THE SIXTH MILITARY-REVOLUTION: WARFARE IN THE
FOURTH INDUSTRIAL REVOLUTION

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JERRY W. CHAMPION, II, MAJ, USA
B.S., George Mason University, Fairfax, VA, 2008

Fort Leavenworth, Kansas
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Historians MacGregor Knox and Williamson Murray originally suggested only five military-revolutions had occurred in the history of the western way of war. However, in 2017 Murray published *America and the Future of War* and said a sixth military-revolution was unfolding in the modern era and it was mostly influenced by rampant technological change. He went on to suggest that society was only in the nascent stages of understanding the 6th MR and understanding what it might mean for present-day militaries. Thus, the researcher's aim in this thesis was to expand on Murray's basic description of the 6th MR by exploring the root causes of change in the first five military-revolutions in order to formulate an argument for what was driving change in the 6th MR. After the historical precedents for revolutionary changes to war were considered, the researcher used the lessons gleaned from that analysis to examine how technology and other factors were influencing the character of war in the modern era. Ultimately, the author's conclusions presented in this thesis offer an expanded explanation of the 6th MR and considers the implications for the present-day U.S. Military.

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Name of Candidate: Jerry W. Champion, II

Thesis Title: The Sixth Military Revolution: Warfare in the Fourth Industrial
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Approved by:

_____, Thesis Committee Chair
Kevin E. Gentzler, DMgt

_____, Member
Donald S. Stephenson, Ph.D.

_____, Member
Kurt P. Vandersteen, MMAS

Accepted this 14th day of June 2019 by:

_____, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

THE SIXTH MILITARY-REVOLUTION: WARFARE IN THE FOURTH
INDUSTRIAL REVOLUTION, by Jerry W. Champion, 99 pages.

Historians MacGregor Knox and Williamson Murray originally suggested only five
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and considers the implications for the present-day U.S. Military.

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ACRONYMS

AFC	Army Futures Command
AI	Artificial Intelligence
CGSC	Command and General Staff College
CRISPR	Clustered Regularly Interspaced Short Palindromic Repeats
IDF	Indirect Fire Artillery
IoT	Internet of Things
IR	Industrial Revolution
ISIS	Islamic State in Iraq and Syria
MDO	Multi-domain Operations
MMAS	Master of Military Art and Science
MR	Military-Revolution
MTR	Military-Technical-Revolution
NATO	North Atlantic Treaty Organization
NSC	National Security Council
NW	Non-Attributional Warfare
PET-DOS	Politics, Economics, Technology – Doctrine, Organization Strategy
RMA	Revolution in Military Affairs
USTRADOC	United States Training and Doctrine Command
U.S.	United States
ULO	Unified Land Operations
U.N.	United Nations
USCYBERCOM	United States Cyber Command

ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

If you're looking for a new idea, try picking up an old book.
— Defense Secretary James Mattis, Remarks to Senior
Leaders at CENTCOM Commander's Conference, 2017

Military professionals, and political leaders responsible for the employment of the armed forces, have an obligation to understand the character of war and possess a reasonable appreciation for its changes throughout history.[1] Managing and anticipating change is a perennial consideration for those in positions of leadership, regardless of industry or discipline, but nowhere is this truer than in the life and death circumstances of war.[2] Williamson Murray, a historian who's written extensively on the changing nature of war's character, believes that society is currently experiencing an extraordinary level of technologically driven change that is fundamentally altering the character of modern warfare.[3] Murray labels this observation the "sixth military-revolution" and it is a continuation of his previous work that created the Military-Revolutions and Revolutions-in-Military-Affairs (MR-RMA) framework to help leaders understand changes throughout war's history. If Murray is correct, and the character of war is indeed being fundamentally altered by rampant technological change, then this author proposes that military professionals, and political leaders, have an obligation to understand what factors are influencing such revolutionary changes in the current environment and consider how the U.S. Military is adapting to effectively engage in 21st Century warfare.

When he proposed the existence of a sixth military-revolution (6th MR), Murray offered that it was an emerging and poorly understood phenomena that required

additional research and analysis.[4] He identified technology as the root cause of change in the 6th MR, but left out any technical descriptions about which technologies were most influential, or how those technologies were affecting present-day military forces.[5] Murray's reason for omitting such an assessment was intentional because he stated it was a nearly impossible task to come to such definitive conclusions while the 6th MR was still developing.[6] However, he did offer that this should not deter modern researchers from exploring the topic altogether as those efforts could be of some value to shape contemporary military innovation efforts and influence foreign policy debates towards meaningful reform.[7]

Background and Context

The origins of modern thinking about military-revolutions is generally attributed to historian Michael Roberts and his lecture "Military-revolution, 1560-1660" given at the Queen's University of Belfast in 1955.[8] Robert's research explored how Maurice of Nassau and Gustavus Adolphus radically transformed 16th Century warfare primarily through linear formations and drilled musketeers.[9] A byproduct of this historical analysis was the creation of a new paradigm for contextualizing the changes that occurred in the history of warfare.[10] In other words, the paradigm of military-revolutions (MRs) was introduced as a way to explain how the conduct of war periodically transformed from one set of norms to another.[11] The concept of MRs went through a few minor modifications between 1955 and 1970, but significant headway was gained in the 1970s by Soviet military thinkers.[12] Fueled by the contemporary fears of the Cold War, Soviet military theorists argued that "computers, space surveillance, and long-range missiles were merging into a new level of military technology significant enough to shift the correlation

of forces between East and West".[13] This observation led the Soviets to coin the idea of

Military Technical Revolutions, or MTRs.[14] Andrew Marshall, head of the United States

Office of Net Assessment[15], became aware of the Soviet's MTR theory, but advocated

for a slightly different take on the situation. While he acknowledged the key role

technology played, he felt the term MTR was inadequate to address the broader doctrinal,

organizational, and strategy changes that typically accompanied technological

advancements.[16] With that mindset, Marshall advocated for the broader concept of

Revolutions-in-Military-Affairs (RMAs) which gave a more complete explanation about

what fueled radical changes in the conduct of warfare.[17]

The height of the MR debate surfaced in the 1990s after the First Gulf War.[18] The

United States' rapid and decisive 100-hour ground offensive that obliterated the Iraqi

Military, spurred renewed interest in the RMA debate.[19] Mainly in response to the fervor

surrounding this revived RMA discussion Knox and Murray, in 2001, presented their

model for understanding revolutionary changes in war which combined Robert's MRs

with Marshall's RMAs. Thus, Knox and Murray's dual purpose MR-RMA concept was

introduced to explain both the evolutionary and revolutionary changes in war. The MR-

RMA model is still influential to military professionals today as it is used as the core

framework to educate newly minted field grade officers at the Army's Command and

General Staff College (CGSC). Consequently, building on Knox and Murray's MR-RMA

model to explain revolutionary changes to war in the modern era is at the core of this

research effort.

Problem, Purpose, and Significance

The principle problem in this study is the absence of a comprehensive explanation to address the key characteristics of change in the 6th MR. In 2001 Knox and Murray's original MR-RMA model stated there were only five MRs in the history of the western way of war.[20] Then, in 2017, Murray's *America and the Future of War* expanded on the MR-RMA concept to state that the world was currently experiencing another MR largely fueled by rampant technological change.[21] He labeled this MR the 6th MR, but said it was poorly defined and understood by modern military professionals and political leaders.[22] Thus, the primary task in this study was to define the key characteristics of the 6th MR, and consider their effects on the present-day U.S. Military. The purpose of the study was to expand on Murray's explanation of the 6th MR and help modern-day military professionals and policy-makers better understand their current environment as they make decisions about military innovations and foreign policy enactments.

The significance of this study is twofold; first, explaining how the United States is experiencing an all-out MR versus just another RMA carries extraordinary implications for the entire defense apparatus. Second, exploring the effects of the 6th MR on the present-day U.S. Military should prove useful in ascertaining whether or not the U.S. is effectively adapting to changes in the current environment. Consider historian Thierry Gongra's view on the matter:

> Establishing whether we are confronted by [an MR] or [an RMA] carries significant policy implications. If we are facing a military-revolution, the policy debate should transcend issues of technology and operations to embrace such fundamental aspects of defence policy as the nature of future conflicts; the size, recruitment mode, and make-up of armed forces; the financing of defence; and the shape of the defence industrial base . . . if we are only confronting an RMA, then the challenge becomes more manageable, and can be met within the current framework of defence, so long as the military maintain the ability to innovate.[23]

Research Methodology and Questions

To define the key characteristics of change in the 6th MR, the author first sought to learn about the historical precedence for revolutionary change established in the first five MRs, and then use that analysis to inform explanations about the 6th. This approach required a mixed methodology research approach that is given a full description in Chapter Three. For now, it is sufficient for the reader to become familiar with the primary and secondary research questions that drove this study and understand the unique research framework that is periodically referenced before getting to Chapter Three.

The primary research question in this project was: What are the key characteristics of the 6th MR and how are they effecting the United States Military? The primary research question was intentionally broken into two parts. The first part of the primary research question was designed to explain the characteristics of the 6th MR to a broad audience and the second part of the primary research question was drafted to consider what the 6th MR meant for the U.S. in particular. The two part nature of this primary research question is what necessitated a mixed methodology research approach and a full description of that methodology is given in Chapter Three.

While studying to answer the primary research question the subjects of politics, economics, technology, doctrine, organization, and strategy emerged as reoccurring themes in the literature.[24] Authors such as Murray, Knox, Lynn, and others generally used politics, economics, or technology to describe the most influential factors revolutionizing the conduct of warfare in a particular MR.[25] Then, they typically asserted that the MRs they were describing had profound effects on the doctrine, organization and strategy of militaries of that particular time in history.[26] Combining the political,

economic, and technological themes with the doctrinal, organizational, and strategy themes led to the creation of the PET-DOS framework that is used in this study. Henceforth, any mentioning of the acronym PET-DOS is meant to consider how some element of politics, economics, technology, doctrine, organization, or strategy effect the character of war within a particular MR. Figure 1 shows how the secondary research questions are nested within the PET-DOS framework to arrive at the findings presented in this thesis.

PRIMARY RESEARCH QUESTION	
What are the key characteristics of the 6th MR and how are they effecting the United States Military?	
SECONDARY RESEARCH QUESTIONS	
1. What were some the key characteristics of the first five military revolutions?	
PET	DOS
2. What **political** changes have occurred that indicate the 6th MR is already underway?	5. What **doctrinal** changes have occurred within the United States Military as a result 6th MR?
3. What **economic** changes have occurred that indicate the 6th MR is already underway?	6. What **organizational** changes have occurred within the United States Military as a result 6th MR?
4. What **technological** changes have occurred that indicate the 6th MR is already underway?	7. What **strategy** changes have occurred within the United States Military as a result 6th MR?

Figure 1.   Primary & Secondary Research Questions

Source: Created by author.

<u>Scope</u>

The limitation of time was the most influential factor affecting the scope of this research project as only nine months were available to the researcher within the CGSC academic year. Because of this, certain delimitations were required. First, as the reader will see in later chapters, not every element of the first five MRs was studied. A complete review of the revolutionary changes in the history of the western way of war was beyond the scope of this research effort, nor was a complete assessment of each MR required to glean lessons from history to inform a modern-day assessment. Instead, each of the first

five MRs were reviewed to first understand what other historians considered to be the root cause of revolutionary change and then to study what effect those changes had on contemporary militaries during that period in history. Where certain elements of the previous MRs were not investigated in sufficient depth to inform the results of this study, they are marked as "unobserved" in Figure 4.

The second delimitation in this study was the prioritization of studying MRs over RMAs. It is understood that RMAs are subordinate and essential elements of MRs and cannot be excluded from this study. However, initial inquiry into the technological factors influencing the contemporary battlefield yielded numerous publications from many authors contemplating how various pieces of technology were redefining the character of war in the 21st Century.[27] For example, authors such as David Patrikarakos and Pete Singer claim social media is the most important technology on the modern battlefield[28] and Henry Kissinger's essay *How the Enlightenment Ends* asserts artificial intelligence is of supreme importance to warfare in the 21st Century.[29] Not to discredit the nuggets of truth in Patrikarakos, Singer, and Mr. Kissinger's writings, but if Murray is correct, and we are experiencing an all-out MR versus an RMA, then scrutinizing the technical effects of social media and artificial intelligence potentially overlooks the larger issue. As the reader will see, this author suggest that social media and artificial intelligence are merely sub-components of the larger situation. Thus, the second delimitation in this research effort was to refrain from studying any one piece of technology in great depth and instead study a broad range of technologies to consider how they converge to influence the 6th MR writ large.

<div align="center">Definition of Terms</div>

Military-Revolutions – MRs are the first part of the dual lens approach that Knox and Murray used to explain revolutionary changes in the character of war. MRs are analogous to large earthquakes that constitute massive and irreversible changes in society and war. Examples of MRs include the creation of the modern nation-state, the industrial revolution, and the invention of nuclear weapons. These events fundamentally altered the conduct of society and had cascading effects on how humans engaged in war.[30]

Revolution-in-Military-Affairs – RMAs are the second part of the dual lens approach used by Knox and Murray to explain the smaller changes in war that affect the battlefield, but not necessarily society as a whole. Consider them the pre-shocks and after-shocks that accompany the larger MR earthquakes.[31] The most commonly used example for RMAs is the German *Blitzkrieg* when a proliferation of armored vehicles transformed the battlefield in World War II. Mechanized warfare certainly affected the battlefield, but did not alter how society functioned.[32]

6th Military-Revolution – The 6th MR is the phrase that Murray gives to the military-revolution that is presently already underway. In this study, the 6th MR is defined as the fusion, or networking, of a broad range of technologies across the physical, digital, and biological domains that is altering how people live, work, and how wars are fought.[33]

Total War – For the purposes of this study, a war is to be considered a total war if the responsible government has the expressed political aim of completely overthrowing one's enemy and pursues that goal with the entirety of its military capacity.[34]

Limited War – For the purposes of this study, a war is to be considered a limited war if the responsible government expresses a political objective that is anything less than the complete overthrow of their enemy or pursues that goal with anything less than the entirety of its military capacity. In other words, the warring government restrains its military commitment as a matter of judgement or will and not ability.[35]

Conclusion

Chapter one provided the broad context required for the reader to navigate and interpret the results of this study. At this point, it should be clear what research is being conducted, generally how that research was performed, and why the findings might be of any significance to military professionals and policy makers in the present-day. Next, Chapter two provides a synopsis of the most influential sources used to inform the results of this study. Chapter Two is not all-inclusive of every source used in this project. It simply provides the reader with a review of the sources that were most influential to the results of this study. Where other sources were used, the endnotes and bibliography section provide additional clarity or give credit to other author's ideas.

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[1] Williamson Murray, *America and the Future of War (*Standford: Hoover Institution Press, 2017), 47-49.

[2] Ibid., 60-61.

[3] Ibid., 60.

[4] Ibid., 62-65.

[5] Ibid., 60-75.

[6] Ibid.

[7] Ibid.

[8] Michael J. Thompson, "Military-Revolutions and Revolutions in Military Affairs," *Strata* (01 July 2006): 82-84.

[9] Ibid., 87-88.

[10] Ibid.

[11] Ibid.

[12] Ibid.

[13] James R. Blaker, "The Officer," *Understanding the Revolution in Military Affairs* (01 October 2006): 82-84.

[14] Thompson, 82-88.

[15] The United States Office of Net Assessment is a department within the Pentagon that serves as in internal think-tank.

[16] Thompson, 82-88.

[17] Williamson Murray and MacGregor Knox, *The Dynamics of Military-Revolution, 1300-2050* (Cambridge: Cambridge University Press, 2001), 1-15.

[18] Ibid., 8-9.

[19] Ibid.

[20] Ibid., 13.

[21] Murray, 60-65.

[22] Murray, 60.

[23] Thierry Gongora and Harald von Riekhoff, *Toward a Military-Revolution in Military Affairs* (Westport: Greenwood Press, 2000), 38.

[24] These themes emerged primarily from reading Knox and Murray's *The Dynamics of Military-Revolution.* It is also necessary to highlight that the term strategy used in this thesis adheres to the broad definition of the word used by Peter Paret in *The Makers of Modern Strategy.* On page three of that work he described the broad use of word strategy, but stated his use of the word was meant to consider the full range of ways that militaries and governments engage in war that includes the tactical, operational, and strategic levels of war.

[25] This is the researcher's assessment about the conclusions presented by these author's essays within *The Dynamics of Military-Revolutions, 1300-2050.*

[26] Ibid.

[27] David Patrikarakos, *War in 140 Characters* (New York, Basic Books Publishing, 2017); P. W. Singer and Emerson T. Brooking, *Like War: The Weaponization of Social Media* (New York: Houghton Publishing Company, 2018); Henry Kissinger, "How the Enlightenment Ends," *The Atlantic,* accessed 30 May 2019, https://www.theatlantic.com/magazine/archive/2018/06/henry-kissinger-ai-could-mean-the-end-of-human-history/559124/.

[28] Patrikarakos, 20-25; Singer and Brooking, 218-220.

[29] Kissinger.

[30] Murray and Knox, 12-13.

[31] Ibid.

[32] Ibid., 154-155.

[33] Klaus Schwab, *The Fourth Industrial Revolution* (New York: Crown Publishing, 2016), 8. This definition is the researcher's adaptation of Schwab's description of the 4th IR.

[34] Considerable disagreement exists about the definitions of total war and limited war. The definitions provided here represent the researcher's view of the terms which were obtained from reading: Carl von Clausewitz, *On War,* ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 577-617; Christopher Bassford, "Clausewitz's Categories of War and Suppression of 'Absolute War'," (Essay, ClausewitzStudies.org, 26 September 2019), accessed 15 December 2019, https://clausewitz.com/mobile/Bassford-Supersession5.pdf; Donald Stoker, "Everything You Think You Know about Limited Wars is Wrong," *War on the Rocks*, 12 December 2016, accessed 01 December 2018, https://warontherocks.com/2016/12/everything-you-think-you-know-about-limited-war-is-wrong/.

[35] Ibid.

CHAPTER 2

LITERATURE REVIEW

Introduction

Chapter two is divided into three parts to structure the literary sources within their respective areas of study. Part one reviews sources from authors such as Clifford Rogers, Colin Gray, Michael Thompson, and Knox and Murray who all discuss their views on how revolutionary changes occur in war. This subject is important because it was necessary to acknowledge that Knox and Murray's MR-RMA concept is not the only view on the subject and each of these author's perspectives influenced the findings in unique ways. In Part II, the focus of the research is narrowed by examining Knox and Murray's MR-RMA model in greater detail. This was necessary because providing an expanded explanation of the 6th MR is essentially an extension of their work. Therefore, the principle source in Part II is Knox and Murray's *The Dynamics of Military-revolutions*, but that source is augmented with other works where necessary. Even though Knox and Murray's book is an anthology that is comprised of eight different authors, other sources were required to explore particular topics and those sources are cited in the endnotes for clarity and transparency. Finally, after reviewing the historical precedence for revolutionary changes to war in the previous MRs, Part III introduces the reader to Klaus Schwab's *The Fourth Industrial Revolution* (4th IR) to explore the political, economic, and technological changes underway in the current environment. Part III references other sources beyond Schwab, but his concepts were most influential to the findings presented in this thesis, therefore Part III is mostly dedicated to educating the

reader on Schwab's description of the 4th IR so his ideas can be translated into meaningful explanations about the character of war in the 6th MR.

<u>Part I: Thinking about Military-Revolutions</u>

As previously mentioned in chapter one, the origins of the MR debate are attributed to Michael Robert's speech in 1955.[1] Since then, several prominent historians including Gray, Rogers, Knox, Murray, Krepinevich, and others developed various models to explain changes in the conduct of warfare throughout history. In *Military-revolutions and Revolutions in Military Affair*, Thompson stated the five widely acknowledged models are "Social Wave", "Radical Transformation", "Revolution in the Revolution", "Continuity and Evolution/Continuous Innovation" and "Punctuated Equilibrium".[2] What follows is a review of each of these models to determine their usefulness in the construction of an explanation about the nature of change underway in the 6th MR.

"The social wave model explored the broad social, political, and economic changes that affect military transformation and the way society organizes and conducts war."[3] The social wave model recognizes only three revolutions: the French Revolution, the Industrial Revolution, and the Information Revolution. Advocates of the Social Wave theory assert revolutionary changes to war are most directly linked to the means of economic production.[4] For example, in the French Revolution agriculture was the economic epicenter of society and revolutionary changes occurred when nation's industrial production capacity became the largest determinant of wealth in the Industrial Revolution. The Social Wave model suggests that the means of war are determined by the means of economic production and true revolutions in warfare only take place when

radical economic change occurs first.[5] The Social Wave paradigm captured the radical changes observed in the history of war, but it did little to address the smaller changes in the conduct of warfare.[6]

Thompson described the "radical transformation" model in which MRs were primarily the result of "far-sighted innovators who were able to see the potential of new technologies and create new doctrines as a result."[7] The most common historical example cited to support this theory is the German *Blitzkrieg*. While all of the belligerents in World War II had access to planes, tanks, radios, and other technological advancements during the interwar period, it was the brilliance of the German military innovators who devised the right mixture of technology, organization, and doctrine that brought about the RMA.[8] However, the radical transformation model had the opposite problem of the social wave model. The social wave model grappled with large changes within MRs, but failed to address the smaller changes that affected military professionals during inter-revolutionary periods. Thompson, through the radical transformation model, addressed the smaller changes, but left the larger MRs almost entirely unaddressed.[9]

In 1993 Clifford Rogers adapted a theory from evolutionary biology to suggest that the notion of MRs in history was flexible and advocated for a view of "punctuated equilibrium".[10] In Roger's view, it was impossible to characterize singular events, such as *Blitzkrieg*, as the impetus for MRs because it failed to account for the complex series of events that preceded its implementation.[11] Instead, Rogers argued that "Western military dominance derived from a series of sequential evolutions, each an attempt to reverse a disequilibrium introduced by the previous one, rather from a single military-revolution".[12] In other words, changes in war occurred as incremental evolutions and not

rapid revolutions. Rogers identified four revolutions over five centuries between 1300

and 1800: Infantry Revolution, Artillery Revolution, Artillery Fortress Revolution, and

Military-Revolution as portrayed by Michael Roberts in 1955.[13] His analysis ended there

and stated it was reasonable to argue for additional revolutions such as the French

Revolution, Industrial Revolution, and Nuclear Revolution as additional periods of

punctuated equilibrium if one so chose. In his view, changes in war were evolutionary,

not revolutionary, and each evolutionary period was simply preceded by "short burst of

change, interspersed with long periods of stasis".[14] Murray and Gray initially criticized

the punctuated equilibrium model noting that MRs "cannot be assumed to follow a

strategically logical and tidy path of action and reaction."[15]

The "Continuity and Evolution/Continuous Innovation" (CeCi) model took a

balanced approach between the radical transformation model and the punctuated

equilibrium model. Authors such as Jeremy Black and Colin Gray postulated that

evolutionary trends existed in the study of MRs, but they were not as steady-state and

linear as put forth by Rogers.[16] They suggested the pace and tempo of change varied

greatly due to military innovation efforts and the change was observed differently as

actors continually attempted to make sense of a chaotic environment.[17] While the authors

of the CeCi model acknowledged both sides of the argument, they failed to provide the

substantive framework that policy makers could use to effectively understand such a

chaotic environment.[18]

Knox and Murray claimed revolutionary changes in war were best observed

through the dual lens of military-revolutions (MRs) and revolutions-in-military-affairs

(RMAs). MRs were the larger of the two forms of change and RMAs were its smaller

subcomponents. A MR was characterized as an event that deeply altered the makeup of all of society and had implications for how societies were fundamentally organized. Knox and Murray stated five MRs had occurred in the history of the western way of war: the 17th Century creation of the modern state, the French Revolution, the Industrial Revolution, the combining of the French and Industrial Revolutions, and the Nuclear Revolution. Each of these historical events caused seismic quakes in the fabric of society and each MR consisted of several smaller RMAs directly impacting the conduct of warfare on the battlefield.[19]

After providing a thorough analysis of the available models, Thompson stated all of these arguments could be reasonably viewed as mere "squabbling over semantics."[20] All of the authors were attempting to understand and contextualize the same phenomena: the process of change and innovation. They all agreed that substantial changes had occurred in warfare's history, but the explanations as to how and why were where they differed. Thompson suggested that each model presented different strengths and weakness and each could be used to understand certain historical events better than others. Thompson offered his readers this assessment: "revolutions are defined by realizations of change, not the pace of change."[21] It was less important to consider whether the change was evolutionary or revolutionary, than for the belligerents involved in the war to realize that " . . . over some relatively brief period of time, the character of conflict had changed dramatically, requiring equally dramatic, if not radical, changes in military doctrine, organization, and strategy."[22]

Part II: Military-Revolutions and Revolutions-in-Military-Affairs

Knox and Murray were greatly influenced by the First Gulf War RMA debates of the 1990's and offered their MR-RMA model in 2001 to provide an intellectual and historical framework to the defense community that could be used to inform sound military policy decisions.[23] At the time of their publishing, and still true today, significant debates were taking place as to how the military should spend its discretionary budget towards technology innovations in order to maintain overmatch against other nations.[24] The MR-RMA model was partly meant to demonstrate MRs were not exclusively based on technological innovations.[25] Knox postulated that technology was often a major contributing factor, but some of the most dramatic changes in the history of warfare owed very little to technology.[26] Knox cited Napoleon and the French Revolution as the quintessential example that MRs were capable of being equally influenced by changes in politics and economics and not just technology.[27] In his view, conversations about how the U.S. should innovate for war had devolved into a narrowly focused argument about which new technology or piece of equipment would win the next war. Knox and Murray wanted to remind policy-makers of the much broader perspective they should take when making decisions about how to posture the U.S. Military for success in future combat operations.[28] The remainder of Part II of the literature review is devoted to understanding how authors Knox, Murray, Lynn, Bailey, Freedman, Carver and others, defined the first five MRs to understand what historical precedence for revolutionary change exists before attempting to define the unique characteristics of the 6th MR.

The First Military-Revolution

The 1st MR was primarily influenced by the 17th Century creation of the modern state.[29] As is common with many of the revolutionary eras, this event does not have a specific date. However, the 1648 Treaty of Westphalia is emblematic of the type of political change experienced in the 17th Century.[30] The treaty brought an end to the Thirty Years' War and Eighty Years' War, also known as the wars of religion, and ushered in the wars of Realpolitik.[31] Under the treaty a prince was free to determine the religion of his own state. Moreover, Christians living in any land where their denomination was not the established one, were free to practice their religion in both public and private accommodations.[32] Aside from the new religious freedoms, the treaty also codified the concept of state sovereignty. Each nation, large or small, was free to govern its peoples within its territorial boundaries free from interference from other nations. This became known as Westphalian Sovereignty and is an essential legal underpinning of the United Nations Charter today.[33]

Lynn attributed these types of political change as the root cause of the 1st MR stating the creation of the modern state provided nations with a period of relative political stability and an organized system of taxation which they used to finance and innovate for future wars.[34] With the creation of the modern nation-state it had become so expensive to wage war that only states could mobilize the resources required for its conduct.[35] A nation's ability to generate wealth is critical to its ability to wage war and the new political realities of the 17th Century created an environment where substantial economic benefits could be reaped through effective taxation.[36]

Lynn highlighted technology's minor influence on the 1st MR using France's 17th Century military, the G*rand Siècle,* as his primary example. Under the reign of Louis XIV, the grand siècle adopted the use of flintlock and bayonet weapons and made a fledgling attempt at artillery integration. However, neither of these weapon systems, or any other technological developments, did much to change the conduct of warfare during this period. Instead, Lynn argued the *Grand Siècles'* doctrinal, organizational and tactical changes were much more indicative of the nature of change underway in the 1st MR.[37]

According to Lynn, a battle culture of forbearance was a tangible side effect of the creation of the modern state.[38] The battle culture of forbearance was all about taking losses stoically and not striking the enemy until he had depleted his resources and was unable to mount a counter attack. This change in strategy differed dramatically from the previous techniques to strike the enemy first, fast, and decisively in the offense. This new attritional strategy required a great deal of resources, both in blood and treasure. All of which would not have been available to Louis XIV had it not been for the prosperity brought about from the effective and efficient systems of taxation. However, material resources were not the only requirement to implement this new tactical strategy. The battle culture of forbearance also mandated a highly disciplined soldier and military units to withstand such battle trauma.[39]

To instill the discipline required for the state to wage war with large armies, Louis XIV made revolutionary changes to the doctrinal and organizational components of his grand siècle.[40] First, Louis XIV took a fanatical approach to drilling his troops. He issued a series of ordinances and directives that increased the frequency and intensity of all drilling in the French military. Additionally, he would often drill with the units personally

to demonstrate his resolve in the importance of training.[41] McNeill observed that these intensive drills enhanced group cohesion through "muscular bonding" - resulting in a perceptible change in the psychology of soldiers that translated into enhanced esprit de corps and the forging of group identity.[42]

Finally, Lynn suggested another ingredient in explaining the grand siècles' success was its organizational restructuring.[43] Specifically, Lynn pointed to the newly standardized military community, the regiment. Under Louis XIV, regiments were standardized with regards to manning, equipping, and training. As a result of these newly formed units drilling and living together, they became the focus of an individual's cultural identity. Exercising authority over these new military communities was a prescribed cadre of officers with clearly defined ranks and functions. Thus, the traditional notion of the "regimental chain of command" was born. This differed greatly from the previous practices of social pedigree and personal bonds defining the hierarchy of authority within units and the traditions established here under the French Regiments is still echoed in the titles, ranks, and command relationships in use today.[44]

The Second Military-Revolution

Much like the 1st MR, the 2nd MR was primarily influenced by political change.[45] Napoleon and the Napoleonic Wars, as emblematic of the French Revolution as they may be, were only made possible because of the cultural, political, and social changes that took place in France between 1789-1799.[46] During this period, France underwent a radical transformation that effectively ended monarchial rule and replaced it with a burgeoning republic. The inhabitants of France transitioned from feudal subjects to national citizens and a pathway for upward mobility in society existed as a meritocracy

instead of a birthright. During this period of political-revolution the military became more important in society because it provided a way for increasing one's status in life. Because of this, and the newly adopted policy of near universal conscription, the French Army grew to a size of more than 750,000 men by 1794.[47] As the military grew in size and prominence, it also became viewed as the primary instrument of achieving France's foreign policy objectives.[48] In that sense, the political-revolution may have preceded the military-revolution, but the war machine would soon take on a life all its own under Napoleon's reign.

Napoleon Bonaparte was a military genius, but his brilliance would likely not have been fully realized had he not lived during the French Revolution. To his credit, Napoleon seized upon the opportunity that was present and built an empire that dominated the European landscape during his lifetime and beyond. His most significant contributions can be viewed through the three categories of politics, doctrine, and strategy. Politically, Napoleon went to great lengths to elevate the status of the soldier in society and perfected the previously existing policy of near universal conscription. He transformed that policy into a *Levee en Mass* that called on all of the French citizenry to serve in the military and aide in the expansion of France's dominance on the European continent. Napoleon's *Levee en Mass* was so successful that it created a French military that grew to more than two million men between 1800 and 1814.[49] Doctrinally, Napoleon took the tenets of the army regulation of 1791 and perfected them in theory and practice. Specifically, he took existing formations and built them around an "all-arms" division and corps headquarters structure.[50] The systematic pairing of infantry, cavalry, artillery, and support units formed the basis of the combined arms fight still foundational in

today's doctrine. Strategically, the most powerful contribution Napoleon brought to the French Revolution was "unity of command." As the Emperor of France, he was both head of state and head of the military. This concentration of power in one man, made France extremely powerful yet also vulnerable. Powerful in the sense that he could wield absolute power to achieve his political objectives, but vulnerable in the sense that there were no checks and balances to keep his ambitions from overextending the military's capacity.[51]

Knox did not address the economic influences of the 2nd MR in great depth, but that does not suggest they were unimportant. Much like the 1st MR the economic characteristics of the 2nd MR were a byproduct of the political revolution. Knox acknowledged the importance of the economic factors at play in the 2nd MR by opening his essay with this statement: "the revolution of industrial capitalism . . . is the greatest transformation in human existence since the coming of agriculture."[52] However, Knox also argued that the effects of true mass production in the industrial age had not quite taken hold in France during Napoleon's time and much more could be learned about the 2nd MR by studying the France's political and technological factors.[53]

Knox used a fair bit of his essay explaining how technology did very little to affect the 2nd MR. His argument was countering the 1990's American RMA enthusiasts' narrative that MRs were influenced primarily by advancements in technology. Knox suggested the only piece of technology that had any impact of the battlefield during the 2nd MR was the Gribeauval Artillery System and it was of minor importance.[54] In essence, the Gribeauval Artillery System simply made artillery pieces lighter, more mobile, and more accurate.[55] While they were exclusively employed by the French

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during the majority of the Napoleonic Wars, it is worth mentioning that they had been in existence since the 1760s without any decisive advantages to the French on the battlefield.[56] In other words, it is fair to say Napoleon's unique employment of mobile artillery gave him an advantage over his enemies, but it would be inaccurate to suggest this single piece of technology was of greater importance than the economic, doctrinal, and organizational advantages he enjoyed from the fruits of the political-revolution.[57]

The Third Military-Revolution

In stark contrast with first two politically driven MRs, Grimsley argues the 3rd MR was most profoundly impacted by innovations to technology and economics.[58] In his essay, Grimsley makes a compelling argument that economic policy, fueled by the monies of the Industrial Revolution, was the greatest determinant in the Union's defeat over the Confederate South in the American Civil War.[59] Before going any further it is necessary to acknowledge that Knox and Murray used the American Civil War to portray the effects of the 4th MR, not necessarily the 3rd MR as done here. However, while the American Civil War rightly fits into the 4th MR when viewed as a whole, its technological and economic features still serve as a valid examples about the character of war in the 3rd MR, especially when one's target audience is of American nationality. For this reason mass-politics, which also greatly affected the conduct of the American Civil War, was unobserved for this study.

Political influences aside, the technology that fueled the Industrial Revolution and the economic power that resulted from such a mass production of goods, fundamentally changed the conduct of warfare in the late 19th Century.[60] These technologies included ironclad warships, steam and rail transportation, the telegraph, and a myriad collection of

other machines that enabled the transition to mass-production instead of limited quantity hand-made goods.[61] Grimsley explained that even though technology was the primary catalyst for change in the 3rd MR, it failed to achieve a decisive victory for either side in the Civil War because there was no asymmetry. Both North and South had access to the same types of technology and were therefore able to employ them in a similar fashion.[62] For all the changes to the character of war these technologies entailed, Grimsley argued it was the brilliant economic policies of the North that ultimately led to the Union's victory.[63]

Grimsley pointed to three specific economic policies that led to the North's victory and they serve to highlight the critical importance of economic principles in the 3rd MR. Grimsley argues the Legal Tender Act of 1862, the Internal Revenue Act of 1862, and the National Bank Act of 1863 served as tipping points in the American Civil War.[64] By 1862 both North and South were waging war at an unprecedented scale enabled by the technological innovations of the industrial revolution. However, waging war on this scale proved to be expensive and both sides were struggling to generate the revenue to finance the war. The key statistic in all of this was that before the start of the war the North held approximately 75% of the nation's taxable wealth.[65] Despite this apparent overwhelming advantage, the fledging economic policies of this newly formed nation were incongruent with reaping the benefits of such material wealth. Without getting into a detailed lesson on economic principles, it is sufficient to say that both sides implemented new economic reforms to fund the war. The South's policies were an abysmal failure that led to a 600% inflation rate.[66] The North's enactment of the three aforementioned policies kept their inflation to a mere 80% by comparison.[67] Grimsley

provided a much more thorough analysis of the economic principles at play during the American Civil War; however, for the purpose of analyzing the characteristics of the 3rd MR, it is sufficient to say that monetary policy took on increased level of importance in the conduct of warfare from the Industrial Revolution onward.[68]

The Fourth Military-Revolution

Bailey characterized the 4th MR, specifically the technological adaptations of indirect fire artillery (IDF), as perhaps "the most significant conceptual development in all the long history of war".[69] The majority of his essay described how that single piece of technology, fueled by massive economic expansion, served to fundamentally change the character of warfare for several generations and still persists in modern battlefields today. Bailey acknowledged the numerous other technological innovations that occurred during the 4th MR, namely tanks, planes, and wireless communication systems, but asserted that all of these inventions derived their wartime relevance from the bloody lessons that were learned from the introduction of IDF during the First World War. In his view, the underlying significance of all of these innovations was that they dramatically reengineered the geometry of the battlefield.[70] In other words, three-dimensional warfare was born and the doctrinal underpinnings of the deep and close battle were shattered beyond recognition.

Three-dimensional warfare was an entirely new concept for military commanders fighting in the 4th MR.[71] Previously, a commander was limited to only destroying what he could see or what his troops could engage via direct contact with the enemy. Three-dimensional warfare meant that an enterprising commander could use his IDF assets to destroy his enemy in the area beyond which he could visually observe the effects or

direct his ground forces to maneuver. This dramatic restructuring of the battlefield geometry meant the commander had entirely new methods of achieving victory at his disposal, but it also meant he had an entirely new threat upon which he must defend. Trench warfare and the correspondingly high death tolls of World War I, opened commander's eyes to the distinctly new form of warfare they were fighting. Thus, much like the 3rd MR, the 4th MR was influenced by technological innovation more than political or economic considerations. It started with IDF, but incremental improvements to planes, tanks, and wireless communications continued to alter three-dimensional warfare from 1914 through 1945 until the introduction of the nuclear bomb and rocket technology introduced the fourth dimension of space.

The Fifth Military-Revolution

In the 5th MR, war was again radically transformed by technology.[72] Much like indirect fire artillery created three-dimensional warfare, the introduction of nuclear weapons and rocket technology created the fourth-dimension of space.[73] In the fourth dimension, threats became persistent, global, and entailed a level of destruction that could annihilate entire nations with the release of a single munition.

Knox and Murray's anthology on MRs did not include a detailed assessment of the 5th MR, so the researcher turned to Paret's *Makers of Modern Strategy* to better understand post-nuclear warfare. In Paret's work Freedman offered that warfare dramatically changed in the post-nuclear era from a military commander's decisions about how the resources of war would be employed to ensure the complete destruction of his opponent, to how political overseers were determining the non-use of the most powerful instruments of war to deter or limit armed conflict to achieve a limited set of

objectives.[74] At least as early as Clausewitz's observation that "war was a mere continuation of policy by other means,"[75] it had been understood that to varying degrees, the military enterprise was subordinate to the aims of its political overseers - political outcomes were the ends and military forces were the means. The unique circumstance of the 5th MR was that technology had generated an entirely new means for achieving the political ends as the conventional military was one option and the nuclear force was another.[76] Because the nuclear force now existed alongside the conventional military force, how much of a nuclear arsenal did the U.S. need to possess? How big did the conventional military force need to be if a nuclear arsenal was such a powerful deterrent for war? These and many other similarly difficult questions were front and center in the civilian-military dialogue of the time.[77]

The mostly civilian-driven grand strategy debates of the next four decades served to define the conduct of warfare in the Cold War era.[78] One could look to such historical artifacts as National Security Council (NSC) memorandum number 68, NSC 162/2, Containment Strategy, Massive Retaliation, Mutually Assured Destruction, the Korean War, the Vietnam War, and the First Gulf War and conclude that warfare during these periods was markedly different than the pre-nuclear age.[79] The complete annihilation of one's enemies became an untenable military objective for nuclear armed nations. The new-normal in the 5th MR was how to achieve political objectives through the application of military force, while keeping the threshold of violence below a level that would prompt the exchange of nuclear weapons.[80]

<u>Part III: The 4th Industrial Revolution</u>

Breaking almost entirely from the discussion of MRs and war, the next section of this chapter provides a review of *The Fourth Industrial Revolution* as authored by Klaus Schwab. Schwab is the founder and executive chairman of the World Economic Forum and in his book, *The Fourth Industrial Revolution*, he addressed the core technologies reshaping society in the 21st Century. The subject is relevant to the 6th MR because Schwab and Murray were witnessing the same phenomena. Both men observed that rampant technological change was altering the fundamental makeup of society, but made these observations from two very different vantage points. Schwab was focused on how these technologies affected the world's economy and Murray was concerned about how these technologies affected the future of warfare. The remainder of this section provides a distillation of Schwab's view on the 4th IR so that its substantive pieces may be used to stitch together a more coherent definition of Murray's 6th MR.

In the first chapter, Schwab offered his opinion that revolutions occur when "new technologies and novel ways of perceiving the world trigger a profound change in economic systems and social structures."[81] The first major change in civilization occurred about 10,000 years ago during the agrarian revolution.[82] This period was marked by mankind's transition from foraging to farming and was largely made possible by the domestication of animals. During the agrarian revolution, the combined efforts of human adaptation and animal domestication led to innovations in production, transportation, and communications.[83] These innovations paved the way for settlements, urbanization, and eventually to the rise of cities. The next major revolution occurred in the late 18th Century with the first industrial revolution. It marked a transition from

muscle to machine power and technologies such as the railroad system and the steam engine were prime drivers of change. In the late 19th Century, the second industrial revolution was brought about by the advent of electricity and the assembly line made mass production possible. Lastly, the third industrial revolution began in the 1960s and was primarily influenced by semiconductors, mainframe and personal computing, and eventually the commercial internet of the 1990s. [84]

Today, Schwab argues a fourth industrial revolution is underway and it is fundamentally shaped by the confluence of emerging technologies across the physical, digital, and biological worlds.[85] These technologies included: artificial intelligence (AI), robotics, the internet of things (IoT), autonomous vehicles, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing.[86] Below, Figure 2 graphically depicts some of the most prominent technologies currently impacting the 6th MR across all three domains.
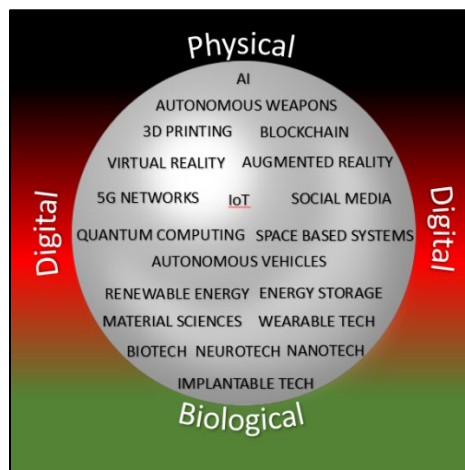
Figure 2.   Technological Fusion

Source: Created by author using data from Klaus Schwab, *The Fourth Industrial Revolution* (New York: Crown Publishing, 2016), 20-25.

Schwab acknowledged that many view the current situation as merely a continuation of the third industrial revolution and it did not merit its own labeling as a fourth.[87] However, he pointed to three characteristics of the current environment that mark a clear distinction from the previous revolution: velocity, breadth and depth, and systems impact. First, the sheer pace of change is on a completely different scale from the previous revolutions. He described the change as exponential rather than linear and the hyper-connected nature of the world only precipitated an increase in velocity as society moves forward. Second, the convergence of all these technologies across the physical, digital, and biological worlds was leading to unprecedented paradigm shifts in the economy, business, society, and individuals. Talking about the convergence issue, Schwab stated "It is not only changing the "what" and "how" of doing things but also "who" we are."[88] Lastly, he described how the fourth industrial revolution was transforming entire systems "across (and within) countries, companies, industries, and society as a whole."[89]

In Chapter two Schwab addresses the specific technologies shaping the 4th IR and he categorized these "megatrends" as primarily physical, digital, or biological in nature. In the physical domain he pointed to autonomous vehicles, 3D printing, advanced robotics, and new materials as essential elements of the revolution.[90] In the digital domain, Schwab highlighted computing power, a vast array of sensors, blockchain technology, and the networks that permit all these things to communicate instantaneously as central to the 4th IR. As an example, he highlighted how these technologies have created what is now called the "on-demand economy" and brought into question the very nature of what is considered valuable. His quote from media strategist Tom Goodwin was

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a powerful illustration as to the nature of the change underway: "Uber, the world's largest taxi company, owns no vehicles. Facebook, the world's most popular media owner, creates no content . . . Airbnb, the world's largest accommodation provider, owns no real estate."[91] These realities called into question the very nature of what was worth owning – the platform or the underlying asset? These digital platforms, connected to the world's consumers through the internet of things, had altered the means of wealth generation for the entire global economy. Finally, in the biological domain, Schwab pointed to advancements in gene sequencing, synthetic biology, and nuerotechnology as being particularly influential in the 4th IR. For example, he pointed to CRISPR, which is a method of gene editing, that is capable of producing personalized pharmaceuticals that respond to a specific patient's DNA sequence.[92] In Schwab's view it is the fusion of these and other technologies across the physical, digital, and biological domains that makes the 4th IR fundamentally different from any of its predecessors.[93]

In the third and final chapter, Schwab discussed the implications of all of these technological advancements across a broad range of audiences. He gave specific analysis on the impacts to the economy, businesses, governments, society and the individual person. He then provided recommendations to each audience about how to adapt in the face of the 4th IR. It is beyond the scope of this thesis to cover the entire range of implications and recommendations. Instead, the most important components are integrated into chapter four to show how each element helped define the key characteristics of the 6th MR. For now, it is sufficient to highlight the central theme of the empowerment paradigm shift that is present throughout his book. The empowerment paradigm shift explained changes in "how governments relate to their citizens; how

enterprises relate to their employees, or how superpowers relate to smaller countries."[94] Historically, the larger entities held the power. The government was more powerful than its individual citizens and bigger states were more powerful than smaller states. The essence of the empowerment paradigm shift underway in the 4th IR was that power was shifting from governments to its citizens, from businesses to their employees, from the nation state to non-state entities.[95] In other words, individuals empowered by globally connected technologies were changing the balance of power around the world. They weren't reclaiming all or even a majority stake in the available power pool, but there was a dramatic rebalancing taking place.

<u>Summary of Literature Review</u>

The material presented in chapter two represented the most influential sources of literature in the study to define the key characteristics of the 6th MR. The analysis on the various models used to understand how revolutionary changes occur in war was useful because it gave the broad context required before dissecting the more granular elements of the MR-RMA framework. A detailed study into the MR-RMA framework was necessary, because defining the characteristics of the 6th MR was an extension of Knox and Murray's original work and understanding the historical precedence established in previous MRs was critical to the development of the researcher's findings. Finally, Schwab's description of the 4th IR was vital because it gave the technical details required to draft a compelling narrative about what differentiated the 6th MR from its predecessors. Next, chapter three provides a more thorough explanation as to how these sources were used to answer the primary and secondary research questions in this research study.

[1] Michael J. Thompson, "Military-Revolutions and Revolutions in Military Affairs," 82-106.

[2] Ibid., 83-86. It is Thompson's assessment that these are the five widely acknowledged models on the subject.

[3] Ibid.

[4] Ibid.

[5] Ibid.

[6] Ibid.

[7] Andrew F. Krepinevich, *Calvary to Computer: The Pattern of Military-Revolutions* (Washington, DC: The National Affairs, 1994), 15-16.

[8] Ibid.

[9] Thompson, 82-88.

[10] Roger's punctuated equilibrium was actually an adaptation of Stephen Jay Gould's punctuated equilibria theory within the field of evolutionary biology.

[11] Clifford Rogers, "The Military-Revolutions of the Hundred Years' War," *The Journal of Military History* (01 August 1993): 241-245.

[12] Ibid.

[13] Ibid.

[14] Ibid.

[15] Colin Gray, *Strategy for Chaos: Revolutions in Military Affairs and Evidence of History* (London, UK: Frank Cass Publishers, 2002), 1-15.

[16] Ibid.

[17] Ibid.

[18] Thompson, 83-106.

[19] Murray and Knox, 1-14. This reference also covers all of the preceding sentences in the same paragraph.

[20] Ibid., 100.

[21] Ibid., 83-106.

[22] Krepinevich, 98.

[23] Murray and Knox, 5-6.

[24] Murray, 67-70.

[25] Ibid., 7-10.

[26] MacGregor Knox, "Mass Politics and Nationalism as Military Revolution: The French Revolution and After," in *The Dynamics of Military Revolutions, 1300-2050,* ed. MacGregor Knox and Williamson Murray (Cambridge, MA: Cambridge University Press, 2001), 57-60.

[27] Ibid.

[28] Murray and Knox, 1-15.

[29] Ibid., 1-14.

[30] LTC John McGrady, CGSC C500 lecture, October 2018.

[31] Scott Hammish, *The Oxford Handbook for Early Modern European History* (Oxford: The English Historical Review, 2017), 975-977.

[32] Ibid.

[33] Edward Luck, "To Protect," *The Economist* (01 November 2017): 12-20.

[34] John A. Lynn, "Forging the Western Army in Seventeenth-Century France," in *The Dynamics of Military Revolutions, 1300-2050,* ed. MacGregor Knox and Williamson Murray (Cambridge, MA: Cambridge University Press, 2001), 35-45.

[35] Ibid.

[36] Dr. Donald (Scott) Stephenson, CGSC H100 lecture, August 2018.

[37] Lynn, 35-56.

[38] Ibid.

[39] Ibid.

[40] Ibid.

[41] Ibid.

[42] William H. McNeil, *Keeping Together in Time: Dance and Drill in Human History* (Cambridge: Cambridge University Press, 1995), 102.

[43] Lynn, 35-56.

[44] Ibid., 35-56.

[45] Knox, 57-60.

[46] Ibid., 57.

[47] Ibid., 67.

[48] Ibid., 66-68.

[49] Ibid.

[50] Ibid.

[51] Ibid.

[52] Ibid., 64-66.

[53] Ibid., 72-74.

[54] Ibid.

[55] Ibid.

[56] Ibid.

[57] Ibid.

[58] Mark Grimsley, "Surviving Military-Revolution: The U.S. Civil War," in *The Dynamics of Military-Revolution, 1300-2050*, ed. MacGregor Knox and Williamson Murray (Cambridge, MA: Cambridge University Press, 2001), 84.

[59] Ibid., 84-86.

[60] Ibid., 75.

[61] Ibid.

[62] Ibid., 76.

[63] Ibid., 84.

[64] Ibid., 88-89.

[65] Ibid., 84.

[66] Ibid., 87.

[67] Ibid., 89.

[68] Ibid., 88-89.

[69] Jonathan B.A. Bailey, "The First World War and the Birth of Modern Warfare," in *The Dynamics of Military Revolutions, 1300-2050,* ed. MacGregor Knox and Williamson Murray (Cambridge, MA: Cambridge University Press, 2001), 132.

[70] Ibid., 132-133.

[71] Ibid.

[72] Lawrence Freedman, "The First Two Generations of Nuclear Strategists," in *The Makers of Modern Strategy: from Machiavelli to the Nuclear Age,* ed. Peter Paret, Gordon A. Craig and Felix Gilbert (Princeton, NJ: Princeton University Press, 1986), 735-745.

[73] Ibid.

[74] Ibid.

[75] Clausewitz, 87.

[76] Freedman, 735-745.

[77] Ibid.

[78] Ibid.

[79] Ibid.

[80] Ibid.

[81] Schwab, 6-9.

[82] Ibid.

[83] Ibid.

[84] Ibid.

[85] Schwab, 1-2.

[86] Ibid.

[87] Ibid., 7-8.

[88] Ibid., 3-4.

[89] Ibid.

[90] Ibid., 15.

[91] Ibid., 20.

[92] Ibid., 14-21.

[93] Ibid., 8.

[94] Ibid., 67-68.

[95] Ibid., 68-70.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

Chapter three describes the methodology used in this research study. As a reminder, the primary task in this study was to define the key characteristics of the 6th MR, and consider their effects on the present-day U.S. Military. The purpose of providing a more complete definition of the 6th MR was to help military professionals and policy-makers better understand their current environment as they make decisions about military innovations and foreign policy decisions in the modern era. The primary research question was "What are the key characteristics of the 6th MR and how are they effecting the United States Military?" The first part of the primary research question was designed to define the 6th MR for a broad audience. The second part of the primary research question was drafted to address what the 6th MR meant for the United States in particular. Secondary research questions were built to address specific sub-components of the primary research question as shown in Figure 1. The remainder of Chapter Three explains three critical topics that are essential to fully understanding the results of this study. Topic one is an explanation of the type of qualitative research analysis that was used and why it was chosen. Topic two, describes how the PET-DOS framework was built and what function it serves in this study. Topic three concludes the chapter with a description of the process used to translate Schwab's narrative about the 4th IR into a meaningful explanation about the technological, political, and economic factors influencing the character of war in the 6th MR.

PRIMARY RESEARCH QUESTION	
What are the key characteristics of the 6th MR and how are they effecting the United States Military?	
SECONDARY RESEARCH QUESTIONS	
1. What were some the key characteristics of the first five military revolutions?	
PET	DOS
2. What **political** changes have occurred that indicate the 6th MR is already underway?	5. What **doctrinal** changes have occurred within the United States Military as a result 6th MR?
3. What **economic** changes have occurred that indicate the 6th MR is already underway?	6. What **organizational** changes have occurred within the United States Military as a result 6th MR?
4. What **technological** changes have occurred that indicate the 6th MR is already underway?	7. What **strategy** changes have occurred within the United States Military as a result 6th MR?

Figure 1.   Primary and Secondary Research Questions

Source: Created by author.

Qualitative Analysis and the PET-DOS Framework

Choosing between qualitative or quantitative methodologies was a simple task because the primary and secondary research questions were not empirical investigations requiring mathematical, statistical or computational explanations.[1] Instead, the research questions were about providing descriptions and meaning to an existing qualitative framework; the MR-RMA concept. However, the task of determining what type of qualitative research methodology to pursue was more challenging. Ultimately, a mixed methodology was chosen that combined the techniques of content analysis with that of a case study style of inquiry. This mixed methodology was chosen because the first part of the primary research question was best suited to a content analysis approach and the second part of the primary research question was best examined through a case study methodology.

Answering the first part of the primary research question required a content analysis approach because the content analysis coding techniques were useful in

succinctly categorizing the ideas presented from various authors in the literature review.[2]

This coding technique was useful because each author took a unique approach to explaining the first five MRs and those complex explanations needed to be distilled into broad categories to identify potential themes amongst them. After studying each of the first five MRs, the themes of politics, economics, and technology emerged. Essentially, each author used one of these broad subjects to make an argument for what they believed was the primary catalyst for change and then considered what influence that catalyst had on the character of war at that time in history. For example, Knox suggested the 1st MR was a critical outcome of the emergence of the 17th Century modern state and it had tremendous implications for the doctrine and organizational structure France's *Grand Siècle*.[3] In this instance, politics was deemed the primary catalyst for change and the text was coded "p". In Grimsley's essay, he made the argument that economic factors were the most influential aspect in determining the victor of the American Civil War, so his text was coded with an "e". In Bailey's essay, he suggested the introduction of indirect fire artillery on the battlefield was the impetus for revolutionary change in the 4th MR so his text was coded with a "t".[4] After reviewing each of the first five MRs, and categorizing each text as either a "p", "e", or "t", it was concluded that any explanation of the 6th MR had to address its political, economic, and technological factors to be considered comprehensive. Thus, the PET of the PET-DOS framework was built and secondary research questions two through four were drafted to explore the political, economic, and technological factors influencing changes to war's character in the 6th MR.

The second part of the primary research question was examined through a case study methodology because it mirrored the techniques used by historians who studied the first five MRs. In their descriptions of revolutionary change each author used specific technological, tactical, doctrinal, organizational, or strategy developments as evidence to support their deductions. For example, Knox used France's *Grand Siècle,* the systematic drilling of troops, and the organizational development of regiments as evidence to persuade his readers that revolutionary changes to war had occurred as a result of the 17th Century creation of the modern state.[5] In his description of the 2nd MR, Lynn used the French Revolution, the Napoleonic Wars, and the Gribeauval Artillery System as evidence to support his assertion that politics, not technology, was the impetus for change.[6] Then in the 5th MR, Freedman and Carver used the atomic bomb, Cold War, Korean War, Vietnam War, and various limited war strategies to describe the new character of war in the post-nuclear age.[7] Following these author's examples, performing a case study analysis on modern-day U.S. Military activities served to provide the evidence required to understand the implications of the 6th MR. As the reader will see in Chapter Four, the doctrine of Multi-domain Operations, the organizational development of USCYBERCOM and Army Futures Command, and the conflicts of the post 9-11 era were used as evidence to consider what effects the 6th MR has had on the U.S. Military. These case studies were chosen because they are analogous to the types of evidence used by Knox, Murray, Freeman, Carver and others in their arguments about revolutionary change in the previous MRs.

After determining that a case study methodology was suitable for answering the second part of the primary research question, secondary research questions about

doctrinal, organizational and strategy changes were drafted to explore the effects of the 6th MR on the U.S. Military. The specific categories of doctrine, organization and strategy were chosen because they broadly conformed to the original definition of RMAs established by Marshall and reinforced by Knox and Murray.[8] Particularly insightful was their explanation that RMAs tended to be subordinate elements of MRs and militaries experiencing a MR inherently underwent changes in their tactics, doctrine, organizational structures, and strategies for war if they were innovating to remain relevant.[9] Based on this definition, if the U.S. Military was indeed experiencing a MR then it followed that they were also experiencing observable changes to their doctrine, organizational structures, and strategies for war. From that deduction, the DOS of the PET-DOS framework was built and the research framework was complete.

Now that the reader understands how the PET-DOS framework was built, it is necessary to explain what function it serves in this study. Simply put, the PET-DOS framework serves to structure the author's argument in a logical fashion and then offer the findings of the study in a succinct manner displayed in a single chart. Below, Figure 2 displays the PET-DOS framework void of any data. Chapter Four is structured to follow the outline presented in Figure 2 and provides the explanations required complete this chart and thus answer the primary and secondary research questions.

KEY CHARACTERISTIC OF CHANGE IN THE SIX MILITARY-REVOLUTIONS		
MR # 1 17th Century creation of the modern State	MR # 2 French Revolution	MR # 3 Industrial Revolution
Evidence	Evidence	Evidence
P E T D O S	P E T D O S	P E T D O S
MR # 4 Combining French & Industrial Revolutions	MR # 5 Nuclear Revolution	MR # 6 Information Revolution
Evidence	Evidence	Evidence
P E T D O S	P E T D O S	P E T D O S
LEGEND: P - Politics E - Economics T - Technology D - Doctrine O - Organization S - Strategy *indicates primary catalyst for change		

Figure 2.   Blank PET-DOS Chart

Source: Created by author.

Defining the 6th MR

Finally, after studying the first five MRs and developing the PET-DOS framework, it was necessary for the researcher to determine what contemporary sources would be used to understand the types of political, economic, and technological change underway in the 6th MR. Among the myriad sources available, the author determined *The Fourth Industrial Revolution* by Klaus Schwab was best suited for the task. While it certainly was not the only source used, Schwab's description of the 4th IR proved to be the most informative piece of literature on these topics and served as the foundational layer of logic upon which a majority of the findings were based.[10] As addressed in Chapter Two, Schwab is president and CEO of the World Economic Forum and he explains the political, economic, and technological change underway in the current

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environment mostly for an audience of global business leaders. For example, Schwab described the political changes in the 4th IR as characterized by the empowerment paradigm shift wherein governments and long-standing institutions were ceding power to individual citizens.[11] Schwab also addressed the underlying nature of economic change in the 4th IR as characterized by a transition from the industrial based economy to the information based economy.[12] Most importantly, Schwab described the technologies shaping the 4th IR by suggesting it was not one particular technology that was redefining society, but a "fusion of a broad range of technologies across the physical, digital, and biological domains fundamentally reshaping how humans lived and worked".[13] While Schwab briefly discussed these issues within the context of global security, he did not explore how these changes affected the conduct of warfare in the 6th MR. Again, his target audience was leaders of the global economy, not practitioners of the art of war. Herein lied the most vital element of this research study - taking Schwab's factors of political, economic, and technological change and putting them within the context of MRs. The language of Schwab's argument needed to be translated into a vernacular that was relevant to military professionals and policy-makers. Having studied the first five MRs, it was possible to scrutinize Schwab's descriptions of the 4th IR and perform the cross-discipline translation required to put Schwab's ideas within the context of MRs. If the process seems particularly abstract, consider a similar approach by historian Clifford Rogers in his adaption of an evolutionary biology theory to promulgate his view of punctuated equilibrium in MRs.[14] The practice of finding meaningful explanations in a cross-discipline study is not unprecedented and in the case of Rogers it produced a theory that has found merit in military and academic communities for over 25 years.[15]

Conclusion

It should now be clear why this particular research methodology was chosen and how the PET-DOS framework was used to explore the key characteristics of change in the 6th MR. The mixed methodology qualitative analysis was chosen primarily because it mirrored the approach taken by authors who studied the previous MRs. Next, Chapter Four uses the PET-DOS framework to structure an argument towards answering the primary and secondary research questions of this project.

[1] Lisa Give, *The Sage Encyclopedia of Qualitative Research Methods* (Los Angeles: Sage Publications, 2008), 1-2.

[2] Alan Bryman, *Business Research Methods* (Cambridge: Oxford University Press, 2011), 1-5. In a content analysis research project all of the available research material is read and placed into categories according to the researcher's purpose. In the context of this research process the researcher's purpose was to determine an author's conclusion about why a military-revolution occurred and categorize it as either politics, economics, or technology (PET).

[3] Murray and Knox, 7-8.

[4] Bailey, 132.

[5] Knox, 57-60.

[6] Lynn, 35-45.

[7] Freedman, 735-745.

[8] Thompson, 82-84; Murray and Knox, 12.

[9] Murray and Knox, 1-15.

[10] This statement does not suggest that Schwab's *Fourth Industrial Revolution* was the sole source of information in defining the 6th MR. Instead, it should be understood that it was the most informative and comprehensive piece of literature on the subject and served as the foundational layer of logic upon which the remainder of the analysis was built. Where other sources contributed to the development of the findings in this thesis, those annotations have been made in the endnotes such as this one.

[11] Schwab, 67-69.

[12] Ibid., 28-32.

[13] Ibid., 13.

[14] Murray, 6.

[15] Roger's model of punctuated equilibrium is still referenced is modern academic writings about military-revolutions. Murray himself used the model to explain elements of the 6th MR in the modern era. So while there is no consensus on the issue of how or even if revolutionary changes occur in war, the fact that Roger's model is still referenced in contemporary literature on the subject lends credit to the argument that his model is still influential.

CHAPTER 4

ANALYSIS AND FINDINGS

<u>Introduction</u>

In Chapter Four, the author explains the analysis that was conducted and presents the findings derived from this study. As a reminder, the primary task in this study was to define the key characteristics of the 6th MR, and consider their effects on the present-day U.S. Military. The purpose of providing a more complete definition of the 6th MR was to help military professionals and policy-makers better understand their current environment as they make decisions about military innovations and foreign policy decisions in the modern era. Chapter Four is structured to follow the PET-DOS framework that was introduced in Chapters One and Three. First, each of the previous MRs is analyzed and its corresponding portion of the PET-DOS chart is presented. This process is repeated for MRs two through five until a consolidated PET-DOS chart is displayed at the end. In the analysis of each MR, the researcher shows what data was analyzed, why it was considered relevant, and the deductions made throughout the process. After each of the previous MRs is analyzed, the author transitions to defining the specific characteristics of the 6th MR within the PET-DOS framework and completes the primary task of this project. After the primary research obligation has been met, the researcher then presents an additional finding derived from this study before transitioning to conclusions and recommendations in Chapter Five.

Analysis

Analysis of the 1st MR

In Lynn's essay, he concluded that political transformation was the primary catalyst for revolutionary change in the 1st MR and showed how innovative leaders, operating under the provisions of a new political reality, could fundamentally change the character of war with attentive modifications to one's doctrine, organization, and strategy.[1] Thus, Figure 4 marks the political column with an asterisk to identify politics as the root cause of revolutionary change in the 1st MR. The Treaty of Westphalia is listed as a characteristics of political change in the 1st MR because it was the evidence used in chapter two to explore the nature of political change in the 1st MR. The researcher planned to explore the United Nations and NATO within the 6th MR, so studying the Treaty of Westphalia held the potential to yield useful insights about how political alliances effected warfare. The characteristics listed in the PET-DOS chart are not intended to represent any assessment as to what historical events were the most influential elements of change in a particular MR. Instead, the characteristics listed in the chart represent what events this researcher studied to inform the findings presented in this thesis.

The economic and technology columns in Figure 4 list "effective bureaucratic taxation" and "flintlock and bayonet weapons" because they were the evidence Lynn used to show the secondary role economic and technological factors played the 1st MR.[2] Lynn's description about the economic factors influencing the 1st MR were brief, but insightful. In summation, he asserted that the state's ability to effectively and efficiently tax its subjects, and generate large quantities of wealth, was a perquisite to funding the

types of large scale wars experienced by Louis XIV's *Grand Siècle*.[3] Flintlock and bayonet weapons are listed because Lynn used those weapon systems to highlight technology's very minor role in influencing the 1st MR.[4] Studying the political, economic, and technological influences of the 1st MR was useful because it helped to understand the interrelationships that exist between these elements and their effect on the conduct of warfare in general.

Finally, the researcher examined Lynn's descriptions of doctrinal, organizational, and strategy changes within the *Grand Siècle* to discern what effects the 1st MR had on the conduct of warfare during that period. Hence, the "systematic drilling of troops", "the regimental system", and "battle culture of forbearance" are listed in Figure 4. Lynn used these topics to substantiate his arguments about the character of war during the 1st MR and that realization led to this researcher's decision to use similar types of evidence while studying the 6th MR. For example, Lynn's arguments about the psychology of the soldier and his ability to withstand the shock and trauma of a battle culture of forbearance, led the researcher to consider the psychological effects of the cyber-domain in the current environment. That realization led to the study of Suler's *Psychology of the Digital Age* and the findings from that research are presented in subsequent sections of this chapter.

Figure 3.   1st MR PET-DOS Chart

Source: Created by author.

Analysis of the 2nd MR

In Knox's essay, he concluded that the 2nd MR was also primarily driven by political change and used the French Revolution and the Napoleonic Wars to examine how warfare had changed at that time in history.[5] Therefore, Figure 5 displays an asterisk in the political column to indicate politics was the root cause of change in the 2nd MR. Within Knox's description of political transformation, his argument that the French people transitioned from feudal subjects to national citizens was particularly insightful because as the reader will see, a similar analogy was made in the description of the 6th MR, as citizen's role in society appears to have transformed again.

The economic column in Figure 5 is listed as "unobserved", but that does not suggest economic factors were unimportant in the 2nd MR. Instead, it is representative of what Knox and Murray called the "additive nature of military-revolutions".[6] The same logic that was applied in the 1st MR to describe Louis XIV's requirement to effectively

tax the French people to wage large wars, equally held true for Napoleon during his conquest across continental Europe in the 2nd MR. The economic column is simply marked as "unobserved" because no additional research was conducted within the 2nd MR to reinforce Knox and Murray argument about the additive nature of MRs.

The technology column displays "Gribeauval Artillery System" because Knox used this weapon system to demonstrate technology's minor role in the 2nd MR.[7] This observation was important because it was a clear example of revolutionary change without technological innovation. While the findings presented in this study ultimately suggest technology is a the core of revolutionary change in the 6th MR, acknowledging its historical role and understanding its enduring interrelationship with political and economic factors proved useful in constructing an argument about its centrality in the present-era.

Finally, the doctrine and organizational columns of Figure 5 list "French Army Regulations of 1791" and "Napoleon's Division and Corps headquarters structure" because those were the pieces of evidence Knox used to show the changing character of war in the 2nd MR.[8] Studying these elements was helpful because it led to the decision to use Multi-Domain Operations and the creation of USCYBERCOM and Army Futures Command as case studies for the analysis of the 6th MR.

MR # 2 French Revolution
Evidence Napoleonic Wars
P* - French Revolution (subject to citizen)
E - Unobserved
T - Gribeauval Artillery System
D - French Army Regulations of 1791
O - Napoleon's Division and Corps HQs structure
S - Unobserved

Figure 4.   2nd MR PET-DOS Chart

Source: Created by author.

Analysis of the 3rd MR

Grimsley's essay marked a turning point in the analysis because he was the first author to state that technology had been the primary facilitator of a MR[9] and that trend appears to persist in MRs three through six. In other words, in this researcher's view, technology more than any other factor, has been the primary catalyst for revolutionary changes to war since the expansion of the industrial revolution in the late 19th Century.[10] This finding was formulated based on the conclusions presented in Grimsley's, Bailey's, Murray's, and Freedman's writings on the subject.[11] Consequently, Figures 6, 7, and 8 each include an asterisk in the technology column to indicate that some technological innovation or collection of innovations was the root cause of the MR.

Grimsley's assertion about the leading role the industrial revolution played in the 3rd MR, particularly the amalgamation of steam engines, railroads, ironclad warships and the telegraph, was a formative bit of analysis.[12] Grimsley's explanation was useful

because it provided the historical precedence to show how a convergence of a broad range of technologies could be kluged together to form a MR. As the reader will see in the descriptions of the 6th MR, this researcher argues that a broad range of technologies has fused together again to create a MR in the modern era.

Lastly, Grimsley's analysis on the economic factors influencing the outcome of the American Civil War proved to be instructive because his analysis revealed how technology could elevate the relevance of other factors in the conduct of warfare.[13] The evidence he provided about the Legal Tender Act of 1862, the Internal Revenue Act of 1862, and the National Bank Act of 1863, made for a compelling argument to show how technology had turned economic policies into a national strategy to achieve military success.[14] The applicability of his work to the study of the 6th MR immediately became clear as the researcher contemplated what new strategies for war might be possible given the technological tools of the 4th IR.

MR # 3 Industrial Revolution
Evidence American Civil War
P - Unobserved
E - Agrarian to Industrial based economy
T* - Steam, Rail, Ironclad Warship, Telegraph
D - Unobserved
O - Unobserved
S - Unobserved

Figure 5.   3rd MR PET-DOS Chart

Source: Created by author.

Analysis of the 4th MR

In Bailey's essay, he strongly advocated for technology's primacy in revolutionizing warfare in the 4th MR and provided a detailed assessment for why he believed indirect fire artillery (IDF) was at the core of that technological change. [15] In his view the importance of IDF was its fundamental restructuring of the battlefield geometry. [16] In other words, he asserted that warfare transitioned from two-dimensional linear fights to three-dimensional operations in which commanders could destroy their opponents in the area beyond which they could visually observe the effects or direct his ground forces to maneuver. [17]

Recognizing the significance of three-dimensional warfare, and battlefield geometry in general, was a critical concept to grasp in order to understand the effects of the 6th MR on the U.S. Military in the present-day. Bailey's assessment was the first of its kind during the course of this study, but the reshaping of battlefield geometry occurred twice more in MR's five and six. In the 4th MR, IDF created three-dimensional warfare. In the 5th MR, nuclear weapons and rocket technology created four-dimensional warfare. Then in the 6th MR the battlefield geometry transformed again as the introduction of the cyber domain created a fifth-dimension to warfare. The key deduction from this analysis was that each restructuring of the battlefield geometry appeared to require significant modifications to military doctrine, organization, and strategy. Combining this realization with the previous finding about the psychology of warfare in the digital age, led the researcher to examine what unique strategies for warfare might exist within 6th MR. The results of that analysis are listed as an additional finding as the end of this chapter under the subheading "Non-attributional warfare".

MR # 4
Combining French & Industrial Revolutions
Evidence World War I
P - Unobserved
E - Unobserved
T* - Indirect Fire Artillery, Aircraft, Tanks
D - Three-dimensional warfare (Aerial)
O - Unobserved
S - Total War

Figure 6.   4th MR PET-DOS Chart

Source: Created by author.

Analysis of the 5th MR

As discussed in Chapter Two, Knox and Murray's anthology on MRs and RMAs did not provide a detailed assessment about the 5th MR. Instead, the researcher used Paret's *Makers of Modern Strategy,* specifically the Freedman and Carver essays, to learn more about warfare in the post-nuclear age.[18] While Freedman and Carver did not use the precise language of MRs and RMAs to construct their arguments, the familiar themes politics, economics, technology, doctrine, organization and strategy were found. Thus, it was possible to use their writings to perform the analysis required to complete the 5th MR PET-DOS Chart as shown in Figure 8.

Freedman and Carver's essays reinforced Murray's assessment that wars in the post-nuclear age were markedly different from wars in the 4th MR.[19] The introduction of the nuclear bombs and inter-continental ballistic missiles created a new type of global threat that limited wars in new and unique ways.[20] Carver's assessment was that the wars

of the 4th MR, particularly World Wars I & II, were the climax of total war strategies in which nation's sought the complete destruction of their opponents and mustered the entirety of its military and national resources to achieve victory.[21] Conversely, Carver argued in the 5th MR total war strategies between nuclear armed nations became irrational because pursuit of such a strategy would likely end in the complete annihilation of both attacker and defender.[22] The evidence Carver used to substantiate this claim was the Cold War, Korean War, Vietnam, Soviet's war in Afghanistan, and a host of other conflicts.[23]

Analyzing Freedman and Carver's essays about warfare in the post nuclear age was useful because it led to the decision to use wars from the post 9-11 era as mini case studies to explore the changing character of war in the 6th MR. As the reader will see under the "Strategy change" subheading, the analysis of the post 9-11 wars was meant to mirror the techniques Freedman and Carver used in their own analysis. The goal was to use contemporary conflicts to explore how military strategies have or have not changed within the 6th MR.

MR # 5	
Nuclear Revolution	
Evidence	
Cold War	
P - Unobserved	
E - Unobserved	
T* - Nuclear Weapons and ICBMs	
D - Four-dimensional warfare (Space)	
O - Conventional vs Nuclear force structures	
S - Limited War	

Figure 7.   5th MR PET-DOS Chart

Source: Created by author.

Summary of Analysis

The information presented in the previous pages showed the reader what analysis was conducted, why certain pieces of evidence were chosen, and the deductions derived from that analysis. Below, Figure 9 displays the consolidated data compiled from that analysis. Again, the characteristics listed in each column do not represent the author's or anyone else's opinion about what historical events were most influential in previous MRs. The researcher simply listed each characteristic to inform the reader what information was used to come to the conclusions presented in this thesis. For the time being the 6th MR portion of the PET-DOS chart is empty because that analysis has not been reviewed.

CHARACTERISTICS OF CHANGE IN THE SIX MILITARY-REVOLUTIONS		
MR # 1 Creation of the modern State	MR # 2 French Revolution	MR # 3 Industrial Revolution
Evidence Louis XIV's Grand Siècle	Evidence Napoleonic Wars	Evidence American Civil War
P* - Treaty of Westphalia	P* - French Revolution (subject to citizen)	P - Unobserved
E - Effective bureaucratic taxation	E - Unobserved	E - Agrarian to Industrial based economy
T - Flintlock and Bayonet Weapons	T - Gribeauval Artillery System	T* - Steam, Rail, Ironclad Warship, Telegraph
D - Systematic drilling of troops	D - French Army Regulations of 1791	D - Unobserved
O - The Regimental System	O - Napoleon's Division and Corps HQs structure	O - Unobserved
S - Battle culture of forbearance	S - Unobserved	S - Unobserved

MR # 4 Combining French & Industrial Revolutions	MR # 5 Nuclear Revolution	MR # 6
Evidence World War I	Evidence Cold War	
P - Unobserved	P - Unobserved	
E - Unobserved	E - Unobserved	
T* - Indirect Fire Artillery, Aircraft, Tanks	T* - Nuclear Weapons and ICBMs	
D - Three-dimensional warfare (Aerial)	D - Four-dimensional warfare (Space)	
O - Unobserved	O - Conventional vs Nuclear force structures	
S - Total War	S - Limited War	

| LEGEND: | P - Politics   E - Economics   T - Technology   D - Doctrine   O - Oganization   S - Strategy   *indicates primary catalyst for change |

Figure 8.   MRs 1-5 PET-DOS Chart

Source: Created by author.

Findings

In this section, the researcher presents the findings derived from the overall study and directly answers the primary research question. The findings are structured to follow the PET-DOS outline by first addressing the political, economic, and technological factors influencing the 6th MR before transitioning to the doctrinal, organizational and strategy implications for the U.S. Military. This section concludes by presenting the completed PET-DOS chart in Figure 9.

Political Change

Continuing the trend that began in the 3rd MR, technology, not politics, appears to be the primary catalyst for change in the 6th MR.[24] However, change rarely happens in

a vacuum and the 6th MR has many implications for the political element of warfare in the 21st Century. As briefly discussed in Chapter Two, the central theme to political change in the 6th MR is the empowerment paradigm shift.[25] Schwab stated that a transition of power is occurring in the world that is unprecedented in its scope and scale.[26] In the "old regime" nation-states were the supreme players on the international stage. If citizens wanted to effect change in the world, they organized themselves in ways to pull the levers of government to enact the desired change. Now disparate groups of like-minded people can organize themselves through a variety of information technology networks and effect change on a global scale. Today, technology has a relatively low cost barrier to entry and this has placed some of the most advanced pieces of technology in more and more people's hands.[27]

Consider that during the Cold War, weapons of mass destruction were generally limited to world super powers who had the vast resources to construct such weapons and possessed organized governments to officiate their use and non-use.[28] In the 6th MR, weapons of mass disruption are in the hands of state and non-state actors, loosely organized groups of people, and even single individuals with their own agenda.[29] Evidence of such a diffusion of power is found in individual examples like Edward Snowden or Julian Assange.[30] These individuals empowered with the tools of the 4th IR, took actions that effected the entire political and security landscape of the global community. Other examples include the Iranian Green Movement in 2009 and the Arab Spring in 2011. Cheap and widely available information technology platforms permitted citizens of these countries to act against their governments in a surprisingly powerful manner. Each of these events support the idea that the 4th IR is characterized by a

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rebalancing of power between governments and the governed. Hierarchical institutions no longer hold a monopoly on power. The empowerment paradigm shift that Schwab addressed in his book is affecting every industry and nearly every person on the planet.[31] This shift in power is analogous to the transfer in power that took place in the French Revolution. In the French Revolution people transitioned from subjects to citizens.[32] In the 6th MR people are transitioning from citizens to power brokers. If one's government fails to act within their best interest, then the tools of circumvention are readily available at their fingertips.[33]

To understand the effects digitally empowered citizens have on the 6th MR consider Clausewitz's statement that the phenomena of war is a paradoxical trinity that is composed of "primordial violence, hatred, and enmity . . . the play of chance and probability . . . and instruments of policy that are subject to reason alone."[34] The first element of the trinity pertains to the will of the people, the second element relates to a commander and his Army, and the third is the purview of governments waging war.[35] A radical change in the balance of power between governments and its people affects every element of war's trinity. The first part of the trinity is affected because the will of the people now has the capacity to play a greater role in the conduct of war through a distributed power system. The second part of the trinity is affected because the 6th MR provides new and complex means of wars for the commander's employment. Specifically, cyber as the fifth domain in war has dramatically altered the ways and means in which modern military commander can prosecute their wars. Finally, the third element of the trinity is greatly affected because governments may still control policy, but

they cannot subject the war to their rationale alone when the people have such powerful means to influence war's activities.

Clausewitz's Trinity shows how war is a human endeavor – people run governments and governments wage war so understanding how people think, behave and interact with one another in 4th IR also provides insights about how people engage in conflict in the 6th MR. To understand the changing nature in people's behavior in the 4th IR, the researcher studied Dr. Suler's *Psychology of the Digital Age* to conclude that governments are not only effected by the empowerment paradigm shift, but they also appear to be affected by fundamental changes in the human psyche".[36]

In 2016 Suler published *Psychology of the Digital Age* which was a seminal work that studied how human behaviors were evolving in the digital domain and what effect it was having on the human psyche and society in general.[37] He led several psychological studies that documented significant changes in an individual's behavior when they were permitted to act behind a layer of digital anonymity.[38] In his findings, he asserted that people behaved differently in the unobservable digital world than in the observable real world. His studies found people tended to be more vocal in their opinions, aggressive in their social encounters, and less empathetic towards others.[39] The more anonymous a person became, the riskier and often more violent the behavior also became.[40] The findings were encapsulated under the banners of "dissociative-anonymity" and the "online disinhibition effect".[41]

Dissociative-anonymity studied the links between actors, activity and consequence. Suler's research showed that digital platforms permitted people to break these traditional links.[42] For example, in the physical world, if someone told a co-worker

they were failing to contribute to the team in a meaningful way, the situation would be fraught with tension and the instigator was less likely to confront the underperforming co-worker.[43] However, given a digital platform that permitted anonymous communication, people tended to not only communicate their displeasure with a co-worker's performance, but also escalate the conversation in an increasingly hostile manner.[44] Suler coined this observation the "disinhibited self" and found that when the traditional links between actor, activity and consequence were broken it significantly altered people's behavior.[45]

There has been considerable research in the cyberpsychology field since Suler introduced his initial findings in 1996.[46] However, there did appear to be a significant gap in the body knowledge when attempting to study its implications for military purposes. Trying to bridge the gap between cyberpsychology and contemporary military operations led to reviewing literature on covert political warfare, cyberwarfare, clandestine operations, and operations in the gray zone. There were countless publications[47] about U.S., Russian or Chinese operations in these areas, but no one appeared to be addressing the underlying cyberpsychology issues Suler suggested permeated the contemporary environment.[48] In light of this finding, a unique observation about character of war in the 6th MR was made and it is addressed as an additional finding within this thesis under the sub-heading "Non-attributional warfare".

<div align="center">Economic Change</div>

Economic change in the 6th MR proved to be just as disruptive as the political environment.[49] Thompson's description of the "social wave" model proved valuable in coming to this conclusion as he theorized that when the means of production change, so

too does the character and tools of war.[50] Today, the world's economy is transitioning away from the traditional industrial base and the information economy is becoming the dominant form of wealth creation.[51] Schwab's description of the on-demand economy vividly illustrates this change: "Uber, the world's largest taxi company, owns no vehicles. Facebook, the world's most popular media owner, creates no content . . . Airbnb, the world's largest accommodation provider, owns no real estate."[52] These realities bring into question the very nature of what is considered valuable; the platform or the underlying asset? This shift in what is considerable valuable is offered as a defining characteristic of economic change in the 6th MR. As sources of wealth transition from material goods to data and information services, businesses begin to lose physical control over their revenue generating assets and this creates a unique security challenge.

Consider the Chinese firm Huawei as an example of how economic principles can impact international relations and national security in the 6th MR. Huawei is the largest telecommunications-equipment manufacturer in the world[53] and in 2017 the Chinese government enacted the National Intelligence Law that obligates Chinese companies to hand over any data on their networks upon request from the government.[54] Huawei's infrastructure is embedded into many industries around the world and provides information services to both the private sector and foreign governments. How do government leaders respond when the Chinese government demands access to the data on Huawei networks? How do businesses respond when their intellectual property and primary revenue generating assets are subject to theft and coercion? Nations have historically gone to war when their national interest were threatened by a foreign entity

and the Huawei example shows how nations must reconsider what constitutes a national security interest in the 6th MR.

Technological Change

The unbridled technological advancements of the past three decades serves as the defining characteristic of change in the 6th MR. While it is reasonable to make an argument that specific pieces of technology are the central ingredient in this change, it is less helpful when trying to understand the 6th MR in its entirety. For example, arguments could be made that the introduction of the semiconductor in the 1960s, the commercial internet in the 1990s, or the proliferation of mobile computing in the early 2000's served as powerful tipping points in the 4th IR.[55] However, each of these arguments fails to adequately capture the significance of the technological change impacting the entire 6th MR. Instead, the view held by Schwab provided the most comprehensive view on the subject. Schwab stated, "It is the fusion of these technologies and their interaction across the physical, digital, and biological domains that make the fourth industrial revolution fundamentally different from previous revolutions."[56]

Providing an exhaustive list of how each of these technologies could change the conduct of warfare is beyond the scope of this thesis. A plethora of literature exists arguing that one or more of these technologies is the seminal issue in contemporary modern conflicts.[57] Intentional or not most of these authors were essentially defining individual RMAs and not considering the MR writ large. It bears repeating that an RMA constitutes a fundamental change in the conduct of warfare on the battlefield - it dramatically affects the manner in which wars are fought, but may not impact the rest of society.[58] RMA's are uniquely susceptible to military innovation and can be used to gain

temporal advantages over one's adversaries.[59] Conversely, a MR is a massive earthquake in the fabric of society and fundamentally alters how people live and work.[60] MRs are generally outside the control of government intervention and the best a nation can do is adapt to the new rules of the world.[61] In this researcher's view, the convergence of all of the technological innovations present in the 4th IR is larger than Knox and Murray's definition of an RMA and it is the fusion of these technologies across the physical, digital, and biological domains that is the defining characteristic of change the 6th MR.

Doctrinal Change

The doctrinal changes experienced by the United States Military appear to support the assertion that a broad range of technologies is the defining characteristics of change in the 6th MR. Doctrine can be viewed as a cultural artifact that is representative of the military mindset at a particular snapshot in time.[62] and since the 1970's the United States Army's central doctrinal framework has transitioned from Active Defense, to AirLand Battle, to Full-Spectrum Operations, to Unified Land Operations (ULO).

In December of 2018 the U.S. Army published "TRADOC Pamphlet 525-3-1 Multi-Domain Operations" which outlined the Army's future operating construct to replace ULO. Multi-Domain Operations (MDO) marks a clear transition in thought from its predecessors. Evidence of this is found by examining both MDO and ULO's core definitions. ULO was defined as, "Simultaneous offensive, defensive, and stability operations or defense support to civil authorities tasks to seize, retain, and exploit the initiative to shape the operational environment, prevent conflict, consolidate gains, and win our nation's wars as a part of unified action".[63] MDO's central operating principle states "Army forces, as an element of the Joint Force, conduct Multi-Domain Operations

to prevail in competition and when necessary, Army forces penetrate and dis-integrate enemy anti-access and area denial systems and exploit the resultant freedom of maneuver to achieve strategic objectives (win) and force a return to competition on favorable terms".[64] Closer examination of these definitions provides a few indicators of how the Army's thinking about war in the 6th MR has changed.

First, the Army has envisioned its role transitioning from "conducting offensive, defensive, stability operations . . . on land . . . to win wars" to "conducting multi-domain [land, sea, air, space, and cyberspace] operations . . . to prevail in competition . . . ." The MDO doctrine echoes the same idea that Schwab shared in his assessment of the 4th IR – recall Schwab stated it was the "fusion of various technologies . . . across the physical, digital, and biological domains . . . ." that mattered most.[65] MDO's land, sea, air, space, and cyberspace approach to conflict is representative of the interrelationship that Schwab claims exist within all of these domains.

MDO's cross-domain approach to warfare was made possible in 2008 by Secretary of Defense Robert Gates formally recognizing cyber as the fifth warfighting domain. The reader can understand the importance of this doctrinal shift by remembering the impacts IDF had on the battlefield in World War I. As discussed in chapter two, the introduction of three-dimensional warfare in the 4th MR "culminated in perhaps the most significant conceptual development in all the long history of war".[66] Bailey argued that the introduction of IDF and three-dimensional warfare essentially gave birth to the modern style of combined arms maneuver still practiced today.[67] The 4th IR has introduced an entirely new dimension to war that portends to have similar doctrinal implications in the present-day.

Organizational Change

The creation of USCYBERCOMMAND is the most recognizable and probably most important organizational change experienced by the United States Military in the 6th MR. In 2010 Secretary Gates directed the creation of USCYBERCOM as a sub-unified command under the control of USSTRATCOM.[68] Previously, cyber activities of the United States had been operating under various ad-hoc organizations such as Joint Task Force – Global Network Operations.[69] Effectively, Gates' action transitioned an emerging capability into a formal and permanent structure within the military enterprise. In pondering the significance of this action consider the long term effects created by the combined arms divisions under Napoleon's reign. Those formations still serve as the core framework upon which the United States Army's infantry divisions are organized today. Building on Gates' formalization of the nascent cyber command, Secretary James Mattis, elevated USCYBERCOM from a sub-unified command (three-star billet) to become the 10th unified combatant command (4-star billet). According to Secretary Mattis, the decision to elevate USCYBERCOM was in "growing recognition of the centrality of cyberspace to U.S. national security and an acknowledgement of the changing nature of warfare".[70]

A final observation about organizational change in the 6th MR is the creation of another four-star command, Army's Futures Command (AFC). Much like the creation of USCYBERCOM, the formation of AFC is representative of the Army's recognition that a confluence of technological advancements is rapidly changing the character of modern war. Just as Figure 2 provided a snapshot of current technologies influencing the 4th IR, AFC's six priorities of innovation offer insight into which technologies the Army

believes are most important.[71] AFC's six priorities are: long-range precision fires, next-generation combat vehicles, future vertical lift platforms, mobile & expeditionary networks, air and missile defense, and soldier lethality.[72] Speaking about these six priorities, the current AFC Commander GEN John Murray, stated that the most important element was the network.[73] "I'm less concerned with how far or fast future vertical lift platform can fly", said GEN Murray "I'm much more focused on ensuring that aircraft and its sensors can talk to everything else on the battlefield in real-time". As information continues to become the primary means of wealth generation in the global economy, information also becomes increasingly important in the conduct of warfare. Regardless of anyone's argument about the efficacy of AFC, USCYBERCOM, and Multi-Domain Operations, their mere existence represents tangible doctrinal and organizational change within the United States and serves to help characterize the nature of change underway in the 6th MR.

Strategy Change

Within the limited scope of this study, no discernable change was observed in the U.S. Military strategies of the 6th MR. Since the introduction of the atomic bomb, nuclear armed nations in general, and the United States in particular, have continued to employ limited war strategies to achieve narrow political objectives.[74] It's worth noting though that limited war strategies were not a new development in the post nuclear age. Clausewitz acknowledged the two overarching strategies of total versus limited war as early as the 19th Century and stated "The first, the supreme, the most far-reaching act of judgement that the statesman and commander have to make is to establish the kind of war on which they are embarking".[75] Murray himself points out that the Crimean War of

1853-1856 is a classic example of a limited war strategy before the 5th MR era.[76] Despite limited wars not being a new development in the 5th MR they did become the prevailing norm for military strategy when nuclear armed nations were involved in the conflict.[77]

American military operations in the post 9-11 era are widely viewed as limited wars and with good cause.[78] While there is a reasonable argument to be made that the initial invasion of Iraq in 2003 was a total war strategy, the justification often provided fails to meet the two defining criteria for total war strategies outlined in chapter one. Those two criteria stated the political aim of the war must be the complete overthrow of one's enemy and the nation must pursue that goal with the entirety of its military capacity. The United States clearly possessed an outwardly expressed political aim of overthrowing the Saddam regime in Iraq and replacing it with a democratic regime that would be a "beacon of democracy for the Middle East".[79] There is also some merit in the argument that the U.S. mustered the entirety of its military capacity to achieve Saddam's annihilation considering U.S. resources were spread thin by simultaneous commitments in Afghanistan. However, these conditions were short lived as the scope and duration of the war extended far beyond its original design. When one considers the second gulf war in its entirety, beginning 2003 and continuing until the removal of all U.S. Forces in 2011, the themes of limited political objectives and a severe reduction in the commitment of military capability, particularly under the Obama administration, overshadow any argument about its initial total war design.

The United States' other major post 9-11 conflicts, namely the Afghanistan War and the war against the Islamic State in Iraq and Syria (ISIS), share similar explanations as to why they constitute being defined as a limited war strategy. Again there are

reasonable arguments to be had that both wars sought the complete annihilation of their opponents, Al Qaeda and the Taliban in Afghanistan and ISIS in Iraq and Syria, but both wars have been fought well below the threshold of the U.S.' total military capacity. In Afghanistan, three U.S. presidential administrations have applied varying levels of military force to achieve their limited political aims and in recent years it can't even be said that the destruction of the enemy is the ultimate political objective now the Taliban are a part of the peace negotiations.[80] In Iraq and Syria, a similar military strategy has been applied. Even though the complete annihilation of ISIS is the ultimate objective of the U.S. government, an unwillingness to commit the entirety of America's military might has kept it clearly in the realm of a limited war strategy.

<center>Summary of Primary Findings</center>

The information presented in the preceding section directly answered the primary and secondary research questions. First the researcher provided a detailed explanation about the political, economic, and technological factors influencing the 6th MR and then examined the doctrinal, organizational, and strategy implications for the U.S. Military. The results of that analysis are presented in their completed form in Figure 9. At this point the primary research obligation has been met and the final section of this chapter discusses the additional finding of non-attributional warfare that was a byproduct of this research process.

CHARACTERISTICS OF CHANGE IN THE SIX MILITARY-REVOLUTIONS		
MR # 1 Creation of the modern State	MR # 2 French Revolution	MR # 3 Industrial Revolution
Evidence Louis XIV's Grand Siècle	Evidence Napoleonic Wars	Evidence American Civil War
P* - Treaty of Westphalia	P* - French Revolution (subject to citizen)	P - Unobserved
E - Effective bureaucratic taxation	E - Unobserved	E - Agrarian to Industrial based economy
T - Flintlock and Bayonet Weapons	T - Gribeauval Artillery System	T* - Steam, Rail, Ironclad Warship, Telegraph
D - Systematic drilling of troops	D - French Army Regulations of 1791	D - Unobserved
O - The Regimental System	O - Napoleon's Division and Corps HQs structure	O - Unobserved
S - Battle culture of forbearance	S - Unobserved	S - Unobserved
MR # 4 Combining French & Industrial Revolutions	MR # 5 Nuclear Revolution	MR # 6 Information Revolution
Evidence World War I	Evidence Cold War	Evidence 4th Industrial Revolution
P - Unobserved	P - Unobserved	P - Power paradigm shift (citzen to power broker)
E - Unobserved	E - Unobserved	E - Industrial to information based economy
T* - Indirect Fire Artillery, Aircraft, Tanks	T* - Nuclear Weapons and ICBMs	T* - Tech's fusion across PHY, BIO, DIG domains
D - Three-dimensional warfare (Aerial)	D - Four-dimensional warfare (Space)	D - Five-dimensional warfare (Cyber)
O - Unobserved	O - Conventional vs Nuclear force structures	O - CYBERCOM & Army Futures Command
S - Total War	S - Limited War	S - Limted War continues
LEGEND:	P - Politics E - Economics T - Technology D - Doctrine O - Oganization S - Strategy *indicates primary catalyst for change	

Figure 9.   Completed PET-DOS Chart

Source: Created by author.

Additional Finding

As periodically referenced in the preceding sections, while the researcher was studying the PET-DOS characteristics of the 6th MR a gap was revealed in the body of knowledge when trying to understand what Suler's principle of dissociative-anonymity meant for the conduct of warfare in the modern era. While trying to answer this question by exploring the previously mentioned subjects of covert political warfare, cyberwarfare, clandestine and gray zone operations, an inconspicuous characteristic that was present in both the 4th and 5th MRs appeared to be missing in the 6th. In the previous MRs, it has been relatively taken for granted that you could readily identify who or what you were fighting. In the Napoleonic Wars, France knew they were at war with Prussia and the rest

of Europe. In World War II, the Allies plainly knew they were at war with the Nazis and Imperial Japan. And in the Cold War the U.S. knew it was at war with the Soviet Union. This does not imply there was absolute clarity in the conflict. Differentiating between combatant and non-combatant or accounting for your enemy's deception campaigns are inherent difficulties in war that Clausewitz's described as fog and friction.[81] But the creation of the cyber-domain greatly complicates the positive identification of adversarial actors and this is why Suler's ideas are so important. His research addresses what happens when the links between actor, activity, and consequence are broken and contemplating what that means for the conduct of warfare led to the researcher's conclusions about non-attributional warfare.

<p style="text-align:center">Non-Attributional Warfare</p>

Non-attributional warfare (NW) is a concept that is not defined in doctrine, policy, or academia; rather, it is a theory for consideration that attempts to explain the unique challenges of warfare in the 6th MR. Attribution, or definitively associating actor to activity, is a unique challenge in the 6th MR, but not an altogether new idea. Political warfare, espionage, covert and clandestine operations, and a handful of other related terms have a long history in the conduct of warfare; however, NW in the 6th MR is markedly different from each of these activities. Covert operations attempt to conceal the actor, clandestine operations attempt to conceal an activity and each is statutorily defined with the requisite legal framework to govern its conduct.[82] Inherent in each of these types of operations is the idea of concealment and secrecy. The subtle and inconspicuous shift in the theory of NW is a transition from concealment to obfuscation. Instead of keeping ones activities completely hidden, the goal in NW is to render them obscure, unclear, or

unintelligible. Traditional covert and clandestine operations exist within a national and international legal framework that yields consequences for malign actors. NW activities occur when actors use the anonymizing tools of the 4th IR to exploit the seams of the existing infrastructure and leave its victims in a legal and political quagmire.

As an example, consider the differences between the 1987 Iran-Contra affair and the 2017 Russian NOTPETYA virus. Both of these activities were undertaken at the behest of a nation-state to promote political objectives in a foreign country, but each event took place within different military-revolutionary eras and serves to highlight some of the unique characteristics of the 6th MR. Beginning in 1981 the Regan administration initiated covert operations to facilitate weapons sales from the U.S. Government to Iran.[83] The money from these sales was subsequently used to fund the Contra rebel fighters in their struggle against the socialist government of Nicaragua.[84] The sale of weapons to the Iranians was in violation of an arms embargo and the funding of the Contras was in violation of the Boland Amendment.[85] Therefore, key individuals inside the U.S. government chose to resort to covert and clandestine operations to pursue national objectives. When the events became public, it resulted in fourteen administration indictments, eleven convictions, and a serious setback for the United States' foreign policy objectives around the world.[86]

Compare the consequences of those covert and clandestine operations with the consequences of the activities of the Russian NOTPETYA virus. In 2017 (alleged) Russian hackers inserted the NOTPETYA virus into the Ukrainian owned business of Linkos Group.[87] One of the Linkos' applications provided financial services to a large number of businesses in the region and the Russian cyberattack was designed to disrupt

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and deter financial relationships between the Ukraine and their international partners.[88] Intentionally or unintentionally, the NOTPETYA virus ended up infecting the global shipping company Maersk and brought 17 of their 76 shipping terminals to a screeching halt for over 72 hours.[89] Shipping manifests, accounts payable, and countless other forms of financially sensitive information were lost or destroyed. Cranes sat dormant and 18-wheelers were backed up for miles in cities all around the world.[90] The virus not only infected Linkos and Maersk, but it impacted everyone who did business with them. NOTPETYA was a catastrophic success for the Russians that cost the global economy over $10billion across dozens of industries and hundreds of companies worldwide.[91] It was the single most expensive cyberattack in history and begs the question: what was the consequence for the Russian government who orchestrated its execution? The answer is nothing; there were no meaningful or enduring consequences. No indictments, no convictions, no restitution to be paid by the Russian government. The only cost imposed on the Putin administration was a smattering of strongly worded demarches and political chastisement from the global community all because NOTPETYA could not be legally traced back to the Russian government.

The Iran-Contra Affair and the Russian NOTPETYA virus show the clear distinction between covert and clandestine operations versus NW activities. In covert and clandestine operations concealment was paramount to success and when events were made public there was a significant cost to be paid. In NW, the actions were never intended to be kept from the public's view. Instead, they were simply designed to include just enough obfuscation that the responsible party could not be held accountable. The NOTPETYA virus is but one of dozens of examples that could be used to examine the

unique characteristics of conflict in the 21st Century. The NOTPETYA virus should make clear that strategies for obtaining political objectives and promoting national interest have evolved in the 6th MR. The theory of NW that is described below was devised to examine how military professionals and policy makers might consider unique methods for achieving political objectives and defending against them in the present-day.

In its broadest definition, Non-attributional warfare is an actor's employment of any means (physical or digital, lethal or non-lethal) to achieve their objectives with the deliberate attempt to disassociate the actor or activity from the responsible party. This definition's specific use of the word actor is meant to be inclusive of the full range of state and non-state actors in the global community. However, if someone wanted to use the theory of NW to devise a definition for national strategy, the definition could be modified to read: Non-attributional warfare is a nation's employment of any means to achieve its national objectives with the deliberate attempt to disassociate the actor or activity from the responsible government. Drawing on the previous discussion about differentiating between covert, clandestine, and NW operations, an actor's NW activities are not relegated to denial of their existence. Instead, they can be openly conducted in the public's view as long as the activity can't be legally attributed to the responsible actor. Thus, it is Suler's ideas about the disassociation between actor, activity, and consequence (enabled by the anonymizing tools of the 4th IR), that is the central and uniquely defining characteristic of Non-attributional warfare in the 6th MR.

Conclusion

Chapter Four explained the analysis that was conducted and presented the findings derived from this study. As a consolidated answer to the primary research

question the reader can consider the following assertion. The key characteristics of 6th

MR consist of three elements: first is the empowerment paradigm shift that adjust the

balance of power between governments and its governed citizens. Second, the 6th MR is

heavily influenced by a transition to the information and on-demand economies that

fundamentally change the nature of what is considerable valuable and therefore what is

considered worthy of securing by force. Third, and most importantly, the root cause of all

of this change is a fusion of a broad range of technologies across the physical, digital, and

biological domains that converges in a manner that fundamentally changes the way

people live and work and how government's wage war.

As a result, these three characteristics of the 6th MR have already had a

tremendous impact on the present-day U.S. Military in three ways. First is the U.S.

Army's doctrinal development of Multi-domain Operations and the second is the U.S.

Military's creation of USCYBERCOM and AFC. These doctrinal and organizational

changes represent precisely the type of substantive change Knox and Murray said

militaries experience when MRs occur.[92] Lastly, while no discernable change was

observed in the United States' tendency to engage in limited war strategies in the post-

nuclear era, hopefully the theory of Non-attributional warfare offered the reader a unique

insight about the changing character of warfare in the 21st Century.

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[1] Lynn, 35-56.

[2] Ibid., 35-36.

[3] Ibid., 55-56.

[4] Ibid., 36-39.

[5] MacGregor Knox, "Mass Politics and Nationalism as Military Revolution: The French Revolution and After," in *The Dynamics of Military Revolutions, 1300-2050,* ed. MacGregor Knox and Williamson Murray (Cambridge, MA: Cambridge University Press, 2001), 57-60.

[6] Murray and Knox, 7.

[7] Ibid., 40-41.

[8] Knox, 57-72.

[9] Mark Grimsley, "Surviving Military-Revolution: The U.S. Civil War," in *The Dynamics of Military-Revolution, 1300-2050,* ed. MacGregor Knox and Williamson Murray (Cambridge, MA: Cambridge University Press, 2001), 74-91.

[10] Grimsley, 74-91; Bailey, 132-153; Murray and Knox, 1-15. In these essays each author concludes that technology was the most influential factor in creating a MR.

[11] Ibid.

[12] Grimsley, 76-78.

[13] Ibid., 80-85.

[14] Ibid., 85-90.

[15] Bailey, 132-153.

[16] Ibid., 132-134.

[17] Ibid.

[18] Freedman, 735-778; Michael Carver, "Conventional Warfare in the Nuclear Age," in *The Makers of Modern Strategy: from Machiavelli to the Nuclear Age,* ed. Peter Paret, Gordon A. Craig and Felix Gilbert (Princeton, NJ: Princeton University Press, 1986), 779-814.

[19] Carver, 779-790.

[20] Ibid.

[21] Ibid.

[22] Ibid., 789-790.

[23] Ibid., 790-812.

[24] Murray, 60-62. This is both Murray's assessment and my own conclusion drawn from the study.

[25] Schwab, 67-68.

[26] Ibid.

[27] Ibid.

[28] Ibid.

[29] Patrikarakos, 20-25.

[30] Charlie Savage, "WikiLeaks Indictment," *The New York Times,* 23 May 2019, accessed 14 November 2018, https://www.nytimes.com/2019/05/23/us/politics/assange-indictment.html?rref=collection%2Ftimestopic%2FWikiLeaks&action=click&contentCollection=timestopics&region=stream&module=stream_unit&version=latest&contentPlacement=3&pgtype=collection.

[31] Schwab, 13-14.

[32] Knox, 57-60.

[33] Patrikarakos, 67.

[34] Clausewitz, 89.

[35] Ibid.

[36] John R. Suler*, Psychology of the Digital Age: Humans Become Electric* (Cambridge, MA: Cambridge University Press, 2016), 12.

[37] Ibid., 1-21.

[38] Ibid., 95-112.

[39] Ibid.

[40] Ibid.

[41] Ibid., 68-112.

[42] Ibid.

[43] Ibid.

[44] Ibid.

[45] Ibid.

[46] Suler published initial findings in 1996, but his book was not published until 2016.

[47] Thomas J. Wright, *All Measures Short of War* (New Haven, CT: Yale University Press, 2017), Antulio J. Echevarria II, *Operating in the Gray Zone*: *An Alternative Paradigm for U.S. Military Strategy* (Carlisle, PA: Strategic Studies Institute and U.S. Army War College Press, April 2016); Jeffrey Collins and Andrew Futter, *Reassessing the Revolution in Military Affairs: Transformation, Evolution and Lessons Learnt* (London: Palgrave MacMillan, 2015). These are some of the specific sources being referenced.

[48] Suler, 1-15.

[49] This is the researcher's assertion based on the analysis from both Thompson and Schwab.

[50] Thompson, 85-87.

[51] Schwab, 28-30.

[52] Ibid., 20.

[53] Jeffrey Dollens, "Huawei Has Been Cut Off from American Technology," *The Economist,* 25 May 2019, accessed 12 February 2019, https://www.economist.com/business/2019/05/25/huawei-has-been-cut-off-from-american-technology.

[54] Arjun Kharpal, "Here's How Trump's Latest Executive Order Could Affect Huawei and the 5G Race," *NBC News*, 16 May 2019, accessed 16 May 2019, https://www.nbcnews.com/tech/tech-news/here-s-how-trump-s-latest-executive-order-could-affect-n1006421.

[55] Schwab, 20-25.

[56] Ibid., 8.

[57] Patrikarakos; Singer and Brooking; Kissinger.

[58] Murray and Knox, 1-15.

[59] Ibid.

[60] Ibid.

[61] Ibid.

[62] Dr. Kevin E. Gentzler, CGSC L400 Lecture, January 2019.

[63] Headquarters, Department of the Army, Army Doctrine Reference Publication 3-0, *Operations* (Washington, DC: Government Publishing Office, October 2017), VI.

[64] Department of the Army, Headquarters U.S. Army Training and Doctrine Command (TRADOC), TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations* (Fort Eustis, VA: TRADOC, December 2018), V.

[65] Schwab, 8.

[66] Bailey, 132-133.

[67] Ibid.

[68] U.S. Cyber Command, "U.S. Cyber Command History," U.S. Army, accessed 01 February 2019, https://www.cybercom.mil/About/History/.

[69] Ibid.

[70] Ibid.

[71] These six priorities come from GEN John Murray's brief to CGSC students on 02 November 2019. While he does not reference the 6th MR he does say these are the most important items of innovation to ensure the militaries success in future conflicts.

[72] Army Futures Command, "Who We Are," U.S. Army, accessed 02 February 2019, https://armyfuturescommand.com.

[73] GEN John Murray, speech to CGSC students, January 2019.

[74] Carver, 790.

[75] Clausewitz, 88.

[76] Williamson Murray and Peter Mansoor, *Hybrid Warfare* (Cambridge, MA: Cambridge University Press, 2012), 199-201.

[77] Carver, 790.

[78] Donald Stoker, "Everything You Think You Know about Limited Wars is Wrong," *War on the Rocks*, 12 December 2016, accessed 01 December 2018, https://warontherocks.com/2016/12/everything-you-think-you-know-about-limited-war-is-wrong/.

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[80] Vanda Felbab-Brown, "The US-Taliban Negotiations Breakthrough: What It Means and What Lies Ahead," *Order from Chaos* (blog), *Brookings*, 29 January 2019, accessed 01 April 2019, https://www.brookings.edu/blog/order-from-chaos/2019/01/29/the-us-taliban-negotiations-breakthrough-what-it-means-and-what-lies-ahead/.

[81] Clausewitz, 119.

[82] Andru E. Wall, "Demystifying the Title 10 – Title 50 Debate," *Harvard National Security Review* (01 June 2011): 5-45.

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[84] Ibid.

[85] Ibid.

[86] Ibid.

[87] Andy Greenberg, "The Untold Story of Notpetya," *Wired* (15 November 2018): 52-63, accessed 20 April 2019, https://www.wired.com/story/notpetya-cyberattack-ukraine-russia-code-crashed-the-world/.

[88] Ibid.

[89] Ibid.

[90] Ibid.

[91] Ibid.

[92] Murray, 14.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

As Defense Secretary James Mattis quipped about looking for new ideas in old books, the author hoped to study the lessons of history to glean useful ideas about warfare in the modern area.[1] The primary task in this research effort was to define the key characteristics of the 6th MR and consider their effects on the present-day U.S. Military. The purpose of the study was to provide a more thorough explanation of the 6th MR and help military professionals and policy-makers better understand their current environment as they make decisions about military innovations and foreign policy decisions in the 21st Century. Chapter Five offers four conclusions and two areas for further study as a result of this research project.

Conclusions

Conclusion One

The first conclusion in this thesis is that the 6th MR is primarily influenced not by a single piece of technology, but by a convergence of a broad range of technologies across the physical, digital, and biological domains. The findings presented in this thesis asserted that technology has been the primary catalyst for revolutionary changes to warfare since the expansion of the industrial revolution in the late 19th Century, but the manner in which that has played out has varied. In the 4th MR Bailey asserted IDF was the most important technology of the era. In 5th MR Murray, Freedman, and Carver all asserted that the atomic bomb was overwhelming responsible for the changes to warfare in the post 1945 world. While the trend appears to have continued, and technology is

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again revolutionizing the conduct of warfare in the modern era, it is now a convergence of a broad range of technologies instead of one particular piece of technology that is most important. This distinction is significant because as Schwab argued throughout his book the power of these technologies are best harnessed when they are fused together. Elevating one in importance over the others diminishes the synergistic effect that can be achieved when they are viewed as a whole. Thus, this researcher cautions against military innovation efforts elevating any one piece of technology as being singularly important during an interwar-period. Instead, each new piece of technology should be considered as a part of a much larger whole and the manner in which that technology shares information across all three domains and fuses with existing capabilities is probably more important than any other consideration.

Conclusion Two

The second conclusion in this thesis is that the character of warfare in the 6th MR is greatly influenced by the empowerment paradigm shift in which long standing formal institutions are ceding power to more informal and distributed forms of governance.[2] Just as radical change occurred in the 2nd MR due to the French people transitioning from feudal subjects to national citizens, people now appear to be transitioning from citizens to power brokers through a technology enabled diffusion of power. This diffusion of power is significant because, as the previous discussion about Clausewitz's Trinity alluded to, those responsible for sending nations to war must account for these new actor's influences on the battlefield as they mobilize for and prosecute wars in the contemporary environment. Today, it is insufficient to solely gain international acceptance for war through traditional methods such as United Nations Security Resolutions. Now, once that

traditional acceptance is gained, it must be maintained in a way that keeps the collective

will of non-traditional entities from usurping the legitimacy of formal governing bodies.

Maintaining legitimacy and the will of the people is certainly not a new concept in the 6th

MR, but it has evolved to include a greater number non-traditional actors who are

globally connected through a diverse set of information networks.

Conclusion Three

The third conclusion in this thesis is that the character of war in the 6th MR is

also influenced by the emergence of the information economy and nations already appear

to be responding to this reality through a reevaluation of their national security

objectives. The specific examples of Uber, Facebook, and Airbnb in the on-demand

economy showed how businesses who own very little physical assets can generate

massive quantities of wealth through ownership of information and digital platforms.[3]

The Huawei example showed how contemporary national security debates are already

being affected by this transformation. The change occurring in the 6th MR is that

information and digital platforms require just as much protection as physical assets much

like the traditional national security interest of maintaining access to oil.

Conclusion Four

The fourth conclusion in this thesis is that the U.S. Military is already responding

to the effects of the 6th MR in a manner that is commensurate with Gongora's description

of how militaries ought to adapt when faced with a MR versus an RMA.[4] The

development of the Army's Multi-domain Operations doctrine mirrors the evolution of

the combined arms doctrine that followed from the introduction of three-dimensional

warfare. Also, the establishment of USCYBERCOM and AFC are indicative of the types of organizational adaptation required as militaries are confronted with the magnitude of change found in adding a fifth dimension to warfare. That said, it is still too soon to tell if these responses by the U.S. Military will be enough. As Murray said, society is only in the nascent stages of understanding and adapting to the 6th MR, so it likely that similar types of changes will be required in the years ahead. For now, the utility in this observation is that while the U.S. Military appears to be adapting and innovating in an appropriate manner, these organizational and doctrinal changes are not final and more change is likely to occur in the years ahead.

Recommendations

Recommendation One

If conclusion number one is valid, and technological convergence is the root cause of change in the 6th MR, then military innovation efforts might be well served by prioritizing the types of cross-domain networks that make convergence possible. Schwab offered that the power of modern technologies was the ability to fuse them together across the physical, digital, and biological domains for a synergistic effect.[5] The key word in that phrase is fuse as it alludes to the importance of the cross-domain networks that enable data to rapidly traverse these three domains. Consequently, this researcher recommends that cross-domain networks should be a priority for military innovation efforts in order to harness the potential synergistic effects that the 4th IR portends.

Recommendation Two

Finally, the theory of NW appears to be a unique characteristic of warfare in the 6th MR and additional research into the effects of dissociative-anonymity are warranted. Specifically, the findings in this thesis asserted there was a gap in the body of knowledge that fails to explain the effects of dissociative-anonymity on governmental organizations. Governments are comprised of many individuals and if they each engage in a variety of digitally anonymous behaviors, especially when interacting with other nations, then what is the cumulative effect of their actions? How are international politics, and by extension the wars that result from failures in diplomacy, influenced by the psychological factors Suler suggested permeate the hyper connected society? Hopefully, these questions stimulate curiosity in future researchers as they explore what it means to be at war in the fourth industrial revolution.

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[1] Remarks by Secretary of Defense James Mattis to senior leaders gathered at the CENTCOM Commander's Conference, July 2017.

[2] This conclusion is drawn from Schwab's definition about the empowerment paradigm shift and adapted for relevance to the discussion on MRs.

[3] Schwab, 57-60.

[4] Gongora, 38.

[5] Schwab, 13-14.

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