2021-06

FOXES AND HEDGEHOGS: BUILDING RANGE IN 21ST CENTURY COMMANDERS

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MONTEREY, CALIFORNIA

THESIS

FOXES AND HEDGEHOGS: BUILDING RANGE IN 21ST CENTURY COMMANDERS

by

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June 2021

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REPORT DOCUMENTATION PAGE			*Form Approved OMB No. 0704-0188*

1. AGENCY USE ONLY *(Leave blank)*	**2. REPORT DATE** June 2021	**3. REPORT TYPE AND DATES COVERED** Master's thesis

4. TITLE AND SUBTITLE
FOXES AND HEDGEHOGS: BUILDING RANGE IN 21ST CENTURY COMMANDERS

5. FUNDING NUMBERS

6. AUTHOR(S) Kevin C. Druffel-Rodriguez

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Postgraduate School
Monterey, CA 93943-5000

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
N/A

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release. Distribution is unlimited.

12b. DISTRIBUTION CODE
A

13. ABSTRACT (maximum 200 words)

In this thesis, I study how the Marine Corps is developing and selecting leaders who will promote innovation and success in the future battlefields. Several studies have analyzed the effects of graduate education and the factors associated with selection for promotion and command selection, but none have separated the Graduate Education Program (GEP) into areas of training and education. Prior research shows that Marine officers with non-professional military education (non-PME) graduate degrees (taught how to think) have lower performance, retention, and promotion rates than Marines at the same career point who attend a PME course (taught what to think). Since the institution of the Commandant's Career-Level Education Board and Commandant's Professional Intermediate-Level Education Board in 2011, the Marine Corps has redirected its best and brightest to attend a graduate-level institution. In this thesis, I use both quantitative and qualitative data to examine how GEP participation affects selection on the lieutenant colonel (LtCol) command screening board. I find that the timing of a Marine's attendance to PME and non-PME GEPs is highly correlated to LtCol command selection, but does not currently predict command performance. Finally, I deduce that the Industrial Age model of education currently utilized by the Marine Corps will be ineffective in developing the interdisciplinary critical thinkers that will be needed for success in 21st century warfare.

14. SUBJECT TERMS range, command selection, graduate education program, professional military education, Naval Postgraduate School, training, education, interdisciplinary thinking, thinking critically, John Boyd, think for yourself, maneuver warfare, Gen. Al Gray	**15. NUMBER OF PAGES** 93
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	**18. SECURITY CLASSIFICATION OF THIS PAGE**	**19. SECURITY CLASSIFICATION OF ABSTRACT**	**20. LIMITATION OF ABSTRACT**
Unclassified	Unclassified	Unclassified	UU

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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FOXES AND HEDGEHOGS: BUILDING RANGE IN 21ST CENTURY COMMANDERS

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ABSTRACT

In this thesis, I study how the Marine Corps is developing and selecting leaders who will promote innovation and success in the future battlefields. Several studies have analyzed the effects of graduate education and the factors associated with selection for promotion and command selection, but none have separated the Graduate Education Program (GEP) into areas of training and education. Prior research shows that Marine officers with non-professional military education (non-PME) graduate degrees (taught how to think) have lower performance, retention, and promotion rates than Marines at the same career point who attend a PME course (taught what to think). Since the institution of the Commandant's Career-Level Education Board and Commandant's Professional Intermediate-Level Education Board in 2011, the Marine Corps has redirected its best and brightest to attend a graduate-level institution. In this thesis, I use both quantitative and qualitative data to examine how GEP participation affects selection on the lieutenant colonel (LtCol) command screening board. I find that the timing of a Marine's attendance to PME and non-PME GEPs is highly correlated to LtCol command selection, but does not currently predict command performance. Finally, I deduce that the Industrial Age model of education currently utilized by the Marine Corps will be ineffective in developing the interdisciplinary critical thinkers that will be needed for success in 21st century warfare.

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LIST OF ACRONYMS AND ABBREVIATIONS

AFIT	Air Force Institute of Technology
AMOS	Additional Military Occupational Specialty
CCLEB	Commandant's Career Level Education Board
CDF	Cumulative Distribution Function
CFT	Combat Fitness Test
CPG	Commandant's Planning Guidance
CPIB	Commandant's Professional Intermediate-Level Education Board
CSB	Command Screening Board
CSC	Command and Staff College
CSP	Command Screening Program
E4S	Education for Seapower
FITREP	Fitness Report
FMFM	Fleet Marine Force Manual
FY	Fiscal Year
GEP	Graduate Education Program
LPM	Linear Probability Model
LTCOL	Lieutenant Colonel
MCDP	Marine Corps Doctrinal Publication
MCO	Marine Corps Order
MCU	Marine Corps University
MMOA	Manpower Management Officer Assignments
MMRP	Manpower Management Records and Performance Branch
MOS	Military Occupational Specialty
MW	Maneuver Warfare
NPS	Naval Postgraduate School
OLS	Ordinary Least Squares
OODA	Observe, Orientate, Decide, Act
PFT	Physical Fitness Test
PME	Professional Military Education
PMOS	Primary Occupational Specialty

RBR	Remove by Request
RO	Reviewing Officer
RS	Reporting Senior
SEP	Special Education Program
SOP	Standard Operating Procedure
TBS	The Basic School
TECOM	Training and Education Command
TFDW	Total Force Data Warehouse
USMC	United States Marine Corps

EXECUTIVE SUMMARY

The Marine Corps is on a crash course with 21st century warfare. In 2018, the Department of the Navy released Education for Seapower that "suggested that there is a disconnect between what education provides for a thinking, learning, and adapting Navy and Marine Corps, and how the naval culture of the twenty-first-century views education … today's Navy and Marine Corps tend to see education as a 'check-in the block' on an Industrial Age path" (Modly, 2018). This suggests that the Marine Corps might be developing inflexible, risk-adverse leaders who will fail to meet the demands of a future battlefield consisting of artificial intelligence, great power competition, and hybrid warfare. This thesis examines the need for the Marine Corps to transition from an Industrial Age learning model to an Informational Age learning model such that future leaders are educated to embrace and flourish in uncertain and wicked environments.

Lieutenant colonel command is customarily the highlight in a Marine officer's 20-year career. This billet offers the opportunity to influence not only the organization but more importantly the Marines within their charge. As such, these commanders are instrumental in developing the future leaders of the Marine Corps and instilling a bias for action and thirst for lifelong learning.

Established in 1992, the Command Screening Program (CSP) seeks to identify and select the most qualified lieutenant colonels and colonels for command. This board replaced the previous method that involved Commanding Generals at every level of command, selecting the commanders for their respective subordinate commands (Marr, 1997). The updated Command Screening Board (CSB) aimed at combating the biases created by Commanding Generals playing favorites or dismissing smaller military occupational specialties (MOS) (National Naval Officer' Association, 2008). I choose only to focus on the lieutenant colonel CSB to better understand a Marine's first chance for command selection. While little has changed regarding the CSP, the latest Marine Corps Order (MCO 1364B), published in 2017, maintains the mission of providing "our Marines with the best and most fully qualified commanders in order to maintain a competent and well-balanced fighting

force" (Headquarters Marine Corps, 2017). What has not been addressed in the CSP is whether we are selecting Marine Officers who know *how* to think rather than *what* to think.

My thesis work analyzes the CSP selection of Marine Corps Officers for lieutenant colonel command. Using data from fiscal year 2015-2019 lieutenant colonel CSBs, I test for the variables that are significant in affecting selection. In addition, I examine whether the selected leaders are well suited for the complexities of 21st century warfare. To answer my research questions, I organize my thesis into two parts: a quantitative data analysis and a qualitative synthesis of books, academic research, and military doctrine.

This dataset I use in the quantitative part of the research is obtained from Tarsiuk (2019) and it includes data on 2,838 screened Marine officers. The data are compiled from three sources: personnel data from Total Force Data Warehouse, CSB results from Manpower Management Officer Assignments-3, and fitness report data from manpower management records. I use multivariate regression models in my analysis to find that the timing of a Marine's attendance to Professional Military Education (PME) (i.e., Expeditionary Warfare School, Captain's Career Course, Command and Staff Colleges) and non-PME (i.e., Naval Postgraduate School, Air Force Institute of Technology) Graduate Education Programs (GEP) is highly correlated to lieutenant colonel command selection but it does not currently predict command performance. Marines who attended a non-PME GEP are less likely to be selected for command than those who attended a PME or no GEP at all. However, Marines who attend non-PME graduate education as a major are, on average, less likely to be selected than captains. This is most likely due to the inability of these Marines to get back to their primary MOS prior to being screened on the CSB. Another explanation is that Marines who attend non-PME GEPs as captains have enough time in their career to reestablish their MOS credibility and remain competitive for lieutenant colonel command.

Based on my findings, I conclude that attending a GEP is not a "career killer" for Marines who want to be lieutenant colonel commanders. What is important to understand is that the timing of a Marine's attendance to a GEP is what affects their odds of command selection. I also conclude that attending a PME or non-PME course does not significantly affect a commander's performance. This is important to highlight because the assumption that Marines are not being selected because they attended a non-PME GEP is unfounded. This

finding, while beneficial to Marine commanders, does not take into account the future of 21st century warfare; only previous counter-insurgency experiences in Iraq, Afghanistan, and Syria are included. It will be advantageous to track this model though the great power competition with China and Russia to determine if advantages for commanders with "range" increase in this domain.

In the qualitative analysis part of the thesis, I find that the Industrial Age model of education currently utilized by the Marine Corps will be insufficient in developing the interdisciplinary critical thinkers that will be needed for success in 21st century warfare. While the release of MCDP 7 *Learning* and MCDP 1-4 *Competing* has reemphasized a focus of education, the Marine Corps is still operating on an Industrial Age learning model that is over-reliant on doctrine, standard operating procedures, and memorization. While this model is efficient and effective in tame environments, they fall short in the complexities of a wicked battlefield. By specializing our way of learning and thinking, we have installed filters to help us focus, but at a significant cost. By filtering issues, we have essentially ignored other concerns and possibly missed critical opportunities.

Commanders who are educated to embrace interdisciplinary thinking, respectful dissent/playing devil's advocate, and view failure as an opportunity to learn not only create better problem solvers but also promote and develop more innovative and creative thinkers within their command. As stated by Adler in his book *Reforming Education: The Opening of the American Mind,*

> the very best thing that our educational institutions can do, so far as general education (not the training of specialists), is to afford preparation for continued learning by their students after the leave these institutions behind them. That cannot be done unless the skills of learning are cultivated in school and unless, in schools and colleges, the students are initiated into the understanding of great ideas and issues and are motivated to continue to seek an ever-increasing understanding of them. (Adler, 1990)

It is from these conclusions that we offer recommendations to aid in the implantation and adoption of "range" to the Marine Corps.

While this thesis is limited in scope, it establishes a starting point for future studies regarding education versus training in talent management. I suggest further studies examine

how the Commandant's Career Level Education Board and Commandant's Professional Intermediate-Level Education Board has affected lieutenant colonel promotions and CSB selections because Marines are no longer self-selecting themselves into these programs. Additionally, exploring the self-removal of eligible officers (through remove by request) would give a better understanding of how Marines view their experience following GEP attendance.

Finally, it would be beneficial to explore the culture and organizational barriers of failure and respectful dissent within the Marine Corps. Countless research has determined that organizations typically do not suffer from a lack of innovate people, but rather from the structure, systems, and culture within the organization itself (Bennett & Parks, 2015). By exposing the benefits of failures and synthesizing the misnomer of respectful dissent, we could put the Marine Corps in a stronger position to reform our education models to eventually develop and select leaders with range.

References

Adler, M. J. (1990). *Reforming education: The opening of the American mind.* Collier.

Bennett, N. & Parks, J. M. (2015). Struggling to innovate? Examine your structure, systems, and culture. *Business Horizons,* 58(5), 563-569.

Headquarters Marine Corps. (2017, March 23). *Command screening program* (Marine Corps Order 1300.64B). Department of the Navy. https://www.marines.mil/portals/1/Publications/MCO%201300.64B_Final_MK.pdf?ver=2017-04-05-071442-330

Marr, D. C. (1997). A statistical analysis of the U.S. Marine Corps lieutenant colonel command screening process [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://calhoun.nps.edu/handle/10945/4227

Modly, T. B. (2018). *Education for seapower*. Department of the Navy. https://www.navy.mil/strategic/E4SFinalReport.pdf

National Naval Officers' Association. (2008, January). *Marine Corps Command Screening Process: "The most important board in the Marine Corps."* Retrieved from http://quantico-nnoa.org/Files/PME/Command_Screening_Process.ppt

Tarsiuk, A. L. (2019). *Complacency kills: A systemic analysis of the USMC command screening program*. [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://calhoun.nps.edu/handle/10945/62306

ACKNOWLEDGMENTS

I would first like to thank my family for their tireless support not only during our time at the Naval Postgraduate School but also over the past decade in the Marine Corps. My wife, Nichelle, is the most selfless person I know and her dedication to our family is remarkable. To my kids, Charley and Logan, you are a constant reminder of the beauty of natural curiosity and true love. To my parents, Steve and Ellen, thank you for allowing me to explore my own “dark path” and always encouraging me to find my passion.

To my thesis advisors, thank you for always being accessible and challenging me to be better. Dr. Tick, thank you for utilizing your wealth of econometrics experience to help me formulate my research questions and exploring areas I had overlooked. Dr. Augier, thank you for sparking my creative curiosity and exposing me to the benefits of range.

To all the Marines I have served with and will serve with in the future, thank you. Your selfless sacrifice is nothing short of incredible and I am humbled to be associated with you. Any accomplishments I obtain are reflective of your hard work and discipline. I promise to always that care of you, learn with you, and hold you in the highest regard.

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I. INTRODUCTION

> Strong leaders are also teachers and mentors. Every Marine is a current or future leader, and therefore, leads by example to seek learning opportunities for themselves and other Marines. All Marines develop leadership skills and improve communication through continuous learning and self-reflection.
>
> —Department of the Navy (2020b)

The battlefield of 21st century warfare will be shrouded in uncertainty. Artificial intelligence, decentralized operations, and constant ambiguity will become the new environment in which we must function. While overwhelming, we cannot afford our leaders to overuse experts and allow their sense of thinking to atrophy. To maintain relevance and ensure domination, we must select leaders who not only thrive, but embrace this fog of war. These commanders also must be educators and advisors to those in their charge in order to perpetuate the mindset of curiosity and interdisciplinary thinking.

Unfortunately, the current structure of professional military education (PME) within the United States Marine Corps (USMC) is modeled after Industrial Age education in which the emphasis is placed on rote memorization and standard operating procedures (SOPs). This process knowingly develops inflexible experts who farm out their thinking and limit their perspectives.

Building on lessons learned from the adoption of maneuver warfare[1] (MW) in the 1980s and 1990s, the Marine Corps has begun a learning rebirth. A new found emphasis on Informational Age models of education[2] is beginning to be discussed for diffusion into PME programs (Mullen, 2018). Additionally, the Graduate Education Program (GEP) is

[1] MW was nested in 1980s military reform, sparked by poor military tactics (attrition warfare) utilized in Vietnam. General Alfred Gray was the key leader in the development and implementation of the MW philosophy in the Marine Corps and is credited with developing and implementing FMFM 1 *Warfighting* and sparking a renaissance of education and learning by creating the Marine Corps University and Commandant's Reading List (Augier & Barrett, 2020).

[2] Informational Age learning is the widely accepted Marine Corps description for post-Industrial Age learning. It can also be called cognitive age learning or judgment age learning (Augier & Barrett, 2019a). The term Informational Age learning was first used in the Marine Corps by Major General William Mullen in his Commander's Guidance as Commanding General for Training and Education Command. The term was then adopted by General David Berger in his Commandant's Planning Guidance.

gaining popularity again and the Marine Corps is now emphasizing non-PME programs (Naval Postgraduate School [NPS]).

While the Marine Corps appears to be trending in the direction of developing and accepting leaders with more "range"[3] (Neller, 2018), there maintains a stigma against non-PME programs. This stereotype is due to their effect of reduced time within a Marine's military occupational specialty (MOS) and association with an inability to command those units at a higher level (Tarsiuk, 2019). In this thesis, I provide a systemic analysis of the effect of GEP attendance (PME and non-PME) on Lieutenant Colonel (LtCol) Command Selection Board and explore if participation in current PME or non-PME courses have the potential to develop effective 21st century commanders.

A. BACKGROUND

1. Lieutenant Colonel Command Selection Board

Established in 1992, the Command Screening Program (CSP) seeks to identify and select the most qualified LtCols and Colonels (Cols) for command. This board replaced the previous method which involved Commanding Generals at every-level of command selecting the commanders for their respective subordinate commands (Marr, 1997). The updated Command Screening Board (CSB) aimed at combating the biased created by Commanding Generals playing favorites or dismissing smaller MOSs (National Naval Officer' Association, 2008). I am choosing only to focus on the LtCol CSB, as mentioned previously, to better understand a Marine's first chance for command selection. While little has changed regarding the CSP the latest Marine Corps Order (MCO), 1364B, was published in 2017 and maintains the mission of providing "our Marines with the best and most fully qualified commanders in order to maintain a competent and well-balanced fighting force" (Headquarters Marine Corps, 2017).

[3] General Neller stated in the 2019 LtCol CSB Precept, that the Marine Corps does not have a "preferred career pattern for officers" and board members should "consider that the Marine Corps benefits when the officer corps possesses a broad spectrum of experiences." This accumulation of perspectives and education is the very definition of an individual with range.

2. Graduate Education Program

Revised in 2019 and replacing the previously named the Special Education Board (SEP), the GEP seeks to annually select officers who meet the qualifications to partake in postgraduate programs (Headquarters Marine Corps, 2019b). The GEP has been refined over the years, but the major shift took place in 2011 with the establishment of the Commandant's Career Level Education Board (CCLEB) and Commandant's Professional Intermediate-Level Education Board (CPIB). This created non-volunteer selectees for placement in graduate-level education. These boards were implemented to combat the low participation rate (80%) of Marines (U.S. Marine Corps, 2020) and increase the quality of students selected for the GEP.

Further refinement was needed within the GEP as Marine's career timing was not initially considered, which resulted in Marines missing key billets-in-grade and negatively affecting their chances of promotion and command selection. This was corrected in 2013 when Manpower Management Officer Assignments (MMOA)-3 began to thoroughly scrub board selectees for career timing considerations. Additionally, in 2016, it became mandatory for Marines to submit college and post-graduate transcripts and fill-out a preliminary questionnaire regarding GEP preference (Figure 1). Finally, in 2017, the selection and slating boards were combined and graduate-level education programs were slated before resident PME schools (Figure 2). This most recent adjustment indicates a cultural shift in the Marine Corps regarding the importance of education (NPS) more than training (resident PME schools).

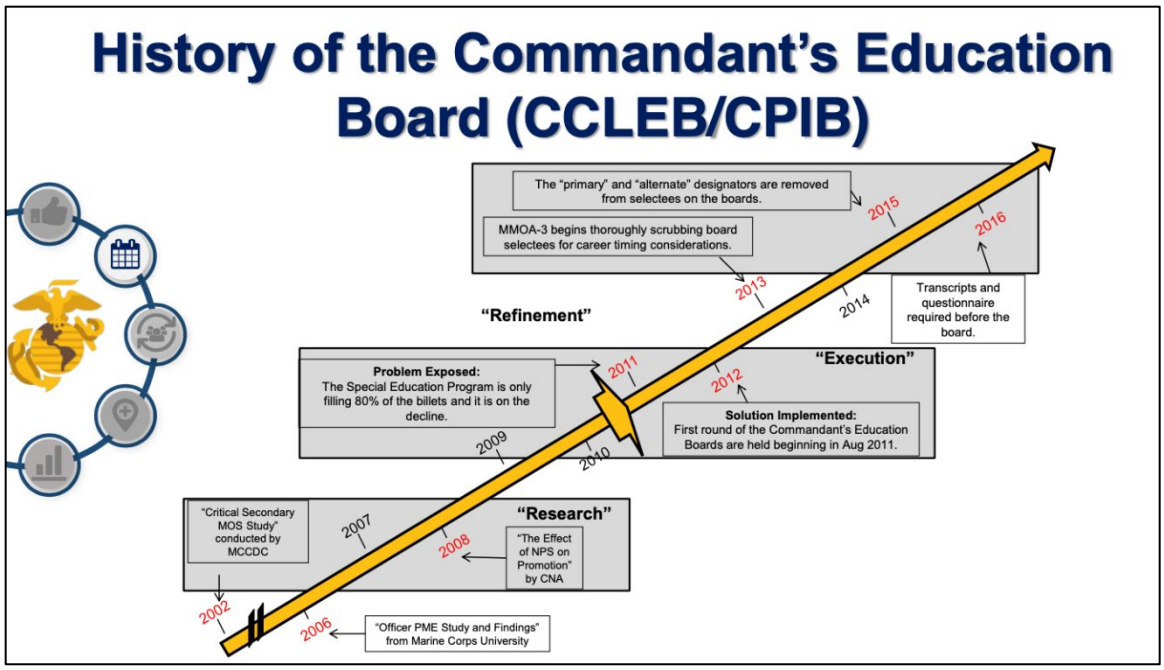

Figure 1. History of the Commandant's Education Board. Source: U.S. Marine Corps (2020)

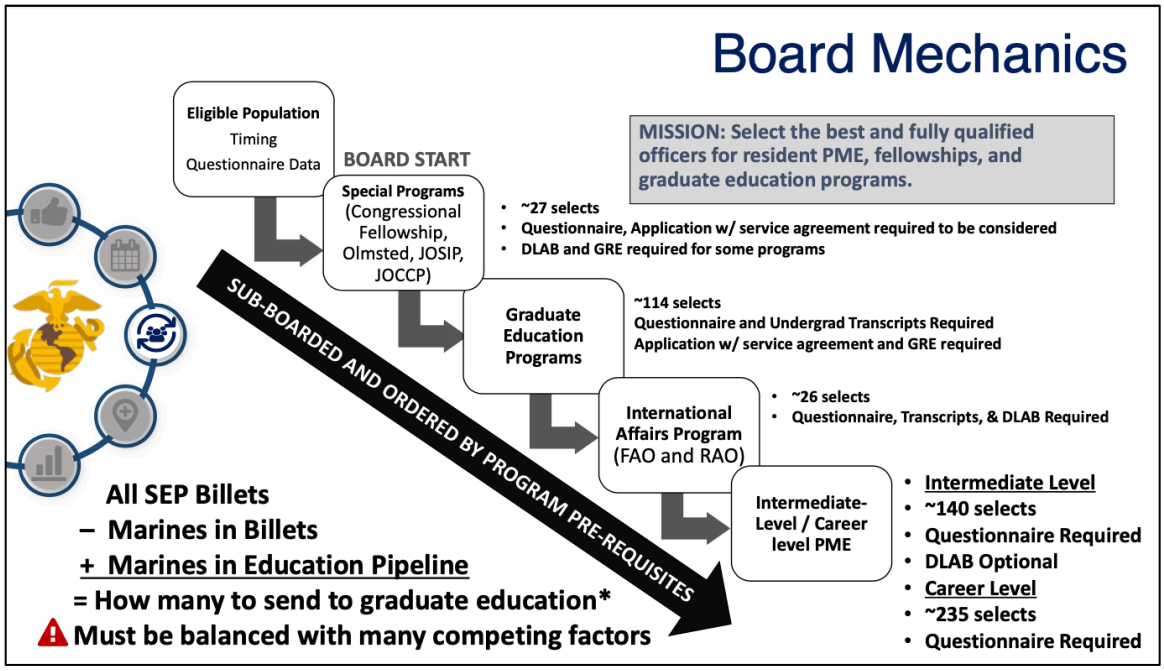

Figure 2. Commandant's Education Board Mechanics. Source: U.S. Marine Corps (2020).

3. Marine Corps' Reemphasis on Education

General Alfred M. Gray Jr., 29th Commandant of the Marine Corps, is responsible for refocusing the Marine Corps towards the importance of education. He established the Marine Corps University in 1989 and successfully provided "unity of effort to how we educate our Corps' most important asset and our lifeblood - our people" (Bowers, 2017). While this was an important first step in shifting the Marine Corps' focus toward education, it unfortunately has been diluted by decades of war in Iraq and Afghanistan, leading to the institutionalization of PME within the Marine Corps (Mullen, 2020). This "cooling effect" has been detrimental in the continuation of learning within in these "hot groups"[4] that were facilitated and nurtured by General Gray (Augier & Barrett, 2020). These hot groups contributed to the grassroots movement that facilitated the Marines Corps' adoption of MW. This perspective on organizational change (hot groups) was a driving factor in the innovation diffusion[5] of learning within the Marine Corps. Unfortunately, the growth of organizational structure and rules has inhibited the innovation and continuation of these hot groups and Marines are now primarily taught what to think and not how to think.

This issue came to light in the Education for Seapower (E4S) when the Department of the Navy "suggested that there is a disconnect between what education provides for a thinking, learning, and adapting Navy and Marine Corps, and how the naval culture of the twenty-first-century views education…today's Navy and Marine Corps tend to see education as a 'check-in the block' on an Industrial Age path" (Modly, 2018). This idea of a stagnate education system led the Marine Corps to take a closer look at why and how we educate.

The recent refocus on the diffusion of learning and education within the Marine Corps can be attributed to the Commanding General's Guidance from Training and

[4] A hot group is a term first published by Harold Leavitt (a psychologist and professor of management) in 1996 to describe how movements can form, spread, and transform organizations. Augier and Barret utilize this term to characterize the grassroots network of young Marines who were responsible for the cultural change within the Marine Corps regarding the adoption of MW.

[5] Everett Roger was a communication theorist and sociologist who research established the theory of innovation diffusion and coined the term "early adopter." His categorization of innovation adopters helped managers and businesses understand the impact of "people differences" on predicting and managing diffusion of products or services.

Education Command. Taking command of Training and Education Command (TECOM) in 2018, Major General Mullen outlined his vision for TECOM by proposing several changes to the model in which we train and educate Marines. He identified the shortcomings of the Industrial Age model in Marine Crops PME courses and the need for a diffusion of a more diverse education process that prepares Marines for the unknown. His guidance also highlighted that "training prepares you to deal with the known in combat, education prepares you to deal with the unknown" (Mullen, 2018).

In the 2019 Commandant's Planning Guidance (CPG), General Berger stated that "there is an increasing dissonance between what we are doing with regard to training and education, and what we need to be doing" (Office of the Commandant of the Marine Corps, 2019). He goes on to emphasize that memorization of facts will not serve the Marine Corps in the next great power competition because we will be fighting a war that is too complex and distributed to simply execute off of memory. He goes on to say that "resourcing a real 'campaign of learning' presents challenges. Further guidance on resourcing will follow, but deliberate service-level O-6 and O-5 talent management, permeant manning adjustments, fiscal reprogramming, and the temporary allocation of highly-qualified manpower from the MCU student population, are all elements of a likely solution for proper resourcing of this critical effort" (Office of the Commandant of the Marine Corps, 2019).

Just recently the Marine Corps released the first Marine Corps Doctrinal Publication (MCDP) since 2001. The purpose of MCDP 7 *Learning* is to diffuse the Marine Corps' philosophy on education and explain why it is important. In the forward, General Berger states that "continuous learning is essential to maneuver warfare because it enables Marines to quickly recognize changing conditions in the battlespace, adapt, and make timely decisions against a thinking enemy" (Department of the Navy, 2020b). This is an important first step in refocusing the Marine Corps on *how* to think and not *what* to think.

B. PURPOSE AND INTENT

The Marine Corps' greatest assets are the Marines within it and as such, the Marine Corps only selects the "highest qualified" Marines to lead them. The purpose of the LtCol

CSB "is to ensure that Marines receive the best possible leadership and to provide all eligible officers with a fair and equitable opportunity to command" (Headquarters Marine Corps, 2019a). This sounds admirable, but there has been a long-standing assumption in the Marine Corps that one's MOS credibility (or specialization) is vital to selection on the LtCol CSB. This assumption has been highlighted by the E4S which concluded that "today's naval professionals see themselves as members of tribes within the naval sphere, as opposed to actually identifying as naval professionals. Officers self-identify as Naval Aviators, Surface Warfare Officers, Submariners, SEALs or Marine Infantry, etc., focusing inward on their tactical and procedural specialty" (Modly, 2018). This issue creates a problem for Marines who are selected to participate in the GEP, formerly the SEP, because they are being forced to operate for years outside their primary military occupational specialty (PMOS). Thus, in my thesis, I use Marine data from the Total Force Data Warehouse (TFDW) and MMOA-3 to examine the following research questions:

1. How does the Selection for Command outcome differ, if at all, for Marines who participate in PME and non-PME GEPs?
2. Does participation in current PME or non-PME courses have the potential to develop future O-5 commanders who stimulate innovation and flexibility in future battlefields?

I conduct a quantitative analysis of the fiscal year 2015 (FY15) to FY19 CSB through the use of a multivariate regression analysis to attempt to explain the effect of MOS credibility (through attending a GEP) on selection on the CSB. The GEP career path is broken into four variables; Captain PME (O-3 level PME attendance), Major PME (O-4 level PME attendance), Captain Non-PME (NPS, Air Force Institute of technology [AFIT], and other civilian graduate-level education programs that remove Marines from their primary MOS for an extended period of time) and Major Non-PME. I then estimate probit or logit models to predict CSB selection by controlling for various predictors (gender, deployments, awards, time in service, etc.). Then, I construct an odds ratio to determine if there is a statistical difference in LtCol command selection based on a Marine attending a PME or non-PME GEP. I conclude that attending a GEP is not a "career killer" for Marines who want to be LtCol commanders, but the timing of a Marine's attendance to a GEP is

what effects their odds of command selection. Additionally, I conclude that attending a PME or non-PME course does not significantly affect a commander's performance.

I also conduct a qualitative analysis that attempts to determine the ideal commander that the Marine Corps should be selecting to operate in the 21st century battlefield. This analysis is an examination of recent literature (books, academic journal articles, and military doctrine) regarding interdisciplinary thinking, industrial versus information learning, and wicked versus tame environments. Finally, I attempt to illustrate differences between industrial and Informational Age learning, through another perspective on organizational change by Everett Rogers, and recommend actions to generate the innovation diffusion of the "process" (learning and education) within Marine Corps PME. From the qualitative portion of this thesis, I conclude that commanders who are educated to embrace interdisciplinary-thinking, respectfully dissent/play devil's advocate, and view failure as an opportunity to learn not only create better problem-solvers, but promote and develop more innovative and creative thinkers within their command.

C. ORGANIZATION OF THE STUDY

I organize this thesis into five chapters. Chapter I provides the background and detailed description of the GEP, CSP, and the Marine Corps' re-emphasis on education. It also is an introduction to the thesis and its significance to the Marine Corps. Chapter II is a review of the literature that examines past military and academic research in these areas. Chapter III defines the data sources, variables, and multivariate models used in the analysis. Chapter IV is the analysis, findings, and interpretations. Chapter V closes the thesis with a discussion of the thesis' recommendations, limitations, and areas for further study.

II. LITERATURE REVIEW

This literature review focuses on a select group of NPS theses that create a base knowledge of GEP selection and indicator variables for "successful" Marine officers. The academic research focuses on two selected works that offer a different perspective on leadership and problem solving through the synthesis of prior establish academic research.

There is significant literature on factors that influence selection on LtCol promotion and CSBs. Most of the studies look at determining the factors associated with being selected for command; demographic characteristics, such as race, PMOS, awards, fitness, marksmanship. However, no previous research has examined the differentiated effect of training (MOS credibility) versus education (attendance at NPS or non-PME schools) on selection for LtCol command. My research attempts to shed light on the assumption of non-PME attendance being a "career-killer" and detrimental to developing future leaders.

A. MILITARY RESEARCH

1. Lianez and Zamarripa (2003)

Lianez and Zamarripa (2003) study the effect of the Marine Corps' GEPs on officer performance. Their goal was to provide data to confirm or deny the Marine Corps' assumption that PME (Command and Staff Colleges [CSCs]) is responsible for an increase in officer performance over the alternative attendance to a Non-PME graduate education (NPS). They derived a performance index from fitness report (FITREP) data and averaged before- and after- markings of officers who attended PME, Non-PME, and no graduate education (NOS). Multivariate regressions (holding affective [Officer Candidate School, Reserve Officers' Training Cops, Prior Service, etc.], cognitive [General Classification Test and The Basic School (TBS) performance], and demographic variables constant) found that the performance of Marine officers with any form of graduate education was not appreciably distinctive from that of Marine officers who did not obtain a graduate education. While the difference of pre- and post- education performance is not notably dissimilar for those Marine officers who attended a graduate school and those who did not,

the performance of those who attended a non-PME graduate education was slightly smaller than those without any graduate education (significant at the 0.10 level). This could indicate that attending a GEP program negatively affects MOS credibility and lowers FITREP markings. A major limitation of the Lianez and Zamarripa (2003) study is that it only analyzed four years (FY1999 through FY2002) of data and the long-term effects of graduate education on officer performance were, therefore, not estimated.

2. Rateike (2017)

Rateike (2017) conducts a quantitative analysis of officer selection by the CCLEB. He uses CCLEB data (MMOA-3) from FY2014 through FY2016 that is merged with data from TFDW, TBS, and Manpower Management Records and Performance (MMRP). His research finds that the CCLEB places considerable weight on job performance (measured from FITREPs), seniority (years of commissioned service), and including a recent picture in the application (which he associated with motivation). His results also indicate that TSB scores (most notability, academic and leadership) are an accurate predictor of selection. A limitation of using the findings from the Rateike (2017) study is that the CCLEB underwent a massive restructuring in FY2017 (adding transcripts and questionnaires before the board meeting). The data analyzed is only relevant to explaining the prior process of the CCLEB. Also, the FITREP data did not include the Section I comments which form a word picture of the Marine and their future potential. It is quite common for quantitative markings in other sections to not match the Section I comments, but the briefers on the CCLEB have access to all data and these comments could alter their assessment of the Marine. In addition, no differentiation between types of college degree or any form of education was used. It would be interesting to see if science, technology, engineering, and math (STEM) degrees increase the probability of selection for CCLEB since they are highly encouraged for admittance into NPS. The main take away from the Rateike study is that MOS credibility (called job performance in his thesis) is a predictor of CCLEB selection and a trait that is associated with a "high-quality" Marine Corps officer. This supports the assumption in this thesis that MOS credibility is associated with performance (derived from FITREPs) and increases when Marines remain within their occupational field.

3. Branigan (2001)

Branigan (2001) analyzes the factors associated with retention and promotion to O-5, with a specific focus on economic returns to graduate education (NPS). He uses data from FY1998 to FY2001 LtCol promotion boards in conjunction with linear regression analysis and probit models to predict retention and promotion of Marine Corps officers. He concludes that a graduate degree from NPS, along with other master's degree awarding institutions, has a positive effect on retention and promotion. He uses several techniques to correct for potential bias due to self-selection and sample-selection, but the results from these techniques were too sensitive and inconclusive. These results are interesting because this study takes place long before the CCLEB and CPIB, therefore, all Marines with degrees from NPS were volunteers and had a tendency to be seen as "selfish" and avoiding the Fleet Marine Force (FMF). Also, the effect on graduate degrees from an institution other than NPS was higher than receiving a graduate degree from NPS. This could be an indicator that a Master's degree obtained through CSC or another PME school is valued more for retention and promotion because Marines can spend more time in their primary MOS and less time in utilization billets (training being viewed as superior to education).

4. Tarsiuk (2019)

Tarsiuk (2019) conducts a quantitative and qualitative analysis of the Marine Corps CSP. Using data from FY15 to FY19 LtCol CSBs, she examines the processes of the CSP, elements determining selection, and the effect of CSB members on the Marines being screened. She determines that the Marine Corps does have existing biases in the boards that should be mitigated. She identifies that board members value different selection outcomes and command types.

Also, she recommends that boards should be more diligent in assessing a candidate's character and other intangible qualities. These conclusions inspired me to conduct a further, more thorough analysis of career timing and the assumption that MOS credibility is a key factor in CSB selection. This area of concern was discussed briefly in Tarsiuk's thesis, but not quantified or explored against current leadership models.

I utilize the CSB data to derive PME and non-PME variables and the FITREP data to better quantify the performance of command selected Marines and identity if PME or non-PME attendance has a significant effect.

B. ACADEMIC RESEARCH

While not academic research themselves, the following books build on scholarly academic research to challenge current notions regarding industrial age learning (i.e., creating and operating in silos). *Range* begins by detailing why generalists are more suited to succeed in a world currently dominated by experts. *Think for Yourself* expands upon this theory of high performing generalists and provides solutions to relearning the ability to think critically in the 21st century. I supplement the ideas highlighted in these books and expand on them with relevant academic literature.

1. *Range* (2019)

Impactful research has been recently referenced in the 2019 *Range* by David Epstein who offers a counterargument to Malcolm Gladwell's *Outliers: The Story of Success.* Epstein argues, citing findings from recent and relevant scientific studies, that, "when you move on from an area of work or an entire domain, that experience is not wasted" (Epstein, 2019). He goes on to propose that this diverse experience enables interdisciplinary thought and empowers individuals to become more efficient and effective problem solvers. This paradigm goes against the common assumption that hyper-specialization is required for success and that only repeated practice can allow one to attain greatness.

This shift toward generalist advantage is supported by the research of psychologists, William G. Chase and Herbert A. Simon,[6] who discovered that experts do not have photographic memories, but rather the ability to recognize patterns. This number of short-term information that can be immediately recalled was termed a "chunk" by

[6] Herbert Simon was an economist, political scientist, and cognitive psychologist who received the Nobel Prize in Economics in 1978. His interdisciplinary research led to theories of "bounded rationality" and "satisficing." He was a pioneer in the field of artificial intelligence, decision-making, and complex systems.

George A. Miller, but Simon was able to combine two non-testable hypothesizes (the number chunk capable in short term recall and the time required to learn one chunk in seconds) one parameter-estimating paradigm. The importance of this experiment is that it allowed Simon to combine two separate systems (capacity for learning and time to learn) into one experiment. His results concluded that "the chunk capacity of short-term memory has been shown to be in the range of five to seven. Fixation of information in long-term memory has been show to take about 5 or 10 seconds per chunk" (Simon, 1974). This discovery explains why experts are typically only successful in one domain because they dedicate their lives to viewing the world through one perspective, which breeds the identification of these chunks when presented with a problem.

Daniel Kahneman's research of the heuristics and biases approach supports the generalist mindset by offering a distrustful attitude toward experts and their opinions.[7] Kahneman coined the term "illusion of validity for the unjustified sense of confidence that often comes with clinical judgement" (Kahneman & Klein, 2009). His research has concluded that experts make substandard choices and reach improper deductions when they blindly follow their intuitions. It is these situations, that experts fail to apply the rules and regulations with which they have utilized throughout their career. This research supports the claim, like Simon, that experts tend to follow pattern recognition which works in tame environments, but can lead to disastrous results when applied to ill-structured problems.

Research by Herman Kahn and Irwin Mann on the common pitfalls of analysis also support the theory of unintended consequences by specialists. In their 1957 research memorandum, they explore the common mistakes made by operations analysts and systems analysts. One of the most frequent pitfalls and that which accurately describes the biases of the specialist is that of modelism. Modelism is the over utilization and mishandling of models in analysis. They conclude that "many analysts prefer to study only the interesting (to them) portions of the whole problem. They often end up by studying an irrelevant or

[7] In Colonel John Boyd's (USAF, Ret.) Conceptual Spiral Presentation, he comments that there are three ways to offend him: call him an analyst (what he identifies as having half a brain), call him an expert (meaning he has everything figured out and cannot learn anything new), or call him an analytical expert (meaning he has half a brain and still thinks he has everything figured out).

overidealized question. Or what is sometimes almost as bad, the question that is being studied is relevant but not complete" (Kahn & Mann, 1957). Modelism can also lead to another mistake called over-concentration. The danger of over-concentration is "the factoring out of a suitable area will be done carelessly or unskillfully and an overly-narrow viewpoint adopted" (Kahn & Mann, 1957). This research supports the claim that specialists are more synonymous with hedgehogs who, when addressed with a problem, typically utilize their expertise and experience to dig deeper within their known domain to generate a perspective and solution.

Epstein goes on to explain the concept of "learning, fast and slow" by exploring the research of Nate Kornell. A cognitive psychologist at Williams College, Kornell conducted studies investigating why U.S. students do not do well on international measures of high school knowledge. He determined that this phenomenon was due to a lack of "desirable difficulties, obstacles that make learning more challenging, slower, and more frustrating in the short term, but better in the long term" (Epstein, 2019). Epstein argues that students who learn under various conditions (called interleaved practice) are forced to recognize deep structural connections among various problems. This allows students to match a strategy with a problem and creates flexibility in one's problem-solving abilities; enabling the use of structure in new domains. Unfortunately, this is not how we are currently teaching within the Marine Corps. The Marine Corps tends to practice block learning, which is the process of repetition so that you learn a procedure. This works well for breaking down a weapons system or programming a radio but hinders our Marine's ability to make decisions in a fluid environment.

Yale law and psychology professor Dan Kahan, has continued to explore the methods and effectiveness of generalists over experts. He calls this personality feature science curiosity because it describes individuals who choose to view new evidence, regardless of their current personal beliefs. These generalists are compared to foxes who continually try and amass information to better understand the world around them. Experts are better compared to hedgehogs who live in a single domain and silo their thinking to one system. These individuals take a very narrow view of problems they are presented with and typically burrow their understanding of issues into their own field of expertise.

This observation that experts self-inflict obstinacy is central to this thesis because Gladwell's "10,000-hour rule" parallels the Marine Corps' propaganda of MOS credibility. Additionally, this book separates the world into two learning environments: wicked and kind. Psychologist Robin Hogarth describes kind learning environments as those that "involve close matches between the informational elements in the two settings (learning and predictions) and are a necessary condition for accurate inferences" (Hogarth et al., 2015). The defines wicked learning environments as those that involve mismatches. This means that kind environments follow patterns and can be easily understood, while wicked environments are complex and may have multiple solutions. These learning environments can be translated to the style of warfare that leaders will face in the 21st century. With increasing access to information and the rise of great power competition, the future battlefield is certain to be full of wicked problems. I intend to use the studies cited in this book and others revolving around the concept of generalists and critical thinking to explain that attendance to non-PME GEPs is the key to developing range and the characteristics needed for commanders to be successful in the uncertain and decentralized battlefield of 21st century warfare.

2. *Think for Yourself* (2020)

In the 2020 book *Think for Yourself: Restoring Common Sense in an Age of Experts and Artificial Intelligence*, the author, Vikram Mansharamani, argues that "experts and technologies are useful-indeed essential-but it is the mindless and blind outsourcing to them that must be guarded against, that generates unnecessary risks to our well-being, and that limits opportunities to realize our true potential" (Mansharamani, 2020).

This hypothesis is supported by Herbert Simon who suggested that humans suffer from "bounded rationality." This means that a person's ability to optimize is limited by current information available, limitations of the mind to interpret tradeoffs, and the scarcity of time. Simon suggests that we should "learn to satisfice" rather than maximize (Simon, 1956). Unfortunately, in a world of overwhelming data and constant uncertainty, Simon's solution has gone overlooked and our gift of choice, once thought of as a position of power, is now being handed out to the nearest expert.

Research by Herman Kahn and Irwin Mann on the common pitfalls of analysis also explore the dangers of blind reliance of experts. In their 1957 research memorandum, they study the mistake entitled "butch." Butch is a "the completely mistaken technical notion or fact" (Kahn & Mann, 1957). What they mean is that when studying on a diverse problem is will be necessary to work with a large number of experts from diverse fields. They recommend that "it is crucial in dealing with these experts not to accept their statements uncritically, not matter how scholarly or distinguished they are (Kahn & Mann, 1957). Kahn & Mann recommend that analysts fight this issue in two ways. First, become a lay expert in all relevant fields, this working knowledge will allow you to ask meaningful questions and detect assumptions from experts. Second, they should solicit as many experts as possible to get a variety of perspectives.

Supporting this notion of being more mission-orientated, Mansharamani references Nobel Laurate Robert Merton and his research on goals-based investing. Merton argues for shift in focus - away from exploiting and toward the possibility of succeeding. To put this in military terms, Merton focus is not on winning battles (short term victories), but winning the war (long term goal). This mission-orientated thinking is synonymous with the Marine Corps' utilization of commander's intent to effectively execute "decentralized command" (a key factor of MW).

Mansharamani utilizes the theory of the Peter Principle, developed by Dr. Laurance J. Peter and Raymond Hull in 1969, to highlight the bureaucratic focus on organization systems and not employee development. The Peter Principle dynamic states that individuals rarely get promoted to the job they are capable of, but more often past it (to their "level of incompetence." The reasoning is that those in charge of promotions focus too much on the current success of one's actions and not the future potential and their ability to adapt at a higher level. Consequently, employees only develop skills that make them effective in their current situation and negate expanding their breadth of understanding. This idea of blindly following protocols is very indicative of the promotion and command selection boards currently utilized within the Marine Corps because it focuses on tangible outputs like MOS credibility and neglects the development of interdisciplinary thinking.

Finally, Mansharamani address the unintended consequences of operating within a system. A system is connection of multiple parts that includes feedback loops to drive change. Unfortunately, specialists only operate in a narrow silo and therefore see change from the outside as an unintended consequence. Alternatively, generalists operate as a system and only see consequences of actions. An example of this phenomenon is the adoption of the seatbelt. People traditionally believe that wearing seatbelts make us safer, but what if they don't? What if they make you feel safer and therefore you drive recklessly? This extreme focus can actually worsen and magnify unintended consequences. For example, countless safety mechanisms have allowed our problems to pile up, making us over confident, and extremely vulnerable to massive disasters. This is explained by Hyman Minsky's financial instability hypothesis which argues that "periods of stability generate instability, as it incentivizes actors to take on greater and greater risk as they remain oblivious to mounting vulnerabilities" (Mansharamani, 2020).

Mansharamani argues that we need to realize that our cognitive bandwidth is a fixed quantity and our attention is a scares resource. This theory has been studied by Gerald Wilde, a psychology professor at Queen's University, and termed risk homeostasis. His theory emphasizes that any decrease in obvious risk for an action will result in people continuing to push the boundaries and exceed set limits. Putting blind faith in advances of technology also increases focus. By doing this, we are increasing the outsourcing of data analysis and not being critical of the results being pushed back. This matters to the Marine Corps because it too is an organization of balanced systems and interconnected parts. While it is useful to have specialists that understand individual elements well, it is also critical that leaders look across domains. By focusing deeply in a singular system, we often fail to see how our actions may exacerbate the very complications we are attempting to mitigate.

So, what are the characteristics of leaders that will be required to facilitate innovation and success in the future environment of warfare? In my qualitative analysis, I explore the mismatch of industrial learning, in PME courses against the future of informational learning in ill-defined warfare. Further, I explore how outsourcing to experts has caused an atrophy in our leaders' ability to think innovatively, placing the Marine Corps in a position of being more vulnerable to risks and more uncomfortable in a world

of uncertainty. We must always remember to keep an open mind with regard to thinking. In Herman Kahn's article "In Defense of Thinking" he explores the difficulty of expanding our minds to counter systemic issues. While Kahn uses examples of slavery and mental illness to drive home his point about "social inhibitions that reinforce natural tendencies to avoid thinking about unpleasant subject" (Kahn, 1962), I ask we open the dialogue to explore the mismatches of specialists and generalists when exploring the effectiveness of 21st century leaders. Kahn concluded his article by stating, "it is quite clear that technical details are not the only important operative facts. Human and moral factors must always be considered" (Kahn, 1962). This is one reason why this thesis has been broken into two parts (quantitative and qualitative). War is not a dichotomy of art or science, but a delicate balance that requires a careful synthesis of data, organizational behavior, and strategy to best determine the leaders we select for command.[8]

[8] FMFM 1 *Warfighting* distinguishes that "while founded on the laws of science, war demands, ultimately, the intuition and creativity of art" (Department of the Navy, 1989). LtGen. Paul Van Riper (USMC, Ret.) has also stated that "the art of war is clearly the most important. It's science in support of the art…The art is the thinking. It's understanding the theory and the nature…The science is represented by the weapons" (Willis, 2003).

III. DATA AND METHODOLOGY

A. FY15-FY19 LTCOL CSB DATA

1. Data Description

The quantitative portion of my thesis focuses on determining if attending a PME or Non-PME course effects selection on the LtCol CSB. I analyzed data previously used in the 2019 NPS thesis by Alissa Tarsiuk. The data set includes individual level data on 1,691 active-duty Marine Corps Officers who were eligible to be screened on the LtCol CSB from FY15 to FY19 (a total of 2,838 observations because non-selected Marines can be screened on multiple FY boards). Table 1 shows the mean descriptive statistics for Marines screened the LtCol CSB from FY15 to FY19.

Table 1. Eligible CSB Officer's Descriptive Statistics Summary (FY15-FY19)

Demographics Summary FY2015-FY2019)	
Eligible Officers (Obs = 2,838)	
Variable	**Mean**
Rank	
Major	0.403
LtCol	0.597
Primary MOS	
Combat Service Support	0.423
Aviation	0.321
Combat Arms	0.256
Experience	
Time in Service (years)	20.130
Combat Deployments	3.529
Non-Combat Deployments	0.782
Gender	
Male	0.952
Female	0.048
Race	
White	0.822

Demographics Summary FY2015-FY2019)	
Eligible Officers (Obs = 2,838)	
Variable	**Mean**
Non-White	0.178
Training	
PFT 1st Class	0.895
PFT Other	0.105
CFT 1st Class	0.894
CFT Other	0.106
Rifle Expert	0.769
Rifle Other	0.231
Pistol Expert	0.649
Pistol Other	0.351
Education	
Captain PME	0.328
Captain non-PME	0.067
Major PME	0.375
Major non-PME	0.074
Performance	
Captain RS Cum RelVal	91.437
Captain RS Cum RelVal	92.476

The data was originally collected from TFDW and MMRP-30. TFDW provided variables that covered training, education, demographics, and experience. These variables are a snapshot in time and reflect what the board members saw when voting on potential commanders. MMRP-30 is responsible for the processing and cataloging of all fitness report data created in the Marine Corps. They provided fitness report data which allowed me to create average cumulative relative Reporting Senior (RS) values for the rank of captain, major and LtCol commanders. This allowed me to give my models a performance variable that voting board members saw when assessing potential commanders. A notable limitation to this data is that it does not contain the data of Marines who self-selected out of the CSB through the process called “remove by request” (RBR). This process is a non-retribution way of eligible officers to remove themselves from consideration for command. There is currently limited data capturing the number of RBRs and reasons for self-removal.

2. Methodology

In this thesis, I conduct a quantitative analysis of the FY15 to FY19 CSB through the use of a multivariate regression analysis to attempt to explain the effect of MOS credibility (through attending a GEP) on selection on the CSB. The GEP career path is broken into four variables; captain and major PME (O-3 and O-4 level resident and foreign PME attendance) and captain and major Non-PME (resident GEPs, International Affairs Programs, Olmsted Scholar Program, training with industry and fellowships removing Marines from their primary MOS for an extended period of time). I then estimate probit models to predict CSB selection by controlling for various predictors (gender, deployments, fitness report performance, time in service, etc.). Then, I construct an odds ratio to determine if there is a statistical difference in LtCol command selection based on a Marine attending a PME or non-PME GEP at certain ranks. Finally, I examine the performance of selected commanders and use a multivariate regression model to determine if GEP attendance does have a statistically relevant effect on fitness reports while in command.

The second method used in this thesis is a qualitative analysis that attempts to determine the ideal commander that the Marine Corps should be selecting to operate in the 21st century battlefield. This analysis is done through an examination of recent literature (books, academic journal articles, and military doctrine) regarding interdisciplinary thinking, industrial versus information learning, and wicked versus tame environments.

B. ECONOMETRIC MODELS

In this thesis, I use three multivariate regression models to better interpret if GEP attendance statistically affects CSB selection and if GEP attendance creates higher performing commanders. I do this through the use of probit and logit regressions and ordinary least squares (OLS). Both models demonstrate how selected variables for demographics, training, education, performance, and experience influence the outcome of LtCol command selection and their performance markings while in command. These models are expressed in more detail in Figures 4 and 6.

1. Probit and Logit Regression Models

Since my thesis focuses on the outcome of whether or not a Marine was selected for LtCol command, I decided to use a binary outcome model. The goal of a binary outcome model is to explain the effects of predictor variables on the response probability of the outcome variable. There are numerous models that can be used for binary outcome models: linear probability model (LPM), probit, and logistic. LPM has several drawbacks including "fitted probabilities [that] can be less than zero or greater than one and the partial effect of any explanatory variable (appearing in level form) is constant" (Wooldridge, 2013). We can alleviate these issues by utilizing a probit or logistic model. Wooldridge describes a probit model as "a model for binary response where the response probability is the standard normal cumulative distribution function (CDF) evaluated at a linear function of the explanatory variables" (Wooldridge, 2013).

For this thesis, I build both probit and logistic regression models that explore how demographics, training, education, performance, and experience relates to the probability of LtCol command selection. Figure 3 displays theoretical probit and logistic models, where *y* is the dependent variable (defined by 1 or 0, as selected for command). The coefficients on the independent variables are defined by β. In a probit model, G is defined as the standard normal CDF, which is represented by an integral where $\Phi(z)$ is assumed to be normally distributed. In a logistic model, *G* is the logistic function that is now represented between zero and one (symbolized by *z*). This value is the CDF for a normal logistic random variable.

Binary Response Model

$$P(y = 1|\boldsymbol{x}) = G(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k) = G(\beta_0 + \boldsymbol{x\beta})$$

Probit Model

$$G(z) = \Phi(z) \equiv \int_{-\infty}^{z} \phi(v)dv$$

Logistic Model

$$G(z) = \frac{\exp(z)}{[1 + \exp(z)]}$$

Figure 3. Probit and Logistic Models. Source: Wooldridge (2013).

One major drawback to utilizing a probit model is that the coefficients on the independent variables can only be used to determine marginal effects and not for quantifiable context. I utilized odds ratio to interpret the magnitude of the logit model coefficients on the dependent variable. Odds ratios center about the value of 1. If the odds ratio is above 1 then the response is more likely to occur for the given factor, relative to the baseline. If the odds ratio is less than one then the response is less likely to occur for the given factor. The following is the probit and logistic regression models I used in this thesis. I control for factors associated with demographics, training, education, performance, and experience to determine how these factors influence an officer's odds of being selected for LtCol command.

$$P(Selection) = G(\beta_0 + \beta_1(Demographics) + \beta_2(Training) + \beta_2(Education) + \beta_3(Performance) + \beta_4(Experience))$$

Figure 4. Thesis Probit and Logistic Model

2. Ordinary Least Squares (OLS) Model

Wooldridge states that OLS models are "a method for estimating the parameters of a multiple linear regression model. The ordinary least squares estimates are obtained by minimizing the sum of the squared residuals" (Wooldridge, 2013).

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + u$$

Figure 5. OLS Model. Source: Wooldridge (2013)

In this thesis, I use an OLS model to estimate the relationship between GEP attendance and a primary selected LtCol's performance while in a command billet.

$$LtCol\ Command\ Performance = \beta_0 + \beta_1(capt\_PME) + \beta_2(capt\_non\_PME) + \beta_3(maj\_PME) + \beta_4(maj\_non\_PME) + \beta_5(Control\ Variables)$$

Figure 6. Thesis OLS Model

In my OLS model, I am concerned with the coefficient on Non-PME (β_2) because it represents the relationship between a commander's attendance of a non-PME course and how that officer performed while in a command role. If there is a statistically significant relationship between the two variables, I expect a negative value on β_2 and β_4 because the assumption is that Marines with decreased MOS credibility make less effective commanders.

C. VARIABLE DESCRIPTION

1. Dependent Variables

There are two dependent variables that I am concerned with in this thesis: LtCol command selection and LtCol command performance. LtCol command selection is a binary variable and LtCol command performance is a continuous variable. Table 2 lists the two dependent variables utilized in this thesis, followed by a narrative of each dependent variable.

Table 2. List of Dependent Variables

Dependent Variables	
Selection Outcome	
Variable Name	**Variable Value**
CSB_selection	= 1 if Officer selected as Primary, = 0 Otherwise
LtCol Command Performance	
Variable Name	**Variable Value**
LTCOL_CMD_RS_RELVAL_CUM	Average FITREP RS Cumulative Value while in LtCol Command

LtCol Command Selection. This variable reflects whether an officer was selected for LtCol command or not. MMOA-3 compiled the data of which officers were selected as primary, alternate, or non-selection for LtCol command. Figure 7 visualizes the outcome of the CSB across FYs and highlights a consistent number of primary and alternate selections.

LtCol Command Performance. This is a continuous variable that represents the average Reporting Senior (RS) cumulative value of each selected commanding officer's FITREP while serving in LtCol command. I utilized FITREP data, obtained from MMRP-30, for all officers screened for command from FY15-FY19. By filtering billet description and unit description, I removed all FITREPs that did not identify as belonging to commanding officers. I then calculated the mean RS cumulative values to use as a command performance variable in this thesis.

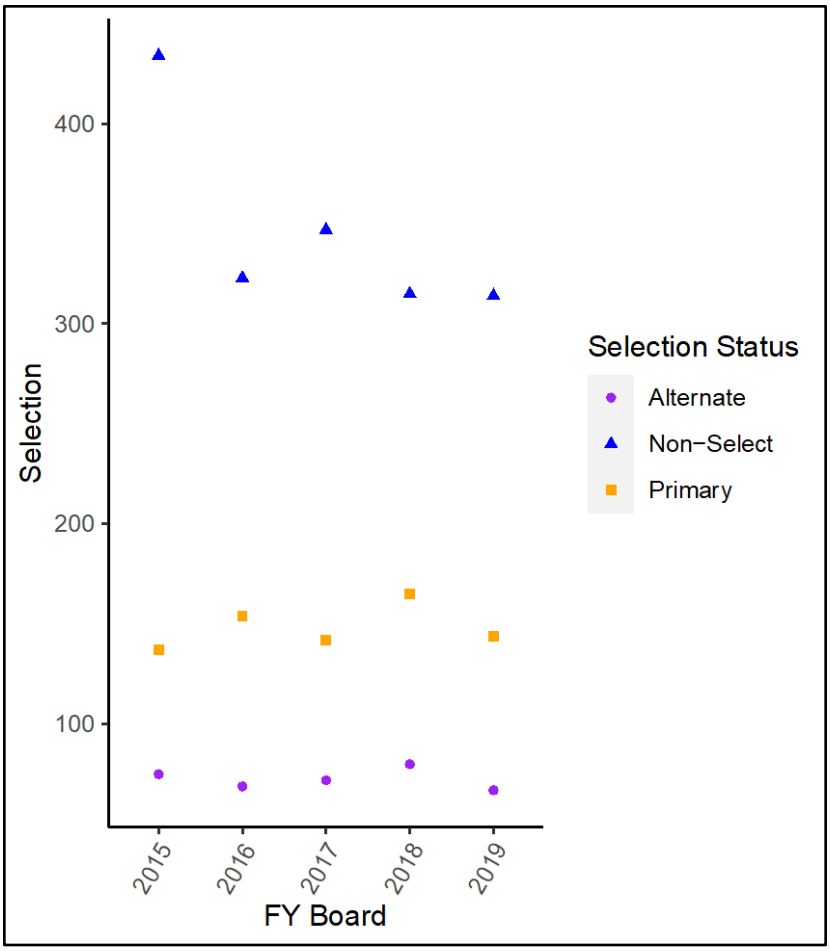

Figure 7. CSB Outcome by Selection Status (FY15-FY19)

2. Independent Variables

There are numerous independent variables that I am concerned with in this thesis that cover the subjects of demographics, training, education, performance, and experience. These variables are a mixture of binary and continuous. Table 3 lists the independent variables utilized in this thesis, followed by a narrative of each independent variable.

Table 3. List of Independent Variables

Independent Variables	
Fiscal Year Board	
Variable Name	**Variable Value**
FY15	= 1 if board took place in FY2015, = 0 if otherwise
FY16	= 1 if board took place in FY2016, = 0 if otherwise
FY17	= 1 if board took place in FY2017, = 0 if otherwise
FY18	= 1 if board took place in FY2018, = 0 if otherwise
FY19	= 1 if board took place in FY2019, = 0 if otherwise
Demographics	
Variable Name	**Variable Value**
Major	= 1 if eligible officer is a major, = 0 if LtCol
Female	= 1 if eligible officer is female, = 0 if male
White	= 1 if eligible officer is white, = 0 if non-white
Primary MOS	
Variable Name	**Variable Value**
Combat Service Support	= 1 if eligible officer has CSS PMOS, = 0 if otherwise
Aviation	= 1 if eligible officer has aviation PMOS, = 0 if otherwise
Combat Arms	= 1 if eligible officer is combat arms PMOS, = 0 if otherwise
Experience	
Variable Name	**Variable Value**
Time in Service (years)	Eligible officer's time in service
Combat Deployments	Eligible officer's number of combat deployments
Non-Combat Deployments	Eligible officer's number of non-combat deployments
Training	
Variable Name	**Variable Value**
PFT 1st Class	= 1 if eligible officer has 1st Class PFT, = 0 if otherwise
CFT 1st Class	= 1 if eligible officer has 1st Class CFT, = 0 if otherwise
Rifle Expert	= 1 if eligible officer has rifle expert, = 0 if otherwise
Pistol Expert	= 1 if eligible officer has pistol expert, = 0 if otherwise
Education	
Variable Name	**Variable Value**
Captain PME	= 1 if eligible officer attended PME course as a Captain, = 0 if otherwise
Captain non-PME	= 1 if eligible officer attended non-PME course as a Captain, = 0 if otherwise

Independent Variables	
Major PME	= 1 if eligible officer attended PME course as a Major, = 0 if otherwise
Major non-PME	= 1 if eligible officer attended non-PME course as a Major, = 0 if otherwise
Performance	
Variable Name	**Variable Value**
Captain RS Cum RelVal	Eligible officer's Average FITREP RS Cumulative Value as a Captain
Captain RS Cum RelVal	Eligible officer's Average FITREP RS Cumulative Value as a Major

Demographics. These variables were created using the data from TFDW. I created variables for gender (female), race (white), and rank (major) representative of the time they were screened on the CSB.

Training. These variables were created using the data from TFDW. I created variables for, 1st Class Physical Fitness Test (PFT) and Combat Fitness Test (CFT), and expert rifle and pistol scores representative of the time they were screened on the CSB.

Education. These variables were created using the data from TFDW and MMRP-30. I created variables for non-PME (at both captain and major ranks), if they attended a resident GEP course (NPS or AFIT), international affairs program, Olmsted Scholar Program, fellowships, or training with industry, verified with additional military occupational specialties (AMOS) and academic FITREP data. I also created variables (at both captain and major rank) for PME, if they attended a resident or foreign PME courses (CSC, Naval War College, international CSCs, etc.) verified with AMOS and academic FITREP data (Headquarters Marine Corps, 2019b). Figure 8 visualizes the trends of primary CSB selection across FYs and broken down by GEP attendance. It is interesting to note the consistent low selection rates for Non-PME attendees and the fluctuation of PME attendance.

Performance. These variables were created using the FITREP data from MMRP-30. I calculated the mean RS cumulative values for every officer at the ranks of Captain and Major. I chose to only evaluate FITREP data at these ranks because they are most

influential when assessing recent command potential and did not include LtCol FITREPs because a majority of the officers being screened have not received LtCol FITREP (due to being recently selected for LtCol, but not yet promoted to that rank).

Experience. These variables were created using the data from TFDW. I created variables for years of service, non-combat deployments, and combat deployments representative of the time they were screened on the CSB.

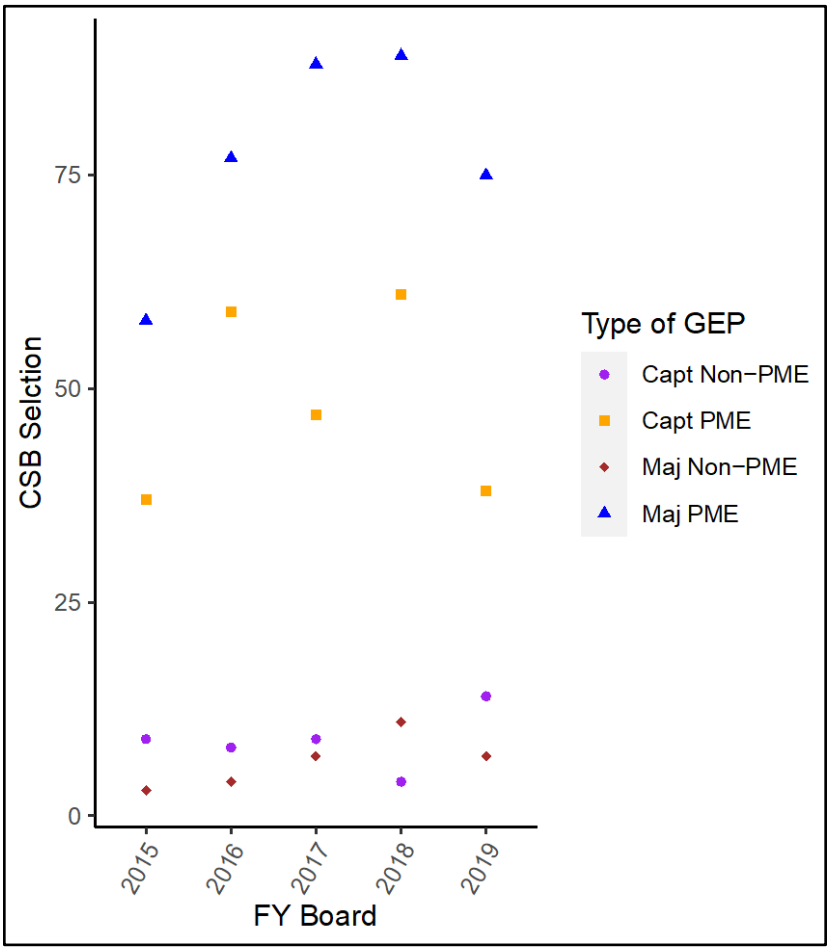

Figure 8. Trend in CSB Selection by GEP (FY15-FY19)

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IV. ANALYSIS AND FINDINGS

A. EFFECT OF PME VS. NON-PME

1. Deriving the Models

In this thesis, I aim to reproduce the data used by the CSB members in making their selections. To do this, I included data representing demographics, training, education, performance, and experience. Performance variables were created using FITREP data, which is a continually debated issue. Some believe that RS values are more accurate of a Marine's performance because they represent the direct supervisor's assessment of the Marine reported on (MRO). The reviewing officer (RO) is the supervisor of the RS and thus has less direct contact and observation of the MRO.

I chose the cumulative score (relative values [RV]) because it reflects how a Marine's FITREP score holds up over time (how much it increases or decreases as the RS evaluates more Marines at the same rank). I use relative values because it more readily provides an apple-to-apples comparison across MROs, whereas RO markings lack this normalization. Additionally, RO evaluations are calculated differently than RS evaluations. RO evaluations reflect how far a Marine is above or below the RO's average score which makes it less sensitive to variability than RS scores (Stolzenberg, 2017). Additionally, the PES manual states that "the only purpose of relative value, by design, is to give individuals making personnel management decisions the ability to weigh the merit of a single fitness report in relations to the RS's rating history or 'profile'" (Headquarters Marine Corps, 2018). Regarding the RO relative values, the PES manual does not emphasize the values like it does for RS values, possibly because RO values are less subjective.

Finally, in Tarsiuk (2019), she utilized the statistical software package JMP in Stata to analyze the selection outcomes using the RS and RO FITREP data. She reported that "there is no difference in the outcomes in using RS cumulative or RO cumulative values" (Tarsiuk, 2019). When observing the FITREP profile shapes she also noticed that no difference was seen, indicating that most of the officers screened on the CSB were already

high performers. From this historical analysis I chose to utilize RS cumulative values for captain and major in my analysis as performance variables.

2. The Quantitative Analysis

(1) Does the Selection for Command outcome differ, if at all, for Marines who participate in PME and non-PME GEPs?

Table 4 displays the marginal effects of the independent variables chosen for this model against the binary dependent variable of selection for LtCol command. I chose to run a probit model (using marginal effects) because the goodness of fit tests for both the probit and logit models and probit were very similar (81.18% vs. 81.32%). It is very interesting to note that *Major PME* remain statistically significant (at the 0.01 level) even with the addition of other variables. From Table 4 we see the coefficient on *Maj PME* (.054) is interpreted as attending a resident PME school (at the O-4 level) increases the probability of CSB selection by 5.4ppts. Conversely, *Maj Non-PME* is also significant (at the 0.001 level) with all variables, but the coefficient is -0.141. This is interpreted as attending a non-PME school (at the O-4 level) decreases the probability of CSB selection by 14.1ppts. This is in line with my hypothesis that attending a non-PME course decreases MOS credibility and negatively affects command selection potential. It is interesting to note that neither the *Captain PME* or *Captain Non-PME* variables are statistically significant. An explanation for could be that these Marines are young enough in their career that their MOS credibility has not been solidified and attendance of these courses do not affect their chances of command selection.

An important variable that is not only statistically significant (at the 0.001 level), but that also has the greatest marginal effects is *Major*. This variable has a coefficient of 0.081 which can be interpreted as holding the rank of major while being screened for command increases the probability of CSB selection by 8.1ppts. This is consistent with previous research that shows a positive effect (using odds ratio) of major on command selection (Tarsiuk, 2019). An explanation for this affect could be that board members view newly selected LtCols as the next generation of commanders and therefore, place a higher premium on Marines holding this rank during board selection. If we combine this

observation of *Major* significance with the observation that *Major PME* and *Major Non-PME* have opposing effects, we can make the conclusion that board member possibly view *Major Non-PME* in a negative light because it is an indicator that these Marines have been recently billeted outside their PMOS. They could also assume that they may not have the most current knowledge of their PMOS and need to be screened on later boards. For *Major PME*, board members might view these Marines as having the most recent knowledge on tactics and doctrine, but also having recently operating within their PMOS. They might assume that this training makes them more qualified to lead at the LtCol level.

A surprise in the variables was the significance and coefficients on the performance variables for *Captain RS Relative Value Cumulative* and *Major RS Relative Value Cumulative*. I hypothesized that these variables would have negligible marginal effects and not be statistically significant because all Marines screened on the CSB board have already been selected on the LtCol promotion board and therefore lower performing Marines would have been already selected out of the sample. Both *RS Relative Value Cumulative (Captain)* and *RS Relative Value Cumulative (Major)* turned out to be significant (at the 0.001 level) and have coefficient sizes similar to *Major PME* (4.2ppts and 4.9ppts, respectively). These coefficients are not as large as their effect in LtCol promotion boards (Stolzenberg, 2017), but they do highlight that the CSB is so competitive that slight variations in FITREP performance can affect selection.

Table 4. Factors as Indicators of LtCol Command Selection (Marginal Effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Selected for Command	**Selected for Command**	**Selected for Command**	**Selected for Command**	**Selected for Command**	**Selected for Command**	**Selected for Command**
Captain PME	-0.011	-0.009	0.008	0.010	0.012	0.014	0.036
	(0.018)	(0.018)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Captain Non-PME	-0.041	-0.028	-0.003	0.008	0.010	0.012	-0.042
	(0.031)	(0.032)	(0.034)	(0.035)	(0.035)	(0.035)	(0.030)
Major PME	0.156***	0.153***	0.155***	0.126***	0.120***	0.121***	0.054**
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Major Non-PME	-0.064*	-0.061	-0.058	-0.070*	-0.077*	-0.078*	-0.141***
	(0.031)	(0.032)	(0.032)	(0.031)	(0.030)	(0.030)	(0.020)
Non-Combat Deployments		0.034***	0.030**	0.023*	0.026**	0.026*	0.030**
		(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Combat Deployments		0.007	0.007	0.008	0.009*	0.009*	0.014***
		(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Selected for Command	**Selected for Command**	**Selected for Command**	**Selected for Command**	**Selected for Command**	**Selected for Command**	**Selected for Command**
Female		-0.012 (0.039)	0.019 (0.042)	-0.002 (0.041)	0.020 (0.043)	0.030 (0.044)	0.052 (0.047)
White		0.082*** (0.020)	0.069*** (0.021)	0.055** (0.021)	0.057** (0.021)	0.052** (0.021)	0.019 (0.022)
Combat Service MOS			-0.061** (0.022)	-0.054** (0.022)	-0.057** (0.022)	-0.051* (0.022)	-0.041 (0.021)
Aviation MOS			0.046 (0.024)	0.029 (0.024)	0.022 (0.024)	0.025 (0.024)	0.079** (0.025)
Years of Service				-0.005* (0.003)	-0.005 (0.003)	-0.005* (0.003)	0.002 (0.003)
Major				0.198*** (0.018)	0.194*** (0.018)	0.190*** (0.018)	0.081*** (0.018)
PFT 1st Class					0.113*** (0.023)	0.113*** (0.023)	0.099*** (0.023)
CFT 1st Class					0.087*** (0.024)	0.088*** (0.024)	0.077** (0.024)
Pistol Expert						0.042* (0.018)	0.026 (0.017)
Rifle Expert						0.024 (0.020)	0.019 (0.020)
RS Relative Value Cumulative (Captain)							0.042*** (0.003)
RS Relative Value Cumulative (Major)							0.049*** (0.003)
Observations	2838	2838	2838	2838	2838	2838	2838

Marginal effects; Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Now that significant variables have been identified it is important to understand if these variables are still significant across different FY boards. This is important because each board is comprised of different members and the precept (instructions for the board) changes every year. I want to see if there could be a bias amongst these five boards in favor of PME or non-PME. Again, I ran a probit model (using marginal effects), but this time I created variables for each of the five boards (FY15, FY16, etc.). These models allowed me to view the marginal effects of the variables across different boards.

I noticed that only three variables remained statistically significant (at least 0.05 level) across all boards. The other variables were only significant during a few boards and their coefficients during those boards were extremely different from the other boards. This indicates to me that there is a disparity amongst the boards concerning important traits. I

looked through the precepts and out briefs from these five boards and there was no indication of any change in policy or instructions that would cause this fluctuation in variable significance. The only assumption I can make is there is personal bias within the board members on the importance of these variables.

What this model shows is attending a non-PME school at the O-4 level is highly significant and decreases the chances of CSB selection regardless of the FY. We can also interpret that performance (interpreted from FITREP values) is also a significant influence of LtCol command selection and highly regarded by board members. As the Marine Corps has begun to implement the CCLEB and CPIB, I hypothesized that non-PME would begin to show fewer negative effects, but as shown in Table 5, *Major Non-PME* is consistent and negative. It is interesting to note that *Captain Non-PME* was positive in two FY boards, but this could be because the board does not view *Captain Non-PM*E as detrimental to MOS credibility as they do at the O-4 level.

Table 5. Marginal Effects Across Fiscal Years

	(1)	(2)	(3)	(4)	(5)
	FY15	**FY16**	**FY17**	**FY18**	**FY19**
Selected for Command					
Captain PME	-0.058 (0.031)	0.047 (0.045)	0.054 (0.047)	0.121** (0.053)	0.060 (0.050)
Captain Non-PME	-0.082** (0.035)	-0.109 (0.062)	0.019 (0.074)	-0.110 (0.067)	0.035 (0.077)
Major PME	0.059 (0.033)	0.087* (0.043)	0.089* (0.040)	0.033 (0.044)	-0.012 (0.041)
Major Non-PME	-0.112*** (0.026)	-0.176*** (0.048)	-0.107* (0.045)	-0.155*** (0.044)	-0.169*** (0.039)
Non-Combat Deployments	0.018 (0.019)	0.001 (0.025)	0.032 (0.022)	0.043 (0.023)	0.072** (0.023)
Combat Deployments	0.015* (0.007)	0.012 (0.010)	-0.006 (0.010)	0.033** (0.012)	0.013 (0.013)
Female	0.170 (0.118)	0.081 (0.149)	-0.009 (0.100)	0.160 (0.118)	0.036 (0.094)
White	-0.089 (0.052)	-0.121 (0.068)	0.099* (0.041)	0.073 (0.047)	0.084 (0.045)
Combat Service MOS	-0.030 (0.038)	-0.023 (0.050)	-0.074 (0.047)	-0.066 (0.053)	0.020 (0.055)
Aviation MOS	0.089 (0.047)	0.146* (0.061)	0.049 (0.054)	0.034 (0.060)	0.116 (0.060)
Years of Service	-0.004 (0.005)	-0.001 (0.006)	0.003 (0.006)	-0.008 (0.006)	0.004 (0.006)
Major	0.088** (0.033)	0.085* (0.044)	0.070 (0.042)	0.076 (0.045)	0.079 (0.044)

	(1)	(2)	(3)	(4)	(5)
	FY15	**FY16**	**FY17**	**FY18**	**FY19**
Selected for Command					
PFT 1st Class	0.020 (0.047)	0.065 (0.074)	0.112* (0.045)	0.128** (0.048)	0.134** (0.049)
CFT 1st Class	0.061* (0.035)	0.146** (0.049)	0.085 (0.056)	-0.072 (0.081)	0.143** (0.044)
Pistol Expert	0.005 (0.030)	0.005 (0.042)	0.053 (0.037)	0.059 (0.042)	0.046 (0.041)
Rifle Expert	0.037 (0.032)	-0.017 (0.049)	-0.034 (0.050)	0.044 (0.047)	0.084 (0.043)
RS Relative Value Cumulative (Captain)	0.040*** (0.006)	0.049*** (0.008)	0.044*** (0.008)	0.040*** (0.009)	0.041*** (0.008)
RS Relative Value Cumulative (Major)	0.036*** (0.006)	0.053*** (0.008)	0.049*** (0.008)	0.070*** (0.009)	0.053*** (0.008)
Observations	646	546	561	560	525

Marginal effects; Standard errors in parentheses
(d) for discrete change of dummy variable from 0 to 1
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Next, I ran a logistic regression model (utilizing the same dependent and independent variables) so that I conduct an odds ratio analysis for command selection. I did this so that I can identify is MOS credibility (PME) has an advantage over non-PME. In Table 6, I found that a Marine who graduated from a resident O-4 level PME school is 1.387 times more likely to be selected on the CSB compared to a Marine who did not graduate/attend that type of school (this was significant at the 0.01 level). Additionally, attending a resident non-PME school as a major, lowers the odds of CSB selection by 0.318 to 1 (or 32 to 100). This is consistent with the data collected in Tables 1 and 3 regarding the marginal effects of these variables on CSB selection. The odds ratio for these variables on the rank of captain are not as significant, but do follow the trend (Figure 9) of the variables for major (attending a resident PME school increase chance of selection, while attending non-PME schools decreases chance of selection).

Numerous other variables were statistically significant in effecting the odds of being selected, but again the variable, *Major*, was not only significant at the 0.001 level, but also has an odds ratio of 1.643. Additionally, the variables for *RS Relative Value Cumulative (Captain)* and *RS Relative Value Cumulative (Major)* continued to be significant (at the 0.001 level) and have odds ratios of 1.299 and 1.358, respectively. This

is consistent with the data collected in Tables 4 and 5 regarding the marginal effects of these variables on CSB selection.

Table 6. Odds Ratio of LtCol CSB Selection (FY2015-2019)

	(1)
	Selected for Command
Captain PME	1.256 (0.151)
Captain Non-PME	0.749 (0.160)
Major PME	1.387** (0.147)
Major Non-PME	0.318*** (0.074)
Non-Combat Deployments	1.206** (0.074)
Combat Deployments	1.091** (0.029)
Female	1.441 (0.367)
White	1.194 (0.177)
Combat Service MOS	0.772 (0.104)
Aviation MOS	1.568** (0.224)
Years of Service	0.991 (0.016)
Major	1.643*** (0.179)
PFT 1st Class	2.107*** (0.438)
CFT 1st Class	1.719** (0.330)
Pistol Expert	1.231 (0.139)
Rifle Expert	1.136 (0.146)
RS Relative Value Cumulative (Captain)	1.299*** (0.028)
RS Relative Value Cumulative (Major)	1.358*** (0.030)
Observations	2838

Exponentiated coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

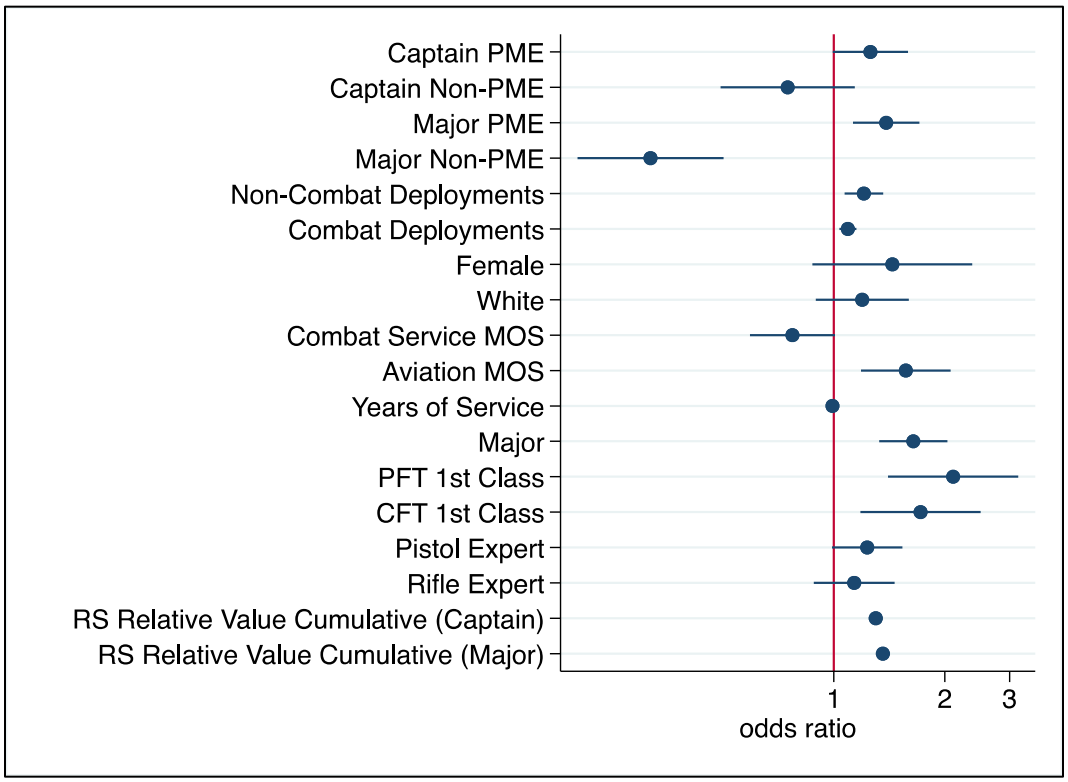

Figure 9. Odds Ratio Visual of LtCol Command Selection

(2) Does LtCol Command Performance differ, if at all, for Marines who participate in PME and non-PME GEPs?

In order to determine if there is a correlation between GEP attendance (time and type) and performance while in command, I build a standard OLS model. For this model I used the same independent variable from previous probit and logistic models, but the dependent variable is now *LtCol Command Performance* (measured by a Marine's average FITREP RS cumulative value while in LtCol command).

Table 7 displays the output from the regression of these variables on command performance. What is fascinating about these outputs is that there are only two variables that are significant. *RS Relative Value Cumulative (Major)* is statistically significant (at the 0.001 level), which is consistent with previous research that indicated that performance in the grade of major positively affects LtCol command performance (Tarsiuk, 2019). *Combat Service MOS* is statistically significant (at the 0.05 level) and my hypothesis for this variable being a significant contributor to command performance is the breadth of the

billets available to Marines with this MOS. Marines with a combat service MOS are typically able to move throughout the MAGTF and gain experience not available for combat arms and aviation MOS (which are more specialized and have a stricter career path). The lack of any other independent variable being statistically significant indicates that attending a PME or non-PME course (regardless of timing in a Marines' career) does not affect their performance while in LtCol command.

This observation, does go against my hypothesis that non-PME courses develop more effective (and therefore higher performing) leaders, but I believe this can be explained by timing. The data for these commanders includes the withdraw from Iraq and Afghanistan and action in Syria. What these commanders have not had to face is the next battlefield 21st commanders will have to fight on. Instead, these commanders were evaluated on their performance of supply detachments of Marines or operating in a familiar counter-insurgency environment.

Table 7. Relationship Between LtCol Command Performance and GEP Attendance (FY15-FY19)

	(1)
	LtCol Command Performance
Captain PME	1.145 (0.563)
Captain Non-PME	0.199 (0.189)
Major PME	1.554 (0.691)
Major Non-PME	0.595 (0.739)
Non-Combat Deployments	0.917 (0.244)
Combat Deployments	0.946 (0.099)
Female	0.192 (0.222)
White	1.479 (0.998)
Combat Service MOS	3.121* (1.757)
Aviation MOS	1.762 (1.033)

	(1)
	LtCol Command Performance
Years of Service	0.991 (0.069)
Major	2.008 (0.988)
PFT 1st Class	1.055 (1.098)
CFT 1st Class	1.495 (1.375)
Pistol Expert	2.239 (1.050)
Rifle Expert	1.564 (0.821)
RS Relative Value Cumulative (Captain)	1.131 (0.102)
RS Relative Value Cumulative (Major)	1.427*** (0.136)
Observations	413
R^2	0.106

Exponentiated coefficients; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

B. GENERALIST VS. SPECIALISTS

> The Marine Corps has always prided itself on producing innovative and adaptable thinkers, planners, and warfighters. This does not occur automatically or by chance, however. Rather, it results from regular re-evaluation and reform of training and education institutions, personnel, and curricula to ensure they remain at the cutting edge of military thought and learning technique.
>
> —Senate Armed Service Committee (2020)

Since assuming his role as Commandant, General Berger has stressed the issue of operational readiness and developing a Marine Corps that will be relevant and lethal in future wars. In his testimony before the Senate Armed Services Committee, Subcommittee on Readiness and Management Support on Marine Corps Readiness, General Berger goes on to recommend that an "expansion of active adult learning techniques and the provision of as many opportunities as possible for students to make tactical and operational decisions in environments that realistically approximate those, they may face in today's rapidly

changing world" (Senate Armed Services Committee, 2020) are essential re-informing and re-invigorating learning throughout the Marine Corps.

In this Chapter I conduct a qualitative analysis of two types of leaders, specialists and generalists. I analyze these leaders through their ability to learn, operate through various environments, and their leadership effects (Table 8). I then synthesize these observations to better recommend the type of leader that will be best suited for command in 21st century warfare.

Table 8. Specialist vs. Generalist Commander Characteristics[9]

Specialist	Generalist
Training (what to think)	Education (how to think)
Block Learning (repetition)	Interleaved Learning (connections)
Current PME (industrial)	Future PME[10] (informational)
Tame Environments (multiple answers)	Wicked Environments (no "right" answer)
Zero-Defect (stagnant)	Free Play (innovation)
Analyze (destruction[11])	Synthesize (creation)
Echo Chambers (groupthink)	Respectful Dissent (devil's advocate)
Depth (hedgehog)	Breadth (fox)
MOS Credibility (be somebody[12])	Interdisciplinary Thinker (do something)

[9] This table was developed through the synthesis of various research and articles regarding MW, leadership, strategic thinking, thinking critically, and education reform. Each comparison is explored in the context of leadership potential and 21st century warfare.

[10] The 38th CPG specifically highlights that "we must change the Training and Education Continuum from an industrial age model, to an information age model" and "we have to enable them to think critically, recognize when change is needed and inculcate a bias for action without waiting to be told what to do" (Office of the Commandant of the Marine Corps, 2019).

[11] *Destruction and Creation* is a 1976 unpublished paper by Colonel John Boyd (USAF, Ret.) that details his framework for braking systems in pieces so that they can be reassembled across numerous domains to generate flexibility and openness in a wicked world.

[12] "To be somebody or do something" is a quote from Colonel John Boyd (USAF, Ret.) that is meant to highlight the systemic careerism that perpetuates in the military. He visualizes a career as two paths, one leading to sacrificing self-values to obtain great assignments and promotions (being somebody) and the other staying true to yourself, but accepting tough assignments and making an impact for the good of the organization (doing something).

My attempt is not to negate the impact of specialist training within the Marine Corps. Specialists are necessary for organizational efficiency and operating within tame environments. Instead, I argue that our Industrial Age learning model, which is currently utilized in our PME courses, negatively influences our current ideal of selecting leaders which is oppressing our ability to innovate and operate successfully in uncertain environments. Additionally, this model is promoting the development of hedgehogs who silo their knowledge instead of breeding foxes who seek out multiple perspectives when problem-solving. These characteristics are not only inefficient for restoring common sense, but develop leaders who stifle any respectful dissent or organizational innovation, leading to the current zero defect and stagnant culture of learning within the Marine Corps (Table 8). Additionally, this Industrial Age model promotes the development leaders who focus on deductive reasoning (destruction/analysis), which tends to over simply problems and make assumptions based on generalizations. This leads to inflexible decisions that are incompatible with a wicked world. In its place, we should be promoting inductive reasoning (creation/synthesis), which starts with observations and works backwards toward developing a generalization. Synthesis allows for a more flexible type of thinking because you start with very specific data and make generalizations that are adaptable to a fluid (wicked) environment (Table 8). Finally, we should be developing "soft skills[13] that nurture familiarity and trust [that] are central to the philosophy of command on which maneuver warfare is based" (Augier et al., 2019).

1. Learning

> The complexity of the modern battlefield and increasing rate of change requires a highly educated force. While different, education and training are inextricably linked. Education denotes study and intellectual development. Training is primarily learning-by-doing. We will not train without the presence of education; we must not educate without the complementary

[13] Soft skills include "communication, teamwork, and interpersonal skills, critical thinking, and problem-solving capability in complex, multidisciplinary situations. These skills are highly generalizable, leaders rely on them more heavily than their technical skills, they are more important to an individual's success, and employers place the greatest value on them when making hiring decisions" (Augier et al., 2019).

> execution of well-conceived training. (Office of the Commandant of the Marine Corps, 2019)

General Berger hits on the main issue of this chapter, which is that future leaders will be more decentralized and dispersed than ever before. To create decision-makers who will be able to not only survive but thrive in these environments, we need to focus on educating them to be more flexible thinkers. I agree that training is more focused on "what to think," emphasizing checklists, SOPs, and doctrine. Educations is associated with "how to think," which is a richer and more permanent form of learning.

However, our current PME courses are "firmly based in the 'lecture, memorize facts, regurgitate facts on command' model of Industrial Age training and education" (Office of the Commandant of the Marine Corps, 2019). This current model emphasizes block learning which is the process of learning through repetition to reinforce knowledge. While this type of learning has its place in the Marine Corps, especially boot camp and initial training, it is ill-suited for creating innovative and flexible thinkers. Instead, TECOM should be structuring PME courses with interleaved learning, which is understanding information through various conditions (Table 8). This method is also known as "learning, fast and slow" because it directs students to pair issues with a possible solution, which strengthens one's problem-solving abilities by enabling the use of multiple perspectives. This is not a foreign concept to the Marine Corps, the recently released MCDP 7 *Learning* effectively argues against overreliance on technology and promotes utilizing multiple outlooks. When discussing the role of learning in warfighting, it highlights that "Marines use skills such as critical thinking, reasoning, viewing situations from multiple perspectives, and visualizing the battlespace in nonlinear terms to determine the best course of action" (Department of the Navy, 2020b). This parallels the concept of self-reflection and how approaching a problem from multiple viewpoints is essential to fighting biases and the blind outsourcing to experts; a skill that quickly atrophies when not regularly exercised.

The interaction between training and education is a constant feedback loop that drives innovation and success (Figure 10). Training is an essential building block for which we begin to develop leaders. From this foundation, a skillset of knowledge is developed.

Then a more expansive education element can be developed where environments are adjusted and interdisciplinary thinking can be nurtured. Mortimer Adler[14] describes this as the difference between learning by instruction and learning by discovery. He states that "to be informed is to know simply that something is the case. To be enlightened is to know, in addition, what it is all about: why it is the case, what its connections are with other facts, in what respects it is the same, in what respects it is different, and so forth" (Adler & Van Doren, 1972). This informational education drives a deeper understanding which in turn can be leveraged to update and streamline training. This constant orientation and evaluation of the interactions between training and education are not only necessary to develop generalist thinkers of the future, but also to ensure that primary training is relevant and efficient.

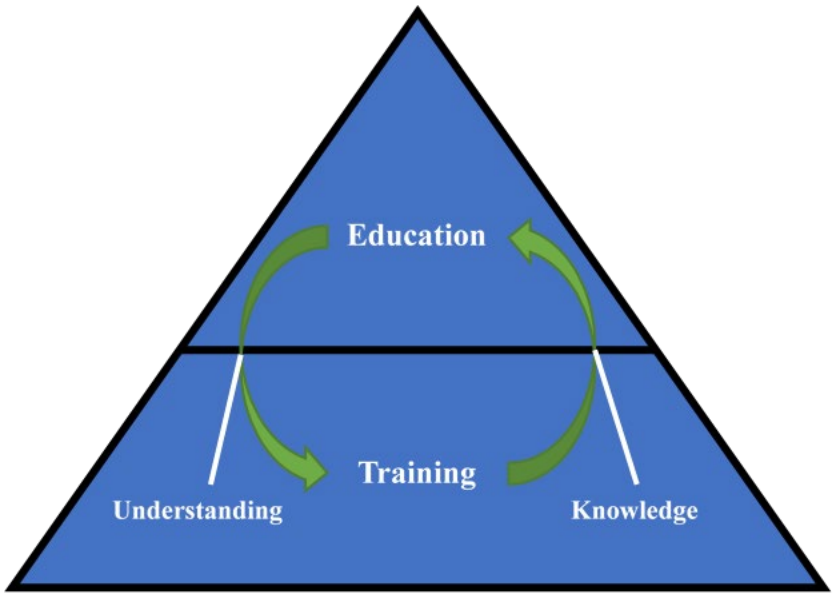

Figure 10. Feedback Loop of Training and Education

[14] Mortimer Adler was a philosopher and educator whose research focused on the methods and techniques used to educate and learn. He is widely known for his works: *How to Read a Book*, *Reforming Education*, and *Invitation to the Pain of Learning* (claiming that learning is a painful, but necessary process).

The main issue with modeling our current PME courses in an industrial model is that we are knowingly producing specialists (Figure 11). By projecting "solutions" to problems and promoting doctrine as the model in which every issue should be addressed, we are stifling innovation and narrowing the perspectives of future leaders. By creating specialists, we are also instilling overconfidence which will eventually backfire when they are "fooled by experience" (Epstein, 2019). This concept refers to specialists and their tendencies to view the world through their domain (or system) and fail to observe problems from other perspectives. This causes specialists to bury deeper and deeper into their system when trying to force a solution to a problem that may not be possible to solve within that one system. The opposite is an interdisciplinary thinker who knows many little things and is constantly collecting perspectives to add to their intellectual range. These integrators also personify objectiveness though self-awareness that their positions as theories that require further exploration (they encourage others to help them challenge their perceptions). They also have a high level of personal curiosity because they chose to investigate new perspectives, regardless of their own self predispositions. In ill-defined domains that are full of uncertainty, experience alone is incapable of improving performance. Successful behaviors of relearning are more essential, and they can be developed by dissecting views in search of lessons to update their beliefs (i.e., learning).

John Boyd[15] addresses the issue of specialists in his unpublished paper, "Destruction and Creation." Boyd argues that "to comprehend and cope with our environment we develop mental patterns or concepts of meaning" (Boyd, 1976). To be able to survive in a disparate world we need to be able to increase our ability to innovate by continually destroying these patterns to create new ones that fit the environment (Figure 8). To do this Boyd first demonstrates from Gödel's 1931 Proof, that we cannot demonstrate the consistency of a system within itself. This means that we have to go outside a system to prove that a domain is consistent. Next, through Heisenberg's 1927

[15] Colonel John Boyd (USAF, Ret.) was a fighter pilot and military strategist. He is known for his "OODA Loop" (continually adjusting perspectives to out-cycle the enemy) and aiding the Marine Corps in adopting MW. He is less known for his discussions regarding the "Conceptual Spiral" and "Destruction and Creation." These later works highlight Boyd's desire to provide a rational framework for his ideas on combat and conflict.

Indeterminacy Principle, that you cannot simultaneously determine the location and velocity of a particle, he denotes that as you become more and more specialize in an area, the uncertainty in your ability to think increases exponentially. Finally, he references the second law of thermodynamics, all observed natural process generate entropy, to support that the world is ill-defined because confusion and disorder (entropy) are continually being generated; if it was not there would be no innovation because we would all be satisfied with the status quo. Therefore, if we try and solve ill-defined problems within the system, we will continually generate mass entropy (uncertainty) and become ever more confused and disorientated. Boyd concludes that "when acting within a rigid or essentially a closed system, the goal-seeking effort of individuals and societies to improve their capacity for independent action tends to produce disorder towards randomness and death" (Boyd, 1976).

Former Marine Corps University (MCU) President, LtGen. Paul Van Riper (USMC, Ret.), outlined his thoughts on the education of strategic thinkers in various environment in his 2013 contribution to the U.S. Army Research Institute's research project entitled *Exploring Strategic Thinking: Insights to Assess, Develop, and Retain Army Strategic Thinkers.* LtGen. Van Riper summarizes the differences in three separate approaches to decision making: System 1 (analytic), System 2 (intuitive), and System 3 (systemic) (Augier & Barrett, 2019b). System 1 is merely an involuntary reaction to a situation. This can be caused by extensive training to SOPs or immediate obedience to orders. System 2 requires metal agility, but relies mostly on pattern recognition. Both Systems 1 and 2 are successful characteristics of specialist in tame environments where problems are linear and patterns are easily recognizable, but fall short when operating in wicked environments; as Herbert Simon said, "intuition is nothing more and nothing less than recognition" (Van Riper, 2013). System 3 is what LtGen. Riper personally designed to operate and make decisions in a wicked environment. He believes that "the essence of this more modern approach to operational design requires a group of people knowledgeable about some aspect of an area, enemy, issue and so forth to engage in a discourse as the attempt to give form to what appears unstructured" (Van Riper, 2013). While LtGen. Van Riper's definition of the System 3 approach is worded for an organization, its basis is

reminiscent of the idea of range and Boyd's Conceptual Spiral. LtGen. Van Riper, like Col. Boyd earlier, emphasizes the awareness that ill-structured or unstructured problems "are not subject to intuition or analytical procedures because the pattern is not obvious and because a rule-set does not exist for solving them" (Van Riper, 2013). What he is inferring is that when making decisions in a wicked world interdisciplinary thought must be applied to generate perspectives that capture the complexities of a non-linear system.

An alternate and effective philosophy to fight uncertainty and become a more effective decision-maker is to utilize Boyd's "Conceptual Spiral." The Conceptual Spiral is not a checklist, SOP, or doctrine. Like MW, it is a philosophy that facilitates relearning and does not become an antiquated step-by-step process. The conceptual spiral calls for the observation of mismatches, which is continually looking for a match between our orientation (thinking and doing) with the emerging novelty. Novelty is produced through analysis (breaking down/destruction) and then synthesis (connecting the dots). It is important to remember that orientation is not a state, but a process (it is also the key to Boyd's Observe, Orientate, Decide, Act [OODA] loop because it paints the way each person views the world; we are all different). The key philosophy that leaders must obtain to be able to utilize the conceptual spiral is to "exploit this whirling (conceptual) spiral of orientation, mismatches, analyses/synthesis, reorientation, mismatches, analysis/ synthesis…so that [they] can comprehend, cope with, and shape—as well as be shaped by—that world and the novelty that arises out of it" (Boyd, 1992). If we continually force Marines to be educated in an Industrial Age model, we are making it harder for them to relearn and expand their view, thus creating inflexibly and closed-minded leaders.

2. Environments

There are two main types of environments in which decision makers and organizations operate, kind and wicked. Psychologist Robin Hogarth explains kind environments as places where "patterns repeat over and over, and feedback is extremely accurate and usually very rapid" (Epstein, 2019). Problems here are confined to a single system and "similar challenges occur repeatedly" (Epstein, 2019). In wicked environments, "the rules of the game are often unclear or incomplete, there may or may not be repetitive

patterns and they may or may not be obvious, and feedback is often delayed, inaccurate, or both" (Epstein, 2019). It is these environments were, since rules are less defined, that experts or specialists have biases/assumptions that emphasize the exact wrong lessons (Figure 11).

As General Berger stated in his Planning Guidance, the future battlefield will be more wicked than ever before. With the focus on great power competition, space, and grey-zone conflict penetrating our daily activities, we are significantly vulnerable to information overload and paralysis-by-analysis. By specializing our way of learning and thinking, we have installed filters to help us focus, but at a significant cost. By filtering issues, we have essentially ignored other concerns and possibly missed critical opportunities. The essential drawback is that "the depth of our focus is blinding us from the breath of perspective." (Mansharamani, 2020).

Specialists typically fear the ill-structured environments of the future because they have a very narrow perspective in which to make decisions (Figure 11). Instead, we should be nurturing the generalist mindset of our future leaders which allows them to embrace the uncertainty. Utilizing an interdisciplinary mentality frees commanders to view the future as a collection of possibilities and does not tie them down to a prediction. Specialists tend to oversimplify the future and try to distill a finite prediction based on their experience. This overconfidence only pigeon holes specialist commanders into narrow courses of action and filters out possible better perspectives or opportunities.

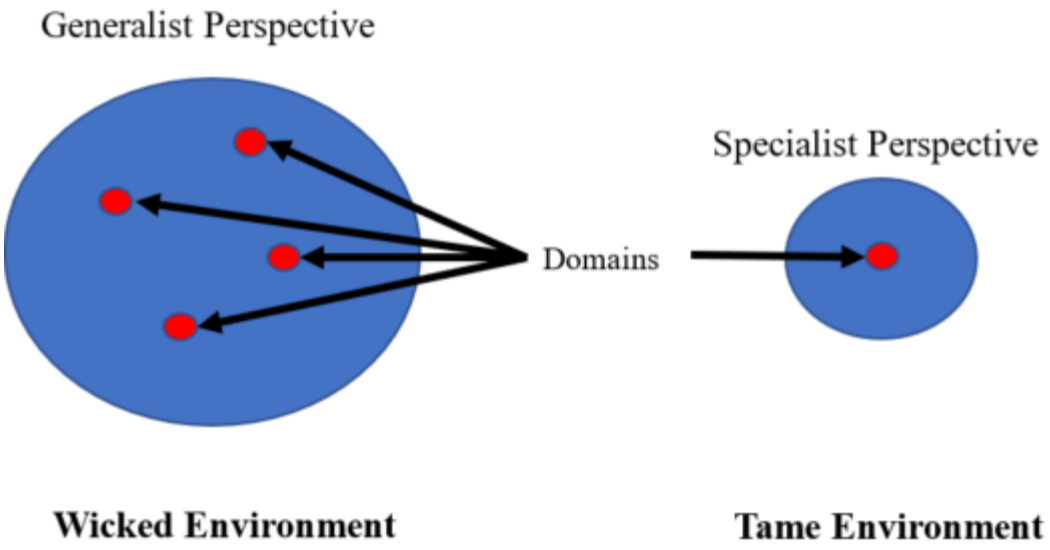

Figure 11. Generalist vs. Specialist in Environments

Another method in which we can categorize the environments that leaders operate within is through the Cynefin framework. The Cynefin framework distinguishes four different contexts (environments) in which leaders may operate: simple, complicated, complex, and chaotic. This framework was developed because, like John Boyd's "Destruction and Creation" observation, there is a failed assumption in neo-classical economic theory and associated textbooks that the world is predictable and orderly. The reality is that we operate in a world of disorder and "in the face of greater complexity, intuition, intellect, and charisma are no longer enough" (Snowden & Boone, 2007). A simple context is a stable and kind environment with a clear cause-and-effect where correct answers exist. This domain is safe for automation, rules, and SOPs. A complicated context typically contains several right answers, but it is more difficult to comprehend the intricacy. This context requires a specialist to aid in the identification and development of a solution (otherwise known as generating the dots). A complex context is a vague and wicked problem that is ill-defined. This is an environment where generalists are needed to connect the dots, not create them. A chaotic context is where searching for the right answers is impossible. The interconnections are ever-changing and any analysis is fruitless. In this context, the best response of the leader is immediate action to take control, then sense the situation, and finally respond.

This ability to define the environment in which we are functioning and select an approach is what Joseph Nye calls "contextual intelligence" (Nye, 2010). This method allows us to generate multiple perspectives and divide complex problems into several complicated ones that can be rationally managed. Also, as leaders, we must always be asking questions because "the important and difficult job is never to find the right answer. It is to find the right questions" (Drucker, 1955). In a world increasingly dominated by technology, we must always remember that algorithms and simulations are not immune to human error (they were programmed by humans). This idea is highlighted in General Berger's CPG when he states that "we will always focus on people over systems in the command and control process per FMFM1. Decisions are what the commander does; systems exist only to support the commander's needs" (Office of the Commandant of the Marine Corps, 2019).

3. Leadership and Decision Making

> Developing fundamental cognitive competencies such as problem framing, mental imaging, critical thinking, analysis, synthesis, reasoning, and problem-solving enables Marines to make effective decisions more quickly in time-constrained operational environments, when they often have incomplete, inaccurate, or even contradictory information. (Department of the Navy, 2020b)

This age of information overload had led to an increased need for thinking. Leaders are so inundated with data that they knowingly write blank checks to other specialists because they believe an "expert opinion" is what the Marine Corps desires. This is an understandable assumption since leaders are being promoted and selected for command based on MOS creditability (specialization) and they are trained to believe that there is an optimal solution to every problem. But in Vikram Mansharamani's book, *Think for Yourself: Restoring Common Sense in an Age of Experts and Artificial Intelligence*, he argues "experts and technologies are useful-indeed essential-but it is the mindless and blind outsourcing to them that must be guarded against, that generates unnecessary risks to our well-being, and that limits opportunities to realize our true potential" (Mansharamani, 2020). This outsourcing has caused atrophy in our ability to think and we are now more vulnerable to risks and more uncomfortable in a world of uncertainty.

To battle this dependence of specialists, we must first relearn what John Boyd taught us about solving a system within a system, "we can neither predict the future migration and evolution … nor just confine them to any one system nor suggest that they fully embrace any such system" (Boyd, 1992). We must encourage our leaders to think across domains and free themselves not only from those experts in their command but the expert tendencies they have learned throughout their Marine Corps career. As stated by Colonel Wyly in "Book on Books,"

> The art of war has no traffic with rules. But if you do not read, you are doomed to dwell in a world of rules made by others. Your mind will atrophy. Instead of being able to sense what aspects of battle never change and what aspects change with conditions, you will have to accept someone else's word as a rule. And because there is no rule in war that works all the time, without the ability to sense and adapt, you will eventually lose. (Wyly, n.d.)

By promoting interdisciplinary thinking, we build a leader's meta knowledge (the realization that they do not know anything with 100 percent certainty) and allow them to become leaders that enable innovation and success.

Developing and promoting leaders who embrace and value interdisciplinary thinking will also pay dividends to future leaders in their charge. Leaders who develop humility and empathy toward generalist thinking tend to percolate that understanding to their subordinates through the promotion of respectful dissent and the use of devil's advocate (Murray, 2014). Respectful dissent is difficult to promote by specialist leaders because their perspectives are too narrow to comprehend future possibilities. Generalists are more adept to exhaust all avenues to ensure that not only is the context and environment well understood, but the proposed resolutions are representative of all relevant domains (Figure 11). The Joint Chiefs of Staff, General Mark Milley, has gone so far as to state that the military is "over-centralized, overly bureaucratic, and overly risk-averse" (Lopez, 2017). In sync with General Berger, General Milley believes the future of warfare will be even more austere, decentralized, and uncomfortable. To survive in this environment, General Milley believes that we need to empower our leaders and decentralize decision making, to achieve the desired effects. He believes we cannot "micromanage and over-specify everything a subordinate has to do…that is not an effective way…to fight. Not an

effective way to conduct operations. You will lose battles and wars if you approach warfare like that" (Lopez, 2017). We must provide our subordinates with "commander's intent" (mission type orders) where the end state is clear, but the method is fluid and adaptable. Not only does this generate buy-in and innovation from the Marines, but it opens the perspective of the commander to those courses of action generated by their executing units.

Military leaders have an atrocious track record for predicting the future (even worse are the prediction rates by experts). Instead of trying the predict the future, we should instead focus on the usefulness of these possibilities in aiding us to think differently. It is these new perspectives that allow us to move away from our biases and broaden our view of the future (Figure 12). Peter Schwartz explains this concept in his book *The Art of the Long View* by observing, "the end result is not an accurate picture of tomorrow, but better decisions about the future" (Schwartz, 1991). If we continue to select leaders who hide from uncertainty, we are exposing units to missing critical threats and prime growth opportunities.

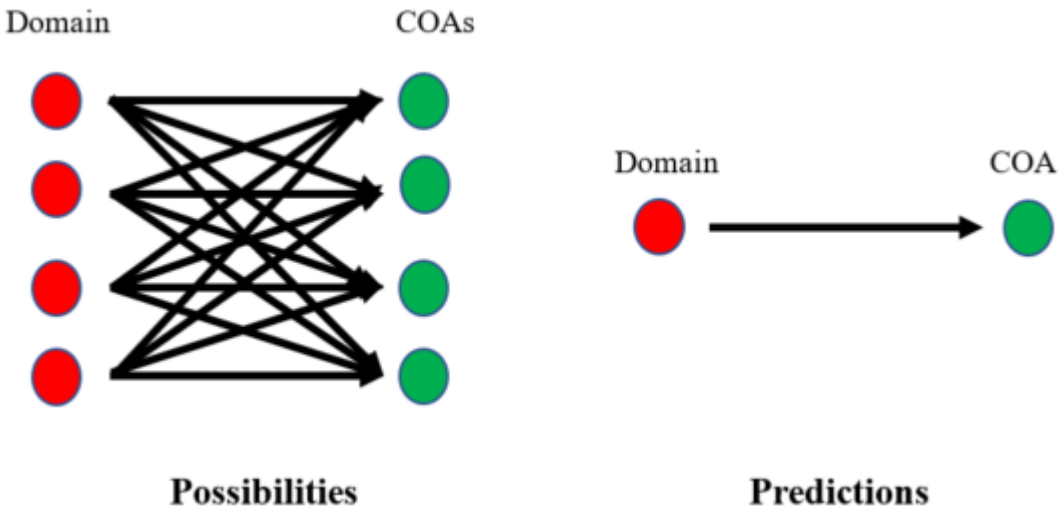

Figure 12. Utilizing Possibilities vs. Predictions

To better understand uncertainty and alternate perspectives, we need to embrace our creative curiosity[16] through critical, creative, and systems thinking. This tactic is essential to connecting the seemingly irrelevant dots (not producing them), which can pay dividends in shocking and powerful perceptions. We often believe that creative passion is a guilty pleasure that takes away from our effectiveness, but we are doing ourselves harm. The pursuit of artistic outlets may generate imagination and breakthroughs. We need to embrace the idea of scattering out our thinking by reading fiction, watching movies, and pursuing imaginative passions. Most importantly the Marine Corps should apply this thinking to the characteristics of future commanders. Instead of following the "golden career path," there may be more value in taking on unfamiliar roles and putting ourselves in positions of increased learning.

MOS credibility is a characteristic that has been preached as the key to promotion for as long as I can remember. I agree that knowing your job is critical to advancement, but it should not generate a learned dependence or inability to think outside one's MOS domain. Despite the ethical ramifications of the Milgram experiment, it did teach us that people in positions of power can make those below them do just about anything. In an age of experts, this power of perceived knowledge has caused us to write them blank checks to our decision making. In turn, we happily don blinders and feel confident that we left it to the experts. However, as leaders, we must remember that our view of the mission is broader in scope than those of the experts we are employing. If we blindly accept assumptions from experts without self-reflection, we are falling into the expert trap of limitations and singular-perspectives.

4. Conclusion

There is no argument that specialists are needed for the Marine Corps to be an efficient fighting force. When dealing in tame environments or complicated contexts, specialists are exceptional at generating dots and providing solutions with a narrow

[16] Creative curiosity is a mixture of skill, passion, and self-reflection that pushes individuals to maximum effectiveness. While difficult to teach and learn it can be accomplished through life-long learning, protection from superiors, and an environment that promotes respectful dissent and risk-tolerance.

perspective. However, with the environment of the future battlefield being wicked and ill-defined, the Marine Corps cannot risk selecting specialist commanders and expect them to remain flexible and promote innovation within their units. Generalist commanders will be needed not only to self-reflect (viewing experts as creators of dots, not inputs) but also to generate a unit cohesion that views failure as an opportunity to learn and respectful dissent as a requirement in innovation and decision making (Table 8).

As John Boyd once said we, as military leaders, can either choose to "be somebody or do something" (Gates, 2008). If we continue to educate through an industrial model and view specialization as our core source of being, we will forever be slaves to experts and our narrow ability to predict the future. General James Mattis warned us of this blind reliance when he said, "we have been fighting on this planet for 5,000 years and we should take advantage of their experience. 'Winging it' and filling body bags as we sort out what works reminds us of the moral dictates and the cost of incompetence in our profession. As commanders and staff officers, we are coaches and sentries for our units: how can we coach anything if we don't know a hell of a lot more than just [Tactics, Techniques, and Procedures]?" (Ingersoll, 2013). Conversely, if we embrace the "dark path" of being a generalist, we open our eyes to possibilities and more importantly generate a culture that can relearn, thrive in uncertainty, and promote interdisciplinary thinking.

V. CONCLUSION

A. DETERMINATIONS

What have we learned about Marines with "range" and how is it useful in the Informational Era? From the qualitative portion of this thesis, we can conclude that attending a GEP is not a "career killer" for Marines who want to be LtCol commanders. What is important to understand is that the timing of a Marine's attendance to a GEP is what effects their odds of command selection. There is a strong correlation, but we cannot prove the causation that board members are viewing recent non-PME graduates as having less MOS credibility and therefore need more time in their current rank to establish their own credibility before being ready for command.

We also can conclude that attending a PME or non-PME course does not significantly affect a commander's performance. This is important to highlight because the assumption that Marines are not being selected because they recently attended a non-PME GEP is unfounded. This finding while beneficial to Marine commanders, does not take into account the future of 21st century warfare (only previous counter-insurgency experiences in Iraq, Afghanistan, and Syria). It will be advantageous to track this model though the great power competition with China and Russia to determine if advantages for commanders with "range" increase in this domain.

From the qualitative portion of this thesis, we conclude that commanders who are educated to embrace interdisciplinary-thinking, respectfully dissent/play devil's advocate, and view failure as an opportunity to learn not only create better problem-solvers, but promote and develop more innovative and creative thinkers within their command. As stated by Adler in his book *Reforming Education: The Opening of the American Mind,* "the very best thing that our educational institutions can do, so far as general education (not the training of specialists), is to afford preparation for continued learning by their students after the leave these institutions behind them. That cannot be done unless the skills of learning are cultivated in school and unless, in schools and colleges, the students are initiated into the understanding of great ideas and issues and are motivated to continue to seek an ever-increasing

understanding of them" (Adler, 1990). It is from these conclusions that we offer recommendations to aid in the implantation and adoption of "range" to the Marine Corps.

B. RECOMMENDATIONS

How do we implement the idea of "range" within Marine Corps commanders? This has been done before, as noted in the discussion of Gen. Gray and his efforts to implement MW into the Marine Corps. Through his leadership and guidance, the Marine Corps "underwent a comprehensive transformation to reemphasize education, including reading and learning outside one's specialty, and building strategic and critical thinking into the organization" (Augier & Hughes, 2019). Innovation diffusion focuses around two major differences; people and products.[17] The philosophy is "if one can better understand how innovations diffuse, one can better predict and manage that diffusion" (Gourville, 2005). As stated in the introduction, the rebirth of learning and education within the Marine Corps can be seen as innovation diffusion of a process. In this section, I provide my personal recommendations for driving change by first exploring the difficulties of diffusing Informational Age learning. Second, I recommend how recently released MCDPs can be used to combat the personal, organization, and bureaucratic inertia that learning and education will have to overcome within the Marine Corps. Third, I pose potential future research projects that will continue where this thesis leaves off.

1. Rogers' Five Factors

While "hot groups" was one perspective on organizational change, Rogers offers an alternate framework to better comprehend innovation diffusion. Compiling 40 years of research, communication theorist and sociologist Everett Rogers has found that 49% to 87% of the variance of innovation adoption can be explained by five product-based characteristics (Rogers, 2003). He argues that by understanding these factors, we can; foresee which

[17] Significant research has explored the effects of people differences regarding innovation diffusion. For example, the effects of personal, organizational, and bureaucratic inertia on adoption. Less is known about the effects of product differences and how to compare and contrast their effects on innovation adoption. I emphasize this observation so that we can better explore the differences between industrial and informational learning.

innovations will be implemented, appropriately develop an innovation to increase the probability of implementation, and facilitate adoption with a targeted promotion campaign.

A longstanding assumption in the world of innovation is that having a great innovation guarantees that it will diffuse into the population. This is a common misconception that can be observed by the slow adoption of the telephone. Alexander Graham Bell invented the telephone in 1876 and it took more than 100 years to reach 90% of American homes. This issue of innovation diffusion is linked to the issues that perception is reality. This translates that how users view a product, is how it will be judged. To ensure innovation diffusion both the actual objective characteristics and those perceived by the end-user need to be managed. To do this, Rogers outlined five product-based factors that largely government the rate of innovation diffusion: "relative advantage, compatibility, complexity, trialability, and observability" (Rogers, 2003). Although Rogers developed this framework for use with products, I will use these factors to highlight the challenges associated with the organizational change and adoption of learning and education within the Marine Corps as a process.[18]

Table 9. Roger's Five Factors: Industrial vs. Information Process Characteristics

Factor	Industrial Era Process	Informational Age Process
Relative Advantage	Status quo and manpower allocations	Increased flexibility and comfort with uncertainty.
Compatibility	Rules and regulations	Risk and possible failure
Complexity	SOPs decrease uncertainty in tame environments, but not in wicked ones	Interdisciplinary thinking, though difficult, decreases uncertainty in wicked environments
Trialability	PME courses	CCLEB and CPIB
Observability	EWS and CSCs	CPG, TECOM, and Senior Marine Office (NPS)

[18] In his book, *Reforming Education*, Mortimer Alder states that "if we recognize, as we should, that genuine learning cannot occur without activity on the part of the learner, then we must also recognize that all learning is a process of discovery on the part of the learner" (Adler, 1990).

Relative advantage is when the innovation is better than the process is replaces. Typically, this is recued costs such as time, effort, or money. However, it is not only economic, can be social status or prestige. As relative advantage increases, the rate of adoption increases. Normally, this is the most obvious and popular driver of innovation diffusion. Thus far, this thesis has focused on the relative advantage of information age learning from the perspective of generalists being more adaptable and comfortable with uncertainty than those leaders educated in the Industrial Age model. However, we must also look that the economic effects of transitioning to an Informational Age learning environment. If the Marine Corps is to further invest in non-PME graduate education there will be fewer Marines available for deployments and to fill positions in the FMF. Additionally, the prestige of "every Marine a rifleman" will have to be adjusted again to include education and learning.

Compatibility is when an innovation exhibits familiar standards and occurrences as previous products. This makes for an easier or harder transition from an old method to a new innovation because people are familiar with it. As compatibility increases, process adoption increases. Unfortunately, Informational Age learning is vastly dissimilar from Industrial Age learning. Instead of rules and regulations, we are asking Marines to explore their curiosity and take risks that could result in failure. Without the top-down support of these new learning environments, Marines will be unwilling to adopt informational learning.

Complexity is when an innovation is difficult to understand or use. As perceived complexity increases, rate of process adoption decreases. The method to overcome complexity is through education (altering how people perceive the innovation). When it comes to education and learning there is the common assumption that the Industrial Age method of SOPs and developing experts decreases complexity, but it is in fact the opposite. Instead of reducing uncertainty, Industrial Age learning merely focuses Marines' perspectives and makes them unimaginative and even more susceptible to analysis paralysis. Alternatively, Informational Age learning opens the aperture of Marine leaders and enables them to attack problems using multiple domains. The drawback is the innovation diffusion of this future model is more complex in execution. While difficult to

understand and implement, this generalist perspective will ironically reduce complexity in future commanders.

Trialability is when an innovation is experimented with on a limited basis, such as offering free samples or a limited time trail of a process. This allows for self-discovery and dispels apprehension. As trialability increases, rate of product adoption increases. When the uncertainty of a process is large, it can be countered with trials. The Marine Corps has done an admirable job at enabling the trialability of Informational Age learning. The development of the CCLEB and CPIB has generated data and exposed Marines to non-PME GEPs that they may not have self-selected into. To continue with this trend, the Marine Corps should explore the reformatting of Industrial Age PME courses to mirror Informational Age non-PME courses like NPS. This will allow Marines, who were apprehensive about losing MOS credibility, to still obtain the benefits of range (though in a shorter time frame).

Observability is when innovation usage and impact are visible to others. Individuals are then able to see the function or need of something by observing others and this action influences them to adopt it. Higher observable usage means higher adoption rates. The Senior Marine Office at the NPS has begun increasing the observability of Informational Age learning by beginning a media campaign that highlights the opportunities and achievements of non-PME graduate education. Additionally, the Marine Corps has begun slating GEPs prior to PME schools to ensure officers with potential and prior superior performance are prioritized. Conversely, every Marine has to complete their rank-specific PME course if they wish to be promoted. As long as Industrial Age learning is emphasized in these courses, Informational Age learning will continue to be viewed as an exception and not the rule.

2. Implementation of MCDP 7 and MCDP 1-4

Now that "process differences" have been determined amongst Industrial and Informational Age learning, we can better focus on "people differences" for the diffusion of learning in the Marine Corps. Published less than a years ago, MCDP 7 *Learning* has been the Marine Corps first attempt to move away from an Industrial Age model of learning

to an Informational Age model of learning. Centered around life-long learning, MCDP 7 is a powerful tool to begin the conversation of education to Marines of all ranks. Where MCDP 7 could be extended is in regards to innovation diffusion. Some senior leaders might believe that MCDP 7 is for junior Marines and it is not applicable to aid in their continuous learning, but I humbly disagree. If the Marine Corps wants to develop future leaders capable of interdisciplinary thought and the ability to nurture respectful dissent and risk-tolerance, then current leaders should be the main focus of these new MCDPs. Without the student-teacher "top-cover" that is generated at the battalion level, an era of relearning and developing range is exceedingly difficult.

For example, look at the Marine Corps' adoption of MW in the 1980s. While young officers, fed-up with failed attrition style warfare from Vietnam, were instrumental in sparking curiosity, it was not until General Alfred M. Gray was selected as the 29th Commandant of the Marine Corps that Fleet Marine Force Manual (FMFM) 1 *Warfighting* was written and MW was officially adopted as the warfighting philosophy of the Marine Corps. As discussed earlier, General Gray was able to create an environment that nurtured "hot groups" in order to combat the organizational inertia of the Marine Corps and effectively change its warfighting culture. He effectively "served as the movement's senior patron who supported and protected maneuver warfare from meddling while also testing it at some of the most strenuous levels possible short of actual combat" (Augier & Barrett, 2020). This leadership style not only increased tribality, observability, and relative advantage, but also decreased the complexity and eased the compatibility of MW diffusion within the Marine Corps. A recent example of this top-cover leadership is Major General William Mullen who, as Commanding General of Training and Education Command, issued a memorandum authorizing Formal Learning Centers to experiment with new learning practices. His intent was to "transition our existing Industrial Age training and education continuum to an Informational Age model - one more focused on active, student-centered adult learning that engenders decision making, adaptiveness, and critical thinking" (Mullen, 2019).

Additionally, MCDP 1-4 *Competing* was published a few months ago and continues to magnify the importance of Informational Age learning. Not a reference publication, its

intent is to encourage critical thinking and the position the Marine Corps holds on the world stage. This publication introduced the competition continuum and why it is important. The competition continuum are the ways in which world players try and achieve relative advantage over one another. The intent of this publication is that Marines better understand competition and in turn spark their innovative curiosity which generates future relative advantages. This publication is a complement to MCDP 7 and should be read by leaders prior to attempting to implement MCDP 7 within their units. For example, in the "education" section of *Competing* it states that "it is not enough for Marines to educate themselves on war and warfighting alone. Such a narrow focus limits the benefits they can give to the Nation" (Department of the Navy, 2020a). It goes on to suggest that "self-education in social, economic, technological, and other matters beyond military history and leadership are essential if Marines are to excel in competition" (Department of the Navy, 2020a). Without using such language, *Competing* is implying that developing range within Marine Corps leadership is essential to remaining relevant and gaining relative advantages on the world stage.

Both MCDP 7 and MCDP 1-4 are champions for interdisciplinary thought and should be read concurrently and discussed at all PME and non-PME education. Additionally, we should take note of Herbert Simon's philosophy regarding problem solving; "[the] major emphasis needs to be directed toward extracting, making explicit, and practicing problem-solving heuristics - both general heuristics, like means - ends analysis, and more specific heuristics, like applying the energy-conservation principle in physics. A student's own learning processes will be enhanced if he understands that a large part of his professional skill resides in the ability to recognize rapidly the situational cues that signal the appropriateness of particular actions" (Simon, 1980). This guidance further stresses the importance of promoting interdisciplinary thought and cognitive recognition of one's own environment when assessing problems and making decisions.

This implementation is necessary if we are to remain a relevant military in the 21st century. In General Mullen's TECOM Commander's Guidance he states, "we can no longer count a technological edge in the next fight. Instead, we have to hone what the

Australian Chief of Defense called the 'Intellectual Edge'[19]" (Mullen, 2018). This guidance, which included the task of developing MCDP 7 *Learning*, also highlights the critical importance of informational learning and its effect on MW. In Major General Mullen's June 2020 Gazette Article, he explores a question from our 37th Commandant, General Robert Neller, "how do we reinvigorate maneuver warfare?" (Mullen, 2020). He goes on to address concerns with our current education system and how continuous education is vital to remaining a member of the profession of arms. The irony is that without a transformation from industrial to Informational Age learning, MW is difficult if not impossible to both understand and reinvigorate. As described in the forward of FMFM 1 *Warfighting*, MW is a philosophy, not a checklist, that enables the ability to think critically and generate a bias for action. If the Marine Corps wishes to re-emphasize and re-indoctrinate Marines in MW, they must implement a learning model that, "is focused on active, student centered learning that uses a problem posing methodology where our students/trainees are challenged with problems that they tackle as groups in order to learn by doing and also from each other" (Mullen, 2018).

3. Further Research

I understand that this thesis is limited in scope and establishes a starting point for future studies regarding education versus training in talent management. I suggest further studies examine how the CCLEB has affected LtCol promotion and CSBs. Unfortunately, at this point, there is not enough data to conduct this research. The first CCLEB selectees are just now being selected for LtCol and being screened on CSBs. This data will most likely be ready for analysis in the next five years. A study that could be conducted currently would be a survival analysis of those selected for CCLEB. This would expand our knowledge regarding the effects of the CCLEB on perceived career potential. We might be able to identify if Marines selected for the CCLEB see themselves as non-competitive and leave the Marine Corps.

[19] Major General Mick Ryan, Australian Defense Force, is credited with coining the term "intellectual edge." He uses this term to describe the necessary competitive advantage needed for future war and strategic competition. This edge is based on the development of a small but proficient land force that effectively utilizes the philosophy of the OODA loop to gain advantages in an uncertain environment or against a formidable opponent.

We might also conduct a survey of the RBR reasons to study if Marines with a non-PME graduate education do not see themselves as competitive or suitable for command and they chose to remove themselves from the LtCol selection pool. It would also be interesting to expand the CSB data set to compare pre-2011 CSB factors and determine if the policies enacted by the Marine Corps affected the CSBs.

One final future study would be to use an event study design around 2011 (when the CCLEB and CPIB were established) to compare "volunteers" (pre-2011) versus those selected to attend NPS through the CCLEB and CPIB. This would be beneficial in establishing the Marine Corps' emphasis on education and the effects GEP policy has had on non-PME selection and future potential in the Marine Corps.

Further qualitative research should explore the conceptual pieces of teaching, learning, and developing "range" within the Marine Corps. The goal these courses would be to "stimulate curiosity, broaden minds and help develop innovative thinking to anticipate future environments of conflict, the attributes of new enemies, and anticipated technologies to employ or confound" (Augier & Hughes, 2019). We should also not limit these courses to arenas of PME. As outlined earlier, the grassroots movement of MW within the Marine Corps was not driven from doctrine, but from hot groups of passionate young Marines who wanted to satisfy their creative curiosity. The Marine Corps must rediscover these outlets for the development of our future leaders. As Gen. Gray said, "it doesn't cost any money to think" (Otte, 2015). With budget cuts on the immediate horizon, we should put our efforts back into brown bag lectures, book clubs, and other venues that allow for the honest exchange of ideas that aid in the rebirth of learning within the Marine Corps.

We must remember that refocusing the Marine Corps on education is a wicked problem, meaning that it does not include a simple solution within one domain. The method for developing range consists of multiple facets, but I believe the following two are critical to the Marine Corps' ability to develop effective leaders in 21st century warfare. First, is the education we choose to expose to our Marines. Second, is the structure in which it is accomplished. Courses on organizational effectiveness, strategic management, and thinking critically are ineffective if continually taught through an Industrial Age learning

model. We must complement these interdisciplinary courses with an Informational Age learning model that injects uncertainty and chaos, allowing for a deeper understanding. Likewise, if we continue to teach System 1 and System 2 thinking, doing so in an Information Age learning environment will not develop the leaders we need.

Finally, it would be beneficial to explore the culture and organizational barriers of failure and respectful dissent within the Marine Corps. Countless research has determined that organizations typically do not suffer from a lack of innovate people, but rather from the structure, systems, and culture within the organization itself (Bennett & Parks, 2015). By exposing the benefits of failures and synthesizing the misnomer of respectful dissent, we could put the Marine Corps in a stronger position to reform our education models to eventually develop and select leaders with range.

LIST OF REFERENCES

Adler, M. J., & Van Doren, C. (1972). *How to read a book: The classic guide to intelligent reading*. Touchstone.

Adler, M. J. (1990). *Reforming education: The opening of the American mind.* Collier.

Augier, M. & Barrett, F. X. (2020). Organizational perspectives on the maneuver warfare movement in the United States Marine Corps: insights from the work of James G. March. *Industrial and Corporate Change, 29(1)*, 143-162.

Augier, M. & Barrett, F. X. (2019a). Leadership for seapower. *Marine Corps Gazette, 103(11)*, 30-35.

Augier, M. & Barrett, F. X. (2019b). Cultivating critical and strategic thinkers. *Marine Corps Gazette, 103(7)*, 72-77.

Augier, M. & Hughes, W. (2019). Innovative thinking: The role of professional military education. *Center for International Maritime Security*. http://cimsec.org/innovative-thinking-the-role-of-professional-military-education/40280

Augier, M., Barrett, F. X., & Dew, N. (2019). Skills for seapower: Why the navy needs to teach soft and hard skills. http://cimsec.org/skills-for-seapower-why-the-navy-needs-to-teach-soft-and-hard-skills/42191

Bennett, N. & Parks, J. M. (2015). Struggling to innovate? Examine your structure, systems, and culture. *Business Horizons,* 58(5), 563-569.

Bowers, W. J. (2017, August 11). *President's strategic intent*. Marine Corps University. https://www.usmcu.edu/About-MCU/Strategic-Plan/

Boyd, J. R. (1976). *Destruction and creation* [Unpublished].

Boyd, J. R. (1992). *Conceptual spiral* [Unpublished].

Branigan, G. A. (2001). *The effect of graduate education on the retention and promotion of Marine Corps officers* [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://calhoun.nps.edu/handle/10945/10846

Department of the Navy. (2020a). *Competing* (MCDP 1-4). https://www.marines.mil/Portals/1/Publications/MCDP%201-4.pdf?ver=/fGwjmqkxGvv0GPe0/mPgdqw%3d%3d

Department of the Navy. (2020b). *Learning* (MCDP 7). https://www.marines.mil/Portals/1/Publications/MCDP%207.pdf?ver=2020-03-30-071343-193

Drucker, P. (1955). *The practice of management*. Harper Business.

Epstein, D. (2019). *Range: Why generalists triumph in a specialized world*. Penguin.

Gates, R. M. (2008). *Remarks to Air War College.* https://archive.defense.gov/Speeches/Speech.aspx?SpeechID=1231

Gourville, J. T. (2005). Notes on Innovation Diffusion: Rogers' Five Factors. HBS No. 505-075. Harvard Business School Publishing.

Headquarters Marine Corps. (2017, March 23). *Command screening program* (Marine Corps Order 1300.64B). Department of the Navy. https://www.marines.mil/portals/1/Publications/MCO%201300.64B_Final_MK.pdf?ver=2017-04-05-071442-330

Headquarters Marine Corps. (2018, May 1). Performance Evaluation System. (MCO 1610.7A). Department of the Navy.

Headquarters Marine Corps (2019a, August 5). *FY20 lieutenant colonel command screening board results* (MARADMIN 429/19, 2019). https://www.marines.mil/News/Messages/Messages-Display/Article/1926180/fy20-lieutenant-colonel-command-screening-board-results/

Headquarters Marine Corps. (2019b, May 30). Marine Corps Graduate Education Program (MCO 1524.1). Department of the Navy.

Hogarth, R. M., Lejarraga, T., & Soyer, E. (2015). The two settings of kind and wicked learning environments. *Current Directions in Psychological Science: a Journal of the American Psychological Society,* 24(5), 379-385. https://doi.org/10.1177/0963721415591878

Ingersoll, G. (2013, May 9). *General James 'mad dog' Mattis email about being 'too busy to read' is a must-read*. Business Insider. https://www.businessinsider.com/viral-james-mattis-email-reading-marines-2013-5

Kahn, H. (1962). *In defense of thinking*. Hudson Institute. https://www.hudson.org/research/2211-in-defense-of-thinking

Kahn, H. & Mann, I. (1957, July 17). *Ten common pitfalls* [Memorandum]. U.S. Air Force Project Rand.

Kahneman, D. & Klein, G. (2009). Conditions for intuitive expertise a failure to disagree. *American Psychologist*, *64(6)*, 515-526. ResearchGate.

Lianez, R. & Zamarripa, L. R. (2003). The effects of the U.S. Marine Corps graduate education programs on officer performance: A comparative analysis of professional military education and graduate education [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://calhoun.nps.edu/handle/10945/1092

Lopez, C. T. (2017, May 5). *Future warfare requires 'disciplined disobedience,' Army chief says*. https://www.army.mil/article/187293/future_warfare_requires_disciplined_disobedience_army_chief_says

Mansharamani, V. (2020). *Think for yourself: Restoring common sense in an age of experts and artificial intelligence*. Harvard Business Review Press.

Marr, D. C. (1997). A statistical analysis of the U.S. Marine Corps lieutenant colonel command screening process [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://calhoun.nps.edu/handle/10945/4227

Modly, T. B. (2018). *Education for seapower*. Department of the Navy. https://www.navy.mil/strategic/E4SFinalReport.pdf

Mullen, W. F. (2018, July 18). *Training and Education Command Commander's Guidance* [Unpublished].

Mullen, W. F. (2019, August 26). *Training and Education Command Authority to Experiment with Learning Practices and Policy* [Unpublished].

Mullen, W. F. (2020). Renavigating Maneuver Warfare. *Marine Corps Gazette* 104(7), 62-66. https://mca-marines.org/wp-content/uploads/Reinvigorating-Maneuver-Warfare.pdf

Murray, N. (2014, July 29). *More dissent needed: Critical thinking and PME*. War on the Rocks. https://warontherocks.com/2014/07/more-dissent-needed-critical-thinking-and-pme/

National Naval Officers' Association. (2008, January). *Marine Corps Command Screening Process: "The most important board in the Marine Corps."* Retrieved from http://quantico-nnoa.org/Files/PME/Command_Screening_Process.ppt

Neller, R. B. (2018, July 2). *Precept convening a screening board to recommend officers of the Marine Corps on the active-duty list in the grade of lieutenant colonel and lieutenant colonel (select) for assignment as commanding officers afloat and ashore.*

Nye, J. (2010). *The powers to lead*. Oxford University Press.

Officer of the Commandant of the Marine Corps. (2019) *Commandant's planning guidance*. https://www.hqmc.marines.mil/Portals/142/Docs/%/2038th%20Commandant%27s%20Planning%20Guidance_2019.pdf?ver=2019-07-16-200152-700

Otte, P. (2015). *Grayisms.* Potomac Institute Press.

Rateike, C. N. (2017). *Quantitative analysis of high-quality officer selection by commandant's career-level education board* [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://calhoun.nps.edu/handle/10945/53036

Rogers, E. M. (2003). *Diffusion of innovations*. Free Press.

Schwartz, P. (1991). *The Art of the Long View*. Currency.

Senate Armed Services Committee, Subcommittee on Readiness and Management Support on Marine Corps Readiness, 116th Cong. (2020). https://www.armed-services.senate.gov/imo/media/doc/Berger_12-02-20.pdf

Simon, H. (1956). Rational choice and the structure of the environment. *Psychological Review, 63*(2), 129-138. http://libproxy.nps.edu/login?url=https://www-proquest-com.libproxy.nps.edu/scholarly-journals/rational-choice-structure-environment/docview/1290944099/se-2?accountid=12702

Simon, H. (1980). Education and problem solving. In D. T. Tuma and F. Reif, (Eds.), *Problem solving and education: issues in teaching and research* (1st ed., pp. 81-96). Lawrence Erlbaum.

Simon, H. A. (1974). How big is a chunk? *Science,* 183(4124), 482-488. JSTOR.

Snowden, D. J., & Boone, M. E. (2007). A Leader's Framework for Decision Making. *Harvard Business Review*. https://hbr.org/2007/11/a-leaders-framework-for-decision-making

Stolzenberg, M. R. (2017). *Exploring Marine Corps officer quality: an analysis of promotion to lieutenant colonel*. [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://calhoun.nps.edu/handle/10945/53053

Tarsiuk, A. L. (2019). *Complacency kills: A systemic analysis of the USMC command screening program*. [Master's thesis, Naval Postgraduate School]. NPS Archive: Calhoun. https://calhoun.nps.edu/handle/10945/62306

U.S. Marine Crops. (2020). Graduate Education Overview. https://www.manpower.usmc.mil/webcenter/content/conn/WebCenterSpaces-ucm/path/Enterprise%20Libraries/OA3CEB/FY19_CEB_Fleet_Brief_20190219.pdf

Van Riper, P. K. (2013). The identification and education of U.S. Army strategic thinkers. In H. Wolters, A. P. Grome, and R. M. Hinds, (Eds.), *Exploring strategic thinking: insights to assess, develop, and retain Army strategic thinkers* (1st ed., pp. 10-31). U.S. Army Research Institute for the Behavioral and Social Sciences.

Willis, S. (2003, December 17). *Battle plan under fire: The immutable nature of war.* NOVA. https://www.pbs.org/wgbh/nova/wartech/nature.html

Wooldridge, J. M. (2013). *Introductory econometrics: A modern approach*. South-Western.

Wyly, M. (n.d.). *Books on books* [Unpublished].

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