and a retired Israeli General, Shimon Naveh, who had developed something he called Systemic Operational Design (SOD) to teach design thinking to officers and help write it into doctrine. In 2006, design was tested in a joint war exercise called *Unified Quest* and among certain circles, but especially Fort Leavenworth, design as a method was proven to have "won" (Zweibelson, 2023).

In 2007 Shimon Naveh had a falling out at Leavenworth due to his strong personality and more traditional officers' suspicions about the new "shiny object" of design. In 2008 a proposed manual for design was rejected by Training and Doctrine Command (TRADOC) as being too complicated and not having enough of the old methods in it. Between 2007 and 2009, several lower-level pamphlets were published about design, the last one a short pamphlet by Dr. Jack Kem that merged design concepts into older rational decision-making processes the Army had used before. These and other concepts were incorporated into the 2010 doctrine. In 2010, Dr. Kem went to Afghanistan and several professors at SAMS who disagreed with him wrote SAMS's *Student Text 2.0*, which attempted to incorporate much of what had been rejected by TRADOC back in 2008 (Zweibelson, 2023).

In 2011, a new SAMS Director, COL Grigsby, vowed to re-do design as it was confusing. Some of the *Student Text 2.0*, written in 2011, made its way into the doctrine update in 2012. Shimon Naveh was hired to work at U.S. Special Operations Command to teach his version of design there in 2012. In 2013, U.S. Army Special Operations Command developed its own version of design. In 2014, U.S. Special Operations Command developed its own version of design as well. Meanwhile, in 2015, Canada, Australia, and many countries in Europe started to develop their own versions of design, many taking cues from both SOCOM and Fort Leavenworth. U.S. Special Operations Command started sending teams to Europe to teach their version of design, which was mainly about breaking free from standardized ways of thinking to support innovation. By 2018 there were three loosely-defined camps within the Army as to how members felt about design: 1) design is for complex and wicked problems only, 2) design is for innovative thinking, and 3) design is "stuff for people on mushrooms" (author's experience). The

first camp also thought that design was not needed for large-scale combat operations (Zweibelson, 2023, Jackson, 2019).

Various Reactions:

The Creation of New Knowledge in the Face of Complexity

I will first map the changes found in the doctrine to their historical context. This supports the argument that the dynamic nature of espoused knowledge is, at least in part, attributable to environmental complexity. First, the focus of the Nineties doctrine on expeditionary capabilities and implying largely a logistics problem reflects the nature of the Cold War and the U.S. military's ideas of future war in a time that reflected more conventional, state-on-state warfare that was seen as proven during the war to oust Saddam Hussein from Kuwait in 1991, otherwise known as *Desert Storm* (Summers, 1992). In 2005 the historical context had shifted and included support to countering an insurgency in Afghanistan and a similar effort in Iraq (Lyon, 2021). The changes in doctrine notably shifted to emphasizing the structure of problems and struggling with uncertainty. By 2010, the doctrine reflected more deeply the continuing struggles in Afghanistan and Iraq by emphasizing the complex nature of war (Woodward, 2011). In 2012, however, a mix of Nineties-era language and the newer languages was noticeable as the newer language, such as "complexity" and "uncertainty," had clearly peaked in 2010, matching U.S. military frustration with the wars and the suspicion that politicians and the populace were growing weary of the never-ending effort (Ricks, 2012). Finally, in 2019, a major new focus of competition reflected a redirection away from the protracted and complex efforts in the Middle East and toward mainly China (Starling, et al, 2021).

The first finding has to do with how a mega-bureaucracy reacts to changes in the environment, either perceived or real. According to the findings, the U.S. Army in the doctrine of 2005 reflected changes in organizational perceptions about how the world operated. From a world that reflected a need to project force across the globe, the doctrine in 2005 reflected a world that was concerned with human wills clashing. Whereas in the Nineties the doctrine was mostly concerned with rational analysis and decision-making, which makes sense with a task environment focused on logistics problems, the doctrine then changed in 2005 to being concerned with very abstract subjects like the structure of problems. Although this change reflected a major shift, positivist methods still dominated the foundations of its doctrine, reflecting a shift within its ontology, but a lag in the shifting of its methodology. The epistemology of the Army and its preferred methodology in 2005, however, really tell the story, as the Army included a host of new ideas with which to understand and operate: root causal analysis, contextual methods, interpretation, pattern recognition, and problem structuring to understand things, and multivariate data analysis and planning to make decisions and act.

These changes both align and do not align with the ontological changes between the Nineties and 2005. It aligns in asserting that sources of knowing are more than just objective analytics based on data (interestingly, the 2005 manual goes into depth about correlation analysis, something the Nineties manual does not even address, suggesting that even the objective analytical methods described in the Nineties were not sufficient for the objective analytical methods required for 2005). The complexity described in the 2005 ontology is reflected in the epistemological assumption of knowing coming from multiple sources. However, this epistemological frame of knowability does not follow complexity theory in terms of the properties of emergence wherein knowing is impossible a priori and thus knowability means

different things depending on the situation. The data suggests that the Army embraced the language of complexity theory in its ontology, but not wholeheartedly in its epistemology.

Even in the best of times, it is doubtful that U.S. Army doctrine goes through a linear process as reflected in the knowledge creation theory literature of observation, recording, distribution, and repeat. In this instance it simply did not happen. From 1997, when the previous manual was written, until May of 2003, the doctrine, based on operational success, was sufficient if measured against tactical success in Afghanistan and in the early days of Iraq. Only from about August, or June at the earliest, did there start to appear signs that things were not going as planned. By February of 2004 it was harder to ignore and by September of 2004 it was conventional wisdom that things were not going well (Filkins, 2008). The timeline for the doctrinal re-write was most likely at the latest beginning in January of 2004, but most likely between January and July of 2003. It most likely was finished between June and September before being staffed Army-wide for comment on the changes. Thus, this manual was being re-written at a time when the Army was just realizing its operations in Iraq were not going well.

It seems fair to conclude that the Army, in the face of this perceived or real complex environmental change and only two years into the Iraq War, attempted to create new knowledge and be responsive to changes in the task environment, yet without the luxury of time to fully find alignment. The related proposition would be that under times of significant environmental turbulence, espoused knowledge in mega bureaucracies is likely to be dynamic, reactive, and reflect competing logics.

Table 5.1: Historical events

Date	Event
March, 2003	War begins
May 2003	President Bush announces end of major combat operations
May 2003	Iraq Army and police disbanded
August 2003	UN Special Representative and 22 members of his staff murdered
Feb 2004	Erbil attacks kill 117 and wound 235 mostly Kurds by Sunnis
March 2004	Al-Qaeda in Iraq mounts wave of violence against Shia
April 2004	Abu Ghraib abuse, fighting in Fallujah, Mahdi army takes several cities
September 2004	Battle for Fallujah, 38 U.S. soldiers, 6 Iraqi soldiers, 1200 insurgents, and 800 Iraqi civilians die.

- https://www.cfr.org/timeline/iraq-war

It is important to note that these incidents reflected in the table above were happening during the development of the new doctrine published in 2005.

It should not be a given to suppose that the knowledge created during this time was done in a rational or linear fashion nor that it had anything to do with the traditional assumptions about learning, those being that they flow from an objectivist frame. Instead, I would suggest that a mega-bureaucracy like the Army needed to react – was pressured to react -- and one way it reacted was to generate knowledge (as opposed to because of a rational or deterministic process). Shortly after the publication of this manual in 2005 and General David Petraeus' taking command of Fort Leavenworth, he had the Counterinsurgency Manual published which emphasized his observations in Iraq previous to 2006. General Petraeus has argued that manual was written at least partially to sell the Northeast elites on the surge of troops into Iraq when he went to Iraq to take over the war afterwards (author observation).

This makes knowledge creation part of a host of actions that a mega-bureaucracy might undertake. Some of these actions might be to make it look like the organization is doing something. Others might have been to secure resources. Still others could be attempts to apply

different, even potentially better methods. The bottom line is that the changes are part of a set of complex reactions to the new environment, not simply part of a linear process of rational learning. They are also likely to be at least partially, if not highly contingent on the specific context, which will be highlighted in the next section.

Searching for Straws:

Making Sense of Complexity Requires Readily Available Ideas

In considering the Army's context prior to 2005, it seems logical that the Army perceived a change in its environment. In 2003-2004, when most of the 2005 manual was written, the U.S. Army faced a growing crisis in Iraq. One could surmise that the Army followed the 1997 doctrine very capably and that that action resulted in a swift victory over Saddam Hussein's forces, much like what had happened in *Operation Desert Storm* more than ten ears prior (Summers, 1992). By late 2003 and 2004, however, Iraq was seen as a complex quagmire and political nightmare. "Mission Accomplished" became "General Betray Us" in the media. Thus, it seems logical that the Army might have been pressured to do something. As previously mentioned before, isomorphic pressures to copy others during dynamically complex situations likely led the Army to look for other ways of understanding and operating. It makes sense that, in looking around at others dealing with complex situations, the terms "ill-structured problems" and "root causal analysis" might have appeared attractive to decision-makers in the Army in 2004. Whereas those two terms did not make much sense when confronted with the problem of projecting force from the south and the north into Iraq in 2003, those terms did make sense when there was pressure to answer the questions, "Why are the Shia so mad at us?" and "Why do we keep having to go into Fallujah?"- if for no other reason than they would offer a different tool

than what commanders and staffs had at their disposal in 2003 (Bolger, 2015, Ricks, 2006, Filkins, 2009).

The Army already used multivariate analysis in its Operations Research and Simulations (ORSA) branch. This also may have reflected an opportunity spotted by members of that branch as well as their epistemological allies within DoD and the numerous think tanks and contractors that are headquartered ubiquitously in the Beltway and around major military bases. Per the Garbage Can Theory of Decision-making (Cohen, et al, 1972), these ORSAs and other empiricists may have been waiting for just such an opportunity to insert their preferred tool: multivariate analysis – into the conversation at the time. Whether it made its way into doctrine as part of that or as an ancillary effort remains to be seen, but it would make sense that, given a perceived change and lack of adequate methods, one method that was already favored by a select group might have made its way into the knowledge creation effort at the time.

There are other ways to imagine why the Army reacted in the manner that it did, but because of the incongruencies and the discrepancy between what it viewed had changed and its methods, it is fair to conclude that the Army, being a mega-bureaucracy with many stakeholders involved, reacted in the manner that it did: creating new knowledge very quickly for a variety of reasons and none of them in a straightforward, logical manner. This pressure to act and act fast could have resulted in, among other effects, the penchant to copy others in a complex situation and the tendency to adopt solutions that were just waiting for an opportunity. Another source of change could have been the resource acquisition cycle. The U.S. Army must follow the Congressionally mandated resource request process which ties doctrine into a system that reinforces resource requests. Thus, at the same time that General Petraeus was requesting a surge

of troops, the concepts for using those troops, found in doctrine, could play at least some part in the process to secure the troops in a potentially circular manner.

Lastly, there is a potential part that sensemaking can play in the development of new knowledge. General Petraeus, to take one example, made sense of his time in Iraq at least partially by developing his own ideas for why things were happening and how they could be improved. He is known to have both authored think pieces during and after his time in Iraq as well as having enlisted bright thinkers like John Nagl to help him develop his concepts. Nagl authored a book called *Learning to Eat Soup With a Knife* that asserted to draw lessons from Vietnam and the British examples in Malaya that could be applied to the American effort in Iraq and Afghanistan. All of these sensemakings, trying to make sense of what they experienced and observed in these military operations, ended up potentially playing a large part in the development of new knowledge (Gentile, 2009 and 2013).

It follows that mega-bureaucracies can create knowledge during complex situations through many different means. Again, these are usually very contextual, but they are also very multi-faceted. No one theoretical explanation does justice for where all of the sources of the new knowledge originate. This is especially apparent in the 2010 version of the doctrine wherein the Army starts to incorporate in a large manner the new concept of design. By the time the 2005 manual had been largely finished, sometime prior to 2005, the design concept had been introduced into the U.S. Army School of Advanced Military Studies and a few minor publications. The concept was mentioned briefly in the Counterinsurgency Manual, published in 2006. In 2010 the new concept showed up in full-force, and though there was still language from 1997 and some of the newer terms from 2005, the 2010 manual incorporated still completely different concepts that were born of complexity theory, systems thinking, and interpretive

theories of knowledge. Thus, in the rush to "do something," knowledge creation in the midst of continued complexity (2008 and 2009 showed that Iraq, and increasingly Afghanistan, were still extraordinarily complex (Woodward, 2010)) influenced the Army to incorporate many different concepts that came from multiple sources.

Co-option: Older Ideas Become Mixed with New Ideas

As we have already seen, however, as the new knowledge enters into the doctrine, the older knowledge is not entirely replaced. One of the interesting points of this study is that even though the Army saw a vastly different landscape in operations as reflected in the 2005 and the 2010 manuals, the methods and language of 1997 were not wholly dropped. Where exactly the old methods were used in conjunction with the newer methods and how the old language explained connections with the new language saw the most change, but there was always, for instance, a consistent description of the use of rational decision-making. Likewise, once the 2005 manual introduced multivariate analysis, that term did not go away. There is a consistency of language and concepts, even though the differences are nuanced.

This new language and older concepts relationship is perhaps reflected the most in the descriptions of how design fits into the older methods of rational decision-making. In 2005, the newer concepts associated later with design are additions to the older method of rational decision-making. In 2010, however, design's concepts are supposed to assist in a particular aspect of decision-making: that of assisting to deal with ill-structured problems that, when properly dealt with, can then allow planning. In 2012, however, design is only used prior to decision-making as a part of planning and only when the problem is identified as ill-structured.

In 2019 the role has come full circle and design is one of many options that, ultimately, are subservient to the tried-and-true rational thinking model of decision-making.

This reflects the older ideas that the mega-bureaucracy never really dropped attempting to be incorporated into the new knowledge creation. This caused the doctrine- especially if looking for consistency of concept across times and not just consistency of language- to be extraordinarily difficult to understand. Design is stated to be used to assist with the ill-structuredness of problems one year and then, a few years later it is to be used to deal with complexity. It is to be used throughout a complex situation for one year and then, a few years later, it is to be used only before the planning effort takes place. These changes in the manner in which the new knowledge concept is incorporated into doctrine can become very confusing to those trying to implement it. Indeed, design was not taught outside of the Army's School of Advanced Military Studies for years after it was first developed for just that reason, even as it was published in doctrine. There was tremendous confusion about how to actually use it and many officers, to include myself, published articles trying to explain how the concept might be used.

This is all to say that mega bureaucracies could create new knowledge in times of complex change that is then mixed with old knowledge in such a way that causes more confusion than clarity. This would also lend the new knowledge to be seen as not as trustworthy as the older knowledge and, if there were any skeptics towards the new knowledge, a self-fulfilling justification to ignore the new knowledge- which is something I experienced when I tried to incorporate the new knowledge during operations. Thus, it is logical to conclude that as mega-bureaucracies incorporate new knowledge in times of complex change, there can be a tendency for the requirements that drive the new knowledge (fast implementation, multiple and competing

justifications, and multiple sources) to be the source of their eventual downfall, which we will discuss in the following section.

Return to the Status Quo: Pre-existing Ontology's Dominance

This leads us to the final conclusion, which is that mega-bureaucracies at some point start to look to return to the status quo, especially in the case wherein knowledge creation was done as a reaction to pressure as opposed to a more emergent or cultural change that could be more long-lasting. The first reason for this is that there is a change in the ontological framing that the mega-bureaucracy undergoes. For the U.S. Army, this change happened when President Obama struck a deal to pull U.S. troops out of Iraq and started to talk about drawing down in Afghanistan. This was further reinforced with President Trump's timeline of withdrawal from Afghanistan and his refusal to increase what small amount of troops the U.S. had in Iraq. Once the U.S. Army saw that two successive U.S. Presidents from two different parties would no longer resource the war efforts in those complex environments, they must have seen the need to question whether things would be as complex going forward (author's observations).

Second, as mentioned in the previous section, there were in-built resistors to the new knowledge by the way the new knowledge had been created. The new knowledge was confusing, and it mixed poorly with the older knowledge, often in contradictory ways. In the case of design, the concept had not been fully tested or sold to the higher-ups enough for it to be adopted across the force. Further, due to certain personalities, as early adopters often are, the concept became associated with troublemakers. The first was Shimon Naveh. A retired Israeli general, Naveh came to the U.S. to teach design after being blamed for the loss of the *Second Intifada* due to his concept for design. He clashed with instructors at Fort Leavenworth and later went to U.S.

Special Operations Command to teach there. Today he is back in Israel teaching the concept, with a new name, to the Israeli General Staff (Zweibelson, 2023). This is all to say that there were quite a few American officers who were anti-design due to Naveh's involvement, whether they were anti-Israeli, pro-Israeli and had adopted the conventional wisdom at the time on the concept, or were just wedded to the older methods and did not want to adopt a new concept, especially one from a foreigner. I, myself, had one boss accuse me of being disloyal to the entire Regiment when I attempted to incorporate some design concepts into a discussion with students in the Special Forces Course.

Lastly, mega bureaucracies can experience some quick swings in their ontological perspectives. This is because complex dynamic change is most likely the status quo for such large organizations with so many stakeholders and such large operations. In the case of the U.S. Army, this quick change in their ontological understanding came from the rise of China and Russia as perceived threats that needed to be focused on over the "small wars" (emphasis on "small") threats of insurgents and the laborious task of building foreign security forces. Although many thinkers had been trying for some time to get the Army to "pivot" towards China and the Pacific and away from the Middle East, this must not have gained sufficient steam until the writing on the wall became apparent that the efforts in Afghanistan and Iraq would not generate the amount of resources that the Army felt it needed going forward to deal with future threats.

The return to the status quo was made all the easier because the old language and concepts were still in the doctrine. Even by 2012 the doctrine had started to reflect less complexity, less design, and more pre-2005 language. By 2019 the return had mostly been completed. The ontology was fully reversed. There was a new name, it was called "the competition continuum," but there was enough in it emphasizing force projection overseas and

large-scale operations that it really looked, ontologically speaking, much like the Nineties, but with just a little bit of new paint.

Epistemologically speaking, the old language had mostly returned. Some of the new language was kept, things like *shared understanding* and that understanding leading to problem solving, but for the most part the old language is back and the new language from 2005 to 2010 is largely gone. In the methods section it is not as apparent that things changed. Design is mentioned, as is collaboration, liaising, and problem framing- all 2005-2012 concepts, but there are some particularly important hints that things have changed drastically. Design is now a method to be used for systemic problems. Systemic is used in place of complex, as the ontology decidedly placed complexity into a problematic formula: complexity + chance and friction = uncertainty and chaos. I fully expect this language to be gone in the next version, as this is more confusing, at least in my head, than the Nineties version of a simple world composed of either general war or limited war. In other words, the world is not objectively complex anymore, complexity is something that is part of a metaphorical mathematical formula that sounds intellectual but does little other than return to some earlier Army language that the Army preferred. This brings us to a quick discussion on Clausewitz.

The task environment throughout the manuals from the Nineties to increasingly as we approach 2019 is one that would be quite familiar to those who have studied Carl von Clausewitz or U.S. Army culture: it describes the environment in terms of *friction* and *uncertainty*: the first a metaphor that Clausewitz famously used and the latter a concept in which Clausewitz spent much time on in his opus, *On War*.

Clausewitz was a Prussian general in the 18th and 19th Centuries who wrote, among other works, the book *On War*, which had an enormous influence on military thinkers beginning in the

middle to late 19th Century (https://www.clausewitz.com/mobile/faqs.htm#Who). Following the Vietnam War, U.S. military thinkers turned to Clausewitz in the early Eighties due to a critical analysis by Colonel Harry Summers of that war using Clausewitz as a frame by which the outcome could be analyzed (Sheckleton, 2022). Clausewitz's ideas were complicated to understand, as his work was unfinished when he died, he wrote in German, he potentially used German Romantic philosophical rhetorical methods (Gat, 2001), he employed metaphors in a descriptive manner as opposed to a prescriptive manner, and he used a dialectical approach: stating his thesis, an antithesis, and then a synthesis.

The U.S. Army, however, as depicted in its doctrine, chose to take Clausewitz's metaphors, dialectical analyses, and descriptions as explicit concepts that could be used prescriptively, as opposed to a method of description. For instance, instead of uncertainty being described in *On War* as fog and that fog being linked to friction metaphorically, and that friction being linked to the aspect of chance in war, the U.S. Army preferred describing things thusly:

> *Chance and friction contribute to the uncertain nature of operations.*
> - ADRP 5-0. 2012, 1-1

Note Clausewitz's own language:

> *"Everything in war is very simple, but the simplest thing is difficult. The difficulties accumulate and end by producing a kind of friction… This tremendous friction … is everywhere in contact with chance, and brings about effects that cannot be measured, just because they are largely due to chance. . .. Moreover, every war is rich in unique episodes."*
> - Clausewitz, 1946

The U.S. Army doctrine reads as if chance and friction are explicit subjects, while Clausewitz is obviously writing metaphorically.

The task environment in 2012, as previously noted, changed dramatically from the 2010 environment to one which would be more recognizable to a member of the armed services in the

Nineties, as Clausewitz's ideas about friction and uncertainty were captured explicitly. In 2019 this did not change, but it was clarified that complexity is what causes uncertainty, which could be a deviation from Clausewitz, who was more steeped in Newtonian physics metaphors and did not blame uncertainty on an abstraction like complexity. Clausewitz might have implied complexity, as some have argued (Beyerchen, 1993), but he did not use the concept as a causal effect for uncertainty. Instead, Clausewitz blamed the multitude of variables at play in war with producing uncertainty.

This is an institution trying to get back to something familiar, so it makes sense it would quote Clausewitz, which its members had been educated on since 1945, but more so since after the Vietnam War and into the Nineties. Thus, the U.S. Army uses familiar terms- the language about simple tasks being difficult is an almost exact lift from Clausewitz:

> Clausewitz: *"Everything in war is very simple, but the simplest thing is difficult. The difficulties accumulate and end by producing a kind of friction…"*
> - Clausewitz, 121

> ADP 5-0*: "…friction describes obstacles that make executing even simple tasks difficult."*
> - 2019. 1-2.

This was done while also mixing in some of the more recent terms that exploded in use in 2010 like complexity and the related concept of chaos. Chaos is not mentioned once in 2010 or 2012, but it is something related to complexity theory. This shows an organization in the midst of trying to find comfort in the traditional, the known, and the trusted, but still having to incorporate some of the more recent concepts it has used in the past.

The return to the Nineties is mostly complete, with a few hangers-on like complexity and chaos. But the Army's ontology in 2019 is solidly back in the rationalist camp with a task environment focused on the Clausewitzian 18th Century model of friction and uncertainty, the over-riding concern being using operational art- a reductive and categorical Nineties concept for

the U.S. Army- to plan, and assuming humans can make decisions rationally and that objectives are best reached by linear deterministic methods. The Army flirted with interpretivist and even post-modern ontological concepts in 2005 and 2010, but by 2019 they had all but vanished, leaving it back where it started from in the Nineties: a rationalist ontology. War is to be viewed from the rationalist ontological position, much as it was in the Nineties, prior to all the radical changes that 2005-2010 wrought.

This finding as well as the other major insights of this research suggest a need to understand the factors of why and how mega-bureaucracies create knowledge in the midst of complex situations, which is to say almost always. Multiple sources combine with the need to "do something" that, when mixed with older language and concepts sows the fruits of the newer concepts' own demise. As soon as the environment seems to change and the stories the mega-bureaucracy tells itself about how the world works, the newer language will be dropped, and the newer concepts co-opted into newer concepts and older language or older concepts with newer-sounding names. This research aims to support the knowledge creation literature by introducing these insights into how mega-bureaucracies create knowledge and why.

Limitations

Given the decisions outlined in Chapter Three on what manuals to analyze and the methods by which I analyzed the doctrine, the research was limited in the following ways. First, because I used the manuals solely, it is possible that the organizational knowledge creation observed in other areas could be more of an insightful artifact of knowledge creation in mega bureaucracies than what is reflected in its official doctrine. Second, without talking to the decision-makers and doctrine writers, the full picture of how knowledge is created by mega-

bureaucracies in complex environments is, at best, only partially appreciated. Third, in taking doctrine outside of its larger bureaucratic context, it is possible that other insights into how mega-bureaucracies create knowledge during complex environmental change were missed. Lastly, since this research focused on the incorporation of design thinking into Army doctrine and the period between 1997 and 2019, it is possible that this change and this time period were peculiar to that context and that context only and might not describe how other organizations would create knowledge in other contexts.

Positionality

My position with respect to the focus of the data, i.e., "design," was one of an "insider," with a great deal of pre-existing ideas about this topic prior to engaging in the research. I have authored several articles, am quoted in some of the lesser forms of the doctrine and have attempted to use the methods in operations. As such, I have come to this topic with the idea that design thinking within a military context is best framed as multi-paradigmatic thinking that utilizes reflective and reflexive approaches, multi-framing skills, and understanding of the dominant paradigm within the military culture. Thus, I expected the doctrine to be non-committal with respect to multi-paradigmatic thinking, internally contradictive, and changing wildly over the years in question. I also expected the doctrine to largely be the result of resource dependency, with a clear link to resource requests, the resource acquisition process, and consistency between ontology, epistemology, and methodology flowing from this rationalist focus on resources.

Considering my reflection on my pre-existing bias, I took the following mitigating actions. First, I used peer checks against my themes as I coded them initially. I then engaged in a

systematic analysis of the doctrine through various coding methods and processes. I then engaged in a member check with colleagues as to the content of my analysis. Having had a long-time engagement with the setting, I attempted to allow myself to be surprised: looking for things that clashed with my pre-formatted ideas. For instance, one thing I was surprised at was how disjointed the doctrine was internally. There was both a consistency across time with different concepts and language and an incorporation of novel items seemingly thrown in at random in a way which appeared confusing or contradictory. These findings clashed with my expectation that knowledge creation was simply the aligning of the resources the mega-bureaucracy wanted and its knowledge of how doctrine supports that process. Instead, I found that the contradictions were not solely due to internal contradictions, they also presented areas that appeared to contradict with the resources in which the mega-bureaucracy pursued. For instance, in 2019 the mega-bureaucracy attempted to make a shift towards China and big-power competition and away from counterinsurgency and so-called "small wars," which did align with its resource requests of more heavy divisions, tanks, and the like. That doctrine, however, still contained many concepts that had been introduced in 2010 to address the complexity of irregular warfare.

Lastly, I applied much of Lincoln and Gruba's (2007) framework for credibility. For this they recommended prolonged engagement with the phenomena, persistent observation, triangulation, peer debriefing, negative case analysis, and member checks. As I was engaged with the subject under discussion since at least 2008 and that I attempted to put the concept to use between 2008 and as recent as 2021, I have been very engaged with the phenomena that is the incorporation of design thinking into the U.S. Army doctrine. Likewise, I have observed the development of the doctrine and of the design thinking portion of that doctrine since at least 2009. I used several types of cross-checking of the data using different methods of inquiry and

looking at various sources. I used peer debriefing, using multiple professors and fellow students at various times and even Army officers, to check my analyses. I used the search for negative instances relating to insights that I thought might have been coming from predetermined bias. Lastly, I used member checks to constantly test the information and my own conclusions and interpretations against a disinterested party. These efforts assisted in mitigating the closeness with which my position was to the subject of the inquiry.

A major component of the approach I took is hermeneutical inquiry to understand how the language of the doctrine changed over time. Abductive methods can be assessed with criteria that evaluate rigor applied during the research analysis. Deductive research seeks to establish assertions through a priori hypothesis testing. Inductive research seeks to find truth associated with a given case that may lend insights into more general patterns (Nowell and Albrecht, 2019). Abductive research inquires into cases which do not fit previously studied phenomena or phenomena that are not easily generalizable and uses both extant theory to help inform analysis while also allowing emergent themes and insight to arise from the data (Schwartz-Shea & Yanow, 2012).

Data saturation was met in multiple ways, the first was a cursory reading of all the relevant manuals to gain a survey-type of familiarity with what kind of information was addressed throughout the manuals. Second, I read the manuals I had narrowed down from front to back to make sure I understood what those manuals contained and how they were organized. Third, I identified portions of the manuals and read these portions with great focus, taking notes as part of an initial coding process. Fourth, I pulled the pertinent data out of the identified portions and put them into a document that I further read and coded. Fifth, over multiple iterations of reading, coding, and categorizing the portions, I became very cognizant of what the

raw data contained. Lastly, I summarized each portion after categorizing them for ease of analysis, referencing each portion with the raw data itself, which I pulled from for the findings and for the final step-back analysis which allowed a more holistic view. Based on these measures, the standard for saturation was met and I was able to note the variability within the data across the time periods studied (Nowell and Albrecht, 2019).

Further Research

To re-summarize, my major findings were:

1) espoused knowledge in mega bureaucracies is dynamic and responsive to perceived or real complex environmental change,

2) espoused knowledge development in mega bureaucracies can be non-linear and may be iterative as changes become mixed with and/or co-opted by older thinking, and

3) due to the dynamic interaction of old and new thinking, espoused knowledge in mega-bureaucracies can be contradictory in terms of mis-aligning ontological, epistemological, and methodological beliefs and approaches.

To move forward past this initial foray into how mega-bureaucracies create knowledge in complex environments would require addressing the limitations of the research. First, in order to look into all aspects of knowledge creation, research should expand into other areas besides just doctrine, which could reflect only one aspect of organizational knowledge creation with potentially only one logic set. The next generation of research questions would need to detail the process by which knowledge is created by the creators themselves. This would entail interviewing the doctrine writers and various decision makers who were responsible for creating the doctrine and any who influenced them as well.

One complex and multi-faceted area in which more research is needed is the overall context within which doctrine exists within an organization. For instance, all the processes and systems that influence doctrine and are then influenced by doctrine would need to be carefully analyzed to see what roles those influences have on knowledge creation as well. Military doctrine production exists within, among other systems and processes, the Joint Capabilities, and Integration Development System (JCIDS), which attempts to coordinate organizational change to aggregate to new capabilities. There is also the doctrine production process, a process governed by the Training and Doctrine Command at Fort Eustis, Virginia. These and other processes and systems may have certain impacts on knowledge creation as well.

It would be important to make sure that other periods of time or contexts do not show somewhat different ways of knowledge creation within mega-bureaucracies in complex environments. It would be worth studying whether the process of knowledge creation is different in some small ways that result in larger differences depending on the context. Additionally, other types of mega-bureaucracies, both public and private, might create knowledge very differently in complex environments than the example shown here. Although I have found evidence that I have argued likely would apply across all mega-bureaucracies in complex environments, it would be important to rule the possibility out that these conclusions applied only to the Army or only to the Army in this one context. It would not surprise me if there were at least some nuances with mega-bureaucracies in other contexts and with other missions. For instance, if a mega-bureaucracy creates knowledge due to one specific causal logic or where the causal logics are multiple, but manifest in different strengths than the one studied here, the process might be somewhat different. I can imagine an instance wherein a situation is so dynamic, and yet is unrelated to combat, that a mega-bureaucracy goes through a different process to create

knowledge than one which is rooted in combat operations. A return to the familiar, such as a "Clausewitzian resurgence" might not be the preferred crutch with which to fall back upon in a situation that is not related to combat.

Lastly, since I do believe that these findings would go a long way towards describing the differences between the traditional understanding of knowledge creation and observations that do not conform to that understanding, future research could offer more insight into the details of the actual process. That would include looking at mega-bureaucracies in complex environments and attempting to determine other influences, nuances based on slight differences within the context, and areas that could be used to leverage more productive knowledge creation versus activities that are more reflective of self-preservation, fear, or other, more negative pressures.

Conclusion

The US Army's ontological view changed from one focused in the Nineties on what we might imagine as conventional war (tanks battling tanks) to one that seemed obsessed with the word "problems" and the solving of said problems in the face of the complexity of Iraq and Afghanistan. In the years between 2005 and 2010, the Army was concerned with the structure of problems, and how they could be structured in such a way as to reduce the complexity in its task environment. In 2012, but even more so in 2019, the doctrinal manual for 5-0 seemed to come full circle, as the data suggests a return to the Nineties concepts of war, planning, and decision-making.

In terms of epistemology, from 2005 to 2010, we see some fundamental changes within the Army doctrine. The Army's best way to visualize became one centered on categories of structured problems: well, medium, and ill. Its way of knowing mixed some of the legacy ways

like variable analysis with new ways such as collaboration and dialog. Finally, its overarching concern was still problem solving, but, since the category of problems had increased, the concern was focused on applying the right conceptual tool to the proper classification of problem. In 2010, the Army's epistemological view doubled down on the ramifications of its ontological shift toward viewing the world as complex. As documented in the previous section, doctrine in 2005 focused on root causal analysis, whether by using variable analysis to find correlations, rational decision making (deduction), or intuition in an effort to address a more complex world. In 2010 the analysis of the data suggests that the Army added more concepts about how to know within a more complex ontology: requiring more non-traditional forms of thinking and sources of knowledge. How to think about war in 2012 seemed to signal a shift away from the heavily detailed depiction of systems thinking and complexity and more towards old ways of thinking, to include the elements of operational design as the art and science of solving the problem of how to get from the present to a desired future.

The changes in the methodology from 1997 to 2019 were profound, often overlapping (new concepts with older concepts mixed in) as well as changing rapidly (such as between 2010 and 2012). The data suggests that in 2005 the Army introduced a different set of methods than it had in the Nineties to deal with complexity. By 2010 this change hit a crescendo and was marked by using design to handle complex and ill-structured situations as part of problem-solving and required new things such as *collaboration* and *dialogue,* which were non-existent in the Nineties (even "dialogue" is non-existent until 2010). By 2012, only two years later, however, the Army had started to come off this crescendo and by 2019 the change was much more of a return to Nineties-style language.

Where the Army seems to have been incongruent in synchronizing across its ontology, epistemology, and methodology were in two areas: 1) the retaining of legacy ideas within its methodology throughout what seems to me to be drastic changes within its ontology and epistemology, and 2) the contradiction of some of the new ideas' fundamental concepts, usually related to the retaining of legacy ideas, while at the same time introducing these new concepts. This can be explained by the idea that mega-bureaucracies will feel forced to "do something" and that doing something without rigorous coordination and thoughtful adoption can lead to confusion, thus sowing the knowledge creation with the seeds of its own destruction.

As the Army incorporated new ideas into its methodologies, it retained the legacy methodologies, always prioritizing the legacy method of rational decision making and deterministic planning while at the same time incorporating the ideas of qualitative epistemologies, multiple ontological frames, and decentralized methods to support said ontologies and epistemologies. This data reflects an organization experiencing rapid change or perceiving rapid change and growing complexity but wanting to hold onto a legacy cultural artifact. In fact, the data suggests that in 2019 the Army returned to its legacy method of the Nineties, even while retaining some of the new concepts it had experimented with from 2005 to 2010. Indeed, the over-arching picture the data paints is one that shows a trip from the Nineties and back, which took the Army from a wholly rationalist and deterministic view into the areas of complexity theory, qualitative knowing, and mixed methodologies before returning it to the Nineties era of rationalist decision-making and deterministic planning.

Ultimately this trip represents why a mega-bureaucracy would change and how it would change in terms of creating knowledge in the face of complex environmental change. When it happens, the stories it tells itself about the world change rapidly, as these are often based on

political pronouncements and are important in funding justifications. The stories a mega-bureaucracy tells itself about how knowledge is gained about phenomena are often more complex.

In the case of a mega-bureaucracy, there are a multitude of stakeholders, and a multitude of places knowledge can come from in the heat of dynamic change. Not a linear or rigorous or even rational process, knowledge creation in this instance serves an expedient purpose: "do something!" The more multi-faceted, the better it is to the many stakeholders. When things continue to appear complex, methods for action and methods for knowing continue to be created for expedient purposes, but in so doing, the seeds of their demise are sowed as older concepts are kept and confusion reigns. As soon as the mega-bureaucracy's stories about the world change again, older knowledge has a chance to re-establish itself, if there is not a new cycle of new knowledge requiring creation to deal with the new ontological complexity.

This research examined a gap related to understanding why and how a mega-bureaucracy creates knowledge in the face of complex changes. To answer that question, I had to become intimately familiar with an example of a mega-bureaucracy creating knowledge. The example of the U.S. Army creating the concept of design in the middle of the Iraq and Afghanistan wars is a case rich with data showing that knowledge creation in explicit terms. This research brought to light new understanding in terms of how organizations create knowledge in that it is not apparent in this example that organizations in all times and places (and sizes) create knowledge in a linear fashion for the rational purpose of learning how to be more effective or do things better.

On the surface it may appear that this is what all organizations are doing or trying to do: create knowledge in a rational and linear manner to "do better." What I have shown, however, is that if this were the case, the U.S. Army's ontological assumptions, epistemological concepts,

and preferred methodologies would be more consistent. It would show a neat nesting of ontology-epistemology-methodology, such as for the Nineties: Rational-rational-rational, 2005: Positivist-positivist-positivist, 2010: Interpretivist-interpretivist-interpretivist, and so on. Instead, we see a conglomeration of changes to the ontological assumptions and a mixed bag following those assumptions as old epistemologies mix with new ones and new methods clash with the new ontologies, the new/old epistemologies, and the old methodologies as some or all are kept in some form or another. This study proposed why that happens and in what ways it happened in this specific case. It expands what we can know about how mega-bureaucracies, in this case, create knowledge and how it is different than the current knowledge creation literature. More research needs to be completed to see if this is the norm for all mega-bureaucracies, whether it is the norm for mega-bureaucracies in all times and places, and whether it serves useful purposes outside of the more expedient ones mentioned herein.

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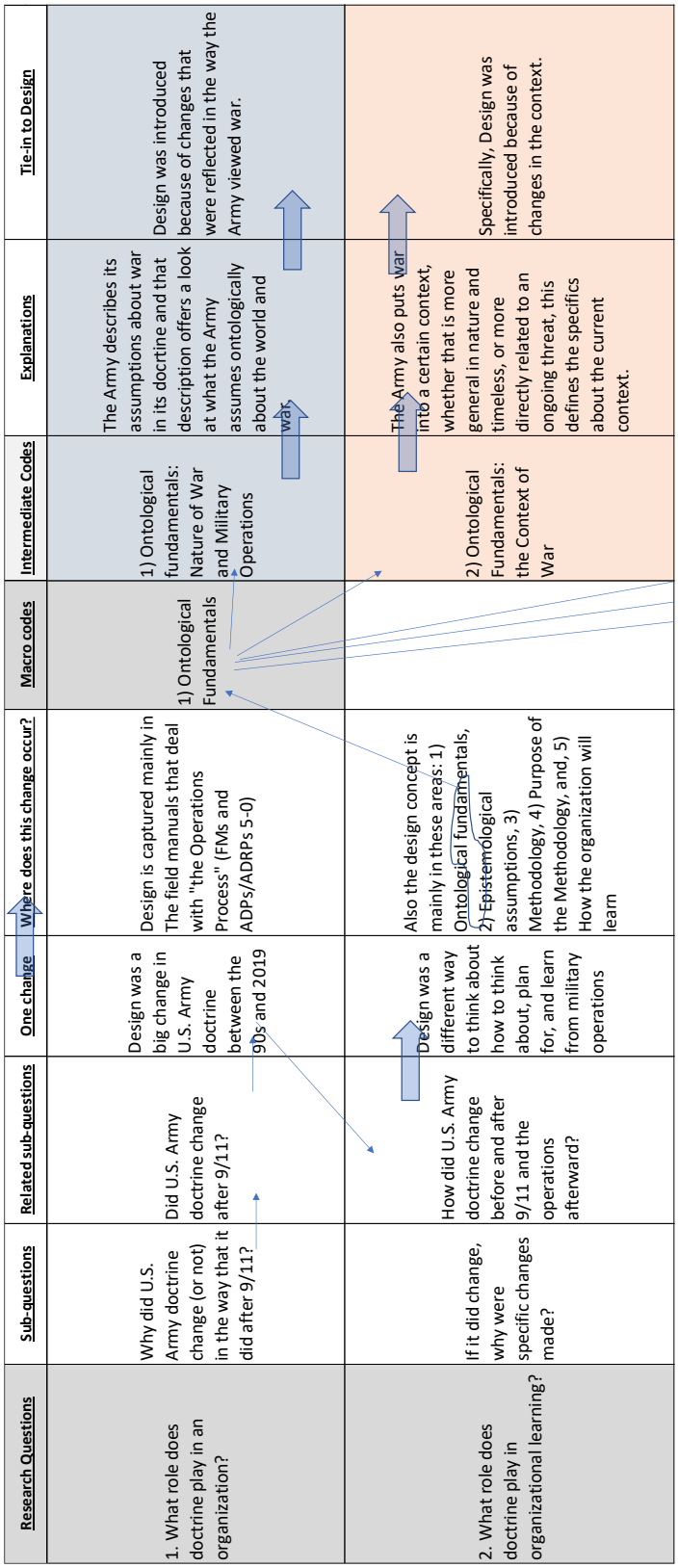
APPENDICES

Appendix A (ontology) 1: first two rows analysis



Research Questions	Sub-questions	Related sub-questions	One change	Where does this change occur?	Macro codes	Intermediate Codes	Explanations	Tie-in to Design
1. What role does doctrine play in an organization?	Why did U.S. Army doctrine change (or not) in the way that it did after 9/11?	Did U.S. Army doctrine change after 9/11?	Design was a big change in U.S. Army doctrine between the 90s and 2019	Design is captured mainly in The field manuals that deal with "the Operations Process" (FMs and ADPs/ADRPs 5-0)	1) Ontological Fundamentals	1) Ontological fundamentals: Nature of War and Military Operations	The Army describes its assumptions about war in its doctrine and that description offers a look at what the Army assumes ontologically about the world and war.	Design was introduced because of changes that were reflected in the way the Army viewed war.
2. What role does doctrine play in organizational learning?	If it did change, why were specific changes made?	How did U.S. Army doctrine change before and after 9/11 and the operations afterward?	Design was a different way to think about how to think about, plan for, and learn from military operations	Also the design concept is mainly in these areas: 1) Ontological fundamentals, 2) Epistemological assumptions, 3) Methodology, 4) Purpose of the Methodology, and, 5) How the organization will learn		2) Ontological Fundamentals: the Context of War	The Army also puts war into a certain context, whether that is more general in nature and timeless, or more directly related to an ongoing threat, this defines the specifics about the current context.	Specifically, Design was introduced because of changes in the context.

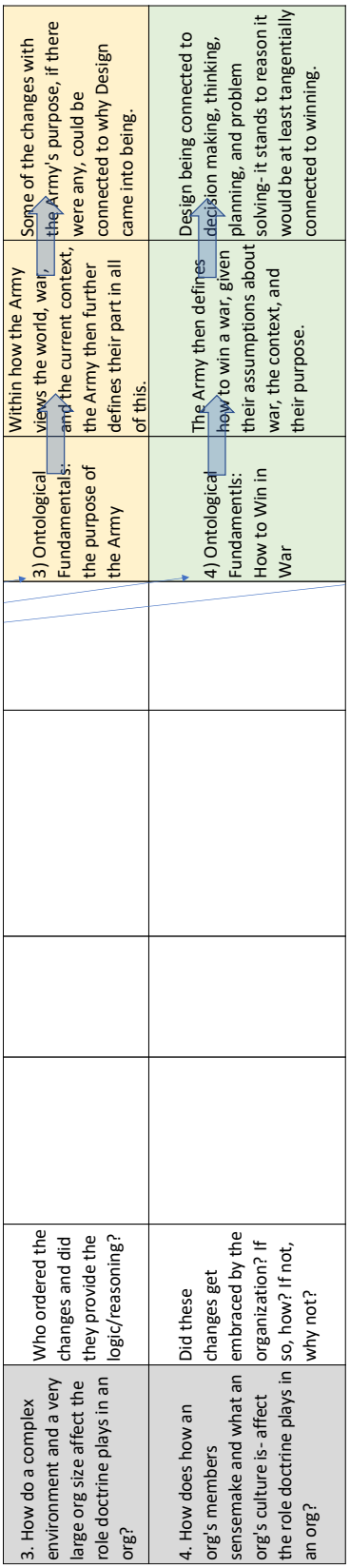
Microcodes		
1993/97	**2005**	**Changes**
War is about either limited objectives or more total.	- Complex Struggles between human wills. - Competition between Commanders.	War changed from a dichotomous either/or categorization to a complex subject dealing with human "will," struggle, and a competition between leaders.
Human and physical dimensional	'- Problems are well structured, medium structured, or ill structured. - Uncertainty due to thinking and adaptive enemies creates friction.	The Context of war went from having two dimensions: human and physical to taking place within a problem structure spanning between well structured to ill structured and friction created by the more ill structured nature of the context.

2010	Changes
N/A	War becomes undefined in 2010
'- Complex, dynamic, uncertain environment. - Physical areas (air, land, sea, and space) and cyberspace, as well as information. - Systemic - Complex and systemic. - Contextually unique and complex structurally and interactively as a whole. - Cause and effect difficult to determine due to constantly evolving environment. - Uncertain and unpredictable. - Motivations of other populations is difficult to determine. - Chance and friction contribute to uncertainty - Uncertain, complex, ever-changing. - Context now: globalization, technology, demographic changes, scarce resources, climate change, WMD, failed states. - Persistent conflict. - Complex and ill-structured	The Context of war changed from involving the structure of problems and friction to being complex, uncertain, dynamic, physical, cyber and information, systemic, contextually unique, unpredictable, indeterminate as to causality, chance and friction, a present context of rapid change, crises, and persistent conflict, as well as the structure of problems being complex and ill-structured.

2012	Changes
N/A	War is still undefined in 2012
Chance and friction contribute to uncertainty.	The context of war changes from multiple and temporal copmlexities to being uncertain because of chance and friction.

2019	Changes
N/A	War, as previously noted since 2010 is undefined.
Dynamic and uncertain; complexity create uncertainty and chance and friction increase it and chaos.	The context of war did not change, but it is clarified that complexity creates uncertainty.

Appendix A (ontology) 1: 3rd and 4th rows analysis



Win in war efficiently	N/A	The purpose of the Army went from efficiently winning to undefined.
'- A force-projection army requires trained units ready for rapid deployment to tough environments. - Mastering environmental dimensions leads to decisive results at minimum	'- Creativity and clarity of thought to outwit the enemy. - Ability to recognize and effectively solve problems. - The achieving of objectives in the most effective and efficient manner possible.	The Army changed the way it understood how wars were won from an army that can project force around the globe at a moment's notice to being creative, clear-thinking, outwitting the enemy, and effectively solve problems.

N/A	The purpose of the Army remained undefined.
'- Timely and effective decisions based on applying judgment to knowledge. - Anticipation of actions. - Reducing the effects of complexity by understanding complex, ill-structured problems.	To win in war changed from creativity and clarity of thought to solve problems to decision making that applies judgment to knowledge in a way that allows understanding of complex, ill-structred problems.

N/A	The purpose of the Army remained undefined.
'- Becoming aware of the difference between what is and what is desired and those obstacles (aka problems) to getting to what is desired. - Added these two sections in after adding the 2019 section in, as they cover the same subjects. - Planning allows one to address a set of problems as a whole. - Problem solving for long-term success is planning, execution, learning (assessment), and modifying solution.	To win in war changes from understanding complex and ill-structured problems to comparing the desired system to the current system and using planning and learning to problem solve.

To achieve national policy objectives	The purpose of the Army changed from being undefined to be about achieving national policy objectives.
'- Implied in 2019: solving problems and key to solving problems is planning. - Operational art, which is the process of developing the concept to achieve the desired end state.	To win in war changed from understanding complexity to using planning and the steps of operational art to solve problems and achieve the desired end state.

Appendix A (ontology) 1: 5th row analysis

5) Ontological Fundamentals: The Decision making process	Lastly, the Army lays out how to make decisions at a fundamental level. This is directly tied to how the Army views the world. As the Army views decisions as the product of thinking and the start of planning and problem solving.	Design is directly connected to decision making, so the introduction of design would have clearly shown up in what the Army thinks about how decision are made.

'- Science and art. Science is quantifiable subjects, art is non-quantifiable. - relies on doctrine. - Analyzing the mission is crucial. - Anticipation, prior preparation, and trained staff.	' - Planning process is problem solving, decision-making, and troop leading procedures. - Planning, and thus decision-making, is based on analytic decision making. - Problem solving is an art and science based on a highly structured analytic process. - Requires all relationships between variables are anticipated and accounted for in the solution. - Subjective analysis of variables enhanced by experience. - Creative thinking - Anticipation, preparation, and trained staff - Mission analysis	The way decisions are best made changed from relying on science for the quantifiable and art for the non-quantifiable to using science and art as a way to solve problems in a highly structured variables-based analytic process.

'- Comes from one's cultural framework - A commander's experience, knowledge, judgment, and intuition lead to anticipation.	The way decisions are made changed from a mix of science and art as a way to solve problems to coming from one's cultural framework and using experience, knowledge, judgment and intuition to anticipate.

'- Delegate decision-making to subordinates to counter uncertainty. - Comes from one's cultural framework. - Apply critical and creative thinking.	The way decisions are made still comes from one's cultural framework, but now must be delegated to subordinates to counter uncertainty and comes from applying critical and creative thinking.

‘- The operations process: planning, preparing, executing, and continuously assessing. - Applying critical and creative thinking. - Based on skilled judgment acquired from experience, training, study, imagination, and critical and creative thinking. - Understand the situation, develop course of action, and produce a plan.	The way decisions are made changed from coming from one's cultural framework and delegating to counter uncertainty to being a product of the operations process and includes understanding the situation, developing a course of action, and producing a plan.

Appendix A (ontology) 2: first two rows raw data

Raw Data
1993/97
War may be of a limited or general nature. Limited war is armed conflict short of general war as was conducted during Operation Just Cause in December 1989. General war, such as World Wars I and II, involves armed conflict among major powers in which the total resources of the belligerents are employed and survival is at stake.
The environment of combat combines human and physical dimensions. Soldiers, the first dimension, are the centerpiece of the Army's doctrine and warfighting ability. Their training, initiative, resilience, and understanding of the demands put on them are key to success on the battlefield. The second dimension of this environment is physical. In accordance with the US National Military Strategy, US Army forces must be prepared to fight and win on short notice anywhere in the world, from blistering deserts to frigid wastelands, in rain forests, tundra, mountains, jungles and swamps, urban sprawl, and all types of terrain in between. Combat operations occur day and night, for weeks or months on end, among friendly or hostile populations, and in areas infested with blight, disease, and epidemics.

2005
‘- Military operations are uncertain and unpredictable. They are complex endeavors—struggles between opposing human wills. - Combat consists of the interplay between two or more opposing commanders—each commander seeking to accomplish their missions while preventing the other from doing the same.
Commanders face thinking and adaptive enemies. They can never predict with certainty how enemies will act and react, or how events will develop. Even friendly actions are difficult to predict because of friction, such as human mistakes and the effects of stress on individuals. In terms of structure, there are three types of problems: well structured, medium structured, and ill structured. Understanding the structure of a problem assists in determining the amount of time and resources required to develop a recommended solution to the problem. Perception of whether a problem is well, ill, or medium structured depends, in part, on the knowledge, skills, and ability of the problem solver.

Nothing coded
Whether operations are designed to relieve suffering from a natural disaster or to defeat a large enemy force, operations are conducted in complex, ever-changing, and uncertain operational environments. An operational environment is a composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander (JP 3-0). An operational environment includes physical areas (air, land, maritime, and space domains) and cyberspace. It also includes the information that shapes conditions in those areas as well as enemy, adversary, friendly, and neutral aspects relevant to operations. An operational environment is not isolated or independent but interconnected by various influences (for example, information and economics) from around the globe. An operational environment is both complex and continuously changing. Complexity describes things or situations with many parts and subparts (structural complexity), as well as the behaviors and resulting relationships among those parts and subparts (interactive complexity). How the many entities behave and interact with each other within an operational environment is difficult to discern and always results in differing circumstances. No two operational environments are the same. While aspects of an operational environment may be less complex than other aspects, an operational environment as a whole is both structurally and interactively complex. In addition, an operational environment is not static but continually evolves. This evolution results from people interacting within an operational environment as well as from their ability to learn and adapt. As they take action within an operational environment, the operational environment changes. Some of these changes are anticipated while others are not. Some changes are immediate and apparent, while other changes are delayed or hidden. The complex and ever-changing nature of an operational environment makes determining the relationship between cause and effect difficult and contributes to the uncertainty of military operations. Uncertainty is what is not known about a given situation or a lack of understanding of how a situation may evolve. Effective leaders accept that they conduct military operations in operational environments that are inherently uncertain. They realize that concrete answers or perfect solutions usually do not exist. For example, friendly forces may be uncertain about existing conditions, such as the exact location and strength of enemy forces. Even if the staff feels confident about the location and strength of an enemy force, the commander still questions what to infer from those facts—the enemy's intentions, for example. And even if the commander makes a reasonable inference, the many options available to the enemy make predicting the enemy's exact behavior quite difficult.

N/A
Similarly, clearly discerning the motivations and reactions of various population groups with respect to the friendly force or the enemy often proves difficult. American ideas of what is normal or rational are not universal. Members of other societies often have different notions of rationality, appropriate behavior, levels of religious devotion, and cultural norms. These differences in perspectives and culture add to the uncertain nature of operations. Chance and friction contribute to the uncertain nature of operations. Chance is the lack of order or clear predictability of operations. A major sand storm that delays offensive operations, the death of a key local leader that leads to an eruption of violence, or an unexpected encounter with an enemy force all illustrate chance. Friction is the combination of countless factors that impinge on the conduct of operations. Friction may be mental, as in indecision over a course of action. It may be physical, as in effective enemy fire. Friction may be external, such as actions imposed by enemy. It may be self-induced, such as the lack of a clearly defined goal, lack of coordination, or complicated plans and command and support relationships. During operations, leaders make decisions, develop plans, and direct actions under varying degrees of uncertainty. Commanders contend with thinking, adaptive enemies in areas of operations where many events occur simultaneously. Often commanders have difficulty accurately predicting how enemies will act and react, how populations will perceive or react to friendly actions, or how events will develop. Within these complex, ever-changing, and uncertain operational environments, commanders conduct full spectrum operations. In the 21st century, several global trends shape the emerging strategic environment and exacerbate the ideological nature of current struggles. These trends present dilemmas as well as opportunities. Such trends include— - Globalization. Technological diffusion. Demographic shifts. Resource scarcity. Climate changes and natural disasters. Proliferation of weapons of mass destruction. Failed or failing states. The collective impact of these trends makes it likely that persistent conflict will characterize the next century. Persistent conflict is the protracted confrontation among state, nonstate, and individual actors that are increasingly willing to use violence to achieve their political and ideological ends. Conflicts will erupt unpredictably, vary in intensity and scope, and endure for extended periods. In a dynamic and multidimensional operational environment, design offers tools vital to solving the complex, ill-structured problems presented by persistent conflict.

Nothing coded
Uncertainty pervades operations in the form of unknowns about the enemy, the people, and the surroundings. Even the behavior of friendly forces is often uncertain because of human mistakes and the effects of stress on Soldiers. Chance and friction contribute to the uncertain nature of operations. The sudden death of a local leader that causes an eruption of violence illustrates chance. The combinations of countless factors that impinge on the conduct of operations, from broken equipment that slows movement to complicated plans that confuse subordinates, are examples of friction.

Nohthing coded
War is inherently dynamic and uncertain. The complexity of friendly and enemy organizations, unique combinations of terrain and weather, and the dynamic interaction among all participants create uncertainty. Chance and friction increase the potential for chaos and uncertainty during operations. Chance pertains to unexpected events or changes beyond the control of friendly forces, while friction describes obstacles that make executing even simple tasks difficult. Both are always present for all sides during combat.

Appendix A (ontology) 2: 3rd and 4th row raw data

In either instance, the Army, as part of a joint team, applies decisive force to fight and win with minimum casualties .	Nothing coded
Warfare presents a challenging environment to any military organization and its soldiers. In a force-projection army, soldiers and units must remain trained and ready for rapid deployment anywhere in the world. The environment will often be harsh. Extreme temperatures, rugged terrain, fear, uncertainty, confusion, exertion, and fatigue will take their toll. Poorly trained soldiers and units succumb to the hostilities of the environment, withdraw inside themselves, and permanently surrender the initiative. Conversely, soldiers and units that are prepared to cope with a tough environment take a giant step toward victory.	Every commander needs a high degree of creativity and clarity of thought to outwit a willing and able opponent. The ability to recognize and effectively solve problems is an essential skill for Army leaders This ensures that the desired objective or end-state is achieved in the most effective and efficient manner.

Nothing coded
Success in operations demands timely and effective decisions based on applying judgment to available information and knowledge. It requires knowing both when and what to decide. Commanders and staff members make countless decisions throughout an operation under constantly changing conditions. Commanders delegate some decisions to the staff while reserving the most important ones for themselves. Commanders are aware that, once executed, the effects of their decisions are frequently irreversible. Therefore, they anticipate actions that follow their decisions. Ultimately, understanding complex, ill-structured problems is essential to reducing the effects of complexity on full spectrum operations.

Nothing coded	All U.S. military operations share a common fundamental purpose—to achieve or contribute to national objectives. Objective—to direct every military operation toward a clearly defined, decisive, and attainable goal—is a principle of war. This principle reinforces the proper relationship between military operations and policy. Military operations must always be subordinate to policy and serve as a way to a political end.
Nothing coded	Planning also helps leaders identify problems and develop solutions to solve or manage those problems. Not all problems require the same level of planning. Leaders often identify simple problems immediately and quickly decide on a solution—sometimes on the spot. Planning is critical, however, when a problem is actually a set of interrelated issues, and the solution to each affects the others. For unfamiliar situations, planning offers ways to solve the complete set of problems as a whole. In general, the more complex a situation is, the more important and involved the planning effort becomes. It is through operational art that commanders develop and translate their operational approach—a description of the broad actions required to achieve the end state —into a concept of operations. An operational approach is the result of the commander's visualization of what needs to be done in broad terms to solve identified problems.

Appendix A (ontology) 2: 5throw raw data

Decision making is both science and art. Many aspects of military operations—movement rates, fuel consumption, weapons effects—are quantifiable and, therefore, part of the science of war. Other aspects—the impact of leadership, complexity of operations, and uncertainty regarding enemy intentions—belong to the art of war. The MDMP relies on doctrine, especially the terms and symbols (graphics) found in FM 101-5-1. Mission analysis is crucial to the MDMP. Anticipation, prior preparation, and a trained staff are the keys to a timely mission analysis.

The Army's doctrinal planning processes (problem solving, MDMP, and TLP) are based on analytic decision making. They provide a common way to think about solving problems.

Problem solving is both an art and a science. It is a highly structured analytic process designed to ensure that all key factors relevant to the problem are considered, and that all relationships between variables are anticipated and accounted for in the solution.

The art of problem solving involves subjective analysis of variables that, in many cases, cannot be easily measured. Leadership and morale, for example, are difficult to measure, but may play a critical role in developing solutions to solve a problem. Problem solvers and decision makers make subjective assessments of such variables based on facts and assumptions and their likely effects on the outcome. A leader's judgment is enhanced by their professional experience.

Creative or innovative thinking is the kind of thinking that leads to new insights, novel approaches, fresh perspectives, and whole new ways of understanding and conceiving things. Creative thinking in not a mysterious gift, nor does it have to be outlandish. It is not reserved for senior officers, all leaders should think creatively. Creative thinking is employed everyday to solve small problems.

Anticipation, prior preparation, and a trained staff are the keys to a timely mission analysis.

A thorough mission analysis is crucial to planning.

Culture is the shared beliefs, values, customs, behaviors, and artifacts members of a society use to cope with the world and each other. Culture influences how people make judgments about what is right and wrong and assess what is important and unimportant. Culture provides the framework for rational thought and decisions. What one culture considers rational another culture may consider irrational.

A condition is an existing state of affairs in the operational environment. Some desired future conditions may be prescribed by higher authority. For example, the higher headquarters may establish a desired future condition that an enemy force has withdrawn across the international border. Other future conditions are envisioned by the commander based on their understanding of the current situation and the mission.

A commander's experience, knowledge, judgment, and intuition assume a crucial role in understanding complex, ill-structured problems. Together, they enhance the cognitive components of design, enhancing commanders' intuition while further enabling commanders to identify threats or opportunities long before others might.

During operations leaders make decisions, develop plans, and direct actions under varying degrees of uncertainty. Commanders seek to counter the uncertainty of operations by empowering subordinates at the scene to make decisions, act, and quickly adapt to changing circumstances. As such, the philosophy of mission command guides commanders, staffs, and subordinates throughout the conduct of operations.

Culture is the shared beliefs, values, norms, customs, behaviors, and artifacts members of a society use to cope with the world and each other. Culture influences how people make judgments about what is right and wrong and how they assess what is important and unimportant. Culture provides a framework for thought and decisions. What one culture considers rational, another culture may consider irrational.

Commanders and staffs apply critical and creative thinking throughout the operations process to assist them with understanding situations, making decisions, and directing action. Critical thinking is purposeful and reflective judgment about what to believe or what to do in response to observations, experience, verbal or written expressions, or arguments. Creative thinking involves creating something new or original. Creative thinking leads to new insights, novel approaches, fresh perspectives, and new ways of understanding and conceiving things.

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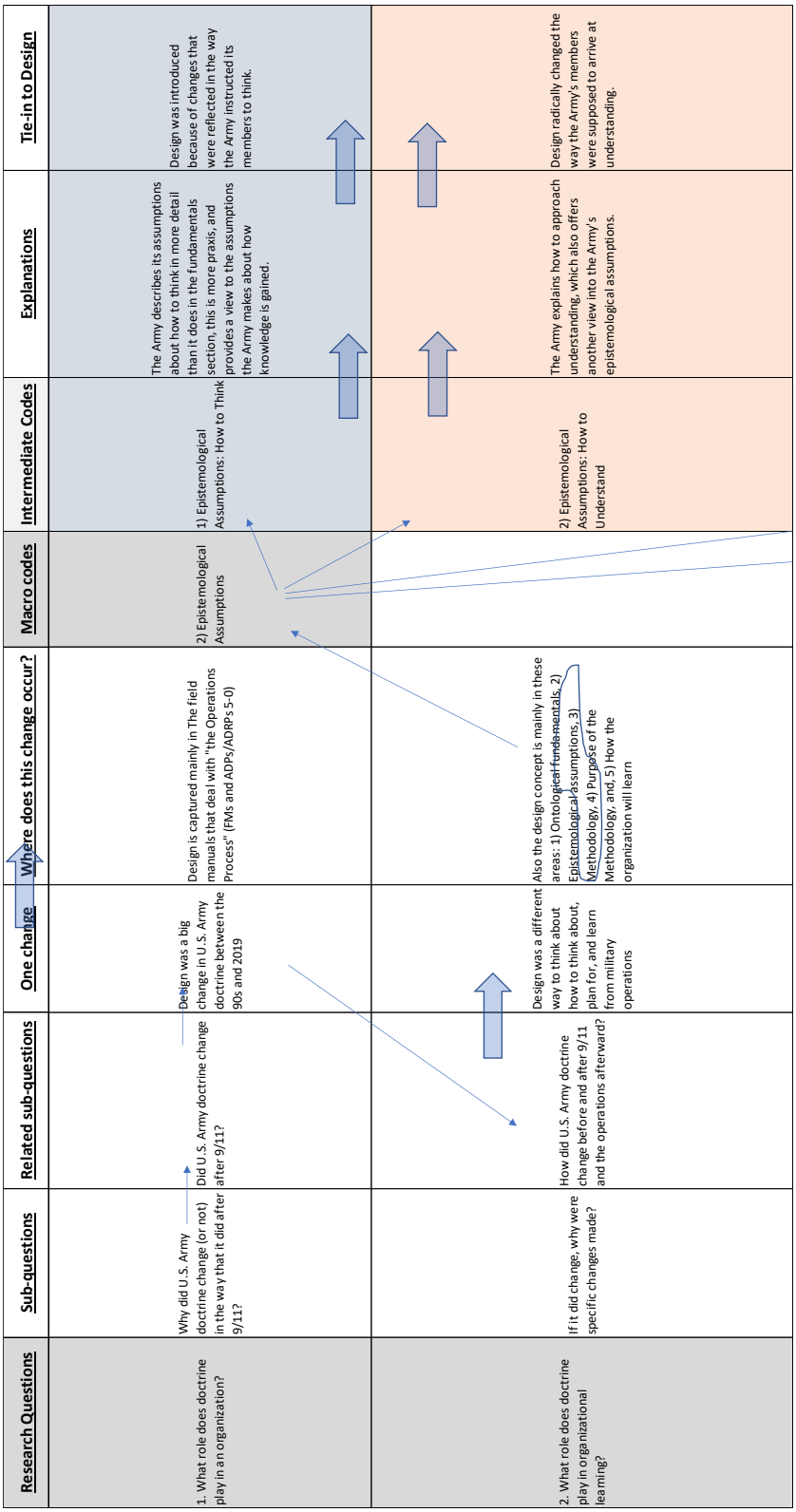
Appendix B (epistemology) 1: first two rows analysis



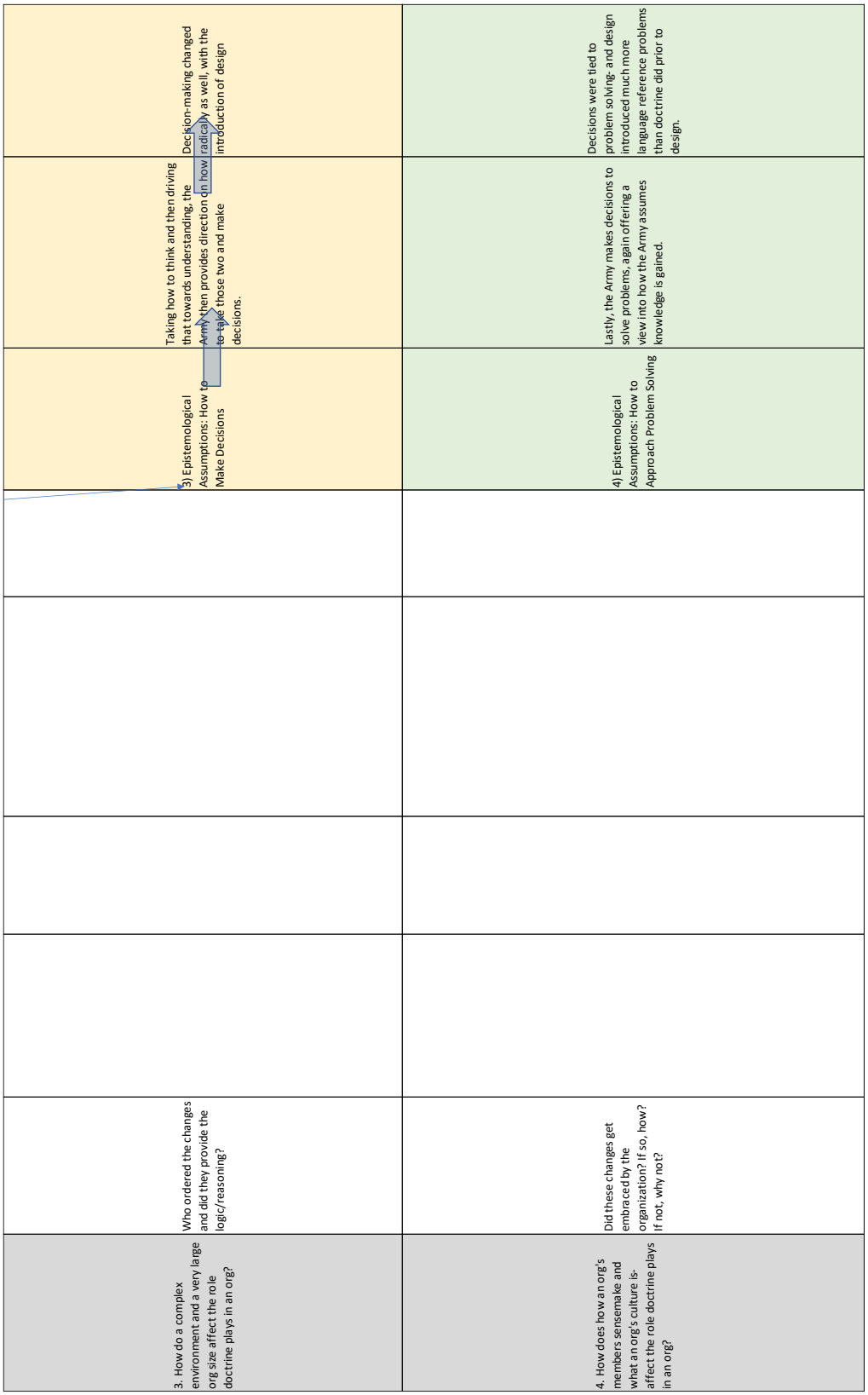
Microcodes		
1993/97	**2005**	**Changes**
- Valid thinking is objective, supported by data, and logical.	- Thinking takes contextual planning methods that then structure that thinking commanders and staffs. - Thinking should visualize how to get from the current state of the environment to the preferred state. - Thinking requires looking at a problem from several viewpoints and then interpreting, analyzing, evaluating, and inferring the solution to the problem. - The elements of design are the framework to think about operations: desired end state, center of gravity, decisive points, lines of operation, culminating point, operational approach, simultaneous and sequential efforts, linear and nonlinear operations, and tempo.	How to think changed from a simple one sentence description of describing "valid thinking as objective ans supported by data and logic to a much longer description that requires contextual methods, visualizing how to get from the current state to the preferred state, looking at problems from multiple viewpoints, interpretation, and the elements of design.
- Success requires understanding everything. - Understanding comes from a process of visualizing the current state of the environment, a desired future, and how to get there. - Visualizing the battlefield is understanding- and is key to winning.	- The mission analysis process [gather facts, make assumptions, analyze higher mission (analyze specified tasks, implied tasks, and then identify mission essential task), issue commander's guidance] allows understanding of the nature of the problem. - Understanding allows visualizing the operation and planning.	From the Nineties to 2005, how to understand changed from visualizing everything on the battlefield to visualizing the operation in terms of the nature of the problem through analyzing the mission.

2010	**Change**
- Thinking requires visualizing a broad concept on how to get from the current situation to the desired end state as the solution to the problem. - Thinking must be in terms of how the problem of the situation is structured: well structured, medium structured or ill structured. - Thinking for ill structured problems requires the design methodology to understand, visualize, and describe the problem and solution. - Complex and ill-structured problems requires operational art, through the design methodology, to link tactics and strategic aims.	From 2005 to 2010, thinking still required a visualization from the current situation to a desired state, but now the situation must be thought of as one of a tye of problem: well-structured, medium-structured, or ill-structured, and design methodology used to understand how to get to the desired state. Ill-structured problems are linked to complexity.
- Understanding comes from applying analysis to determine the relationships among variables, which allows pattern recognition. Complete understanding is the ideal, but often won't happen. - Understanding the complex nature of war requires reductive (analysis) thinking and thinking about how the parts of a situation act as a whole (synthesis). - Initial understanding is not complete and may be inaccurate or conditions change- therefore periods of reduced understanding will give way to better understanding. - Understanding comes from analyzing 8 variables: political, military, economic, social, information, infrastructure, physical environment, and time- against the 6 mission variables: mission, enemy, terrain and weather, troops, time, and civil considerations. - Cultural effects on operations is part of understanding. - Understanding comes from appreciating how one's own culture influences how one understands situations and makes decisions and thus requires reflection and analysis of difference between cultural frames. - Understanding requires collaboration and interaction that then allow updated understanding. - Understanding the situation is required to visualize how to change to the desired end state. - Design includes understanding the complex context (economy, governance, information, tribes, religion, history, and culture)- which is required to overcome challenges, as recent events show. - Individuals cannot understand things today as they are too complex and it is risky to assume efforts are mutually supportive today. To overcome this commanders can collaborate and use design: critical thinking, understanding the operational environment, solve the right problem, adapt, achieve desired goals. - Understanding an environment's complex nature helps identify unintended consequences of well-intentioned efforts. Deep understanding takes multiple perspectives and varied sources of knowledge. - The operational environment's context is understood through the intelligence process. Design helps seek and address complexity before one attempts to impose simplicity.	From 2005 to 2010, how to understand changed from visualizing the operation in terms of the nature of the problem through analyzing the mission to applying analysis to determine relationships among variables, which allows pattern recognition, reductive analysis thinking, sythesizing parts, analyzing 8 variables against the 6 mission variables, appreciating cultural effects, collaboration, interaction, visualizing how to change to the desired state, appreciating contextual complexity, critical thinking, thinking about unintended consequences, using multiple perspectives and varied sources of knowledge, and understanding is a part of design: critical thinking, understanding the operational environment, solving the right problem, adatping, and achieving desired goals.

2012	Change
- Thinking requires envisioning an approach to achieve the desired end state. - Planning is the art and science of solving for how to get to a desired future. - Normally military activities benefit from deterministic approaches. - The more complex and unfamiliar a situation is, the more important planning is to solve problems. - To get to the desired end state, commanders and staffs use operational art, which is a set of intellectual tools: end state, center of gravity, decisive points, lines of operation and lines of effort, operational reach, basing, tempo, phasing and transitions, culmination, and risk. - Problems are obstacles to a desired objective and framing the problem is understanding those obstacles.	From 2010 to 2012, thinking expanded to include everything in 2005 and 2010 as well as using art and science to solve the problem of how to get to a desired future and emphasizing planning as important for complex situations. In addition, operational art is mentioned as a set of intellectual tools that in 2005 were labeled elements of design. Problems are defined as those obstacles to getting to the desired objective.
- Visualization requires understanding the current conditions, a desired future set of conditions, and how to get to the desired future. - Situational understanding is required for success and that is the product of applying analysis and judgment to information to determine relationships between operational and mission variables to facilitate decisionmaking. - As the situation evolves, understanding will be reduced, and thus one must work at maintain situational understanding. - Situational understanding comes from analyzing the 8 operational variables (PMESII-PT) against the 6 mission variables (METT-TC). - How culture will affect operations is part of situational understanding. - Planning is based on imperfect knowledge and assumptions about the future, nonetheless the understanding and learning during planning results in improved situational understanding that facilitates decisoinmaking.	From 2010 to 2012, how to understand changed from a large set of activities that included applying analysis to determine variable relationships and pattern recognition, reductive analysis, collaboration, visualizing how to change to the desired state, and using design to a smaller set of activities which kept applying variable analysis, analyzing operational against mission variables, and cultural effects, and introduced understanding as situational and tied to the process of planning.

2019	Changes
- Thinking about military activities requires imagining them as competitive activities within a range between peace and war. - Thinking is visualizing an operational approach to get from the current situation to a set of desired future conditions and accomplish the mission. - The thinking approach by commanders and staffs to get to the preferred end is operational art, the intellectual tools of: end state, centers of gravity, decisive points, lines of operation and effort, tempo, phasing and transitions, operational reach, culmination, basing, and risk.	From 2012 to 2019, there was a major change in that thiking about war became an exercise in thinking between the continuum of peace and war, labeled competition. Thinking how to get from the current situation to a desired future was kept, and the the link between the preferred ends and using operational art- the intellectual tools labeled elements of design in 2005 was as well.
- Understanding context (conditions, circumstances, and influences) requires understanding problems. - Analysis and judgment of information to determine relationships among operational and mission variables leads to understanding. - Because there will be periods of reduced understanding, staffs must function in uncertain environments. - Creating shared understanding is a principle, and comes from sharing with unified action partners. - Higher headquarters ensure subordinates understand the bigger picture and subordinates ensure that higher HQs understand their particular situation. - 8 Operational (PMESII-PT) variables and mission variables (undefined) help build situational understanding. - The understanding and learning during planning has great value- planning cannot predict the future. - Understanding the complex nature of war requires reductive (analysis) thinking and thinking about how the parts of a situation act as a whole (synthesis).	From 2012 to 2019, how to understand changed little, all of the 2012 points were kept with the addition of defining context as conditions, circumstances, and influences, linking understanding of context to understanding problems, and creating shared understanding between higher and lower headquarters.

Appendix B 1: 3rd and 4th two rows analysis



- MDMP [Military Decision Making Process] is an adaptation of the Army's problem solving method to assist in developing estimates and a plan. - MDMP is a detailed, deliberate, sequential process. - MDMP can be used even in time-constrained environments when mission variables have not changed. - MDMP explores enemy and friendly COAs, analyzes and compare friendly and enemy capabilities, and assist the commander in decisonmaking. - MDMP has seven steps: receive mission, analyze mission, develop, analyze, and compare COAs, approve a COA, produce an order.	- Decision making is picking the best course of action to accomplish the mission. Some decisions are deliberate, using the MDMP. - The Army's analytical approach to decision making is problem solving and MDMP. - Analytic decision making is good when time is available, but during execution it is not. - When time does not allow analytical decision making, one must use intuitive decision making, which is experience-based pattern recognition. - Intuitive decision making does not work well for inexperienced leaders, complex situations, or competing COAs. - Intuitive decisions are often the result of MDMP processes. - Time-constrained MDMP is based on intuition. - Intuition sets boundaries for analysis. - Time available is the normal determinant on whether to use intuition or the formal process. - MDMP is an established and proven analytical process adapted from Army problem solving. - MDMP is detailed, deliberate, and sequential and used to analyze friendly and enemy COAs. - Intuitive or time-constrained decision making uses MDMP as a foundation. - MDMP is time-consuming.
Identify current and future problems that will affect mission accomplishment: continuous major staff function.	- Planning is the way to solve problems. To solve problems, commanders envision a desired outcome, lay out effective ways to achieve it, and communicates vision, intent, decisions, and results expected. - Detailed planning is essential when the problem is complicated. - Mastering the planning process is important, but creative thinking and sound judgment to solve tactical problems is key. - Anticipatory planning that involves projecting thoughts forward in time and space, influencing events before they occur is key. - The more complex a situation, the more extensive the planning required. - Two ways for Army units to solve problems: Troop Leading Procedures (TLPs) and MDMP. - Army problem solving is a form of decision making: define the problem, develop possible solutions, arrive at best solution, implement. - The science of problem solving involves quantitative analytical tools that attempt to establish a correlation between two variables, which will then make it possible to predict the effects on the dependent variables when changes occur in the value of the independent variable. - Problem solving is understanding situations, finding causes, arriving at conclusions, making good judgments, and learning from experience- and requires critical reasoning. - Imagination is required for unfamiliar problems. Leaders use their intuition, experience, and knowledge. - Creativity is key to solve problems and groups are often more creative than individuals, however groups often suffer from groupthink. - Well-structured problems mean the problem is well-defined, analysis is easy, and there is a correct, verifiable answer. - Most problems the Army will face are medium-structured problems: some information is available, problems partially defined, require some creativity, involve making assumptions. - Ill-structured problems have no clear formulation of the problem, not all information available, complex- many variables, difficult to analyze, no prediction possible, require multiple solutions applied concurrently. - Problem solvers in ill-structured problem situations might have to reduce the complex problems into smaller problems.

From the Nineties to 2005, how to best make decisions changed from the Military Decision Making Process (MDMP)- a rational decision making process that was an adaptation of the Army's problem solving method to problem solving and MDMP. Intuitive decision making was also added when time is short, which requires pattern recognition, experience, or simple situations, but MDMP is still the foundation for that kind of decison making.	- Decisionmaking comes from an individual's intuition or a more deliberate approach. Several decisionmaking methodologies exist: design, rapid decisionmaking and synchronization process, MDMP, and Troop Leading Procedures (TLP). - Design helps commanders anticipate events, visualizing consequences of different approaches to determine whether they will achieve the desired end state. - A thorough design effort reduces complexity and is essential to anticipating likely enemy reactions. - Desired future conditions form the basis for decisions that ensure progress consistently toward the desired end state.	From 2005 to 2010, MDMP and intuition were kept, but design, rapid decision making, and Troop Leading Procedures (TLPs) were added on as different methodologies for decision making. Design is mentioned as reducing complexity, essential to anticipating enemy reactions, and helping determine whether commanders will achieve the desired end state.
Problem solving changed from the Nineties to 2005 in a large way, from being tied to figuring out how to accomplish missions to much more, including identifying planning as the way to solve problems, envisioning a desired outcome and how to get to that outcome, using creative thinking and sound judgment, using procedures or the military decision making process, defining the problem, using quantitative analytical tools to identify correlations between variables, predicting effects on dependent variables when independent one changes, using imagination, intuition, experience, and knowledge. Problem solving is defined in 2005 as a form of decision making and, further, problems are categorized as either well-structured, medium structured, or ill-structured, with different methods for each.	- Planning helps solve problems, the operations process- the art and science of understanding, visualizing, describing, directing, leading, and assessing forces to accomplish missions- is key to planning. - For simple problems, leaders do not have to engage in detailed planning. When a problem is a set of interrelated issues, planning is critical. Planning is critical in complex situations. - Well-structured problems have verifiable solutions, like math and logistics problems. - Medium-structured problems are more complex and are more contextual. Army problem solving, the MDMP, and TLPs are methods for medium-structured problems. - Ill-structured problems are the most interactive and are complex, nonlinear, and dynamic. The end state is unclear or might not be achievable and the problem definition is debatable. In this case a more detailed planning process using MDMP is necessary. - Design can assist in complex, ill-structured problems what the problem is. The situation must be analyzed using the operational variables to frame and understand the problem. - In more complex situations, the more smaller units will have to use design to deal with problems. - Commanders must lead adaptive and innovate efforts to identify and solve complex problems, reframing how to view the situation as necessary.	From 2005 to 2010, problem solving stayed relatively the same, with planning being the method to solve problems and the structure of the problem (well, medium, and ill) determining the method to apply. Design is introduced as a way to deal with complex situations and related problems.

The MDMP is an iterative planning methodology to understand the situation, develop a COA, and produce a plan that best accomplishes the mission.	From 2010 to 2012, MDMP is the only methodlogy mentioend for decision making.
- Solving problems requires planning. The Army's framework for planning is the operations process: understand, visualize, and describe their environment, make decisions, and direct, lead, and assess operations. - Understanding culture helps solve problems. - Understanding the culture of unified action partners is key to decision making, and, thus, solving problems. - Critical and creative thinking is key to problem solving. - Planning is only part of problem solving, it also includes implementing the solution, learning, and modifying as required. - Depending on the situation, Army commanders conduct Army design methodology before or with MDMP. In an unfamiliar problem, ADM often happens before MDMP.	From 2010 to 2012, problem solving did not change much, solving problems still required planning, but it was more explicitly tied to the operations process of understanding, visualizing, and describing the environment, making decisions, and directing, leading and assessing operations. Understanding culture was added as well as learning. Design was changed to the "Army design methodology" and is placed "often before the decision making process."

- Decision making depends on the type of operations: large-scale combat requires rapid decisions, counterinsurgency are generally more methodical and deliberate. - Decisions made during execution are either execution or adjustment decisions. - The decision support tool template, decision support matrix, execution matrix, and execution checklist assist the commander and staff with decisions during execution.	From 2012 to 2019, decision making depends on the type of operation: large-scale vs counterinsurgency are juxtaposed as requiring rapid decisions and methodical processes respectively. Templates, matrices, and checklists are specifically recommended to support decisions during execution.
- The Army's framework to problem solve is the operations process- planning, preparing, executing, and continuously assessing the operation. Commanders use the operations process to understand, visualize the end state and how to get there, make decisions, direct, lead, and assess operations. - Upon receiving a mission, commanders filter information through the operational and mission variables (METT-TC) to analyze the situation. - Critical thinking is reflective thought about what to believe or do in response to the situation. By thinking critically, individuals form judgments about information being true or false. It involves questioning information, assumptions, conclusions, and points of view. This helps identify causes of problems. - Creative thinking examines problems from a new perspective and develop innovative solutions. - With unfamiliar problems, leaders must apply creative thinking to question the status quo and visualize a better future. - Successful planning/problem solving requires the integration of conceptual and detailed thinking using several methods to do so: ADM, MDMP, TLPs, RDMSP, Army Problem Solving. - All Army methods are for planning operations, but Army Problem Solving is a way to identify and solve a variety of problems. It is similar to MDMP: an analytical approach to define a problem, develop solutions, arrive at the best solution, develop a plan, and implement the plan to solve the problem.	From 2012 to 2019, problem solving changed somewhat in its framing of the operations process. No longer was the framework understand, visualize, and describe the environment to make decisions, it was planning, preparing, executing and assessing. The purpose of the operations process was to understand, visualize the end state and how to get there, make decisions, direct, lead, and assess operations. So, the environment (situation) was the key and the purpose was operations (action). Critical thinking was defined in 2019 and that definition was reflective thinking, which identified causes of problems. Additionally, problem solving was said to come from integrating conceptual and detailed thinking using several methods: ADM, MDMP, TLPs, RDMSP, and Army Problem Solving. All these different methods were described as useful for planning operations, but Army Problem Solving was specifically about problems, although it was noted to be similar to the military decision making process: define a problem, develop solutions, arrive at best solution, develop a plan, and implement the plan to solve the problem.

Appendix B2: first two rows raw data

Raw Data	
1993/97	90s cont.
- To be valid, conclusions must be relevant to the topic, objective, and supported by the data, and they must be arrived at through a logical thought process.	
Understanding the total environment and its potential impact on combat is essential to successful planning and execution. Battlefield visualization is the process whereby the commander develops a clear understanding of his current state with relation to the enemy and environment, envisions a desired end state, and then visualizes the sequence of activities that will move his force from its current state to the end state. In short, it provides the key to where and how the commander can best lead and motivate soldiers, and see the battlefield, his own forces, the enemy, and the end state. It is critical to mission accomplishment that commanders have the ability to visualize the battlefield.	

2005

Full spectrum operations demand a flexible approach to planning that adapts planning methods to each situation. An effective planning process structures the thinking of commanders and staffs while supporting their insight, creativity, and initiative.

Commander's visualization is the mental process of achieving a clear understanding of the force's current state with relation to the enemy and environment (situational understanding), and developing a desired end state that represents mission accomplishment and the key tasks that move the force from its current state to the end state (commander's intent) (FM 6-0). Commander's visualization (see Figure 1-2) is a way of mentally viewing the dynamic relationship among Army forces, enemy forces, and the environment at the present while conducting operations against an opposing force over time.

Critical reasoning is the purposeful, self-regulating judgment that includes interpretation, analysis, evaluation, and inference that leaders use to solve problems. It is an essential leader skill and is a central aspect of decision making. The word "critical" in this context does not mean finding fault. Critical reasoning means getting past the surface of the problem and thinking about the problem in depth. It means looking at a problem from several points of view instead of being satisfied with the first answer that comes to mind. Army leaders need this ability because many of the choices they face are complex and offer no easy solution.

Commander's visualization is the mental process of achieving a clear understanding of the force's current state with relation to the enemy and environment (situational understanding), and developing a desired end state that represents mission accomplishment and the key tasks that move the force from its current state to the end state (commanders intent) (FM 6-0). Commander's visualization begins in planning and continues throughout the operations process until the force accomplishes the mission.

This analysis contributes to developing situational understanding and providing a common understanding of the nature of the problem among the commander, staff, and subordinates. In turn, commanders can better visualize and describe an operation to the staff and subordinate commanders.

A thorough mission analysis is crucial to planning. Both the process and products of mission analysis help commanders refine their situational understanding and determine their mission. Accurate situational understanding enables them to better visualize the operation.

2005 cont.

The elements of operational design are tools that help Commanders visualize operations and conceptually link ends, ways, and means. While the elements of operational design give commanders a framework to think about operations.

- End state and military conditions
- Center of gravity
- Decisive points and objectives
- Lines of operation
- Culminating point
- Operational reach, approach, and pauses
- Simultaneous and sequential
- Linear and nonlinear operations
- Tempo

2010 cont.

Design is a methodology for applying critical and creative thinking to understand, visualize, and describe complex, ill-structured problems and develop approaches to solve them. Critical thinking captures the reflective and continuous learning essential to design. Creative thinking involves thinking in new, innovative ways while capitalizing on imagination, insight, and novel ideas. Design is a way of organizing the activities of battle command within an organization. Design occurs throughout the operations process before and during detailed planning, through preparation, and during execution and assessment.

If the link between strategy and tactics is clear, the likelihood that tactical actions will translate into strategic success increases significantly. For complex, ill-structured problems, integrating and synchronizing operations to link sequences of tactical actions to achieve a strategic aim may prove elusive. Through design, commanders employ operational art to cement the link between strategic objectives and tactical action ensuring that all tactical actions will produce conditions that ultimately define the desired end state. As understanding of the operational environment and problem improves, design adapts to strengthen the link between strategy and tactics, promoting operational coherence, unity of effort, and strategic success.

As learned in recent conflicts, challenges facing the commander in operations often can be understood only in the context of other factors influencing the population. These other factors often include, but are not limited to, economic development, governance, information, tribal influence, religion, history, and culture. Full spectrum operations conducted among the population are effective only when commanders understand the issues in the context of the complex issues facing the population. Understanding context and then deciding how, if, and when to act is both a product of design and integral to the art of command.

Today's operational environment presents situations so complex that understanding them—let alone attempting to change them—is beyond the ability of a single individual. Moreover, significant risk occurs when assuming that commanders in the same campaign understand an implicit design concept or that their design concepts mutually support each other. The risks multiply, especially when a problem involves multiple units, Services, multinational forces, or other instruments of national power. Commanders mitigate these risks with collaboration and by applying the design fundamentals:
- Apply critical thinking.
- Understand the operational environment.
- Solve the right problem.
- Adapt to dynamic conditions.
- Achieve the designated goals.

Developing a thorough understanding of the operational environment is a continuous process. Even though this understanding will never be perfect, attempting to comprehend its complex nature helps identify unintended consequences that may undermine well-intentioned efforts. Deep understanding reveals the dynamic nature of the human interactions and the importance of identifying contributing factors. Leaders can gain this understanding by capitalizing on multiple perspectives and varied sources of knowledge. Intelligence knowledge generated as part of the intelligence process contributes to contextual understanding of the operational environment. (See FM 2-0.) Design encourages the commander and staff to seek and address complexity before attempting to impose simplicity.

2012 cont.

Conceptual planning is directly associated with operational art—the cognitive approach by commanders and staffs—supported by their skill, knowledge, experience, creativity, and judgment—to develop strategies, campaigns, and operations to organize and employ military forces by integrating ends, ways, and means (JP 3-0). Operational art is a thought process that guides conceptual and detailed planning to produce executable plans and orders.

In applying operational art, commanders and their staffs use a set of intellectual tools to help them communicate a common vision of the operational environment as well as visualizing and describing the operational approach. Collectively, this set of tools is known as the elements of operational art.

Elements of operational art
- End state and conditions
- Center of gravity
- Decisive points
- Lines of operations and lines of effort
- Operational reach
- Basing
- Tempo
- Phasing and transitions
- Culmination
- Risk

2019

The range of military operations is a fundamental construct that helps relate military activities and operations in scope and purpose within a backdrop of the competition continuum. The potential range of military operations extends from military engagement, security cooperation, and deterrence in periods of competition to large-scale combat operations in periods of war. Whether fighting terrorists as part of a limited contingency operation or defeating a peer threat in large-scale combat, the nature of operations is constant.

As commanders build understanding about their OEs, they start to visualize solutions to solve the problems they identify. Collectively, this is known as commander's visualization—the mental process of developing situational understanding, determining a desired end state, and envisioning an operational approach by which the force will achieve that end state (ADP 6-0).

In building their visualization, commanders first seek to understand those conditions that represent the current situation. Next, commanders envision a set of desired future conditions that represents the operation's end state. Commanders complete their visualization by conceptualizing an operational\ approach—a broad description of the mission, operational concepts, tasks, and actions required to accomplish the mission (JP 5-0). Figure 1-3 depicts activities associated with developing the commander's visualization.

OPERATIONAL ART
Operational art is the cognitive approach by commanders and staffs—supported by their skill, knowledge, experience, creativity, and judgment—to develop strategies, campaigns, and operations to organize and employ military forces by integrating ends, ways, and means (JP 3-0).

Understand
1-32. Understanding an OE and associated problems is fundamental to establishing a situation's context and visualizing operations. An operational environment is a composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander

BUILD AND MAINTAIN SITUATIONAL UNDERSTANDING
1-50. Success in operations demands timely and effective decisions based on applying judgment to available information and knowledge. As such, commanders and staffs seek to build and maintain situational understanding throughout the operations process. Situational understanding is the product of applying analysis and judgment to relevant information to determine the relationships among the operational and mission variables (ADP 6-0). Commanders and staffs continually strive to maintain their situational understanding and work through periods of reduced understanding as a situation evolves. Effective commanders accept that uncertainty can never be eliminated and train their staffs and subordinates to function in uncertain environments.

As commanders build their situational understanding, they share their understanding across the forces and with unified action partners. Creating shared understanding is a principle of mission command and requires communication and information sharing from higher to lower and lower to higher. Higher headquarters ensure subordinates understand the larger situation to include the operation's end state, purpose, and objectives. Staffs from lower echelons share their understanding of their particular situation and provide feedback to the higher headquarters on the operation's progress. Communication and information sharing with adjacent units and unified action partners is also multi-directional.

2019 cont.

ELEMENTS OF OPERATIONAL ART

In applying operational art, commanders and their staffs use a set of intellectual tools known as the elements of operational art. These tools help commanders understand, visualize, and describe operations and help to formulate their commander's intent and planning guidance to include the operational approach. Commanders may use these tools in any operation; however, their application is broadest in the context of long-term operations.

Not all elements of operational art apply at all levels of warfare. A battalion commander may be concerned about the tempo of an upcoming operation but is probably not concerned with an enemy's center of gravity. A corps commander may consider all elements of operational art in developing a plan. The application of specific elements of operational art depends on the situation and echelon.

Elements of operational art
x End state and conditions
x Centers of gravity
x Decisive points
x Lines of operations and lines of effort
x Tempo
x Phasing and transitions
x Operational reach
x Culmination
x Basing

Operational and Mission Variables

1-52. Operational and mission variables are categories of relevant information commanders and staffs use to help build their situational understanding. Commanders and staffs use the eight interrelated operational variables—political, military, economic, social, information, infrastructure, physical environment, and time (known as PMESII-PT)—to help understand an OE. Operational variables are those aspects of an OE, both military and nonmilitary, that may differ from one operational area to another and affect operations.

THE FUNCTIONS OF PLANNING

2-14. Imperfect knowledge and assumptions about the future are inherent in all planning. Planning cannot predict with precision how enemies will react or how civilians will respond during operations. Nonetheless, the understanding and learning that occurs during planning have great value.

Understanding the situation requires both analysis and synthesis. Analysis is the process of studying a situation by successively dividing it into parts and addressing each part in turn. For example, the initial stages of mission analysis and IPB rely heavily on analysis. Understanding the parts of a situation is necessary; however, understanding the parts alone does not provide an appreciation of the relationships among the parts. That appreciation requires synthesis. Synthesis is thinking about how the parts of a situation work together as a whole rather than in isolation. As part of planning, the commander and staff synthesize results of mission analysis to make sense of the situation before developing COAs.

Appendix B2: 3rd and 4th rows raw data

The MDMP is an adaptation of the Army's analytical approach to problem solving. The MDMP is a tool that assists the commander and staff in developing estimates and a plan. The full MDMP is a detailed, deliberate, sequential, and time-consuming process used when adequate planning time and sufficient staff support are available to thoroughly examine numerous friendly and enemy courses of action (COAs). This typically occurs when developing the commander's estimate and operation plans (OPLANs), when planning for an entirely new mission, during extended operations, and during staff training designed specifically to teach the MDMP. The MDMP is the foundation on which planning in a time-constrained environment is based. The products created during the full MDMP can and should be used during subsequent planning sessions when time may not be available for a thorough relook, but where existing METT-T factors have not changed substantially. The commander uses the entire staff during the MDMP to explore the full range of probable and likely enemy and friendly COAs, and to analyze and compare his own organization's capabilities with the enemy's. This staff effort has one objective—to collectively integrate information with sound doctrine and technical competence to assist the commander in his decisions, leading ultimately to effective plans.
The staff must continually identify current and future problems or issues that will affect mission accomplishment.

The military decision-making process has seven steps (Figure 5-2). Each step of the process begins with
certain input that builds upon the previous steps. Each step, in turn, has its own output that drives subsequent steps.

Receipt of Mission.
Mission Analysis.
Course of Action Development.
Course of Action Analysis.
Course of Action Comparison.
Course of Action Approval.
Orders Production.
Figure 5-2. The steps in the MDMP

Decision making is selecting a course of action as the one most favorable to accomplish the mission (FM 6-0). Planning is a form of decision making. However, not all decisions require the same level of planning. Commanders make hundreds of decisions during operations in an environment of great uncertainty, unpredictability, and constant change. Some decisions are deliberate, using the MDMP and a complete staff to create a fully developed and written order.

The Army's analytical approach to decision making is Army problem solving (see Chapter 2) and the MDMP.

The analytic approach to decision making serves well when time is available to analyze all facets affecting the problem and its solution. However, analytic decision making consumes time and does not work well in all situations—especially during execution, where circumstances often require immediate decisions.

Intuitive decision making is the act of reaching a conclusion that emphasizes pattern recognition based on knowledge, judgment, experience, education, intelligence, boldness, perception, and character. This approach focuses on assessment of the situation vice comparison of multiple options.

Intuitive decision making is faster than analytic decision making in that it involves making decisions based on an assessment of the situation rather than a comparison of multiple courses of action (COAs). It relies on the experienced leader's ability to recognize the key elements and implications of a particular problem or situation, reject the impractical, and select an adequate (rather than the optimal) COA.

Intuitive decision making, however, does not work well when the situation includes inexperienced leaders, complex or unfamiliar situations, or competing CAs.

The two approaches to decision making are rarely mutually exclusive. Commanders often base an intuitive decision during execution on the situational understanding and products generated as part of a preceding MDMP.

Leaders who understand the dynamic relationship that time and uncertainty have on enemy and friendly forces are better equipped to develop effective plans.

Planning is the means by which the commander envisions a desired outcome, lays out effective ways of achieving it, and communicates to his subordinates his vision, intent, and decisions, focusing on the results he expects to achieve (FM 3-0).

Commanders, assisted by their staff, use the activities of visualizing the battlespace, describing the visualization to subordinates, directing action in terms of the battlefield operating systems (BOS) to achieve results, and leading the unit to mission accomplishment

Planning and plans accomplish several key functions. When the problem is simple, detailed planning may not be necessary. When the problem is complicated, planning is essential. Planning, however, is not an end in itself. Using a prescribed planning process does not guarantee an organization will improve its situation. Mastering the procedural aspects of planning is important; however, creative thinking and applying sound judgment to solve tactical problems is the foundation of effective planning. Planning takes on value when performed properly using methods appropriate to the conditions and activities being planned. Accomplished properly, planning greatly improves performance.

Anticipatory planning is essential to seizing and retaining the initiative. It involves projecting thoughts forward in time and space to determine how to influence events before they occur, rather than responding to events dictated by others. To seize the initiative, commanders must anticipate events and act purposefully and effectively before enemies do starting with the initial commander's visualization.

Some situations require extensive planning, some very little. In general, the more complex a situation, the more important and involved the planning effort.

Effective planning requires dedication, study, and practice. Planners must be technically and tactically competent and understand basic planning concepts.

This chapter describes a standard, systematic approach for solving problems. It discusses critical reasoning skills and problem solving techniques in a group setting. Army problem solving is applicable to all Army activities, not just operations. It establishes the base logic for the Army's two tactical planning processes: troop leading procedures and the military decision making process. Chapter 2 assumes more than one person is working on the problem; however, the techniques apply to individuals as well. Formats for staff studies and decision papers, products of Army problem solving, are located in Appendix A. Decision briefings are discussed in Appendix B.

Army problem solving is a form of decision making. It is a systematic approach to defining a problem, developing possible solutions to solve the problem, arriving at the best solution, and implementing it.

When commanders direct the MDMP in a time-constrained environment, many of the techniques, such as choosing only one COA, depend on intuitive decisions.

Intuitive decision making helps set boundaries for the analysis and fills in the gaps that remain.

Each method of decision making has strengths and weaknesses. Selecting one over the other depends primarily on the experience of the commander and staff, and how much time and information are available. The analytic approach is more appropriate when enough time and information are available to choose among different COAs, or when the staff is inexperienced. The majority of tactical decisions made during execution, when time is short and information is lacking or doubtful, are intuitive.

Military Decision Making Process
The military decision making process (MDMP) is an established and proven analytical planning process. It is an adaptation of Army problem solving as discussed in Chapter 2. This chapter describes the steps of the MDMP and explains how commanders, staffs, and subordinate headquarters interact during planning. Additionally, this chapter offers ways to shorten the process when planning in a time-constrained environment.

The MDMP can be as detailed as time, resources, experience, and situation permit. The MDMP is detailed, deliberate, sequential, and time- consuming. All steps and sub-steps are used when enough planning time and staff support are available to thoroughly examine two or more friendly and enemy course of actions (COAs). This typically occurs when developing operation plans (OPLANs), when planning for an entirely new mission, or during training designed to teach the MDMP.

The full MDMP provides the foundation on which planning in a time- constrained environment is based. Before a staff can effectively abbreviate the MDMP, it must master the steps of the full MDMP.

The disadvantage of using the full MDMP is that it is time-consuming. The longer the higher headquarters spends planning, the less time for subordinates to plan, prepare, and execute operations. Additionally, more time devoted to planning versus preparation and execution can allow enemies to improve their posture. This may lead to yielding the initiative, resulting in a loss of momentum or lost opportunities for the friendly force.

Not all problems require lengthy analysis to solve. For simple problems, leaders often make decisions quickly—sometimes on the spot. However, for complicated problems involving a variety of factors, a systematic problem solving approach is essential. The amount of analysis required to effectively solve a problem depends on the problem's complexity, the leader's experience, and amount of time available.

The science of problem solving involves the use of various quantitative analytical tools available to the staff. Quantitative analysis seeks to define and evaluate relevant factors or variables that can be measured or counted. Quantitative analysis can be useful for identifying trends in data sets, and sharp departures from expected norms or measurements. The results are often organized and displayed in the form of charts and graphs. Quantitative analysis requires measuring or counting the values of relevant variables, and calculating changes in the observed effects on the problem or variable of interest. When a correlation can be established between two variables, it is possible to predict the effects on the dependent variable when changes occur in the value of the independent variable. For example, calculating the correlation of forces in a tactical problem is accomplished through a quantitative analysis process. If the outcome is unfavorable or puts the operation at risk, commanders can allocate more forces and observe the effect on the correlation of forces ratio.

Army leaders are faced with a variety of problems, each requiring its own solution. A problem may be broad and conceptual, such as how to improve unit readiness; or more refined, such as determining the best allocation of a critical resource. Critical reasoning (thinking) is key to understanding situations, finding causes, arriving at justifiable conclusions, making good judgments, and learning from experience—in short, problem solving.

Sometimes leaders face problems that they are not familiar with or an old problem requires a new solution. In this instance, leaders must apply imagination, a departure from the old way of doing things. Army leaders prevent complacency by finding ways to challenge subordinates with new approaches and ideas. Leaders rely on their intuition, experience, and knowledge. They ask for input from subordinates to reinforce team building by making everybody responsible for, and a shareholder in, the accomplishment of difficult tasks.

Creativity by Army leaders is key to developing effective solutions to problems. Often, groups can be far more creative than individuals. While working in a group is advantageous, group problem solving has potential pitfalls. One of these pitfalls is "groupthink."
Groupthink refers to a mode of thinking that people engage in when they are deeply involved in a cohesive group. It occurs when members, striving for agreement, override their motivation to realistically evaluate alternative courses of action. The group makes a collective decision and feels good about it because all members favor the same decision. In the interest of unity and harmony, there is no debate or challenge to the selected solution.

N/A

Medium-structured problems are more interactively complex than well-structured problems. For example, a field manual describes how a battalion task force conducts a defense, but it offers no single solution that applies to all circumstances. Leaders can agree on the problem ("how best to conduct a defense"), appropriate tasks, and the end state for the operation. However, they may disagree about how to apply the doctrinal principles to a specific piece of terrain against a specific enemy. Furthermore, a defense can succeed against one enemy yet fail against another under precisely the same circumstances. Success and failure may differ as a function of interactive complexity rather than a structure or technical difference between the two enemy forces. Success during execution requires not only learning to perfect a technique but also adjusting the solution based on changing conditions. Army problem solving, the military decisionmaking process (MDMP) (see appendix B), and troop leading procedures (TLP) (see appendix C) are methods to help leaders understand and develop solutions for medium-structured problems.

Ill-structured problems are the most interactive. They are also complex, nonlinear, and dynamic— and therefore the most challenging to solve. Unlike well- or medium-structured problems, leaders disagree about how to solve ill-structured problems, what the end state should be, and whether the desired end state is even achievable. At the root of this lack of consensus is the difficulty in agreeing on what is the problem. Unlike medium-structured problems, there is no clear action to take because the nature of the problem itself is not clear. This is often the case in operations involving multiple military (joint and multinational) and civilian organizations over extended periods. Leaders use design to help them understand complex, ill-structured problems and to develop a broad operational approach to manage or solve them. (See chapter 3.) Based on this understanding and operational approach, Army leaders continue more detailed planning using the MDMP to develop a fully synchronized plan or order that serves as the practical scheme for solving the problem.

Persistent conflict presents a broad array of complex, ill-structured problems best solved by applying design. Design offers a model for innovative and adaptive problem framing that provides leaders with the cognitive tools to understand a problem and appreciate its complexities before seeking to solve it. This understanding is fundamental to design. Without thoroughly understanding the nature of the problem, commanders cannot establish the situation's context or devise approaches to effect change in the operational environment. Analyzing the situation and the operational variables provide the critical information necessary to understand and frame these problems.

The practice of design is not exclusive to a particular level of command. Design can apply to all levels, depending on the context and circumstances. However, given the complexity of the operational environment, the need for design at lower echelons often increases as brigades and battalions contend with the challenges of shaping environments and conducting operations over extended periods.

Design requires the commander to lead adaptive, innovative efforts to leverage collaboration and dialog to identify and solve complex, ill-structured problems. To that end, the commander must lead organizational learning and develop methods to determine if reframing is necessary during the course of an operation. This requires continuous assessment, evaluation, and reflection that challenge understanding of the existing problem and the relevance of actions addressing that problem.

Nothing initially coded. Added this in upon further review of 2019 5-0 (note: I initially coded no data. The reasoning was because in 2019 the language on thinking about decision making was largely taken out, replaced with how to do it vice how to think about it, was conflated with planning and problem solving, or some other term that put it out of the category of thinking about decision making or the epistemological frame of decision making. Upon further review, however, I think the below can be sufficiently analyzed with respect to what the Army implies about how to think about decision making.

The situation and type of operations affects the character of the operations process. For example, planning horizons (a point in time commanders use to focus the organization's planning efforts) and decision cycles are generally shorter in large-scale combat operations than in a counterinsurgency operation. The accelerated tempo, hyperactive chaos, and lethality of large-scale combat operations often require rapid decision making and synchronization to exploit opportunities and reduce risk. During large-scale ground combat, command posts displace often, communications are degraded, and troops receive limited precise information about the enemy. These conditions influence the operations process. Streamlining staff processes and the unit's battle rhythm to those related to the defeat of the enemy is essential.

Counterinsurgency operations are generally more methodical and deliberate. For example, they often have consolidated and stationary headquarters, longer planning horizons, and more time available for information gathering and analysis to inform decision making.

Decisions made during execution are either execution decisions or adjustment decisions.

Several decision support tools assist the commander and staff during execution. Among the most important are the decision support template, decision support matrix, execution matrix, and execution checklist. The current operations integration cell uses these tools, among others, to help control operations and to determine when anticipated decisions are coming up for execution.

The Army's framework for organizing and putting command and control into action is the operations process—the major command and control activities performed during operations: planning,
preparing, executing, and continuously assessing the operation. Commanders use the operations process to drive the conceptual and detailed planning necessary to understand their OE; visualize and describe the operation's end state and operational approach; make and articulate decisions; and direct, lead, and assess operations.

1-53. Upon receipt of a mission, commanders and staffs filter information categorized by the operational variables into relevant information with respect to the mission. They use the mission variables, in combination with the operational variables, to refine their understanding of their situation and to visualize, describe, and direct operations. The mission variables are mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (known as METT-TC). Commanders and staffs view all the mission variables in terms of their impact on mission accomplishment. (See FM 6-0 for a detailed description of the operational and mission variables.)

Critical thinking is purposeful and reflective thought about what to believe or what to do in response to observations, experiences, verbal or written expressions, or arguments. By thinking critically, individuals formulate judgments about whether the information they encounter is true or false, or if it falls somewhere along a scale of plausibility between true or false. Critical thinking involves questioning information, assumptions, conclusions, and points of view to evaluate evidence, develop understanding, and clarify goals. Critical thinking helps commanders and staffs identify causes of problems, arrive at justifiable conclusions, and make good judgments. Critical thinking helps commanders counter their biases and avoid logic errors.

Creative thinking examines problems from a fresh perspective to develop innovative solutions.

N/A

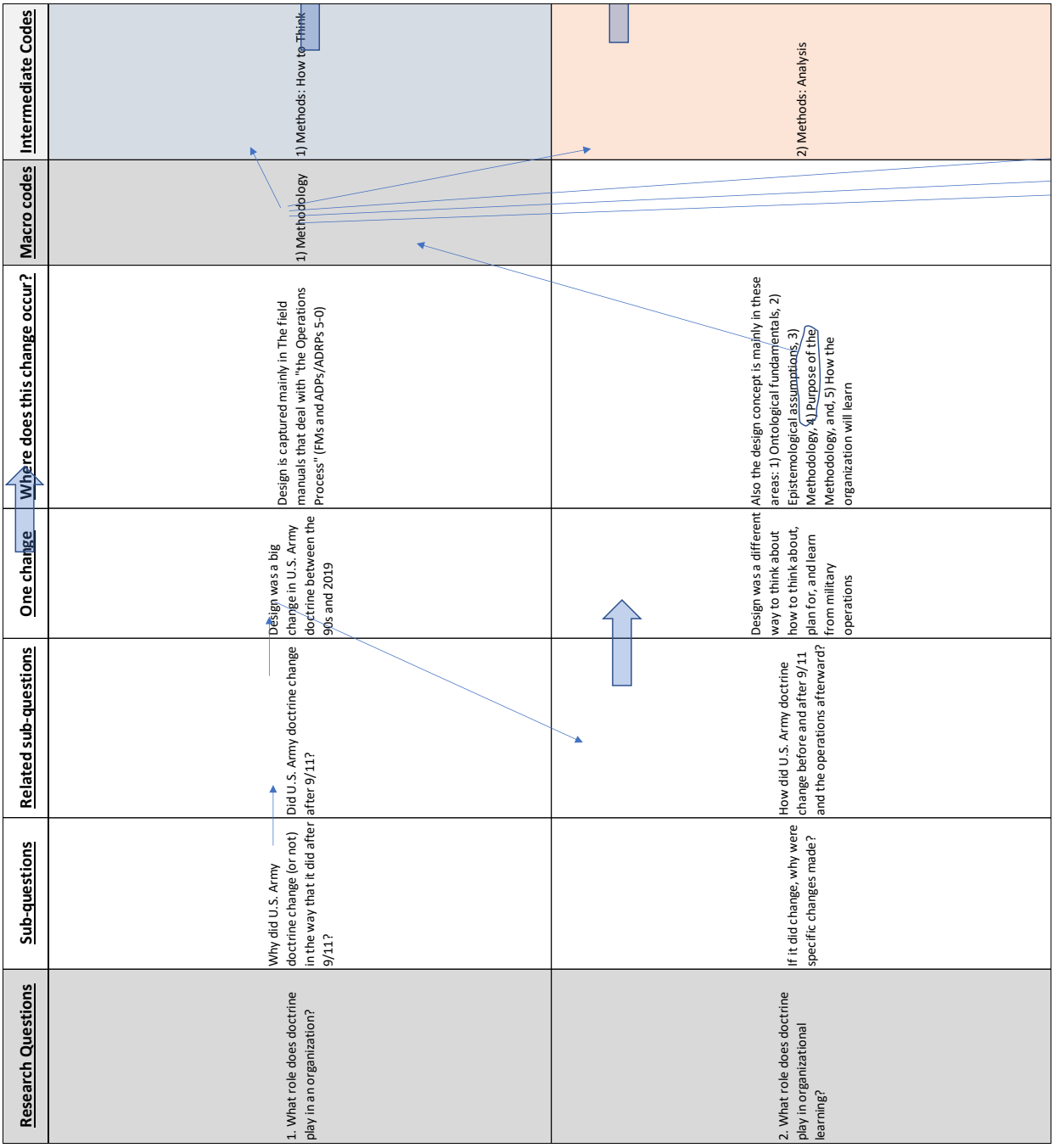
Creative thinking creates new and useful ideas, and reevaluates or combines old ideas to solve problems. Leaders face unfamiliar problems that require new or original approaches to solve them. This requires creativity and a willingness to accept change, newness, and a flexible outlook of new ideas and possibilities.

Breaking old habits of thought, questioning the status quo, visualizing a better future, and devising
responses to new problems require creative thinking. During operations, leaders routinely face unfamiliar problems or old problems under new conditions. Leaders apply creative thinking to gain new insights, novel approaches, fresh perspectives, and new ways of understanding problems and conceiving ways to solve them.

Successful planning requires the integration of both conceptual and detailed thinking. Army leaders employ several methodologies for planning, determining the appropriate mix based on the scope of the problem, time available, and availability of a staff. Planning methodologies include—
z Army design methodology.
z The military decision-making process.
z Troop leading procedures.
z Rapid decision-making and synchronization process.
z Army problem solving.

ARMY PROBLEM SOLVING
2-99. The ability to recognize and effectively solve problems is an essential skill for Army leaders. Where
the previous methodologies are designed for planning operations, Army problem solving is a methodology available for leaders in identifying and solving a variety of problems. Similar in logic to the MDMP, Army problem solving is an analytical approach to defining a problem, developing possible solutions to solve the problem, arriving at the best solution, developing a plan, and implementing that plan to solve the problem.

Appendix C (methods) 1: first two rows analysis



Intermediate Codes	Explanations	Tie-in to Design		Microcodes 1993/97
1) Methods: How to Think	how to think while conducting the methodology	Design was introduced as a methodology to think differently.		Problem-oriented
2) Methods: Analysis	how to analyze the situation for the purpose of planning and decision making	Design offered different ways than traditional ways to analyze the situation.		- Analyze by identifying problems that affect unit using judgement and experience and a systematic approach. - Collect and evaluate facts necessary to solve problems. - Analysis consists of 17 steps and ends with defining the tactical problem and determining solutions.

2005	
- Understand time and uncertainty - Planning is envisioning a desired outcome and how to achieve it. - Visualize the battlespace and direct action using systems - Simple problems don't need plans, complicated ones do. - creative thinking and sound judgment key to solving problems and planning - Proper planning improves performance - Project thoughts forward in time and space to determine how to influence events before they occur rather than responding - The more complex a situation, the more important planning is. - Planners must be technically and tactically competent - A standard, systematic approach for solving problems is applicable to all Army activities, not just operations. - 2 planning processes: Troop Leading Procedures and the military decision making process. - Problem solving is a form of decision making - Problem solving is a systematic approach to defining a problem, developing solutions, picking the best one, and implementing it. - The science of problem solving involves establishing a correlation between two variables so that one can predict the effects on the dependent variable when changes occur to the independent variable. - problem solving is using critical reasoning to do causal analysis and learn from experience. - Leaders rely on intuition, experience, and knowledge as they face new problems and ask input from subordinates. - Group problem solving sometimes suffers from groupthink. - Avoid groupthink by being aware of it and realistically evaluating alternative courses of action. - well-structured problems are the easiest problems to deal with because all information is available and a formula or algorithm makes analysis easy. - Medium-structured problems represent the preponderance of the problems Army leaders face: some information is available and require making assumptions about the future - ill-structured problems have no clear formulation, not all required information is available, multi-variate- thus difficult to analyze - problem solvers must sometimes reduce complexity into smaller problems	90s were short and sweet- how to think about the method was to think of it as problem solving. This changed in 2005 to lists of things to think about, to include: systems thinking, complexity, the concept of ill-structured problems, standardization, and spelling out rational decision making.
'- Staff analysis consists of 17 tasks, commander's do their own analysis to assess staff work and develop visualization.	Analysis went from identifying problems through judgment and experience and a systematic approach to defining the tactical problem to just the 17 tasks of analysis.

2010	
- The central part of the operations process is the art and science of understanding, visualizing, describing, directing, leading, and assessing forces to accomplish missions and commanders are the most important participant. - Commanders visualize an operation - Planning is the process that translates a commander's visualization into specified details - Planning is the art and science of understanding a situation, envisioning a desired future, and how to get to that future. - The more complex that situation, the more important planning is. - Math problems are well-structured, medium problems are not clearly solved - Ill-structured problems are complex, nonlinear, and dynamic, therefore the most challenging to solve. Leaders disagree with what the end state should be for ill-structured problems and what the problem is. Leaders use design to help understand complex, ill-structured problems to manage or solve them. Once design is over, leaders use MDMP to solve the problem. - Complex, ill-structured problems come from persistent conflict - Applying design best solves ill-structured problems - Design allows innovative problem framing and an understanding of the problem. - Analyzing the situation's variables helps understanding - Design can apply to all levels - Design requires collaboration and dialog to identify and solve complex and ill-structured problems - organizational learning must determine if reframing is necessary - Reframing requires reflection to challenge understanding of the problem	2010 kept the ideas of complexity and ill-structured problems, and added the ideas of design, reframing, collaboration and dialog, and tying the steps of understanding, visualizing, describing, directing, leading, and assessing- the operations process- more formally to planning and solving problems.
'- Cultural awareness affects how one perceives a situation. - Understanding culture is key to understanding situations and arrive at decisions. - Some staff conduct analysis as the commander and staff members engage in design. - Analysis must ensure that superiors and subordinates have a common understanding of the purpose and that goals are realistic and feasible. - Design analyzes symptoms, underlying tensions, and root causes of conflict. - Understanding starts with analyzing the context and confirming the desired end state of the higher authority. - To understand, one must clarify the reasons to change existing conditions and assess feasibility of the theory of action. - Apply critical thinking by depicting the current state of the environment and comparing it to the desired state. - To analyze the environment, identify relationships among relevant variables and actors' tendencies and potential interactions and relationships. - Analyze the problem by isolating root causes of conflict- defining the essence of complex, ill-structured problems- and understanding how variables will resist or facilitate transformation. - The problem frame details how tensions, competition, opportunities, and challenges must be addressed to transform the current conditions into the desired conditions. - Use hypotheses and models to identify motivations and agendas. - To understand the problem- analyze tensions- as they are vital to changing the existing conditions, but can also undermine change. - Analyze potential risks of actions and the emergence of unintended consequences through analyzing tensions- capabilities and vulnerabilities of those who oppose the desired end state. - After analyzing hypotheses or models, one might need to reframe- to maintain linkage between actions and desired conditions.	In 2010, analysis became much more than just the 17 steps, culture was important, design, critical thinking, and systems thinking: analyze the environment, i.d. relationships among relebant variables, isolating the root causes of conflict in order to address complexity, framing the problem, and using hypotheses and models to assist in reframing.

2012	
- The operations process is the Army's framework for exercising mission command - The operations process is planning, preparing, executing, and assessing. - Planning is necessary to understand, visualize, and describe the environment, make decisions, and direct, lead, and assess operations. - Understanding culture improves mission accomplishment - Unity of effort comes from understanding the culture and customs of partners - critical and creative thinking are key to the operations process. - Critical and creative thinking begin with a rigorous analysis of friendly and enemy forces - Planning is a part of the operations process and only a part of problem solving. Implementing, learning, and changing are the other parts of problem solving. - The less familiar a problem is, the more the Army Design Methodology is conducted before the decision making process.	In 2012, the Army added "Mission Command" and simplified the operations process to planning, preparing, executing, and assessing. They also added understanding culture. Critical and creative thinking, while not new, was emphazied more as the key to problem solving and that planning was a part of problem solving- that the operations process was how to solve problems, and the other steps of problem solving were: implementing, learning, and changing. Lastly, design was changed to "Army Design Methodology."
'- Analysis includes reflecting on one's own culture, cultures in the area of operations, history, and sensitivity to partner traditions. - Analysis of operational and mission variables must be coupled with critical and creative thinking about challenges and opportunities. - If conditions are not met, commander might reframe, which means revisiting hypotheses and decisions- leading to new problem statement and approach. - Frame the problem by isolating root causes of conflict: tensions and symptoms- and comparing the current state to the desired state and the obstacles to the desired. - Reframing is revisiting hypotheses and decisions and might be done because of a lack of progress, assumptions wrong, or unanticipated outcomes. - Reframing should happen when conditions are not achievable and is key to learning. - Commanders may engage in design- framing the environment and problem- while the rest of the staff conducts the analysis.	In 2012, analysis still included culture, but added one's own culture to how to conduct analysis. Variables were codified to be operational or mission variables. Reframing is explicitly tied to hypothesis testing and modeling, and design is codified as framing the environment and problem.

2019	
- The operations process is the Army's framework for exercising command and control: planning, executing, and continuously assessing. The operations process allows visualization of the environment and end state. - Commanders filter information categorized by operational variables into relevant information. They then use mission variables to understand, visualize, describe, and direct operations. - Critical thinking allows a determination of whether information is true or false and includes questioning assumptions to evaluate evidence and develop understanding and identify causes of problems. - Unfamiliar problems require creative thinking. - Visualizing a better future requires creative thinking. Leaders will routinely face unfamiliar problems and must be creative. - Based on the scope of the problem, planning methodologies include: Army design methodology, rational decision making processes, troop leading procedures, rapid decision making and synchronization process, and Army problem solving. - Army problem solving is similar to rational decision making can help identify and solve a variety of problems and defines the problem, develops solution, arrives at the best solution, develops a plan and implements the plan to solve the problem.	In 2019, much carried over from 2012: the operaitons process was planning, executing, and assessing- although that took out learning and changing. Critical and creative thinking are still key, as is envisioning a future and applying different methodologies depending on the scope of the problem.
'- Analysis tools include operational and mission variables, estimates, collaboration, and liaising. - Reframing is learning and includes revisiting earlier hypotheses and decisions reference the environment, problem, and desired end state.	In 2019, things were simlified as to analysis: operational and mission variables were kept, collaboration and liaising were added, and reframing was the method for learning, the outcome of using analysis coming from hypothesis testing. Lastly, analysis was part of the cycle of environment-problem- and desired end state framing.

Appendix C2: first two rows: raw data

Raw Data	
1993/97	2005
The staff must continually identify current and future problems or issues that will affect mission accomplishment.	Leaders who understand the dynamic relationship that time and uncertainty have on enemy and friendly forces are better equipped to develop effective plans. Planning is the means by which the commander envisions a desired outcome, lays out effective ways of achieving it, and communicates to his subordinates his vision, intent, and decisions, focusing on the results he expects to achieve (FM 3-0). Commanders, assisted by their staff, use the activities of visualizing the battlespace, describing the visualization to subordinates, directing action in terms of the battlefield operating systems (BOS) to achieve results, and leading the unit to mission accomplishment Planning and plans accomplish several key functions. When the problem is simple, detailed planning may not be necessary. When the problem is complicated, planning is essential. Planning, however, is not an end in itself. Using a prescribed planning process does not guarantee an organization will improve its situation. Mastering the procedural aspects of planning is important; however, creative thinking and applying sound judgment to solve tactical problems is the foundation of effective planning. Planning takes on value when performed properly using methods appropriate to the conditions and activities being planned. Accomplished properly, planning greatly improves performance. Anticipatory planning is essential to seizing and retaining the initiative. It involves projecting thoughts forward in time and space to determine how to influence events before they occur, rather than responding to events dictated by others. To seize the initiative, commanders must anticipate events and act purposefully and effectively before enemies do starting with the initial commander's visualization. Some situations require extensive planning, some very little. In general, the more complex a situation, the more important and involved the planning effort. Effective planning requires dedication, study, and practice. Planners must be technically and tactically competent and understand basic planning concepts. This chapter describes a standard, systematic approach for solving problems. It discusses critical reasoning skills and problem solving techniques in a group setting. Army problem solving is applicable to all Army activities, not just operations. It establishes the base logic for the Army's two tactical planning processes: troop leading procedures and the military decision making process. Chapter 2 assumes more than one person is working on the problem; however, the techniques apply to individuals as well. Formats for staff studies and decision papers, products of Army problem solving, are located in Appendix A. Decision briefings are discussed in Appendix B. Army problem solving is a form of decision making. It is a systematic approach to defining a problem, developing possible solutions to solve the problem, arriving at the best solution, and implementing it. Not all problems require lengthy analysis to solve. For simple problems, leaders often make decisions quickly—sometimes on the spot. However, for complicated problems involving a variety of factors, a systematic problem solving approach is essential. The amount of analysis required to effectively solve a problem depends on the problem's complexity, the leader's experience, and amount of time available.
Staff officers routinely analyze matters that affect operations. Essential in an analysis is identifying problems that may affect the staff officer's area of interest or the command as a whole. Judgment and experience are major factors in the staff officer's ability to recognize problems. He should develop a systematic approach, weighing each new item of information in relation to other information at his disposal. Staff research is the collection and evaluation of facts necessary to solve problems or to provide information. Some facts are available in office records while others can be found only by examining many sources. The problem determines the research needed. Only after analyzing the problem and listing the main issues to be considered can the staff officer determine how much and what kind of information he must collect. The extent of research is the staff officer's decision. The staff officer must decide The result of mission analysis is defining the tactical problem and beginning the process of determining feasible solutions. It [mission analysis] consists of 17 steps, not necessarily sequential, and results in the staff formally briefing the commander. (See Figure 5-4.) In addition to the staff 's mission analysis, the commander conducts his own mission analysis so that he has a frame of reference to assess the staff's work.	Mission analysis consists of 17 tasks, not necessarily sequential (see Figure 3-5). In addition to the staff's mission analysis, commanders perform their own mission analysis. This gives them a frame of reference to assess the staff's work and develop their visualization.

2005 (cont.)

The science of problem solving involves the use of various quantitative analytical tools available to the staff. Quantitative analysis seeks to define and evaluate relevant factors or variables that can be measured or counted. Quantitative analysis can be useful for identifying trends in data sets, and sharp departures from expected norms or measurements. The results are often organized and displayed in the form of charts and graphs. Quantitative analysis requires measuring or counting the values of relevant variables, and calculating changes in the observed effects on the problem or variable of interest. When a correlation can be established between two variables, it is possible to predict the effects on the dependent variable when changes occur in the value of the independent variable. For example, calculating the correlation of forces in a tactical problem is accomplished through a quantitative analysis process. If the outcome is unfavorable or puts the operation at risk, commanders can allocate more forces and observe the effect on the correlation of forces ratio.

Army leaders are faced with a variety of problems, each requiring its own solution. A problem may be broad and conceptual, such as how to improve unit readiness; or more refined, such as determining the best allocation of a critical resource. Critical reasoning (thinking) is key to understanding situations, finding causes, arriving at justifiable conclusions, making good judgments, and learning from experience—in short, problem solving.

Sometimes leaders face problems that they are not familiar with or an old problem requires a new solution. In this instance, leaders must apply imagination, a departure from the old way of doing things. Army leaders prevent complacency by finding ways to challenge subordinates with new approaches and ideas. Leaders rely on their intuition, experience, and knowledge. They ask for input from subordinates to reinforce team building by making everybody responsible for, and a shareholder in, the accomplishment of difficult tasks.

Creativity by Army leaders is key to developing effective solutions to problems. Often, groups can be far more creative than individuals. While working in a group is advantageous, group problem solving has potential pitfalls. One of these pitfalls is "groupthink." Groupthink refers to a mode of thinking that people engage in when they are deeply involved in a cohesive group. It occurs when members, striving for agreement, override their motivation to realistically evaluate alternative courses of action. The group makes a collective decision and feels good about it because all members favor the same decision. In the interest of unity and harmony, there is no debate or challenge to the selected solution.

2-18. Being aware of the existence of groupthink is the most important factor in avoiding it.

Well-structured problems are the easiest problems to deal with since—

•All required information is available.

•The problem is well defined.

•A solution technique (formula or algorithm) with few variables is available that makes analysis easy.

• There is a correct, verifiable answer.

Medium-structured problems represent the preponderance of the problems Army leaders face. These types of problems fall between the two extremes of well- and ill-structured problems. In these medium-structured problems, problem solvers may find that—

• Some information is available.

• The problems may be partially defined.

• Such problems may or may not lend themselves to routine solutions.

• The problems require some creative skills to solve.

• The problems normally involve making assumptions about future conditions or impacting current actions on the future.

Ill-structured problems are at the opposite end of the spectrum since—

•No clear formulation of the problem appears possible.

•Not all required information is available.

•They are complex involving many variables, making them difficult to analyze.

• These are normally problems of prediction with no verifiable answer.

• They may require multiple solutions applied concurrently or sequentially. Problem solvers must sometimes reduce complex ill- structured problems into smaller problems.

2010

At the center of the operations process is battle command—the art and science of understanding, visualizing, describing, directing, leading, and assessing forces to accomplish missions. Commanders are the most important participants in the operations process. The staff and subordinate commanders assist commanders in the exercise of battle command during all activities of the operations process.

1-53. As commanders visualize an operation, they describe it to their staffs and subordinates to facilitate shared understanding of the situation, the mission, and commander's intent. Commanders ensure subordinates understand the visualization well enough to begin course of action development and preparation activities. Commanders describe their visualization in their commander's intent and planning guidance. During execution, commanders describe their updated visualization as planning guidance that results in fragmentary orders.

Planning is the process by which commanders (and the staff, if available) translate the commander's visualization into a specific course of action for preparation and execution, focusing on the expected results (FM 3-0). Put another way, planning is the art and science of understanding a situation, envisioning a desired future, and laying out an operational approach to achieve that future. Based on this understanding and operational approach, planning continues with the development of a fully synchronized operation plan or order that arranges potential actions in time, space, and purpose to guide the force during execution.

Throughout operations, Army leaders face various problems, often requiring unique and creative solutions. Planning helps commanders and staffs understand problems and develop solutions. Not all problems require the same level of planning. For simple problems, leaders often identify them and quickly decide on a solution—sometimes on the spot. Planning is critical, however, when a problem is actually a set of interrelated issues, and the solution to each affects the others. For complex situations, planning offers ways to deal with the complete set of problems as a whole. Some situations require extensive planning, some very little. In general, the more complex a situation, the more important and involved the planning effort.

Well-structured problems are easy to identify, required information is available, and methods to solve them are fairly obvious. While often difficult to solve, well-structured problems have verifiable solutions. Problems of mathematics and time and space relationships, as in the case with detailed logistics planning and engineering projects, illustrate well-structured problems.

Medium-structured problems are more interactively complex than well-structured problems. For example, a field manual describes how a battalion task force conducts a defense, but it offers no single solution that applies to all circumstances. Leaders can agree on the problem ("how best to conduct a defense"), appropriate tasks, and the end state for the operation. However, they may disagree about how to apply the doctrinal principles to a specific piece of terrain against a specific enemy. Furthermore, a defense can succeed against one enemy yet fail against another under precisely the same circumstances. Success and failure may differ as a function of interactive complexity rather than a structure or technical difference between the two enemy forces. Success during execution requires not only learning to perfect a technique but also adjusting the solution based on changing conditions. Army problem solving, the military decisionmaking process (MDMP) (see appendix B), and troop leading procedures (TLP) (see appendix C) are methods to help leaders understand and develop solutions for medium-structured problems.

Understanding the culture of a particular society or group within a society can significantly improve the force's ability to accomplish the mission. Leaders are mindful of cultural factors in three contexts:
- Awareness of the cultures within a region that the organization operates.
- Sensitivity to the different backgrounds, traditions, and operational methods of the various military (joint and multinational), civilian (intergovernmental, nongovernmental, and private), and host-nation organizations.
- Awareness of how one's own culture affects how one perceives a situation.

Understanding other cultures applies to all operations, not just those dominated by stability. For example, some enemies consider surrender a dishonor worse than death, whereas others consider surrender an honorable option. Commanders use different tactics with the enemy depending on the culture.

Understanding the culture of joint and multinational forces and civilian organizations within an operational area is crucial to successful operations. Army leaders take the time to learn the customs as well as the doctrine and procedures of their partners. These leaders consider how culture influences how their military and civilian partners understand situations and arrive at decisions.

Commanders may also elect to conduct design in parallel with the MDMP. In this instance, members of the staff conduct mission analysis as the commander and other staff members engage in design activities. Knowledge products—such as results from intelligence preparation of the battlefield and running estimates—help inform the design team about the operational environment. Commanders may direct some staff members to focus their mission analysis on certain areas.

Commanders ensure that superiors and subordinates share a common understanding of the purpose behind intended actions. Initial guidance provided by a higher political or military authority may prove insufficient to create clearly stated, decisive, and attainable objectives in complex situations that involve political, social, economic, and other factors. After commanders conduct a detailed study of the situation, they may conclude that some desired goals are unrealistic or not feasible within the limitations. These limitations stem from the inherent tension that often exists among different goals, historical tensions in the local population, interactions of different actors seeking to improve their own survivability and position, and limited resources and time available to achieve the mission. One can never fully understand the dynamics of a conflict in advance. Well-intentioned guidance without detailed study may lead to an untenable or counterproductive solution.

When commanders use design, they closely examine the symptoms, the underlying tensions, and the root causes of conflict in the operational environment.

Understanding the operational environment begins with analyzing the context of the situation in accordance with guidance and direction from a higher authority. This fosters learning while generating an increased understanding of the operational environment. Commanders and their staffs review relevant directives, documents, data, previous guidance, and missions. Commanders inform their higher authority of new information or differences in initial understanding of the operational environment. Commanders also confirm the desired end state if provided by the higher authority, or propose their own. For the commander, this knowledge clarifies the higher authority's perspective of the operational environment.

To achieve a shared understanding of higher directives and policy, the commander and staff—
- Clarify the reasons and expectations to change existing conditions.
- Compare current or new instructions with other standing guidance or policies.
- Identify and resolve conflicting guidance with known facts.
- Assess feasibility, acceptability, and suitability of any directed action for achieving the desired end state.

Commanders apply critical thinking to every aspect of this analysis. Critical thinking leads to a deeper appreciation of the higher commander's intent and helps to refine the higher commander's understanding of the operational environment. This is an essential step to gain a shared understanding of the situation. The environmental frame depicts the current state of the operational environment. Based on higher guidance, it also defines the desired conditions that constitute a desired end state by examining the tendencies and potentials of relevant actors and operational variables.

Within the environmental frame, commanders review existing guidance, articulate existing conditions, determine the desired end state and supporting conditions, and identify relationships and interactions among relevant operational variables and actors. They analyze groupings of actors that exert significant influence in the operational environment knowing that individual actors rarely share common goals. By identifying and evaluating tendencies and potentials of relevant actor interactions and relationships, commanders and their staffs formulate a desired end state that accounts for the context of the operational environment and higher directives.

2012

The Army's framework for exercising mission command is the operations process—the major mission command activities performed during operations: planning, preparing, executing, and continuously assessing the operation (ADP 5-0). (See figure 1-1.) Commanders, supported by their staffs, use the operations process to drive the conceptual and detailed planning necessary to understand, visualize, and describe their operational environment; make and articulate decisions; and direct, lead, and assess military operations.

Understanding the culture of a particular society or group within a society can significantly improve the force's ability to accomplish the mission.

Understanding the culture of unified action partners is crucial to building mutual trust and shared understanding. Army leaders take the time to learn the customs as well as the doctrine and procedures of their partners. These leaders consider how culture influences the situational understanding and decisionmaking of their military and civilian partners. This mutual understanding between leaders and their counterparts helps build unity of effort.

Critical and creative thinking are indispensible to the operations process. For both commanders and staffs, these two skills begin with a rigorous analysis of friendly and enemy forces, as they relate to one another in time and space.

Just as planning is only part of the operations process, planning is only part of problem solving. In addition to planning, problem solving includes implementing the planned solution (execution), learning from the implementation of the solution (assessment), and modifying or developing a new solution as required.

Depending on the situation—to include the familiarity of the problem—commanders conduct Army design methodology before, in parallel with, or after the MDMP. When faced with an unfamiliar problem or when developing initial plans for extended operations, commanders often initiate the Army design methodology before the MDMP.

Understanding other cultures applies to all operations, not just operations dominated by stability. Leaders are mindful of cultural factors in four contexts:
- Awareness of how one's own culture affects how one perceives a situation.
- Awareness of the cultures within a region where the unit operates.
- Awareness of how history has shaped the culture of a region where the unit operates.
- Sensitivity to the different backgrounds, traditions, and operational methods of the various unified action partners.

This analysis includes weapons systems ranges, mobility options afforded by terrain and weather, operational reach, communications systems ranges, sustainment, and other considerations of the operational and mission variables. Disciplined and focused analysis of the operational and mission variables, coupled with critical and creative thinking about the challenges and opportunities resulting from that analysis, is essential to developing a full appreciation of the range of alternatives available to accomplish missions.

If the current operational approach fails to meet these criteria, or if aspects of the operational environment or problem change significantly, the commander may decide to reframe. Reframing involves revisiting earlier hypotheses, conclusions, and decisions that underpin the current operational approach. Reframing can lead to a new problem statement and operational approach, resulting in an entirely new plan.

The planning team frames the problem to ensure that they are solving the right problem, instead of solving the symptoms of the problem. Framing the problem involves understanding and isolating the root causes of conflict. The planning team closely examines the symptoms, the underlying tensions, and the root causes of conflict. Tension is the resistance or friction among and between actors. From this perspective, the planning team can identify the fundamental problem with greater clarity and consider more accurately how to solve it. A technique for framing the problem begins with two basic questions:
- What is the difference between the current state and the desired state of the operational environment?
- What is preventing US forces from reaching the desired end state?

Answers to these questions help identify the problem.
2-43. Based on the problem frame, the planning team develops a problem statement—a concise statement of the issue or issues requiring resolution

Reframing is the activity of revisiting earlier design hypotheses, conclusions, and decisions that underpin the current operational approach. In essence, reframing reviews what the commander and staff believe they understand about the operational environment, the problem, and the desired end state. At any time during the operations process, the decision to reframe may be triggered by factors such as—
l Assessment reveals a lack of progress.
l Key assumptions prove invalid.
l Unanticipated success or failure.
l A major event that causes "catastrophic change" in the operational environment.
l A scheduled periodic review that shows a problem.
l A change in mission or end state issued by higher authority

During operations, commanders decide to reframe after realizing the desired conditions have changed, are not achievable, cannot be attained through the current operational approach, or because of change of mission or end state. Reframing provides the freedom to operate beyond the limits of any single perspective. Conditions will change during execution, and such change is expected because forces interact within the operational environment. Recognizing and anticipating these changes is fundamental to Army design

Commanders may also elect to conduct the Army design methodology in parallel with the MDMP. In this instance, members of the staff conduct mission analysis as the commander and other staff members engage in framing the operational environment and the problem. This focus helps commanders better understand aspects of the operational environment. The results of mission analysis (to include intelligence preparation of the battlefield and running estimates) inform commanders as they develop their operational approach that, in turn, facilitates course of action development during the MDMP.

2019

The Army's framework for organizing and putting command and control into action is the operations process—the major command and control activities performed during operations: planning,
preparing, executing, and continuously assessing the operation. Commanders use the operations process to drive the conceptual and detailed planning necessary to understand their OE; visualize and describe the operation's end state and operational approach; make and articulate decisions; and direct, lead, and assess operations.

1-53. Upon receipt of a mission, commanders and staffs filter information categorized by the operational variables into relevant information with respect to the mission. They use the mission variables, in combination with the operational variables, to refine their understanding of their situation and to visualize, describe, and direct operations. The mission variables are mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (known as METT-TC). Commanders and staffs view all the mission variables in terms of their impact on mission accomplishment. (See FM 6-0 for a detailed description of the operational and mission variables.)

Critical thinking is purposeful and reflective thought about what to believe or what to do in response to observations, experiences, verbal or written expressions, or arguments. By thinking critically, individuals formulate judgments about whether the information they encounter is true or false, or if it falls somewhere along a scale of plausibility between true or false. Critical thinking involves questioning information, assumptions, conclusions, and points of view to evaluate evidence, develop understanding, and clarify goals. Critical thinking helps commanders and staffs identify causes of problems, arrive at justifiable conclusions, and make good judgments. Critical thinking helps commanders counter their biases and avoid logic errors.

Creative thinking examines problems from a fresh perspective to develop innovative solutions.
Creative thinking creates new and useful ideas, and reevaluates or combines old ideas to solve problems. Leaders face unfamiliar problems that require new or original approaches to solve them. This requires creativity and a willingness to accept change, newness, and a flexible outlook of new ideas and possibilities.

Several tools assist leaders in building situational understanding and creating a shared understanding across the force to include—
z Operational and mission variables.
z Running estimates.
z Intelligence.
z Collaboration.
z Liaison.

During execution, ADM supports organizational learning through reframing. A reframe is a shift in understanding that leads to a new perspective on the problem or its resolution. Reframing is the activity of revisiting earlier hypotheses, conclusions, and decisions that underpin the current operational approach. In essence, reframing reviews what the commander and staff believe they understand about an OE, the problem, and the desired end state.

2019 (cont.)

Breaking old habits of thought, questioning the status quo, visualizing a better future, and devising responses to new problems require creative thinking. During operations, leaders routinely face unfamiliar problems or old problems under new conditions. Leaders apply creative thinking to gain new insights, novel approaches, fresh perspectives, and new ways of understanding problems and conceiving ways to solve them.

Successful planning requires the integration of both conceptual and detailed thinking. Army leaders employ several methodologies for planning, determining the appropriate mix based on the scope of the problem, time available, and availability of a staff. Planning methodologies include—

z Army design methodology.
z The military decision-making process.
z Troop leading procedures.
z Rapid decision-making and synchronization process.
z Army problem solving.

ARMY PROBLEM SOLVING

2-99. The ability to recognize and effectively solve problems is an essential skill for Army leaders. Where the previous methodologies are designed for planning operations, Army problem solving is a methodology available for leaders in identifying and solving a variety of problems. Similar in logic to the MDMP, Army problem solving is an analytical approach to defining a problem, developing possible solutions to solve the problem, arriving at the best solution, developing a plan, and implementing that plan to solve the problem.

Appendix C3: rows 3 and 4 analysis

3. How do a complex environment and a very large org size affect the role doctrine plays in an org?	Who ordered the changes and did they provide the logic/reasoning?
4. How does how an org's members sensemake and what an org's culture is- affect the role doctrine plays in an org?	Did these changes get embraced by the organization? If so, how? If not, why not?

3) Methods: Battlefield Visualization	how to visualize the abstractions inherent within a war effort	Through thinking differently and analyzing differently, design changed some of the concept of visualizing the situation.
4) Methods: How to decide	how to make a decision during the execution of the methodology	The introduction of design affected the decision process based on the steps prior to making decisions.

'- The commander can visualize the battlefield by collecting, processing, analyzing, and transforming data into knowledge. This knowledge is then communicated to subordinates through orders to achieve a common situational awareness.	'- Commanders visualize the operation by defining the area of operations, battlespace, and battlefield organization and considering the factors of mission, enemy, terrain and weather, troops, and support, time, and civil considerations, estimates, input, experience, and judgment. They can then determine the desired end and how to get there. - During the decision making process, commander's visualize the situation through their intent, planning guidance, and information requirements and use their experience and the nature of the mission to describe the operation, as well as the elements of operational design.
'- Decisions come from analysis of the problem. - Decision making is knowing when and what to decide and understanding consequences.	'- Decision making is either analytic or intuitive. - Analytic decisions are systematic: analyze problem, generate possible solutions, analyze and compare, select best one. - Problem or tactical missions require analytic decisions. - Critical reasoning includes interpretation, analysis, and evaluation. - Critical thinkers must explain their interpretation in terms of their method of reasoning and, when solving problems, their analysis of their own judgments, taking into account their biases or self-interest. - Problem solving is a systematic way to arrive at the best solution, one must remain objective and prepare an unbiased solution based on the facts. - Steps of problem solving: identify the problem, gather information, develop criteria, generate solutions, analyze solutions, compare solutions, implement decision.

'- Commanders visualize the operation by defining the area of operations, battlespace, and battlefield organization and considering the factors of mission, enemy, terrain and weather, troops, and support, time, and civil considerations, estimates, input, experience, and judgment. They can then determine the desired end and how to get there. - During the decision making process, commander's visualize the situation through their intent, planning guidance, and information requirements and use their experience and the nature of the mission to describe the operation, as well as the elements of operational design.	In the 90s, the commander visualizes the battlefield by collecting and processing data-transforming it into knowledge. In 2005 this changed to more specifically address defining the area and considering a list of variables, all to understand how to get to the preferred future end state. They use the tools of intent, planning guidance, and information requirements, through their experience and operational design to describe the operation.
'- Decision making is either analytic or intuitive. - Analytic decisions are systematic: analyze problem, generate possible solutions, analyze and compare, select best one. - Problem or tactical missions require analytic decisions. - Critical reasoning includes interpretation, analysis, and evaluation. - Critical thinkers must explain their interpretation in terms of their method of reasoning and, when solving problems, their analysis of their own judgments, taking into account their biases or self-interest. - Problem solving is a systematic way to arrive at the best solution, one must remain objective and prepare an unbiased solution based on the facts. - Steps of problem solving: identify the problem, gather information, develop criteria, generate solutions, analyze solutions, compare solutions, implement decision.	How to decide in the 90s was about analysis of the problem. In 2005 the rational decision making process was spelled out more: analysis was part of the first step, then generating solutions, analyzing them, and then selecting the best one. Crtical thinking was added as well as the steps of problem solving: i.d. the problem, gather information, develop criteria, generate solutions, compare solutions, and implement the decision.

'- Commanders conduct design- if the problem is complex- to understand, visualize, and describe the situation- by framing the problem and developing a solution. - Commanders visualize the situation by using elements of operational design, input, principles of war, estimates, the common operational picture, their experience and judgment, subject matter experts. They visualize through intent, planning guidance, and information requirements. - The commander's visualization of the situation must flow from how they have framed the problem and, using design, how to change the situation to the desired condition. - Design helps visualize the arrangement and use of military and nonmilitary capabilities to achieve the desired conditions that will lead to the desired end state. - The commander develops contextual understanding by framing the operational environment- how the context developed, currently exists, and future trends. - The end state is the set of conditions that meet the objectives of policy or orders. A condition is a reflection of the state of the environment. - When visualizing the desired end state, time is significant. - The environmental frame helps commanders understand the behaviors of relevant actors in the environment. - A diagram illustrating relevant actor relationships is not enough, a narrative allows for more detailed description of the environment. - The desired end state must take into account the tendencies and potentials of the relevant actors in the environment. - A problem statement considers what requires transformation and how to transform using tension and competition to the desired end state. - The staff creates a design concept to solve the problem that explains the rationale on how to achieve the desired conditions through potential actions. - The operational approach is the visualization for how to produce the conditions required for the desired end state through defeat or stability mechanisms. It provides the logic that underpins the required tasks. - One method to depict the operational approach is to use lines of effort that show the link between tasks, objectives, conditions, and the desired end state, along with an explanatory narrative. - The visualization of the approach for achieving the desired end state is articulated through the problem statement, intent, planning guidance, and mission narrative. - The mission narrative is the expression of the operational approach for the mission and include the conditions that define the desired end state. - To apply design, one may use the elements of operational design.	In 2010, visualization was tied directly to design and complexity: if the problem was complex, then environmental and problem framing must first be accomplished, followed by framing the way to get to the preferred situation. Almost as an aside, one method of applying design was to use the elements of operational design.
'-Planning is part of problem solving. - The problem solving model is the logic for decision making. - Steps: define problem, gather information, develop solutions, analyze solutions, select best solution, implement solution. - Design relies on collaboration and dialog about the problem and environment. The design concept consists of the problem statement, intent, mission narrative, and planning guidance. - Decision making combines conceptual and detailed plans. It can be based on design or higher orders. - Design includes identifying the problem and a desired outcome and deciding how best to get the outcome. - Design comes before decision making if the problem is ill-structured. - Mission analysis informs the design concept that then informs decision making options. - If there is no time, design does not have to be used. As time becomes available, design can be initiated. - Commanders understand current conditions, desired conditions, then an approach to get to the desired conditions. - Decision making is enhanced through collaboration and dialog. - Design requires innovation, adaptation, and continuous learning, which enhances decision making. - Design involves projecting decisionmaking forward to influence events before they occur. - Commanders compare the current situation with their experiences or history to come up with innovative efforts to solve complex, ill-structured problems. - Design answers three questions: what is the context, what is the problem, what general approach will solve the problem. - Collaboration and dialog are the keys to success in an iterative process of inquiry, contextual understanding, and synthesis.	How to decide in 2010 was about problem solving and planning a part of that problem solving. The steps were explicitly laid out, as they were in 2005: define the problem, gather information, develop solutions, analyze, select best one, and implement. Design is tied to this as the way to identify the problem and a desired outcome and how to get there, although it is advised to use collaboration and dialog while conducting it.

'- The construction of narrative gives meaning to things through story. - Narrative construction is central to framing, and is key to understand the environment, problem, and solutions. - A visual model based on logical inference from evidence helps creative thought turn into understanding of the situation. - Army design methodology entails framing the environment, problem, and an operational approach to solve the problem. It results in a problem statement, intent, and an operational approach that links conceptual and detailed planning. - Establish the context for describing the problem and an operational approach by framing the environment. - To frame the environment, focus on analyzing the operational and mission variables and depict them through the relationships of the relevant actors in the environment. - Develop a contextual understanding of the situation by framing current conditions and all behaviors of the relevant actors in the environment. - The second part of the environmental frame is the desired conditions of a future end state that meets the policy objectives or orders. A condition is a reflection of the state of the environment. - Based on the environment and problem, planners consider approaches to solve the problem- which are the main ideas guiding planning and execution. - To visualize the operational approach, planners use the elements of operational art and defeat or stability mechanisms to achieve the desired end state. - Depict the operational approach using lines of effort that link tasks, objectives, conditions, and the desired end state and a narrative.	Visualization in 2012 changed to emphasize narrative and its centrality to framing. Visualizing the situation through a model, showing logical inferences is also new, as is calling design "Army design methodology" and tying framing of the environment to operational and mission variables.
'- Decision making steps have inputs, a method, and outputs that lead to increased understanding of the situation and facilitating the next step. - If time is not available, the Army design methodology does not have to be conducted. As time becomes available, commanders can initiate design.	How to decide in 2012 was simplified to the steps of the Military Decision Making Process and that the Army design methodology did not need to be conducted if one does not have time.

- To apply operational art, answer questions associated with defining the ends, ways, means, and risks. - Develop an operational approach through operational art- the broad actions that achieve the end state through defeat mechanisms and stability mechanisms. - Army design methodology is a method to apply critical and creative thinking to visualize problems and solutions and links conceptual to detailed plans. First, frame the environment, frame problems, develop an approach, and reframe as necessary. - Army design methodology produces understanding of the environment, problem, intent, and an approach that links conceptual and detailed planning.	In 2019, applying operational art- the way in which to envision the battlefield- is tied directly to ends-ways-means (and risk). Defeat and stability mechanisms achieving the end state are new, although the Army design methodology is mentioned and the steps of framing the environement, problem, approach, and reframing are codified.
'- Decision making is an analytical planning methodology to understand the situation, develop options, and produce a plan. - Decision making consists of steps whose outputs facilitate the next step: receive mission, analyze, option development, option analysis, option comparison, option approval, produce orders. - Problem solving steps: gather information, identify problem, develop criteria, generate solutions, analyze solutions, compare solutions, implement decision.	Decision making in 2019 was tied directly to producing a plan and the rational decision making process kept.

Appendix C4: rows 3 and 4 raw data

Therefore, in his intent statement, the commander must clearly articulate his battlefield visualization to his subordinates and staff to ensure the optimum development and execution of his concept of operations. The staff assists the commander with his battlefield visualization by collecting, processing, analyzing, and transforming data into knowledge, allowing the commander to apply his judgment to achieve understanding of the situation in the form of his vision. The staff then helps him communicate his battlefield visualization to his subordinates by preparing orders and informational products to achieve a relevant common picture and situational awareness. An information network must be in place and operating to support battlefield visualization.	After receiving a mission, commanders develop their initial commander's visualization. During mission analysis, they visualize an operational framework by defining and arranging its three components— area of operations (AO), battlespace, and battlefield organization (see FM 3- 0). The operational framework helps commanders visualize the arrangement of friendly forces and resources in time, space, and purpose with respect to each other, the enemy or situation. They consider the factors of mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC), staff estimates, input from other commanders, experience, and judgment to develop situational understanding. From this situational understanding, commanders determine the desired end state and develop a construct of how to get their organization from its current position to that desired end state. During the MDMP, commanders describe their commander's visualization through the commander's intent, planning guidance, and commander's critical information requirements (CCIR). Commanders describe an operation in terms suited to their experience and nature of the mission. They use an operational framework and the elements of operational design to describe the relationship of decisive, shaping, and sustaining operations to time and space (see FM 3-0). They emphasize how the combination of decisive, shaping, and sustaining operations relates to accomplishing the purpose of the overall operation.
Once a problem is identified, the staff officer must analyze what actions or coordination must take place to resolve the issue. Sometimes the staff officer will have the capability and authority to correct the problem without direction from the commander. If not, once the problem is thoroughly analyzed, the staff officer must inform the commander so that he can make the appropriate decision to resolve the issue. Decision making is knowing if to decide, then when and what to decide. It includes understanding the consequence of decisions. Decisions are the means by which the commander translates his vision of the end state into action.	The commander makes other decisions very quickly. This results in a fragmentary order (FRAGO). When developing plans, commanders normally choose between analytic or intuitive means of decision making. Analytic decision making approaches a problem systematically. Leaders analyze a problem, generate several possible solutions, analyze and compare them to a set of criteria, and select the best solution. When faced with a problem or tactical mission, Army leaders define the problem; gather information relevant to it; develop, analyze, and compare COAs; and select the optimal solution. It is a systematic approach to defining a problem, developing possible solutions to solve the problem, arriving at the best solution, and implementing it. Commanders normally direct their staff or subordinate leaders to recommend solutions to problems. In formal situations, they present their recommendations as staff studies, decision papers, and decision briefings (see Appendices A and B). At lower echelons, recommendations are normally presented orally. Developing good critical reasoning skills is crucial for effective problem solving and requires study and practice. There are several cognitive skills involved in critical reasoning to include: • Interpretation. Leaders must comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, and judgments. Examples of interpretation include, recognizing and describing a problem or clarifying what a chart or graph means. • Analysis. The problem solver must identify the intent of statements, ideas, and concepts provided for interpretation. Examining ideas and determining and analyzing arguments are sub-skills of analysis. Identifying the similarities and differences between two solutions for a given problem is an example of analysis. • Evaluation. Leaders must assess the credibility of statements or other representations such as a perception, experience, situation, judgment, or belief relevant to the problem. They also assess the logical strength of the actual or intended relationships among statements, descriptions, questions or other forms of representations.

	Commanders conduct design to help them with the conceptual aspects of planning to include understanding, visualizing, and describing. After receipt of or in anticipation of a mission, commanders may begin design to understand the operational environment, frame the problem, and develop an operational approach to solve the problem. The situation—to include the complexity of the problem— guides the commander's decision on whether to use design. To develop their commander's visualization, commanders draw on several sources of knowledge and relevant information. These include— o The elements of operational design. (See FM 3-0.) o Input from the staff, other commanders, and partners. o Principles of war. (See FM 3-0.) o Operational themes. (see FM 3-0) and related doctrine. o Running estimates. o The common operational picture. o Their experience and judgment. o Subject matter experts. 2-56. Commanders describe their visualization in doctrinal terms, refining and clarifying it as circumstances require. Commanders express their initial visualization as— o Initial commander's intent. o Planning guidance, including an initial operational approach. o Commander's critical information requirements (CCIRs). o Essential elements of friendly information that must be protected. The commander's visualization and description of the actions required to achieve the desired conditions must flow logically from what commanders understand and how they have framed the problem. Design provides an approach for how to generate change from an existing situation to a desired objective or condition. Commanders project their understanding beyond the realm of physical combat. They must anticipate the operational environment's evolving military and nonmilitary conditions. Therefore, design encompasses visualizing the synchronized arrangement and use of military and nonmilitary forces and capabilities to achieve the desired end state. This requires the ability to discern the conditions required for success before committing forces to action. The commander and staff develop a contextual understanding of the situation by framing the operational environment. The environmental frame is a narrative and graphic description that captures the history, culture, current state, and future goals of relevant actors in the operational environment. The environmental frame describes the context of the operational environment—how the context developed (historical and cultural perspective), how the context currently exists (current conditions), and how the context could trend in the future (future conditions or desired end state). The environmental frame enables commanders to forecast future events and the effects of potential actions in the operational environment. The environmental frame explains the actors and relationships within a system and surfaces assumptions to allow for more rapid adaptation. The environmental frame evolves through continuous learning, but scopes aspects of the operational environment relevant to higher guidance and situations. The desired end state consists of those desired conditions that, if achieved, meet the objectives of policy, orders, guidance, and directives issued to the commander. A condition is a reflection of the existing state of the operational environment. Thus, a desired condition is a sought-after future state of the operational environment. Commanders explicitly describe the desired conditions and end state for every operation. This description provides the necessary integration between tactical tasks and the conditions that define the end state. Time is a significant consideration when developing the desired end state. How time relates to the desired end state heavily influences not only the expectations of higher authorities but also how commanders use forces and capabilities to achieve desired conditions. Staffs exercise diligence throughout design to account for the expected time required to achieve the desired conditions. They also qualify whether the desired conditions are intended to be lasting or transient in nature. This temporal dimension is essential to developing effective operational approaches. It impacts the feasibility, acceptability, suitability, and completeness of any resulting plan.
Good critical thinkers must also explain the logic of their interpretation in reaching conclusions. They must explain what they think and how they arrived at the judgment. They also are good at self-regulating themselves to improve on their previous opinions. • Explanations. When presenting recommendations, leaders must be able to state the method of reasoning. They justify their reasoning in terms of the facts, assumptions, and criteria upon which their results were based. They must also be able to present their reasoning in the form of a cogent argument. • Self-regulation. When solving problems, leaders must self- consciously monitor their cognitive activities, the elements used in those activities, and the results produced. They do this particularly by applying skill in analysis, and evaluation to their own judgments with a view toward questioning, confirming, validating, or correcting either their reasoning or results. An example is for the problem-solver to examine their views on a controversial issue with sensitivity to the possible influences of personal biases or self-interest. Problem solving is a daily activity for Army leaders. Army problem solving is a systematic way to arrive at the best solution to a problem. It applies at all echelons and includes the steps needed to develop well-reasoned, supportable solutions (see Figure 2-1). It incorporates risk management techniques appropriate to the situation (see FM 100-14). Army leaders remain as objective as possible when solving problems. The goal is to prepare an unbiased solution or recommendation for the decision maker, based on the facts. Problem solving is an important Army leadership action (see FM 22-100). It is essential to good staff work. 1 – ID the Problem 2 – Gather Information Facts, Assumptions, and Interests 3 – Develop Criteria 4 – Generate Possible Solutions 5 – Analyze Possible Solutions 6 – Compare Possible Solutions 7 – Make and Implement the Decision Figure 2-1. Seven Step Problem-Solving Model Commanders can alter the MDMP to fit time-constrained circumstances and produce a satisfactory plan (see paragraphs 3-203 to 3-240). In time- constrained conditions, commanders assess the situation; update their commander's visualization, and direct the staff to perform those MDMP activities needed to support the required decisions. Streamlined processes permit commanders and staffs to shorten the time needed to issue orders when the situation changes. In a time-constrained environment, many steps of the MDMP are conducted concurrently. To an outsider, it may appear that experienced commanders and staffs omit key steps. In reality, they use existing products or perform steps in their heads instead of on paper. They also use many shorthand procedures and implicit communication. Fragmentary orders (FRAGOs) and warning orders (WARNOs) are essential in this environment.	Just as planning is only part of the operations process, planning is only part of problem solving. In addition to planning, problem solving includes implementing the planned solution (execution), learning from the implementation of the solution (assessment), and modifying or developing a new solution as required. The object of problem solving is not just to solve near-term problems, but to do so in a way that forms The Army problem solving model appears in figure 2-1. Army problem solving applies to all Army activities, not just operations. The Army problem solving model establishes the base logic for the military decisionmaking process and troop leading procedures. • Recognize and define the problem. • Gather information. • Develop possible solutions to the problem. • Analyze possible solutions. • Select the best solution. • Implement the solution and assess results. Figure 2-1. The Army problem solving model The design methodology relies heavily on structuring inquiry about the operational environment and the problem through collaboration and dialog. (See chapter 1.) Design emphasizes developing a holistic understanding of the operational environment and framing the problem. From this understanding, design continues by considering an operational approach for problem resolution and developing a design concept. The design concept consists of the problem statement, initial commander's intent, mission narrative, and commander's planning guidance. The MDMP combines the conceptual and detailed aspects of planning. Commanders use it to build plans and orders for extended operations, as well to develop orders for short-term operations within the framework of a long-range plan. The MDMP can be conducted based on a design concept or based on a higher order or directive without the benefits of formal design activities preceding the MDMP. This methodology includes identifying and understanding the problem and determining a desired outcome. From this understanding, commanders develop several options for achieving that outcome. Commanders study and test these options in detail and then evaluate them against a set of criteria. Such actions help commanders determine the best option. This comparative analysis may result in a choice that modifies one of the options by incorporating features of others. The MDMP proceeds with the production of a fully synchronized plan or order for execution.

The design concept is the link between design and detailed planning. It reflects understanding of the operational environment and the problem while describing the commander's visualization of a broad approach for achieving the desired end state. The design concept is the proper output of design, conveyed in text and graphics, which informs detailed planning. It is articulated to the planning staff through the—
- Problem statement.
- Initial commander's intent.
- Commander's initial planning guidance.
- Mission narrative.
- Other products created during design.

Products created during design include the text and graphics of the operational environment and problem. Diagrams representing relationships between relevant actors convey understanding to the planning staff. The problem statement generated during problem framing communicates the commander's understanding of the problem or problem set upon which the organization will act.

The initial commander's intent and planning guidance visualize and describe the desired end state along with implications for further planning. The design concept organizes desired conditions and the combinations of potential actions in time, space, and purpose that link the desired end state to the conduct of full spectrum operations. The planning guidance orients the focus of operations, linking desired conditions to potential combinations of actions the force may employ to achieve them. Other information provided in the initial planning guidance includes—
- Information integration.
- Resources.
- Risk.

The mission narrative is the expression of the operational approach for a specified mission. It describes the intended effects for the mission, including the conditions that define the desired end state. The mission narrative represents the articulation, or description, of the commander's visualization for a specified mission and forms the basis for the concept of operations developed during detailed planning. An explicit reflection of the commander's logic, it is used to inform and educate the various relevant partners whose perceptions, attitudes, beliefs, and behaviors are pertinent to the operation. It also informs development of supporting information themes and messages for the mission and serves as a vital tool for integrating information engagement tasks with other activities during execution.

In applying design, the commander and staff may draw on the elements of operational design relevant to the situation. (See FM 3-0.) The design concept promotes mutual understanding and unity of effort throughout the echelons and partner organizations. Thus, the design concept is the rationale linking design to detailed planning. From the design concept, planners determine how to apply forces and capabilities to achieve the desired end state.

In a broad sense, a narrative is a story constructed to give meaning to things and events. Individuals, groups, organizations, and countries all have narratives with many components that reflect and reveal how they define themselves. Political parties, social organizations, and government institutions, for example, all have stories bound chronologically and spatially. They incorporate symbols, historical events, and artifacts tied together with a logic that explains their reason for being. To narrate is to engage in the production of a story—an explanation of an event or phenomenon by proposing a question or questions in relation to the artifacts themselves. These questions may include—
- What is the meaning of what I see?
- Where does the story begin and end?
- What happened, is happening, and why?

Narrative construction—the conscious bounding of events and artifacts in time and space—is central to framing. Commanders, staffs, and unified action partners construct a narrative to help understand and explain the operational environment, the problem, and the solutions. Not only is the narrative useful in communicating to others, the act of constructing the narrative itself is a key learning event for the command.

2-29. Army design methodology relies heavily on forming and presenting ideas in both narrative and visual (graphic) form. Visual information tends to be stimulating; therefore, creativity can be enhanced by using visual models and constructs. The complexity of some problems requires creating a model of the problem. A visual model, based on logical inference from evidence, helps creative thought to develop into understanding. A graphic can often point to hidden relationships that were not considered through conversation alone. In addition, visually displaying periodic summaries of work helps individuals see the results of what is being thought. This, in turn, points to new ways of thinking and possible areas for further examination. In other words, seeing something drawn graphically helps individuals think through challenging problems, especially when examining abstract concepts.

Army design methodology entails framing an operational environment, framing a problem, and developing an operational approach to solve the problem. Army design methodology results in an improved understanding of the operational environment, a problem statement, initial commander's intent, and an operational approach that serves as the link between conceptual and detailed planning. Based on their understanding and learning gained during Army design methodology, commanders issue planning guidance, to include an operational approach, to guide more detailed planning using the MDMP.

2-33. The commander, members of the staff, subordinate commanders, and unified action partners form a planning team to establish context for describing the problem and developing an operational approach by framing an operational environment.

depending on the mission—to include the complexity of the problem—commanders conduct design before, in parallel with, or after the MDMP. When faced with an ill-structured problem or when developing initial

The results of mission analysis (to include intelligence preparation of the battlefield and running estimates) inform commanders as they develop their design concept that, in turn, facilitate course of action development during the MDMP.

In time-constrained conditions requiring immediate action or if the problem is well structured, commanders may conduct the MDMP and publish an operation order without conducting design. As time becomes available during execution, commanders may then initiate design to help refine their commander's visualization and the initial plan developed using the MDMP.

First, commanders understand the conditions that make up the current situation. From this understanding, commanders next visualize desired conditions that represent a desired end state. After envisioning a desired end state, commanders then conceptualize an operational approach of how to change current conditions to the desired future conditions.

Moreover, design requires effective and decisive leadership that engages subordinate commanders, coordinating authorities, representatives of various staff disciplines, and the higher commander in continuing collaboration and dialog that leads to enhanced decisionmaking. (Paragraphs 1-31 through 1-36 discuss collaboration and dialog.) This facilitates collaborative and parallel planning while supporting shared understanding and visualization across the echelons and among diverse organizations. It is the key to leveraging the cognitive potential of a learning organization, converting the raw intellectual power of the commander and staff into effective combat power.

Innovation, adaptation, and continuous learning are central tenets of design. Innovation involves taking a new approach to a familiar or known situation, whereas adaptation involves taking a known solution and modifying it to a particular situation or responding effectively to changes in the operational environment. Design helps the commander lead innovative, adaptive work and guides planning, preparing, executing, and assessing operations. Design requires agile, versatile leaders who foster continuous organizational learning while actively engaging in iterative collaboration and dialog to enhance decisionmaking across the echelons.

Applying design involves anticipating changes in the operational environment, projecting decisionmaking forward in time and space to influence events before they occur.

Commanders compare similarities of their current situations with their own experiences or history and the design team's experiences or history to distinguish unique features that require novel, innovative, or adaptive solutions. They understand that each situation requires a solution tailored to the context of the problem. Design provides an approach for leading innovative, adaptive efforts from which to effectively act on and efficiently solve a complex, ill-structured problem. It fosters thinking and interacting as commanders develop approaches to resolve the differences between the current conditions and desired conditions of the environment through the conduct of full spectrum operations.

Three distinct elements collectively produce a design concept as depicted in figure 3-1. Together, they constitute an organizational learning methodology that corresponds to three basic questions that must be answered to produce an actionable design concept to guide detailed planning:
- Framing the operational environment—what is the context in which design will be applied?
- Framing the problem—what problem is the design intended to solve?

The MDMP consists of seven steps as shown in figure 2-6 on page 2-12. Each step of the MDMP has various inputs, a method (step) to conduct, and outputs. The outputs lead to an increased understanding of the situation and to facilitating the next step of the MDMP. Commanders and staffs generally perform these steps sequentially; however, they may revisit several steps in an iterative fashion, as they learn more about the situation before producing the plan or order.

In time-constrained conditions requiring immediate action, or if the problem is familiar, commanders may conduct the MDMP and publish an operation order without formally conducting Army design methodology. As time becomes available during execution, commanders may then initiate Army design methodology to help refine their commander's visualization and the initial plan developed using the MDMP.

2-34. In framing an operational environment, the planning team focuses on defining, analyzing, and synthesizing the characteristics of the operational and mission variables (see chapter 1). Members of the planning team capture their work in an operational environmental frame (using narrative and visual models) that describes and depicts the history, culture, current state, relationships, and future goals of relevant actors in an operational environment. An operational environmental frame consists of two parts — the current state of the operational environment and the desired end state of the operational environment.

2-35. The commander and staff develop a contextual understanding of the situation by framing the current conditions of an operational environment. In doing so, the planning team considers the characteristics of all the operation and mission variables relevant to a particular operational environment. This includes identifying and explaining behaviors of relevant actors in the operational environment. An actor is an individual or group within a social network who acts to advance personal interests. Relevant actors may include individuals, states and governments, coalitions, terrorist networks, and criminal organizations. They may also include multinational corporations, nongovernmental organizations, and others able to influence the situation.

2-38. The second part of an operational environmental frame involves envisioning desired conditions of an operational environment (a desired end state). A desired end state consists of those desired conditions that, if achieved, meet the objectives of policy, orders, guidance, and directives issued by higher authorities. A condition is a reflection of the existing state of the operational environment. Thus, a desired condition is a sought-after future state of the operational environment.

2-44. Based on their understanding of the operational environment and the problem, the planning team considers operational approaches—the broad general actions—to solve the problem. The operational approach serves as the main idea that informs detailed planning and guides the force through preparation and execution.

The planning team uses the elements of operational art (see ADRP 3-0) to help think through the operational environment and visualize and describe the operational approach. As the planning team considers various approaches, it evaluates the types of defeat or stability mechanisms that may lead to conditions that define the desired end state.

Planners can depict the operational approach by using lines of effort that graphically articulate the links among tasks, objectives, conditions, and the desired end state (see figure 2-5). Army design methodology offers the latitude to portray the operational approach in a manner that best communicates its vision and structure. Ultimately, the commander determines the optimal method to articulate the operational approach. However, it is important that narratives accompany lines of effort to ensure subordinate commanders and Soldiers understand the operational approach.

Applying operational art requires commanders to answer the following questions:
- What conditions, when established, constitute the desired end state (ends)?
- How will the force achieve these desired conditions (ways)?
- What sequence of actions helps attain these conditions (ways)?
- What resources are required to accomplish that sequence of actions (means)?
- What risks are associated with that sequence of actions and how can they be mitigated (risks)?

Operational art encompasses all levels of warfare. It requires creative vision, broad experience, and a knowledge of capabilities, tactics, and techniques across multiple domains. Commanders and staffs employ operational art during ADM and the MDMP.

2-53. It is through operational art that commanders develop and translate their operational approach—a description of the broad actions required to achieve the end state—into a concept of operations. An operational approach is the result of the commander's visualization of what needs to be done in broad terms to solve identified problems. It is the main idea that informs detailed planning. When developing an operational approach, commanders consider ways to employ a combination of defeat mechanisms and stability mechanisms. Defeat mechanisms relate to offensive and defensive operations; stability mechanisms relate to stability operations.

2-89. Army design methodology is a methodology for applying critical and creative thinking to understand, visualize, and describe problems and approaches to solving them. ADM is particularly useful as an aid to conceptual planning, but it must be integrated with the detailed planning typically associated with the MDMP to produce executable plans and orders. There is no one way or prescribed set of steps to employ the ADM. There are, however, several activities associated with ADM including framing an OE, framing problems, developing an operational approach, and reframing when necessary as shown in figure 2-4. While planners complete some activities before others, the understanding and learning within one activity may require revisiting the learning from another activity. Thus, ADM is iterative in nature.

The results of ADM include an understanding of an OE and problem, the initial commander's intent, and an operational approach that serves as the link between conceptual and detailed planning. Based on their understanding and learning gained during ADM, commanders issue planning guidance—to include an operational approach—to guide more detailed planning using the MDMP.

ADM includes interconnected thinking activities that aid in conceptual planning. By first framing an OE and its associated problems, ADM helps commanders and staffs to think about the situation in depth. This in-depth thinking enables them to develop a more informed approach to solve or manage identified problems.

THE MILITARY DECISION-MAKING PROCESS

2-92. The military decision-making process is an iterative planning methodology to understand the situation and mission, develop a course of action, and produce an operation plan or order. It is an orderly, analytical process that integrates the activities of the commander, staff, and subordinate headquarters in the development of a plan or order. The MDMP helps leaders apply thoroughness, clarity, sound judgement, logic, and professional knowledge to develop situational understanding and produce a plan or order that best accomplishes the mission.

2-93. The MDMP consists of seven steps. Each step of the MDMP has inputs, a series of sub-steps, and outputs. The outputs lead to an increased understanding of the situation facilitating the next step of the MDMP. Commanders and staffs generally perform these steps sequentially; however, before producing the plan or order, they may revisit several steps in an iterative fashion as they learn more about the situation. The seven steps are—
- Step 1 – Receipt of mission.
- Step 2 – Mission analysis.
- Step 3 – COA development.
- Step 4 – COA analysis.
- Step 5 – COA comparison.
- Step 6 – COA approval.
- Step 7 – Orders production, dissemination, and transition.

The steps to Army problem solving are—
- Step 1 – Gather information.
- Step 2 – Identify the problem.
- Step 3 – Develop criteria.
- Step 4 – Generate possible solutions.
- Step 4 – Analyze possible solutions.
- Step 6 – Compare possible solutions.
- Step 7 – Make and implement the decision .

Appendix C5: row 5 analysis

5) Methods: Planning	how to take the decision and turn it into action	Design changed the approach to planning by introducing new concepts and steps prior to and during planning, but, most importantly, the different ways to plan based on design concepts

N/A--- this is weird- going to go back and look at the 90s---	- Planning could be a scheme or a formal document- a plan is an interim product of planning. - Planning is guided by problem solving, decision making, and leading procedures. - Planning tools: reduction sequencing control risk forecasting intel, planning pitfalls. - Planning pitfalls are an issue with improper planning, not of the concept of planning. Pitfalls: forecasting too far out, delays in planning, planning too detailed, planning as scripting, inflexibility, - Planning is sequential and linear. - Planning is a continuous action, when conditions change, the plan must be changed.	In the 90s, planning was not mentioned. In 2005, planning was seen as sequential and linear, associated with common pitfalls, and is guided by problem solving, decision making, and leading procedures.

- during planning commanders focus their activities on understanding, visualizing, and describing - Planning is only part of problem solving. - Planning pitfalls are an issue with improper planning, not of the concept of planning. Pitfalls: forecasting too far out, delays in planning, planning too detailed, planning as scripting, inflexibility, - Planning consists of conceptual and detailed components- design assists with the conceptual: understanding, visualizing, and describing. - Within the planning staff, design frames the problem more fully and establishes the context for action. - Design provides the means to convert intellectual power into combat power. (Purpose?)	In 2010, planning was changed to be about understanding, visualizing, and describing. It was still only a part of problem solving and the pitfalls were kept, although a new concept called conceptual planning was introduced that was juxtaposed with detailed planning. Conceptual planning was tied to design.

- Planning starts the operations process- it does not stop; it is ongoing. - When the current order is no longer relevant, reframing the problem and a new plan is required. - Planning could be detailed and done by a staff, or less structured and hasty. The time horizons for planning may be years all the way down to minutes. - A product of planning is a plan or order. - Plans become orders once directed for execution and vary in many forms based on the context. - Decision making and planning can begin in anticipation of a mission. - Planning pitfalls are an issue with improper planning, not of the concept of planning. Pitfalls: forecasting too far out, delays in planning, planning too detailed, planning as scripting, inflexibility.	In 2012, planning was the result of design and problem defining and the pitfalls were kept.

- Planning is the art and science of understanding the present, envisioning the future, and determining ways to get to the future. Planning develops solutions to problems and anticipate events. Purpose: to move to a more desired future. - Planning is a continuous learning activity. Planning starts the operations process does not stop; it is ongoing. - could be detailed and done by a staff, or less structured and hasty. The time horizons for planning may be years all the way down to hours. - Planning methods vary, they may be forward-based or planning in reverse and could be analytical decision making or systemic as in Army design methodology. - A product of planning is a plan or order, meant to synchronize actions of forces to achieve the mission. - Plans and orders describe a situation, establish organization, assign tasks, and provide coordination. - Planning is a science and an art- quantifiable for science and the arrangement of forces being art. The method of science is gained through training and study, art through training and experience. - The science side of planning is those things that can be measured and analyzed. - The science of planning deals with the practical issues with respect to the physical. - The art of planning requires understanding the environment. - The art of planning involves planning within the commander's intent by choosing options including: arrangement of activities, assignment of tasks, organization, control, tempo, analyzing risk. - Planners look at options for solutions that balances competing demands and takes into account variables like the mission, enemy, terrain, weather, troops, and time. - Planning often begins before receipt of a mission.	In 2019, planning was much more detailed: it was the art and science of understanding the present and how to get to a better future and which used design language. Analytical methods were juxtaposed with systemic methods and Army design methodology was specifically tied to systemic. Science and art reference planning were made explicit- science being the physical and "practical" and art being understanding.

Appendix C6: row 5 raw data

None – I'm checking this- this doesn't sound right.	A plan may be a formal, articulated document or an informal scheme. Since planning is an ongoing process, a plan is an interim product of planning based on information and understanding at the moment that is subject to revision. The Army uses three different, but related processes to guide planning activities: • Army problem solving. • The military decision making process (MDMP). • Troop leading procedures (TLP). This section discusses the key planning concepts that aid in effective planning. These include— • Nested concepts. • Sequencing operations. • Control measures. • Risk mitigation. • Hasty and deliberate operations. • Intelligence, surveillance and reconnaissance. • Planning horizons. • Parallel and collaborative planning. • Forward and reverse planning. • The one-third/two-thirds rule. • Planning pitfalls.

Commanders recognize both the benefits and the potential pitfalls of planning. They ensure that planning is performed properly to avoid them. Planners' guard against several common mistakes. These pitfalls generally stem from a common cause: the failure to appreciate the unpredictability and uncertainty of military operations. Pointing these out is not a criticism of planning but of improper planning. Commanders discipline the planning process and teach staffs the relevance of product content. Common pitfall include—
• Attempting to forecast and dictate events too far into the future.
• Delaying planning to gain more detailed information.
• Planning in too much detail.
• Using planning as a scripting process.
• Applying planning techniques inflexibly.

Each step begins with inputs that build on previous steps. The outputs of each step drive subsequent steps. Errors committed early affect later steps. While the formal process begins with the receipt of a mission and has as its goal the production of an order, planning continues throughout the operations process.

Preparation and execution, while not part of the MDMP, are shown in the lower portion of Figure 3-1 to highlight the importance of continuous planning. Once a plan or order is produced, it is transmitted to those who will execute it quickly enough for them to produce their own plans and prepare for the operation. Backbriefs and rehearsals occur during preparation. They are essential to ensure those responsible for execution have a clear under- standing of the mission, commander's intent, and concept of operations. (See FM 6-0 for a detailed discussion on rehearsals.) During execution, plans are refined or planning for a new operation begins, as the situation requires. Assessment is continuous and occurs during planning, preparation, and execution. At any time during the operations process, the situation may require the commander to restart the MDMP. Examples of these circumstances include—
• The commander receives a new mission.
• The commander receives or perceives a possible follow-on mission.
• The commander receives or perceives a contingency based on a variance in the current operation.

The relationships among the activities of battle command and the activities of the operations process are dynamic. All the activities of battle command occur in planning, preparation, execution, and assessment, but take on different emphasis throughout the operations process. For example, during planning commanders focus their activities on understanding, visualizing, and describing while directing, leading, and assessing. During execution, commanders often focus on directing, leading, and assessing while improving their understanding and modifying their visualization.

Just as planning is only part of the operations process, planning is only part of problem solving. In addition to planning, problem solving includes implementing the planned solution (execution), learning from the implementation of the solution (assessment), and modifying or developing a new solution as required. The object of problem solving is not just to solve near-term problems, but to do so in a way that forms the basis for long-term success.

COMMANDERS AVOID PLANNING PITFALLS
2-81. Commanders recognize the value of planning and avoid common planning pitfalls. These pitfalls generally stem from a common cause: the failure to appreciate the unpredictability and uncertainty of military operations. Pointing these out is not a criticism of planning but of improper planning. The four pitfalls consist of—
- Attempting to forecast and dictate events too far into the future.
- Trying to plan in too much detail.
- Using planning as a scripting process.
- Institutionalizing rigid planning methods.

Planning consists of two separate, but closely related components: a conceptual component and a detailed component. The conceptual component is represented by the cognitive application of design. The detailed component translates broad concepts into a complete and practical plan. During planning, these components overlap with no clear delineation between them. As commanders conceptualize the operation, their vision guides the staff through design and into detailed planning. Design is continuous throughout planning and evolves with increased understanding throughout the operations process. Design underpins the exercise of battle command, guiding the iterative and often cyclic application of understanding, visualizing, and describing. As these iterations occur, the design concept—the tangible link to detailed planning—is forged.

In leading design, commanders typically draw from a select group within the planning staff, red team members, and subject matter experts internal and external to the headquarters. The commander selects these individuals based on their expertise relative to the problem. The commander expects these individuals to gain insights and inputs from areas beyond their particular expertise—either in person or through reachback—to frame the problem more fully. Design serves to establish the context for guidance and orders. By using members of the planning staff to participate in the design effort, commanders ensure continuity between design and detailed planning as well as throughout the operations process. These are purpose-built, problem-centric teams, and the commander may choose to dissolve them once they complete the design effort.

Commanders leverage design to create and exploit opportunity, not just to ward off the risk of failure. Design provides the means to convert intellectual power into combat power. A creative design tailored to a unique operational environment promises—
- Economy of effort.
- Greater coherence across rotations among units and between successive operations.
- Better integration and coordination among the instruments of national power.
- Fewer unintended consequences.
- Effective adaptation once the situation changes.

Planning is both a continuous and a cyclical activity of the operations process. While planning may start an iteration of the operations process, planning does not stop with the production of an order. During preparation and execution, the plan is continuously refined as the situation changes.

In some circumstances, commanders may determine that the current order (to include associated branches and sequels) is no longer relevant to the situation. In these instances, instead of modifying the current plan, commanders reframe the problem and develop an entirely new plan.

Planning may be highly structured, involving the commander, staff, subordinate commanders, and others to develop a fully synchronized plan or order. Planning may also be less structured, involving a platoon leader and squad leaders rapidly determining a scheme of maneuver for a hasty attack. Planning is conducted for different planning horizons, from long-range to short-range. Depending on the echelon and circumstances, units may plan in years, months, or weeks, or in days, hours, and minutes.

A product of planning is a plan or order—a directive for future action. Commanders issue plans and orders to subordinates to communicate their understanding of the situation and their visualization of an operation. A plan is a continuous, evolving framework of anticipated actions that maximizes opportunities. It guides subordinates as they progress through each phase of the operation. Any plan or order is a framework from which to adapt, not a script to be followed to the letter.

Plans and orders come in many forms and vary in the scope, complexity, and length of time they address. Generally, commanders and staffs develop a plan well in advance of execution, and the plan is not executed until directed. A plan becomes an order when directed for execution based on a specific time or event. Some planning results in written orders complete with attachments. Other planning produces brief fragmentary orders first issued verbally and then followed in writing.

Commanders initiate the MDMP upon receipt of or in anticipation of a mission. Commanders and staffs often begin planning in the absence of a complete and approved higher headquarters' operation plan (OPLAN) or operation order (OPORD). In these instances, the headquarters begins a new planning effort based on a warning order (WARNO) and other directives, such as a planning order or an alert order from their higher headquarters. This requires active collaboration with the higher headquarters and parallel planning among echelons as the plan or order is developed.

PLANNING PITFALLS

2-128. Commanders and staffs recognize the value of planning and avoid common planning pitfalls. These pitfalls generally stem from a common cause: the failure to appreciate the unpredictability and uncertainty of military operations. Pointing these out is not a criticism of planning, but of planning improperly. The four pitfalls consist of—

l Attempting to forecast and dictate events too far into the future.
l Trying to plan in too much detail.
l Using the plan as a script for execution.
l Institutionalizing rigid planning methods.

2-9. The science of planning encompasses aspects of operations that can be measured and analyzed. These aspects include the physical capabilities of friendly and enemy organizations. The science of planning includes a realistic appreciation for time-distance factors; an understanding of how long it takes to initiate certain actions; the techniques and procedures used to accomplish planning tasks; and the terms and graphics that compose the language of military operations. While not easy, the science of planning is fairly straightforward.

2-10. Mastery of the science of planning is necessary for military professionals to understand the physical and procedural constraints under which units operate. These constraints include the effects of terrain, weather, and time on friendly and enemy forces. However—because combat is an intensely human activity—the solution to problems cannot be reduced to a formula. This realization necessitates the study of the art of planning.

2-11. The art of planning requires understanding the dynamic relationships among friendly forces, the threat, and other aspects of an OE during operations. It includes making decisions based on skilled judgment acquired from experience, training, study, imagination, and critical and creative thinking. Commanders apply judgment based on their knowledge and experience to select the right time and place to act, assign tasks, prioritize actions, and allocate resources. The art of planning involves the commander's willingness to accept risk.

2-12. Planning requires creative application of doctrine, units, and resources. It requires a thorough knowledge and application of the fundamentals of unified land operations (see ADP 3-0) and the fundamentals of tactics (see ADP 3-90). The art of planning involves developing plans within the commander's intent and planning guidance by choosing from interrelated options, including—
z Arrangement of activities in time, space, and purpose.
z Assignment of tactical mission tasks and tactical enabling tasks.
z Task organization of available forces and resource allocation.
z Choice and arrangement of control measures.
z Tempo.
z The risk the commander is willing to take.

2-13. These interrelated options define a starting point from which planners create distinct solutions to particular problems. Each solution involves a range of options. Each balances competing demands and requires judgment. The variables of mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (known as METT-TC) always combine to form a different set of circumstances. There are no checklists that adequately apply to every situation.

Commanders initiate the MDMP upon receipt of, or in anticipation of, a mission. Commanders and staffs often begin planning in the absence of an approved higher headquarters' OPLAN or OPORD. In these instances, they start planning based on a warning order (WARNORD), a planning order, or an alert order from higher headquarters. This requires active collaboration with the higher headquarters and parallel planning among echelons as the plan or order is developed.