



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

JOINT APPLIED PROJECT REPORT

CONTRACT MANAGEMENT MATURITY MODEL ASSESSMENT OF THE AIR FORCE NUCLEAR WEAPONS CENTER

June 2019

By: **Robert N. Peters**
 Susan L. Stewart
 Shila F. Weese

Advisor: **Rene G. Rendon**
Co-Advisor: **Jeffrey Sorensen,**
 AFNWC/PZ

Approved for public release. Distribution is unlimited.

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.			
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE June 2019	3. REPORT TYPE AND DATES COVERED Joint Applied Project Report	
4. TITLE AND SUBTITLE CONTRACT MANAGEMENT MATURITY MODEL ASSESSMENT OF THE AIR FORCE NUCLEAR WEAPONS CENTER			5. FUNDING NUMBERS
6. AUTHOR(S) Robert N. Peters, Susan L. Stewart, and Shila F. Weese			
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) The Department of Defense's (DoD) contract management function has appeared on the Government Accountability Office's (GAO) high-risk list since 1997. Up to this point, the DoD's response to identified contracting deficiencies has been an increase in workforce training. However, the DoD should focus its attention on contract management process capabilities; organizational assessments are critical to an organization's success. The purpose of this research is to assess the contract management process capability of the Air Force Nuclear Weapons Center (AFNWC) using the Contract Management Maturity Model (CMMM). Based on an analysis of survey responses of the AFNWC contracting workforce, this research summarizes CMMM assessment ratings and assigns current levels of process maturity to each key process area. In addition, the research compares the CMMM assessment results with current AFNWC process efficiency and effectiveness metrics. Finally, the research identifies opportunities and provides recommendations for contract management process improvements within the AFNWC organization. The results provide a benchmark of current process maturity to AFNWC senior leadership, and the recommendations offer a roadmap to help guide the organization to the achievement of higher maturity levels for the contract management key process areas.			
14. SUBJECT TERMS Contract Management Maturity Model			15. NUMBER OF PAGES 89
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release. Distribution is unlimited.

**CONTRACT MANAGEMENT MATURITY MODEL ASSESSMENT OF THE
AIR FORCE NUCLEAR WEAPONS CENTER**

Robert N. Peters, Civilian, Department of the Air Force
Susan L. Stewart, Civilian, Department of the Air Force
Shila F. Weese, Civilian, Department of the Air Force

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN CONTRACT MANAGEMENT

from the

**NAVAL POSTGRADUATE SCHOOL
June 2019**

Approved by: Rene G. Rendon
Advisor

Jeffrey Sorensen
Co-Advisor

Brett M. Schwartz
Academic Associate, Department of GSBPP Program Office

THIS PAGE INTENTIONALLY LEFT BLANK

CONTRACT MANAGEMENT MATURITY MODEL ASSESSMENT OF THE AIR FORCE NUCLEAR WEAPONS CENTER

ABSTRACT

The Department of Defense's (DoD) contract management function has appeared on the Government Accountability Office's (GAO) high-risk list since 1997. Up to this point, the DoD's response to identified contracting deficiencies has been an increase in workforce training. However, the DoD should focus its attention on contract management process capabilities; organizational assessments are critical to an organization's success. The purpose of this research is to assess the contract management process capability of the Air Force Nuclear Weapons Center (AFNWC) using the Contract Management Maturity Model (CMMM). Based on an analysis of survey responses of the AFNWC contracting workforce, this research summarizes CMMM assessment ratings and assigns current levels of process maturity to each key process area. In addition, the research compares the CMMM assessment results with current AFNWC process efficiency and effectiveness metrics. Finally, the research identifies opportunities and provides recommendations for contract management process improvements within the AFNWC organization. The results provide a benchmark of current process maturity to AFNWC senior leadership, and the recommendations offer a roadmap to help guide the organization to the achievement of higher maturity levels for the contract management key process areas.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	BACKGROUND	1
B.	PURPOSE OF RESEARCH	2
C.	RESEARCH QUESTIONS	3
D.	BENEFITS AND LIMITATIONS OF RESEARCH.....	3
E.	METHODOLOGY	4
F.	ORGANIZATION OF REPORT	5
G.	SUMMARY.....	5
II.	LITERATURE REVIEW	7
A.	INTRODUCTION.....	7
B.	AUDITABILITY THEORY	7
	1. Competent Personnel.....	8
	2. Effective Internal Controls.....	10
	3. Capable Processes	11
C.	AGENCY THEORY.....	13
D.	CONTRACT MANAGEMENT PROCESSES	15
	1. The Contract Management Standard (CMS).....	15
	2. Contract Management Domains: Pre-Award	16
	3. Contract Management Domains: Award.....	18
	4. Contract Management Domains: Post-Award	19
	5. The Contract Management Body of Knowledge.....	21
E.	CONTRACT MANAGEMENT MATURITY MODEL	24
F.	SUMMARY	28
III.	AIR FORCE NUCLEAR WEAPONS CENTER.....	29
A.	INTRODUCTION.....	29
B.	AFNWC OVERVIEW	29
C.	AFNWC ORGANIZATIONAL STRUCTURE	31
	1. NC3 Integration Directorate and PEO for NC3 Systems (AFNWC/NC).....	32
	2. Air Delivered Capabilities Directorate (AFNWC/ND).....	32
	3. Intercontinental Ballistic Missile (ICBM) Systems Directorate (AFNWC/NI).....	32
	4. Nuclear Technology and Interagency Directorate (AFNWC/NT)	32
D.	AFNWC/PK-PZ CONTRACTING DIRECTORATE	33

1.	PZN—Nuclear Contracting Division	33
2.	PZC - Clearance/Program Support Division	34
3.	PKX—Resource Management.....	34
4.	PZB—ICBM Contracting Division (Hill)	34
E.	SUMMARY	35

IV.	CMMM ASSESSMENT RESULTS AND PROCESS IMPROVEMENT RECOMMENDATIONS.....	37
A.	INTRODUCTION.....	37
B.	SELECTION OF STUDY PARTICIPANTS	37
C.	ADMINISTRATION OF CMMM SURVEY	38
D.	MATURITY LEVEL ANALYSIS.....	38
1.	Pre-Award Processes: Procurement Planning, Solicitation Planning, Solicitation, Source Selection.....	41
2.	Post-Award Processes: Contract Administration and Contract Closeout	42
E.	KEY PROCESS AREA ANALYSIS.....	43
1.	Procurement Planning.....	43
2.	Solicitation Planning.....	44
3.	Solicitation	45
4.	Source Selection	46
5.	Contract Administration	47
6.	Contract Closeout	48
F.	PROCESS ENABLER ANALYSIS.....	49
1.	Process Strengths	49
2.	Process Results	50
3.	Management Support	50
4.	Process Integration	51
5.	Process Measurement	51
G.	AFNWC CURRENT PROCESS METRICS.....	52
1.	Procurement Action Lead Time (PALT).....	52
2.	Speed to Contract.....	54
3.	Effectiveness	55
H.	ANALYSIS OF METRICS COMPARED WITH CMMM ASSESSMENT RESULTS.....	57
I.	RECOMMENDATIONS FOR CONTRACT MANAGEMENT PROCESS IMPROVEMENTS.....	58
1.	Procurement Planning, Solicitation Planning, Solicitation, Source Selection	58
2.	Contract Administration and Contract Closeout	59
3.	Recommendations for AFNWC’s Internal Metrics.....	60

J.	SUMMARY	61
V.	SUMMARY, CONCLUSIONS, AND AREAS FOR FURTHER RESEARCH	63
A.	INTRODUCTION.....	63
B.	SUMMARY.....	63
C.	CONCLUSION.....	64
D.	AREAS FOR FURTHER RESEARCH.....	65
	LIST OF REFERENCES.....	67
	INITIAL DISTRIBUTION LIST	71

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF FIGURES

Figure 1.	Auditability Triangle. Source: Rendon and Rendon (2015).....	8
Figure 2.	The Contract Management Standard. Source: NCMA (2019).....	16
Figure 3.	NCMA Contract Management Body of Knowledge Competency Chart. Source: NCMA (2017).....	22
Figure 4.	AFNWC Snapshot. Source: Lt. Col. R. Smith, email to author (21 May 2019).....	29
Figure 5.	AFNWC Organization. Source: J. H. Founds, email to author (16 April 2019).....	31
Figure 6.	AFNWC/PZ Organizational Structure. Source: Lt. Col. R. Smith, email to author (21 May 2019).	33
Figure 7.	AFNWC Survey Respondent Demographics.....	38
Figure 8.	AFNWC Survey Results.....	40
Figure 9.	AFNWC CMMM Summary Chart	41
Figure 10.	Summary Ratings of CMMM Six Key Process Areas.....	43
Figure 11.	Procurement Planning Summary Chart	44
Figure 12.	Solicitation Planning Summary Chart	45
Figure 13.	Solicitation Summary Chart.....	46
Figure 14.	Source Selection Summary Chart.....	47
Figure 15.	Contract Administration Summary Chart.....	48
Figure 16.	Contract Closeout Summary Chart	49
Figure 17.	AFSC/PK Cycle Standards. Source: D. Stark, email to author (23 May 2019).....	54
Figure 18.	AFSC/PZB Speed to Contract. Source: D. Stark, email to author (13 May 2019).....	55
Figure 19.	AFSC/PZB Effectiveness Comparison to PALT. Source: D. Stark, email to author (13 May 2019).	56

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF ACRONYMS AND ABBREVIATIONS

1102	Contracting Job Series
AFB	Air Force Base
AFGSC	Air Force Global Strike Command
AFLCMC	Air Force Life Cycle Management Center
AFMC	Air Force Materiel Command
AFNWC	Air Force Nuclear Weapons Center
AFRL	Air Force Research Lab
AFSC	Air Force Sustainment Center
AFTC	Air Force Test Center
BAA	Broad Area Agency Announcements
CIDS	Computer Information Delivery System
CMBOK	Contract Management Body of Knowledge
CMMM	Contract Management Maturity Model
CMS	Contract Management Standard
COSO	Committee on Sponsoring Organizations
DAU	Defense Acquisition University
DAWIA	Defense Acquisition Workforce Improvement Act
DemVal	Demonstration and Validation
DoD	Department of Defense
FAR	Federal Acquisition Regulation
GAO	Government Accountability Office
GBSD	Ground Based Strategic Deterrent
ICBM	Intercontinental Ballistic Missile
IGE	Independent Government Estimates
LGM-30	Silo Launched, Surface Attack, Guided missile
NCMA	National Contract Management Association
OCS	Operational Contract Support
OIG	Office of the Inspector General
PALT	Procurement Action Lead Time
SCO	Senior Contracting Official
TACOM	Theater Army Command
UCA	Undefinitized Contract Actions

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

We extend out sincerest appreciation to our advisor, Dr. Rene Rendon, for sharing his contract management wisdom with patience and good humor. Thank you for guiding us through this project and helping us to become better contract managers, researchers, and writers along the way.

We wholeheartedly thank our co-advisor, Mr. Jeffrey Sorenson, Deputy Director of Contracting for the Air Force Nuclear Weapons Center, for his support in executing our research, as well as the AFNWC contracting workforce for participating in our survey.

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

A. BACKGROUND

Within the federal government, the Department of Defense (DoD) is the largest contracting agency, representing over two-thirds of federal government spending (Government Accountability Office [GAO], 2009). In 2018, the DoD obligated approximately \$459 billion to supplies and services (Usaspending.gov, 2018). According to usaspending.gov (2018), this represents a 12% increase from the \$409 billion the DoD obligated in 2017. As the DoD budget continues to increase, the amount of funds obligated increases, and contracting professionals are dealing with more contract actions than ever before. With this continuous rise in military spending, the contracting workforce must be able to manage their processes as efficiently as possible to ensure the effective use of taxpayer dollars.

Since the early 1990s, the Government Accountability Office (GAO) has tracked many areas of the federal government on their high-risk list, which is updated every two years for each new Congress (GAO, 2019). According to the 2019 GAO high-risk report, the DoD contract management function was added to the list in 1992 and still remains there today. The GAO considers DoD contract management high-risk because of the high turnover of the workforce and heavy reliance on contractors which can cause gaps in skills and competencies (GAO, 2019). Services acquisition is another area of contract management the GAO monitors due to the complexity of writing service requirements and the DoD's lack of foresight into budgeting for services (GAO, 2019). Operational Contract Support (OCS) is the final area of contract management the GAO has been monitoring as a result of the vast amount spent on OCS and the difficulty the DoD has integrating OCS into planning and training (GAO, 2019). The Office of the Inspector General (OIG) also included contract management on its "Top Management Challenges for Fiscal Year 19." The OIG is required by federal law to identify the "most serious management and performance challenges facing the agency" and to include its statement in the agency's annual financial report (DoD OIG, FY19, p. 3). The OIG monitors acquisition and contract management due to the DoD's difficulty meeting schedule, cost, and performance expectations for major weapon systems in spite of DoD efforts to

improve these programs (DoD OIG, FY19). Up to this point, the DoD's response to the increased oversight of the contract management function has been more training for the contracting workforce (Rendon & Winn, 2017).

Due to the important role the contract management function plays in acquisitions, researchers have conducted several studies and analyses of the function within various DoD organizations. Organizational contract management process studies collect data to assess a firm's capability and maturity levels and to implement process improvements directed at areas of deficiencies (Rendon, 2008). One tool used to analyze the capability of the contracting function's processes is the Contract Management Maturity Model (CMMM). Rendon (2010b) explains that the model was developed specifically for the DoD's contracting agencies and contains six phases beginning with pre-award activities and concluding with post-award activities. The CMMM itself has five ratings of maturity for each process phase.

The AFNWC demonstrated interest in our research, so we chose this organization to study. The AFNWC is the center under the Air Force Materiel Command (AFMC) that oversees all areas of nuclear material management in support of Air Force Global Strike Command (AFGSC) (Department of the Air Force [DAF], 2019). The center consists of four major execution directorates, but our assessment is comprised mainly of the Intercontinental Ballistic Missile (ICBM) Systems Directorate located principally at Hill AFB, Utah, and the Nuclear Support Contracting Division with support branches located at the following bases: Kirtland AFB, New Mexico; Eglin AFB, Florida; Tinker AFB, Oklahoma; and Hanscom AFB, Massachusetts (DAF, 2019). AFNWC leadership recognized the benefit of deploying the CMMM to determine a benchmark for the current state of their organization's contract management process capability and to "[provide] the organization with a detailed road map for improving the capability of its contract management processes" (Rendon, 2008, p. 207).

B. PURPOSE OF RESEARCH

The primary objective of this research is to assess the contract management process capability of the AFNWC using the CMMM. This paper will summarize CMMM assessment ratings to describe the current state of contract management process maturity at the AFNWC, provide analysis of ratings, and identify opportunities for contract

management process improvement. Through our research and analysis, we intend to display the benefit to assessing the process capabilities as another facet to improve the competence of the contract management function.

A secondary objective of this research is to compare the CMMM assessment results with current process metrics used to measure the quality and effectiveness of the contract management processes at the AFNWC. These metrics will be analyzed to determine if internal process metric results are consistent with the findings of the CMMM assessment and whether they support successful outcomes for the six key process areas.

C. RESEARCH QUESTIONS

In order to meet the objectives of our research, we will answer the following questions:

1. What is the maturity level of each contracting key process area within the AFNWC?
2. Based on the results of the analysis, how can the AFNWC improve its maturity levels for each contracting key process area?
3. How do the process maturity levels compare to the current AFNWC metrics?

D. BENEFITS AND LIMITATIONS OF RESEARCH

This research will help the AFNWC understand the capabilities of their contract management processes and identify areas for improvement. It will assess and benchmark the current state of the organization's contract management process capability and provide the organization guidance on how to create a plan to improve its contract management process capability (Rendon, 2008).

Another benefit of the research is the ability for AFNWC leadership to compare the assessment results to current organizational metrics. This will help determine if there is a correlation between the metrics and the contracting workforce's valuations of the key process areas. The analyzed data will benefit the center by pinpointing the deficient key process areas that are possibly negatively affecting the metrics. The research will also help to determine if

the center is using appropriate metrics or otherwise lacking metrics that identify achievement of agency goals in any one key process area.

One limitation of the research is that it is based on surveys that are anonymous and voluntary. There is no way to assess the honesty of the responses. The survey was emailed to the workforce by the Deputy Director of Contracting for the AFNWC with an invitation for voluntary participation. Another limitation of the research is that emails are easy to overlook for busy personnel, and even people with intentions of completing the survey may not have returned to it before the deadline.

We received completed surveys from approximately 41% of the surveyed 1102 workforce, and while that number is statistically relevant, it clearly does not represent all of the AFNWC contracting personnel. A smaller sample group can be more susceptible to skewed data, and it is possible the respondents (who chose to respond to something outside of their normal duties) are higher-achieving employees who have differing opinions and expectations than employees who would not take it upon themselves to spend time on an optional survey. The CMMM itself is a limitation due to the fact it is based on qualitative data (Rendon, 2016). It relies completely on the responses to the survey questions. “The CMMM should be used as an initial tool in assessing an organization’s contract management process capability” (Rendon, 2016, p. 370). In order to gain more comprehensive data, follow-up surveys and interviews should be conducted as well as a comparison of the survey results to organizational metrics (Rendon, 2016).

E. METHODOLOGY

For this research project, our team reviewed current literature related to auditability and agency theories as well as contract management processes. The purpose was to explain the interrelationship between capable processes, a competent workforce, and effective internal controls. We also sought to understand the principal-agent relationship and its effect on contractual arrangements. We conducted a web-based survey of the contracting workforce, level II-certified and higher, within the AFNWC at Hill AFB and Kirtland AFB. The survey is a previously developed instrument used to assess the contract management process maturity levels of the six contract management phases as reflected in NCMA’s Contract Management

Body of Knowledge (CMBOK). We collected current metrics monitored by the AFNWC and used the CMMM to identify deficiencies and areas for improvement within the AFNWC's contract management processes.

F. ORGANIZATION OF REPORT

This research paper consists of five chapters, including this introduction to the study that provided background regarding the importance and complexity of the contracting function within the DoD and progressed with the purpose of this research. The chapter then discussed the research questions posed as well as the benefits and limitations of the study. A description of the methodology used to conduct the survey followed, and the final component is the organization of the report.

Chapter II contains a literature review of auditability and agency theories as well as contract management processes and the contract management maturity model. Chapter III contains a background of the AFNWC organization surveyed; Chapter IV presents the findings from the survey results as well as a comparison of our assessment to current AFNWC metrics. Chapter V consists of a summary, conclusion, and areas for further research.

G. SUMMARY

This chapter introduced the ever-growing importance of the contracting function and the need to assess contract management process capabilities. It then identified the purpose of our research, which is to assess the contract management process maturity levels, and thus process capabilities, of the contract management process within the AFNWC. This chapter then presented our research questions as well as benefits and limitations of our study. The methodology by which we deployed our survey and collected our data was included. Finally, the organization of the report was presented. The next chapter is the literature review, which presents current research on auditability and agency theories, contract management processes, and the contract management maturity model.

THIS PAGE INTENTIONALLY LEFT BLANK

II. LITERATURE REVIEW

A. INTRODUCTION

This literature review consists of peer-reviewed articles, books, and government documents relating to contract management. First, a discussion of the theoretical basis for this research is presented. The theories introduced include auditability theory, which describes that by “making things auditable,” organizations can provide assurance that they are operating ethically and within accepted guidelines (Power, 1996, p. 289), and agency theory, which is concerned with the nature of the principal-agent relationship (Eisenhardt, 1989). Finally, literature relating to contract management processes and contract management maturity models is discussed.

B. AUDITABILITY THEORY

A common theme in auditability theory literature posits a viewpoint of audit as an active process of “making things auditable” (Power, 1996, p. 289). Power (2007) states, “a theory of auditability requires a much wider field of vision than an audit alone because it delineates a distinctive managerial and governmental epistemology by which organizational practices can be publicly known to both their participants and by distant others” (p. 162). The importance of auditability in public procurement organizations cannot be overstated, as it is essential to ensure public trust that taxpayer funds are spent in a manner that provides value; are used in compliance with applicable policy and regulations; and are protected against fraud, waste, and abuse. However, in order to “make things auditable,” organizations must establish an institutionally acceptable knowledge base and a system of processes and practices that supports auditability (Power, 1996).

Rendon and Rendon (2016) argue that auditability theory can be applied to support DoD’s contract management goals and objectives using the conceptual framework of the auditability triangle. The auditability triangle, as seen in Figure 1, portrays the relationship among three components of governance: competent personnel, effective internal controls, and capable processes (Rendon & Rendon, 2015, p. 715). In the following sections, each component of the auditability triangle will be discussed.

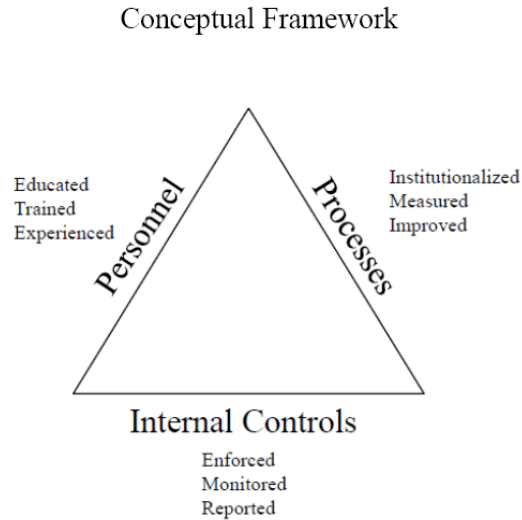


Figure 1. Auditability Triangle. Source: Rendon and Rendon (2015).

1. Competent Personnel

The “competent personnel” component of the auditability triangle refers to the education, training, and experience of acquisition personnel performing contract management duties. DoD supports the development of a competent acquisition workforce through statutory requirements such as the Defense Acquisition Workforce Improvement Act (DAWIA, 1990). DAWIA mandates DoD acquisition personnel meet core requirements for professional certification to include: possessing a baccalaureate degree in any field of study including or in addition to 24 credits in a business-related discipline, obtaining required functional training, and meeting experience requirements (DAU, 2019).

DAWIA was enacted into public law on November 5, 1990, in an effort to reform the acquisition workforce by establishing minimum education, training, and experience requirements commensurate with the complexity of the acquisition position held following a Packard Commission Report entitled: *A Formula for Action: A Report to the President on Defense Acquisition* (1986). The commission noted that acquisition personnel are undertrained and inexperienced compared to industry counterparts, while recognizing the complex and critical role of the acquisition career field. “Contract specialists must master the extensive, complex body of knowledge encompassing materials and operations management, contract law, cost analysis, negotiation techniques, and industrial marketing.

Yet, the Office of Personnel Management designates the Contract Specialist personnel series (GS 1102) as an administrative and not a professional series under Civil Service Title VIII” (1986, p. 29). The commission made recommendations for the enhancement of the professional status of the contract specialist and establishment of minimum training and education requirements for acquisition personnel.

Research relating to DAWIA’s impact on the competence of DoD’s acquisition workforce indicates the workforce is better trained. However, the demands of the ever-complex DoD acquisition environment necessitate adaptation of the requisite skill sets of acquisition personnel. “The result of the professionalization of the acquisition workforce has led to an acquisition workforce that is expert and specialized in their specific functional area yet careerist and insular” (Snider, 1996, p. 97). “As defense contracting continues to encounter problems in meeting cost, schedule and performance objectives, the defense acquisition system will continue to be reformed, and the defense contracting workforce will need to continue to reflect the changing knowledge, skills and abilities needed to manage defense acquisition program” (Rendon, 2010c, p. 21).

Most recently, the Section 809 Advisory Panel on Streamlining and Codifying Acquisition Regulations (2019) has made three recommendations to Congress on improving identified shortcomings in the current DoD acquisition workforce development model. The panel recommended creating a workforce development path which focuses on obtaining the necessary qualifications to perform, as opposed to attainment of DAWIA certifications. A workforce-focus on obtaining DAWIA certifications often leads to early attainment, resulting in acquisition personnel which are certified, but not necessarily qualified for full performance of duties. The panel also suggested identification of clear career paths for all acquisition personnel while supporting the development of skills necessary for progression along the career path. The final recommendation was encouragement of exchange programs with industry to facilitate a wide breadth of experience and knowledge. The panel concluded that, “addressing these shortcomings will ultimately lead to a workforce that is better equipped to navigate the global macro-business environment and embolden appropriate risk-taking skills” (p.5).

2. Effective Internal Controls

Rendon and Rendon (2016) describe the effective internal controls component of the auditability triangle as “referring to the objectives of enforcing internal control policies to ensure compliance with laws and regulations, monitoring procedures to assess enforcement and reporting any material weaknesses” (p. 754). The GAO’s *Standards for Internal Control in the Federal Government* (the “Green Book”) (GAO, 2014) defines internal control as “a process effected by an entity’s oversight body, management, and other personnel that provides reasonable assurance that the objectives of an entity will be achieved” (p. 5). The GAO further describes internal controls as “inclusive of the plans, methods, policies, and procedures an organization uses to conduct its core mission, safeguard its assets, and help managers achieve desired results through effective stewardship of resources” (GAO, 2014, p. 5).

The Committee on Sponsoring Organizations (COSO) of the Treadway Commission established the Internal Control Framework, updated in 2013, which defines internal control activities in five components. The GAO’s Green Book (GAO, 2014) “adapts these principles for a government environment” (p. 1) and provides a description of the five components of internal control as follows:

Control Environment—The foundation for an internal control system. It provides the discipline and structure to help an entity achieve its objectives.

Risk Assessment—Assesses the risks facing the entity as it seeks to achieve its objectives. This assessment provides the basis for developing appropriate risk responses.

Control Activities—The actions management establishes through policies and procedures to achieve objectives and respond to risks in the internal controls system, which includes the entity’s information system.

Information and Communication—The quality information management and personnel communicate and use to support the internal control system.

Monitoring—Activities management establishes and operates to assess the quality of performance over time and promptly resolve the findings of audits and other reviews. (pp. 7–8)

The COSO (2013) argues that, when integrated, these five components of internal controls provide the foundation for an effective internal control system. The GAO's Green Book (GAO, 2014) states that "the five components represent the highest level of the hierarchy of standards for internal control in the federal government" (p. 7). The GAO (2014) also contends that, while the establishment of effective "internal controls provides reasonable assurance the organization will have success meeting objectives, success is not guaranteed" (p. 5). Factors outside organizational control, such as a natural disaster, can have an adverse impact. Notwithstanding these factors, GAO (2014) recognized that the effectiveness of an internal control system is reliant on the personnel implementing the system throughout the organization. GAO's perspective highlights the importance of the previously discussed "competent personnel" component of the auditability triangle and the interrelated relationship each component has in supporting auditability. In the next section, the final component of the auditability triangle, capable processes, is discussed.

3. Capable Processes

"The capable process component of the auditability triangle reflects DoD contract management processes and related activities performed by the contracting workforce" (Rendon & Rendon, 2016, p. 754). Whereas the competent personnel component of the auditability triangle discussed DoD emphasis on the ability of the workforce to perform contracting tasks, the capable processes component focuses on increasing the contract management process capability of the organization (Rendon, 2010a).

Ahern, Clouse, and Turner (2001) define process capability as the "inherent ability of a process to produce planned results. As the capability of the process increases, it becomes predictable and measurable" (p. 4). "Effective contracts depend, to a great extent, on the processes used to create those contracts, [and], in order to award and successfully manage effective contracts, organizations must have mature contract management processes in place" (Garrett & Rendon, 2015, p. 80). Contract management process capability is "discussed in terms of contracting life cycle event (pre-award, award, and post award) [and] measured using different levels of maturity based upon the extent to which processes are institutionalized, integrated with other organizational processes, measured

and continuously improved” (Rendon & Rendon, 2016, p. 754). Nieto-Rodriguez and Evrard (2004) found that “a higher level of maturity will in most cases deliver superior performance in terms of project delivery and business benefits” (Rendon & Rendon, 2016, p. 11).

The importance of DoD’s contract management processes cannot be overstated as the outcome of those processes account for over two-thirds of all federal government spending (GAO, 2009). However, the GAO has consistently listed DoD contract management as high-risk since the 1990s. Thai (2004) and Rendon (2010a) observed that the high magnitude and high risk of DoD spending necessitates the importance of the DoD’s “contract management processes being well managed” (p. 2).

The DoD’s primary response to GAO’s high-risk rating of contract management has been addressing challenges related to its acquisition workforce, such as hiring, developing, and retention of competent personnel (GAO, 2019). However, the DoD lacks action plans to reduce the GAO’s high-risk rating that emphasize organizational contract management process capability. Although DoD efforts to reduce the high-risk rating of the contract management function by focusing on improving the competence of the acquisition workforce represent an important and necessary step, “competent organizations (in terms of process capability) are also necessary to ensure successful project results” (Rendon, 2016, p. 752). Rendon (2016) cited earlier works by Deming (1986) when he described the importance of emphasizing process capability as “85% of quality problems are related to processes, while only 15% of problems are controlled by individual workers” (p. 24). Deming’s percentages indicate that substantial opportunities to reduce the GAO’s high-risk rating of DoD’s contract management function exist through contract management process capability improvement initiatives.

Kelman (2001) noted that in contrast with the “traditional view of contracting as a subsidiary administrative function, [that within the federal government,] contracting management must be considered a core competency” (p. 16). Many organizations that have recognized the need to develop their contracting management process competencies have done so with the application of organizational process maturity models (Rendon, 2010b). Contract management maturity models will be discussed in detail in a later section;

however, “the true value of assessing an organization’s contract management process capability is realized when the results are used in developing a road map for implementing contract management process improvement initiatives” (Rendon, 2015, p. 1498).

As the literature described, mature processes drive successful business arrangements and positive outcomes for the acquisition organization. DoD opportunities to reduce the GAO’s high-risk rating of the contract management function through process improvement initiatives were also highlighted. The next section discusses Agency Theory, and the nature of government-contractor (principal-agent) relationships that occur in business and contractual arrangements. Agency Theory presents important insights into the principal-agent relationship for the acquisition professional to consider during the formation and administration of contracts.

C. AGENCY THEORY

Agency theory was founded upon economists’ research relating to risk sharing among individuals or groups during the 1960s and 1970s (Eisenhardt, 1989). Agency theory expanded this risk-sharing research to address the “so-called agency problem that occurs when cooperating parties have different goals and division of labor” (Eisenhardt, 1989, p. 58). Specifically, agency theory describes and provides insights into the nature of principal-agent relationships that occur in contractual arrangements.

A principal-agent relationship occurs when “one party (the principal) delegates work to another (the agent), who performs that work” (Eisenhardt, 1989, p. 58). “A contract between the government and a contractor reflects a principal-agent relationship” (Rendon, 2010, p. 4). Eisenhardt (1989) states that “agency theory is concerned with resolving two problems that can occur in agency relationships. The first is the agency problem that arises when (a) the goals or desires of the principal and agent conflict and (b) it is difficult or expensive for the principal to verify what the agent is actually doing” (p. 58). The second problem Eisenhardt describes “arises when the principal and agent have different attitudes toward risk” (p. 58). An agent with a perception of risk that differs from the principal may be influenced to pursue actions of self-interest that do not align with the objectives of the principal (Eisenhardt, 1989).

The government acting as the principal in an agency relationship has the objectives of “obtaining the product or service at the right quality, right quantity, right source, right time, and at the right price” (Lee & Dobler, 1971; Rendon, 2010a, p. 4). Additionally, the government has an objective to fulfill public policy and statutory requirements (Rendon, 2010a). Alternatively, the contractor while acting as the agent may pursue objectives of earning higher profits or increasing market share. “Because of the different and conflicting objectives between the principal and agent, each party is motivated and incentivized to behave in a certain manner, which includes either withholding or sharing information” (Rendon, 2010a, p. 4). In situations where the agent has more information, the principal may not be sure if the agent is acting in the principal’s best interest.

Rendon (2010a) characterized the relationship of agency theory to the contract management process when stating,

Agency theory is concerned with the conflicting goals between the principal and agent in obtaining their respective objectives and is focused on mechanisms related to obtaining information (for example, about the marketplace, the supply or service, or the contractor), selecting the agent (to counter the problem with adverse selection), and monitoring the agent’s performance (to counter the effects of moral hazard). Thus, how contracts are planned (for example, competitive or sole source), structured (fixed price or cost reimbursement, with or without incentives), awarded (based on lowest priced, technically acceptable offer, or the highest technically rated offer), and administered (centralized or decentralized, level and type of surveillance, and use of project teams...), has its basis in agency theory and the principal-agent problem. (p. 5)

Agency theory provides insight into the nature of the principal-agent problem and highlights how conflicting objectives and information asymmetry influence behaviors in contractual relationships. The contract management process “has its basis in agency theory” and, if appropriately structured, provides a method to counter the effects of adverse selection (where one party may have hidden information) and moral hazard (where one party has hidden behaviors) (Rendon, 2010a, p. 5). Ultimately, contract management processes are established to mitigate the potential for agent behaviors that do not align with the objectives of the principal. In the next section, contract management processes will be discussed in greater detail.

D. CONTRACT MANAGEMENT PROCESSES

DoD contracting has changed over the years from an administrative task to a critical function essential to the success of a program (Garrett & Rendon, 2005b). Contract management is “a strategic process integral to corporate strategy and directly contributing to the organization’s competitive advantage;” therefore, it is necessary to assess the various processes which encompass contract management (Garrett & Rendon, 2005b, p. 48). Furthermore, “in order to award and successfully manage effective contracts, organizations must have disciplined, capable, and mature contract management processes in place.” It is also important for organizations to have a firm understanding of the contract management process itself and the activities it contains.

1. The Contract Management Standard (CMS)

The National Contract Management Association (NCMA) created a framework known as the Contract Management Body of Knowledge (CMBOK) which contains a Contract Management Standard (CMS) for which the intent is to “define and standardize the term of ‘contract management’” (ncmahq.org, n.d.). The purpose of the CMS is to define the contract management function by the various processes it contains and how those processes work together (CMS, version 2.0, 2019). As seen in Figure 2, the CMS version 2.0 (2019) asserts that there are three phases to the life cycle of a contract: pre-award, award, and post-award. These phases are further delineated into five contract management “domains”: Develop Solicitation (in which Procurement Planning plays a role); Develop Offer; Form Contract; Manage Contract Performance; and Close Contract (CMS version 2.0, 2019). Each of these domains has subdomains with specific proficiencies and duties, which combined make up the contract management process (CMS version 2.0, 2019). The next section discusses the domains and subdomains in detail.

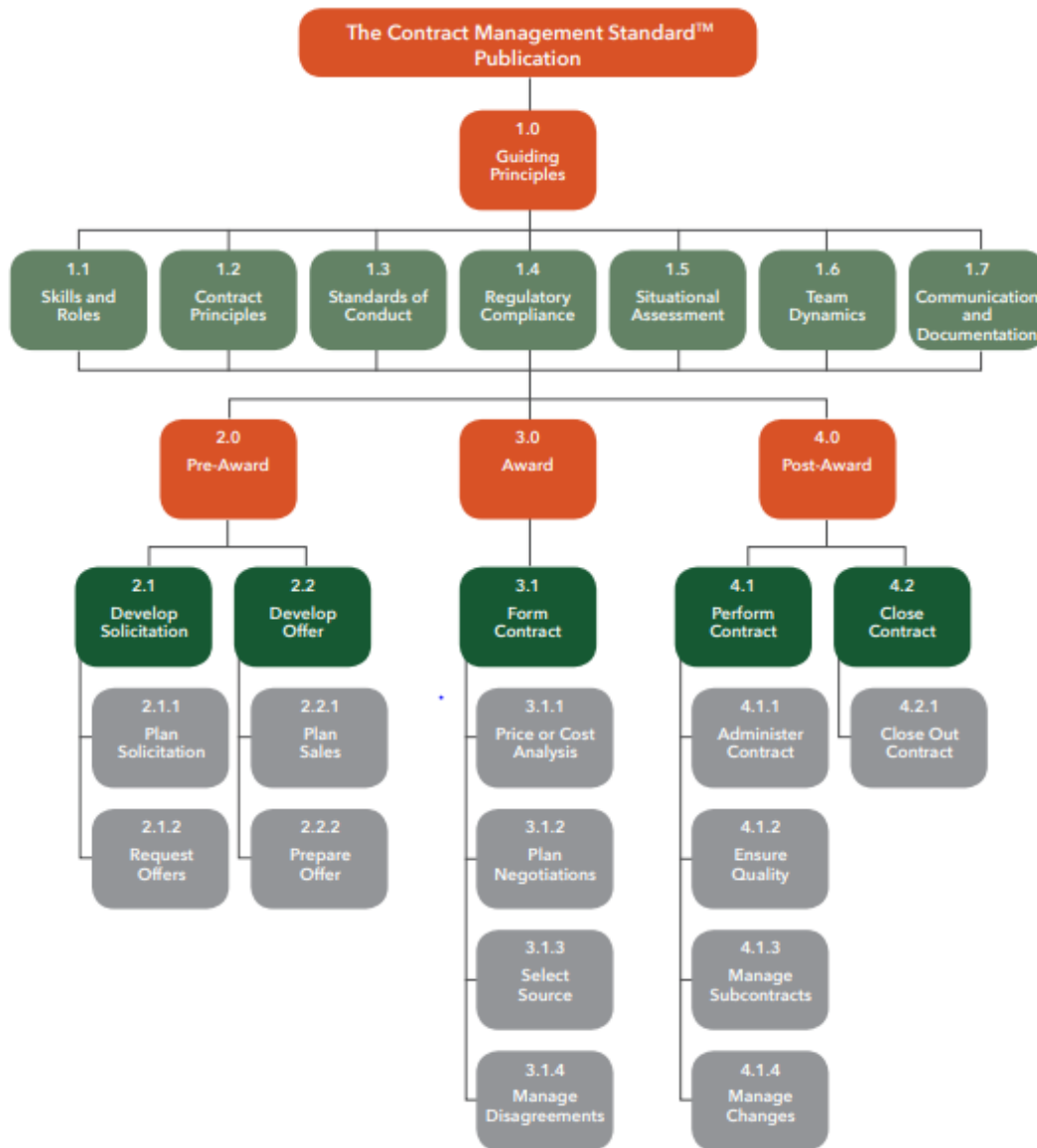


Figure 2. The Contract Management Standard.
Source: NCMA (2019).

2. Contract Management Domains: Pre-Award

Of the contract management domains, two occur in the pre-award phase of the contract life cycle (NCMA, 2019). Develop Solicitation consists of the contracting professional receiving the requirement and assisting the team in the creation of a complete strategy to fulfill the customer’s need, while Develop Offer focuses on the seller’s side and

consists of creating sales strategies and preparing an offer in response to a solicitation (NCMA, 2019).

a. *Develop Solicitation*

The development of the solicitation occurs after the team has performed adequate market research and decided upon a contracting strategy and consists of two sub-domains (NCMA, 2019).

(1) Plan Solicitation

Procurement planning helps to develop the contracting strategy and is one of the key process areas of the CMMM (which we will discuss in detail in the next section); however, CMS does not break this task out separately and instead includes it within solicitation development. According to the Contract Management Standard version 2.0, “the value added by [the solicitation] process is the accurate presentation of the customer requirement through a solicitation in order to create a viable contract that can be performed” (p. 9).

(2) Request Offers

The second subdomain is “request offers,” which consists of contract managers preparing solicitations in order to meet the customer’s need (NCMA, 2019). The value added by this process is the creation of detailed solicitations that fully explain the customers’ requirements and therefore allow the seller to provide a responsive proposal (NCMA, 2019).

b. *Develop Offer*

The development of the offer is the second domain of the pre-award phase and is primarily the responsibility of the seller (NCMA, 2019). It consists of two subdomains, which are Plan Sales and Prepare Offer.

(1) Plan Sales

Plan Sales is the process of developing a sound business strategy by assessing the marketplace and competition (NCMA, 2019). According to the CMS (NCMA, 2019), the value added by Plan Sales is the attention paid to a customer's short- and long-term goals and ensuring the organization provides a successful response to a solicitation.

(2) Prepare Offer

Prepare Offer is the execution of a company's business plan in order to successfully respond to a solicitation (NCMA, 2019). CMS (NCMA, 2019) asserts the value added by this task is exploiting a company's strengths in order to improve marketplace positioning by winning contracts.

3. Contract Management Domains: Award

The award phase of the contract life cycle consists of one contract management domain which is Form Contract. This is the phase where both the buyer and seller work together to award a contract.

a. Form Contract

According to the Contract Management Standard (NCMA, 2019), there are four subdomains which create the contract formation process. This process adds value by ensuring buyers select the best source to perform the contract and by working with the seller to negotiate contract terms and conditions (NCMA, 2019).

(1) Price or Cost Analysis

Determining price reasonableness consists of evaluating an offeror's proposed price without looking at detailed cost elements while determining cost reasonableness requires the evaluation of individual cost elements to make a determination of fair and reasonable (NCMA, 2019). The value added by these processes is the determination of cost reasonableness and realism in order to assist an organization in preparation for negotiations and also to reduce risk in contract performance (NCMA, 2019).

(2) Plan Negotiations

Plan Negotiations consists of the preparation to interact with offerors based on their responses to solicitations and may involve clarifying requirements and granting consideration to alternative approaches (NCMA, 2019). The value added is the assurance that the contractor and government both fully understand the requirements and the other party's position in order to find compromise (NCMA, 2019).

(3) Select Source

“Select Source is the process of analyzing submitted offers in accordance with the solicitation evaluation criteria to select the source that has the highest probability of satisfactory contract performance” (NCMA, 2019, p. 14). The value added to this process is to minimize risk to both contract performance as well as risk of a protest by providing transparency in the selection process (NCMA, 2019).

(4) Managing Disagreements

The final subdomain in the award phase is Managing Disagreements, which consists of resolving conflicts between buyers and actual or potential contractors (NCMA, 2019). According to the CMS version 2.0 (NCMA, 2019), the value added by this process is the ability to resolve conflicts using formal or informal means.

4. Contract Management Domains: Post-Award

Post-award is the final phase of the contract management life cycle and contains the domains of Perform Contract and Close Contract (NCMA, 2019). These domains contain the tasks of managing contract performance and contract close-out which together include all of the contract administration activities (NCMA, 2019).

a. Perform Contract

The Perform Contract domain consists of contract execution and managing the relationship with the contractor as well as managing contract changes (NCMA, 2019). The value added by this area is ensuring compliance with contract terms and conditions as well

as technical requirements and conducting post-award assessments (NCMA, 2019). This domain consists of four subdomains.

(1) Administer Contract

The tasks associated with Administer Contract are establishing open communications between the contractor and the contracting office and monitoring and documenting contractor performance (NCMA, 2019). The buying function is also responsible for confirming contractor compliance with contractual terms and conditions (NCMA, 2019). These tasks add value by increasing the likelihood of a successful contract by managing risk (NCMA, 2019).

(2) Ensure Quality

The tasks associated with this subdomain are planning for contract delivery as well as inspecting and accepting the goods or services (NCMA, 2019). These tasks add value by ensuring the deliverables meet the contract terms and requirements (NCMA, 2019).

(3) Manage Subcontracts

This subdomain involves the management of contractors who support the prime contract (NCMA, 2019). The value added by this activity is a point-of-contact responsible for subcontractor oversight and managing technical and financial performance (NCMA 2019).

(4) Manage Changes

Manage changes is the final subdomain under the Perform Contract domain and consists of initiating contract changes through negotiation and consideration and executing contract modifications (NCMA, 2019). According to the CMS version 2.0 (NCMA, 2019), this process adds value by allowing flexibility to the contract but also adheres to the terms and conditions of the basic contract.

b. Close Contract

The final domain of the post-award phase is Contract Closeout which is the responsibility of the both the buyer and seller (NCMA0, 2019). According to the CMS version 2.0 (NCMA, 2019), tasks associated with contract close-out are ensuring the requirements of the contract have been satisfied and settling any outstanding issues. Finally, reconciling the contract for final payment completes the process (NCMA, 2019). Close Contract consists of one subdomain.

(1) Close Out Contract

The tasks associated with this subdomain are ensuring that contract performance is complete, accomplishing final contractor evaluations, and ensuring final payment is complete and that the contract has been reconciled (NCMA, 2019). “The value added by this process is the completion, delivery, and acceptance of the contract requirement(s) in accordance with the contract terms and conditions” (NCMA, 2019, p. 19).

5. The Contract Management Body of Knowledge

As presented within this section, the Contract Management Standard provides the contracting professional a standardized definition of the processes that inform the field of contract management. The following discussion presents NCMA’s CMBOK as shown in Figure 3. The CMBOK incorporates the three phases of the contract management life cycle defined in the CMS and serves as a guide for the acquisition professional as it organizes the collective knowledge of the contract management profession and identifies the competencies necessary for successful contract management. As displayed in Figure 3, CMBOK consists of seven primary competencies which are delineated into 30 process competencies.



Figure 3. NCMA Contract Management Body of Knowledge Competency Chart. Source: NCMA (2017).

The leadership and management competencies “facilitate and fortify the integration of all other contract management competencies” (Winn & Rendon, 2017, p. 73). Leadership is essential to the success of an organization due to the motivational impact leaders have on the workforce to inspire them to embrace the organization’s mission and goals (Winn & Rendon, 2017). The leadership competency is comprised of competence,

character, collaboration, and vision, which tie directly to the management competency as effective managers must possess proficient leadership skills (NCMA, 2017).

The Management competency comprises all of the functional areas of an organization: business; finance; project; risk; and supply chain (NCMA, 2017). “The ‘Management’ competency includes the skills needed for the planning, organizing, directing, and controlling the resources, funds, equipment, and time to accomplish the organization’s goals” (Winn & Rendon, 2017, p. 73).

The Guiding Principles competency applies to all aspects of contract management and to the life cycle competencies--pre-award, award, and post-award (Winn & Rendon 2017). Furthermore, the Guiding Principles competency forms the foundation for NCMA’s Contract Management Standard. According to CMS version 2.0 (NCMA, 2019), “guiding principles for contract management are applicable throughout all phases of the contract life cycle in all contract management circumstances, irrespective of changes in priorities, strategies, requirements, or resources” (p. 4.)

The Pre-Award competency is the first phase of the contract life cycle, which was discussed in the previous section. The overarching proficiencies for pre-award are acquisition planning; requesting offers; business development; and develop a win strategy (NCMA, 2017).

The Award competency is the second phase of the contract life cycle and is referred to as “Form Contract” in the CMS framework. The competencies associated with forming the contract are cost or price analysis; conduct negotiations; source selection; manage legal conformity (NCMA, 2017).

The Post-Award competency is the final phase of the contract life cycle (NCMA, 2017). Per the CMS version 2.0 (NCMA, 2019), the activities that comprise this phase are contract administration and contract close-out. The high-level activities of the contract administration competency are administering contract performance, executing contract changes, and managing contract close-out (NCMA, 2019). The CMBOK chart further details the competencies associated with contract administration to include ensuring quality and subcontract management. Per the CMS version 2.0 (NCMA, 2019), contract close-out

is the domain of both the buyer and the seller. The competencies associated with close-out are: verifying all the requirements of the contract are satisfied; settling unresolved matters; and reconciling the contract to make final payment. These steps verify that the obligations of the contract have been met. The close-out phase also consists of verifying that: all performance has been accomplished; final payment has been made; and the contract has been reconciled. These steps ensure that the terms and conditions of the contract have been satisfied.

The Learn competency is the final proficiency of the CMBOK competency chart. “The dynamic nature of the contract management function demands that both contract managers and their organizations seek continuous improvement through continuous learning and the development of individual competence as well as organizational capability” (Winn & Rendon, 2017, p. 72). Furthermore, the learn competency emphasizes the improvement of individual workforce competencies, such as training and certifications, as well as organizational capabilities, such as the measuring of internal processes in order to implement improvements.

Organizations understand the value of the contract management process and how this process can impact their competitive advantage (Rendon, 2008.) But how do they know if their contract management processes are capable? In the next section, we will explore the measurement of contract management processes and how the data can be used to assess and improve process capabilities.

E. CONTRACT MANAGEMENT MATURITY MODEL

Performance measurement has been a focus of public organizations since at least the mid-2000s (Rendon, 2008). Organizations increasingly understand the need to measure critical functions in order to assess process capabilities and implement process improvements (Rendon 2008). The CMMM was developed in 2003 to assess the process capability and maturity of DoD organizations’ contract management functions (Rendon, 2010b). “In measuring an organization’s contract management process maturity, the CMMM focuses on key practice activities within each of the key process areas. These key practice activities reflect the tools, techniques, and proven best practices which leading

organizations use in their respective contract management processes” (Rendon, 2008, p. 10).

Process maturity, as it relates to the CMMM, is defined as the ability of an organization’s processes to consistently deliver successful results for both the buyer and seller (Garrett & Rendon, 2005b). Although the CMMM was developed to focus on both buyers’ and sellers’ processes, this research will focus only on the buyers’ side. Rendon (2008) states that, “the six key process areas and related practice activities allow the organization to focus on specific areas and activities involved in procurement” (p. 205).

1. Procurement Planning is “the process of identifying which business needs can be best met by procuring products or services outside the organization” (Garrett & Rendon, 2005b, p. 51).
2. “Solicitation Planning is the preparation of the documents needed to support the solicitation” (Rendon, 2008, p. 208). Identifying potential sources and documenting program requirements are tasks associated with this process area.
3. Solicitation is the advertising of requirements to prospective sellers in order to fulfill an organizational requirement (Rendon, 2008).
4. “Source selection is the process of receiving bids and proposals and applying evaluation criteria in order to select a provider” (Rendon, 2008 p. 208).
5. Contract administration is the process of monitoring contract performance and ensuring both parties are meeting contractual requirements (Rendon, 2008).
6. Contract Closeout is “the process of verifying that all administrative matters are concluded on a contract that is otherwise physically complete. This involves completing and settling the contract, including resolving any open items” (Rendon, 2008, p. 208).

Each of the key process areas contain specific activities that form the basis for the CMMM (Rendon, 2008). It is an organization’s implementation of best practices in each

of the key process activities which helps to assess the maturity of each key process area (Rendon, 2011).

Now that we have defined the six key CMMM process areas as well as the activities and competencies associated with each, we will discuss the maturity levels and their implications to the organization's contract management process. The CMMM contains five levels of maturity that apply to each of the six key process areas:

1. **Ad hoc:** An organization at this level acknowledges the existence of contract management processes and even understands the value of using them (Rendon, 2008). Additionally, organization-wide processes do not exist, but the organization does use some processes, albeit on a sporadic basis. Furthermore, the processes are only informally documented, and there is no set method for using them. Finally, contracting employees are not held responsible for complying with contract management processes (Rendon, 2008).
2. **Basic:** "Organizations at this level of maturity have established some basic contract management processes and standards within the organization, but these processes are required only on selected complex, critical, or high-visibility contracts" (Rendon, 2008, p. 206). While some official documentation exists for the process requirements, personnel do not consider the process established throughout the entire organization, and the organization does not require the consistent use of the process (Rendon, 2008).
3. **Structured:** "At this level of maturity, contract management processes and standards are fully established, institutionalized, and mandated throughout the entire organization" (Rendon, 2008, p. 206). In addition, "formal documentation has been developed for these contract management processes and standards, and some processes may even be automated." Since the processes are established, tailoring of documents is allowed based on the complexity of the contract action (Rendon, 2008). "Senior organizational

management is involved in providing guidance, direction, and even approval of key contracting strategy, decisions, related contract terms and conditions, and contract management documents” (Rendon, 2008, p. 206).

- 4. Integrated:** “Organizations at this level of maturity have contract management processes which are fully integrated with other organizational core processes such as financial management, schedule management, performance management, and systems engineering” (Rendon, 2008, pp. 206–207). Furthermore, both members from other functional organizations as well as end-users play essential roles on the contracts team. Finally, senior management regularly uses metrics to assess various contract management processes and for decision-making within the contracting function (Rendon, 2008).
- 5. Optimized:** At this maturity level, organizations “systematically uses performance metrics to measure the quality and evaluate the efficiency and effectiveness of the contract management processes” (Rendon, 2008, p. 207). In addition, continuous process initiatives are implemented to improve contract management processes, and best practices and lessons learned are in place to continually improve contracting documentation and processes. “Finally, contract management process streamlining initiatives are implemented by the organization as part of its continuous process improvement program” (Rendon, 2008, p. 207).

The five maturity levels provide a visual representation of an organization’s contract management process capability and effectiveness (Rendon, 2008). They are an important component of the CMMM which helps an organization understand the strengths and weaknesses of its critical processes (Rendon, 2008).

“The best practices of contract management key process areas are categorized by the following [Process Enablers]: Process Strength, Successful Outcomes, Management Support, Process Integration, and Process Measurement” (Rendon, 2011, p. 10). Each CMMM item relates to one of these process enablers (Rendon, 2011). In addition, analysis

of CMMM assessment results will discuss each process maturity level for each key process area as well as process enablers.

F. SUMMARY

In this chapter, we reviewed the literature associated with contract management theories and processes. We began with a review of auditability theory and the relationships among its three aspects: competent personnel, effective internal controls, and capable processes. We then discussed agency theory, which describes the principal-agent relationship problems such as adverse selection and moral hazard. We then moved on to a discussion of literature pertaining to contract management processes and specifically discussed NCMA's Contract Management Body of Knowledge (CMBOK) and the Contract Management Standard (CMS) embedded within the CMBOK and how it provides guidelines for both buyers and sellers. Finally, we discussed the CMMM with its six key process areas and the activities of which it is comprised as well as the five maturity levels and the organizational implications of each. Now we will provide a detailed portrayal of the AFNWC whose contracting personnel provided the data for our research.

III. AIR FORCE NUCLEAR WEAPONS CENTER

A. INTRODUCTION

This chapter introduces the Air Force Nuclear Weapons Center, which is the nucleus of this study and our research. In this chapter, we will discuss the organizational structure of the Air Force Nuclear Weapons Center, its mission, and its strategic goals. We will examine the structure of AFNWC support organizations and provide contracting data for the AFNWC/PK-PZ organizations where the survey study was deployed.

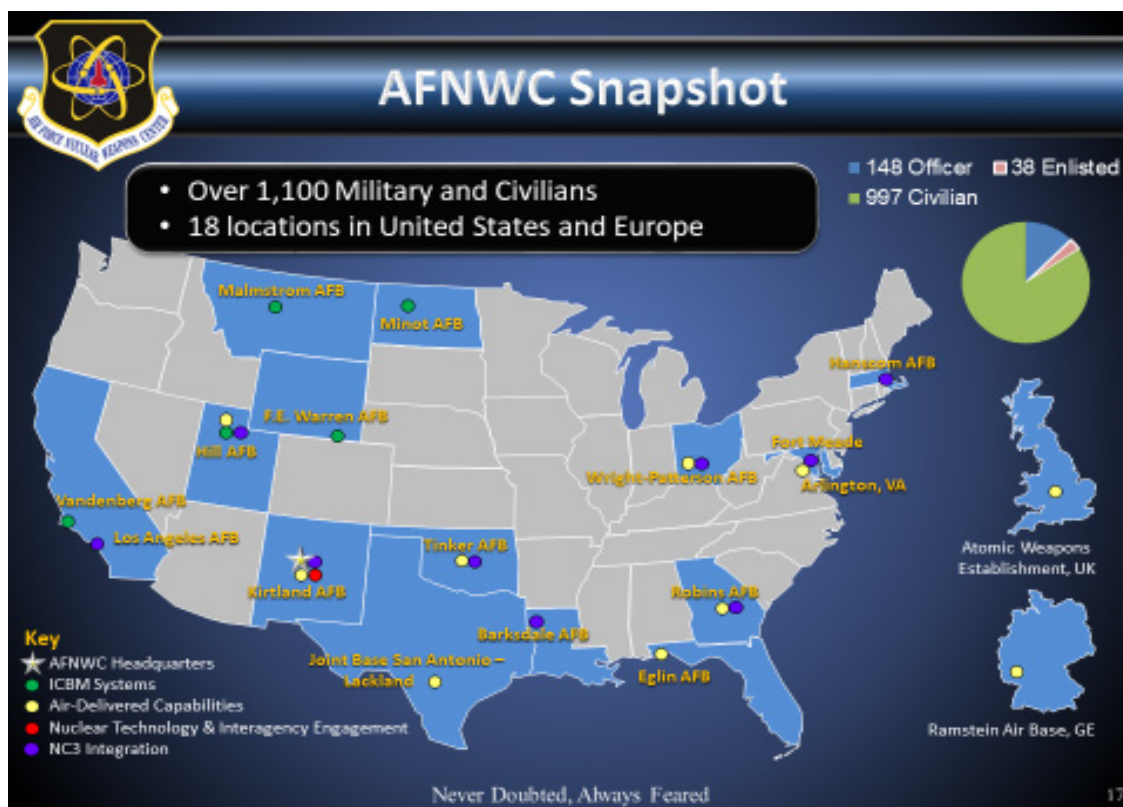


Figure 4. AFNWC Snapshot. Source: Lt. Col. R. Smith, email to author (21 May 2019).

B. AFNWC OVERVIEW

The Air Force Nuclear Weapons Center (AFNWC), created March 31, 2006, is the directorate within Air Force Materiel Command (AFMC) that presides over all aspects of

nuclear materiel management, supporting the AFMC commander and Air Force Global Strike Command (AFGSC) (DAF, 2019). AFNWC is also assigned Air Force responsibility to coordinate interagency (Department of Energy/National Nuclear Security Administration) efforts to sustain and extend the life of nuclear warheads and bombs for the Air Delivered and Intercontinental Ballistic Missile (ICBM) legs of the United States Strategic Triad. Headquarters for AFNWC is Kirtland Air Force Base, New Mexico, (Department of the Air Force [DAF], (2016). The center locations as shown in Figure 4 employ approximately 1,100 civilian and military and are assigned through 18 locations worldwide.

AFNWC's mission is to "deliver nuclear capabilities warfighters use every day to deter and assure" (Department of the Air Force [DAF], 2015). AFNWC's strategic goals include "sustaining nuclear surety across AFMC's nuclear enterprise" (DAF, 2015) to be the leader in engagement and advocacy for the nuclear enterprise, and to deliver to the warfighter mission-ready weapons. "The center is responsible for the entire scope of the nuclear weapons [spares, repairs, sustainment, and] support for two-thirds of the Nuclear Triad" (DAF, 2015).



Figure 5. AFNWC Organization. Source: J. H. Founds, email to author (16 April 2019).

C. AFNWC ORGANIZATIONAL STRUCTURE

AFNWC is a subordinate unit within the Air Force Materiel Command (AFMC), which consolidated into a five-center construct model including the Air Force Life Cycle Management Center (AFLCMC), the Air Force Sustainment Center (AFSC), the Air Force Test Center (AFTC), Air Force Nuclear Weapons Center (AFNWC) and the Air Force Research Lab (AFRL) (Department of the Air Force [DAF], 2013). The five-center structure allowed AFMC to trim its authority and centralize related functions such as organizing, training, and equipping by placing them under one commander (RAND, 2013). AFNWC Organizational Structure as shown in Figure 5 includes four major execution directorates: NC3 Integration Directorate (AFNWC/NC), Air Delivered Capabilities Directorate (AFNWC/ND), the ICBM Systems Directorate (AFNWC/NI), and the Nuclear Technology and Interagency Directorate (AFNWC/NT) (DAF, 2019).

1. NC3 Integration Directorate and PEO for NC3 Systems (AFNWC/NC)

The Nuclear Command, Control and Communications Integration Directorate “advises AFSC on the NC3 Weapon System’s technical architecture” and is instrumental in making key decisions concerning investment and modernization (DAF, 2019).

2. Air Delivered Capabilities Directorate (AFNWC/ND)

The Air Delivered Capabilities Directorate supports product managers for nuclear matters within each of the B-2, B-21, B-52, F-15, F-16, and F-35 program offices and also provides authorized test systems and support equipment. The directorate responsibilities include “delivering, sustaining and supporting air-delivered nuclear weapon systems for our warfighters to secure the future of our nation and protect our allies every day” (DAF, 2019).

3. Intercontinental Ballistic Missile (ICBM) Systems Directorate (AFNWC/NI)

The ICBM Systems Directorate (NI) is located at Hill AFB, UT. Its workforce includes about 70 active-duty military and approximately 400 federal civilians who are responsible for the integration of weapons system management of the Minuteman III (LGM-30) and Ground Based Strategic Deterrent (GBSD) (DAF, 2019). The ICBM Directorate is the face that the customer sees and “is responsible for \$7 billion in Future Year Defense Program” spending supporting the nations silo-based ICBM fleet (DAF, 2012). They handle procurement of spares, equipment modification and replacement, provide storage and transportation to maintain and sustain the aging silo-based ICBM system. (DAF, 2019).

4. Nuclear Technology and Interagency Directorate (AFNWC/NT)

Nuclear Technology and Interagency Directorate is responsible for “providing intelligence support to AFNWC, analyzing the full spectrum of weapons effects to support acquisition programs and inform tactics and procedures, and assessing current and future nuclear systems to identify and mitigate potential vulnerabilities” (DAF, 2019).



AFNWC/PZ Org Structure & Manning Summary

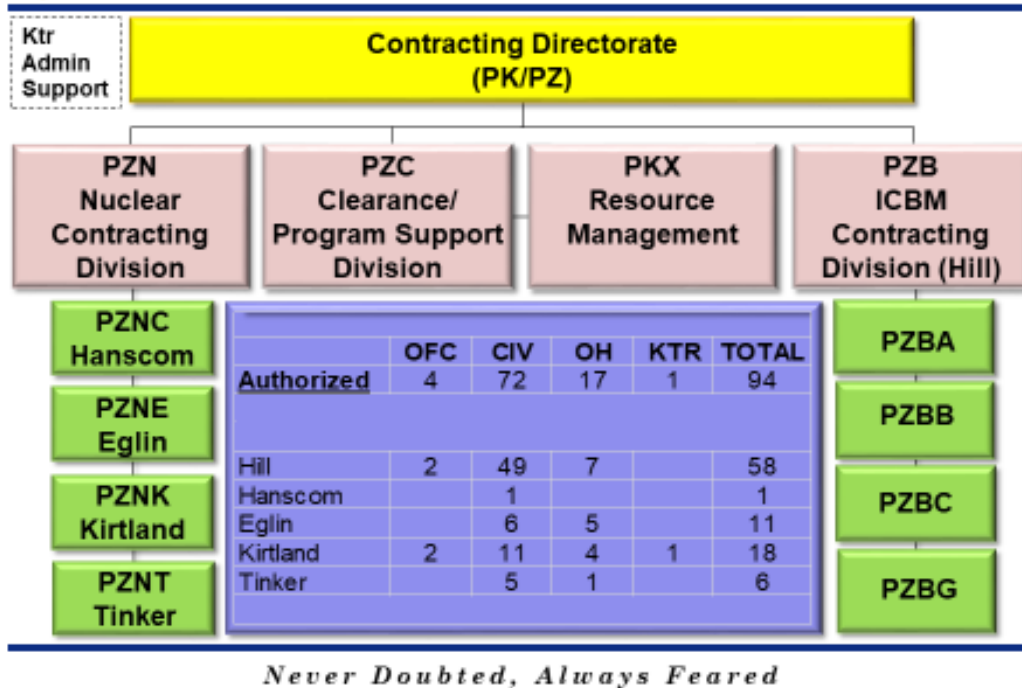


Figure 6. AFNWC/PZ Organizational Structure. Source: Lt. Col. R. Smith, email to author (21 May 2019).

D. AFNWC/PK-PZ CONTRACTING DIRECTORATE

Figure 6 displays the organizational structure and a manning summary for the Contracting Directorate that supports the AFNWC/NI and its mission.

1. PZN—Nuclear Contracting Division

Mission: Execute agile and responsive business solutions to acquire, sustain, modernize and retire Air-Delivered nuclear capabilities for our Nuclear Enterprise and the Warfighter’s needs (D. Stark, email to author, 23 May 2019).

- **PZNC**—Hanscom AFB located in MA, is a start-up function and postured to become a separate division, systems and sustainment support for the Nuclear Command, Control, Communication (C3) enterprise.

- **PZNE**—Eglin AFB, located in FL, provides systems and sustainment support for the B52 Bomber and Long Range Stand Off (LRSO) Cruise Missile platforms.
- **PZNK**—Kirtland AFB, located in NM, provides systems and sustainment support for Nuclear Technology and Integration Directorate (NT) and the Air Delivered Capabilities Directorate (ND) interests.
- **PZNT**—Tinker AFB, located in OK, provides systems and Sustainment support for the Air Launched Cruise Missile (ALCM) platform.

2. PZC - Clearance/Program Support Division

This contracting support division ensures effective, timely review of contract actions and pricing support. The division ensures that competition and ombudsman policies and goals are met and serves as an expert business advisor by providing accurate guidance on contract policy on all acquisitions which require SCO approval.

3. PKX—Resource Management

As part of PZC, Resource Management ensures the use of effective resource management on behalf of the PZ Director to include budget, staffing positions, and workforce management topics.

4. PZB—ICBM Contracting Division (Hill)

PZB is the contracting division for AFNWC/NI ICBM and includes 57 1102- coded employees (contracting job series) of which 23 are DAWIA level II-certified and 34 are DAWIA level III-certified. They are responsible for the contracting support for acquisition, modernization, and sustainment of the currently deployed Minuteman III workforce. The division utilizes a mixture of contract vehicles from small-dollar commercial Firm Fixed Price contracts to large-dollar cost-type source selections, as well as Broad Area Agency announcements, which result in major research and development source selections and award. This directorate currently delivers on budget execution of 33 official programs valued at approximately \$22 billion (Department of the Air Force [DAF], 2012). For the

first quarter of FY 2019, the AFNWC's obligation total was over \$398M on approximately 90 contract actions (D. Stark, email to author, 23 May 2019).

Another major weapons system program being handled by AFNWC/PZB is the Ground Based Strategic Deterrent (GBSD). This program is one of the mainstays of the Pentagon's efforts to update and streamline the U.S. nuclear forces by developing and procuring the next-generation ICBM. As with the aforementioned programs, this major program is strategic to national defense, and it is therefore important to have educated, well-trained contracting professionals as well as a benchmark for contract management processes. As a member of the AFNWC contracting workforce, one of the benefits of this study will be recommendations for improvement to current processes. The assessment of the current state of contract management process maturity will focus on existing processes within the AFNWC. Mature processes can increase capability and escalate the return on investment in the acquisition operation.

E. SUMMARY

This chapter introduced the AFNWC, including its mission and strategic goals. The chapter then outlined the basic organizational structure of the AFNWC as a subordinate unit of AFMC and gave an overview of the branches within the directorate. Finally, we presented a discussion of the PK/PZ contracting directorate and the various divisions which support the major nuclear weapons systems and their respective roles. The next chapter will discuss the AFNWC's CMMM assessment results, offer an overview of current metrics used at the AFNWC, and provide recommendations to improve the maturity levels for each key process area.

THIS PAGE INTENTIONALLY LEFT BLANK

IV. CMMM ASSESSMENT RESULTS AND PROCESS IMPROVEMENT RECOMMENDATIONS

A. INTRODUCTION

This chapter presents the results of the Contract Management Maturity Model (CMMM) assessment administered at Air Force Nuclear Weapons Center at Hill AFB, UT and Kirtland AFB, NM. We offer analysis of our evaluation of each contract management key process area as it relates to the organization's assessment results. Using the assessment results derived from the surveys, we assign a maturity level to decide the overall contract management process maturity level for the center. We then present our analysis of AFNWC metrics and examine associations to the CMMM assessment results. Finally, we present recommendations to AFNWC on how to improve contracting process capability.

B. SELECTION OF STUDY PARTICIPANTS

The CMMM is created to assess the process capability of the contract management function and to furnish a benchmark of an organization's contract management process maturity (Garrett & Rendon, 2005a). To conduct our survey, we chose AFNWC contracting personnel who are DAWIA levels II and III certified and who directly execute procurement processes, i.e., contracts specialists and contracting officers. We strategically surveyed contracting employees with these certification levels to determine the current state of the AFNWC's contract management process capability as these personnel have the education, training, and experience necessary to competently administer all aspects of the contract management process. All DoD contracting professionals are required to have a baccalaureate degree as well as to have completed at least 24 semester credit hours in a business discipline (DAU, 2019). Selecting a focused group of survey participants helps to exclude bias and builds legitimacy into the data. As evidenced by course completion and certification attainment, DAWIA-certified levels II and III personnel possess the requisite contracting expertise to successfully administer all contracting activities throughout the contract management process.

C. ADMINISTRATION OF CMMM SURVEY

The CMMM survey was administered in October 2018 by the Deputy Director of Contracting for the AFNWC. He sent the survey electronically via email to all DAWIA-certified levels II and III qualified personnel, and it remained open for 15 days. The survey participants were asked to voluntarily provide responses to a 62-question survey using a five-point Likert Scale to assign a contract management process capability to each key process area. When the survey period concluded, we analyzed the responses in order to determine the maturity level for each key process area. The average scores for each question in each process area were totaled to calculate a key process area total. The aggregate scores were then converted based on a ten-question and eleven-question scale to determine the process maturity level. Figure 7 displays the demographics of the AFNWC contracting community DAWIA levels II and III, including their years of experience and whether they have warrants.

Total Eligible	Completed Responses	Warranted	DAWIA Level II	DAWIA Level III	Years of Experience
90	37	31	12	25	<3 = 3 4-8 = 7 9-13 = 9 14-18 = 11 19 or more = 7

Figure 7. AFNWC Survey Respondent Demographics

D. MATURITY LEVEL ANALYSIS

There were approximately 90 eligible survey participants, and we received 37 completed surveys, which represents a 41% response rate. In this section, we will present the responses for the contract management key process areas as well as the corresponding results for the organizational process maturity assessment. We will then discuss the process enablers for each key process area. “The survey items are related to the organization’s use of specific contract management best practices within each key process area. Each survey item is associated with a specific process capability enabler related to Process Strength,

Process Results, Management Support, Process Integration, and Process Measurement” (Rendon, 2015, p. 1488).

Figure 8 illustrates the mean and standard deviation for each survey question in each key process area of the CMMM as well as a total mean for each key process area. The mean total for each key process area determines its level of process maturity, which is discussed in Figure 9.

Process Area	Key Process Area/Item Number/Description	Mean	SD	n
	Procurement Planning			
Procurement Planning	1.1 Process Strength	4.4	0.83	37
	1.2 Process Strength	3.7	1.39	37
	1.3 Process Strength	3.8	1.16	37
	1.4 Process Results	3.8	1.20	37
	1.5 Management Support	4.5	0.65	37
	1.6 Process Integration	4.4	0.75	37
	1.7 Process Integration	4.1	0.88	37
	1.8 Process Integration	4.2	1.04	37
	1.9 Process Measurement	3.2	1.50	37
	1.10 Process Measurement	3.9	1.13	37
	Total	39.8		
	Solicitation Planning			
Solicitation Planning	2.1 Process Strength	4.1	0.98	37
	2.2 Process Strength	3.9	1.16	37
	2.3 Process Strength	4.1	1.06	37
	2.4 Process Results	4.2	0.76	37
	2.5 Management Support	4.2	0.94	37
	2.6 Process Integration	4.3	0.96	37
	2.7 Process Integration	4.1	1.05	37
	2.8 Management Support	4.1	0.74	37
	2.9 Process Measurement	3.0	1.72	37
	2.10 Process Measurement	3.9	1.09	37
	Total	39.9		
	Solicitation			
Solicitation	3.1 Process Strength	4.2	0.92	37
	3.2 Process Strength	3.6	1.48	37
	3.3 Process Strength	3.7	1.30	37
	3.4 Process Results	4.2	0.62	37
	3.5 Management Support	4.2	0.98	37
	3.6 Process Integration	4.2	0.82	37
	3.7 Process Integration	4.1	0.92	37
	3.8 Process Integration	4.0	1.04	37

Process Area	Key Process Area/Item Number/Description	Mean	SD	n
	3.9 Process Measurement	3.1	1.70	37
	3.10 Process Measurement	3.9	1.13	37
	Total	39.4		
	Source Selection			
Source Selection	4.1 Process Strength	4.1	1.27	37
	4.2 Process Strength	3.7	1.65	37
	4.3 Process Strength	3.9	1.51	37
	4.4 Process Results	4.2	1.24	37
	4.5 Management Support	4.2	1.30	37
	4.6 Process Results	3.9	1.33	37
	4.7 Process Results	4.1	1.26	37
	4.8 Process Integration	4.4	1.21	37
	4.9 Process Integration	4.1	1.32	37
	4.10 Process Measurement	3.0	1.86	37
	4.11 Process Measurement	3.7	1.41	37
	Total	43.2		
	Contract Administration			
Contract Administration	5.1 Process Strength	4.0	1.08	37
	5.2 Process Strength	3.6	1.49	37
	5.3 Process Strength	3.8	1.31	37
	5.4 Process Results	3.9	0.98	37
	5.5 Management Support	3.8	1.30	37
	5.6 Process Integration	3.9	1.29	37
	5.7 Process Integration	3.6	1.56	37
	5.8 Process Integration	3.6	1.62	37
	5.9 Process Integration	3.7	1.56	37
	5.10 Process Measurement	2.8	1.79	37
	5.11 Process Measurement	3.6	1.38	37
	Total	40.5		
	Contract Closeout			
Contract Closeout	6.1 Process Strength	3.7	1.47	37
	6.2 Process Strength	3.6	1.64	37
	6.3 Process Strength	3.7	1.52	37
	6.4 Process Results	3.7	1.70	37
	6.5 Management Support	3.2	1.65	37
	6.6 Process Integration	3.2	1.72	37
	6.7 Process Integration	3.2	1.80	37
	6.8 Process Measurement	2.5	1.92	37
	6.9 Process Measurement	2.8	1.89	37
	6.10 Process Measurement	2.6	1.82	37
	Total	32.2		

Figure 8. AFNWC Survey Results

CONTRACT MANAGEMENT MATURITY MODEL©						
MATURITY LEVEL	PROCUREMENT PLANNING	SOLICITATION PLANNING	SOLICITATION	SOURCE SELECTION	CONTRACT ADMIN	CONTRACT CLOSEOUT
5 OPTIMIZED						
4 INTEGRATED						
3 STRUCTURED	★	★	★	★		
2 BASIC					★	★
1 AD HOC						

AFNWC *n* = 37

Figure 9. AFNWC CMMM Summary Chart

Figure 9 depicts the process maturity levels for each of the six key process areas in the CMMM, which are discussed in detail below.

1. Pre-Award Processes: Procurement Planning, Solicitation Planning, Solicitation, Source Selection

Based on our analysis of survey responses, AFNWC key process areas of Procurement Planning, Solicitation Planning, Solicitation, and Source Selection were rated at the Structured maturity level, which is level three. A structured process maturity level indicates a “well-established and institutionalized [process capability]” (Rendon, 2010b p. 39). Furthermore, at a level three structured process capability, “contract management processes and standards are fully established, institutionalized, and mandated throughout the entire organization” (p.14). However, at this level, processes are not integrated with other functional areas, and end-users do not play essential roles on the contracts team (Rendon, 2010b). Senior management does not regularly use metrics to assess various

contract management processes and for decision-making within the contracting function (Rendon, 2008).

Activities related to Procurement Planning, Solicitation Planning, Solicitation, and Source Selection include: determining and defining the requirements; determining proposal evaluation criteria; advertising the procurement opportunity; and conducting negotiations with suppliers (NCMA, 2019). With the formalized processes, the AFNWC uses some process automation, and contract managers have latitude to customize and tailor the documents to meet the needs of their procurements (Rendon, 2010b). Examples include tailoring documents for differing contract types, dollar thresholds or whether the procurement is for a supply or service (Rendon, 2010b). AFNWC senior organizational management takes an active approach in these contract management process areas and provides guidance and approval of contracting strategies and contract documents (Rendon, 2010b).

2. Post-Award Processes: Contract Administration and Contract Closeout

We assessed AFNWC Contract Administration and Contract Closeout as Basic, level two, based on our analysis of survey responses. At the Basic process maturity level, the AFNWC organization utilizes some contract management processes, but they “[do] not consider these contract management processes or standards established or institutionalized throughout the entire organization” (Rendon, 2010b, p. 13). The processes may be required only on high-dollar or contracts receiving senior management oversight (Rendon, 2010b). Although some contract management process documents may be formalized, “there is no organizational policy requiring the consistent use of these contract management processes and standards other than on the required contracts” (Rendon, 2010b, p. 14). Activities related to Contract Administration and Contract Closeout include measuring contractor performance and negotiating and processing final contractor payments (NCMA, 2019).

Figure 10 illustrates a summary of the means derived from the responses of each item on the 62-question survey. We will go into further detail on each of the six key process areas, but it is evident from the benchmark results, as well as from the previous discussion

of the maturity levels, that the pre-award key process areas of Procurement Planning, Solicitation Planning, Solicitation, and Source Selection received higher scores than the post-award key process areas of contract administration and contract closeout.

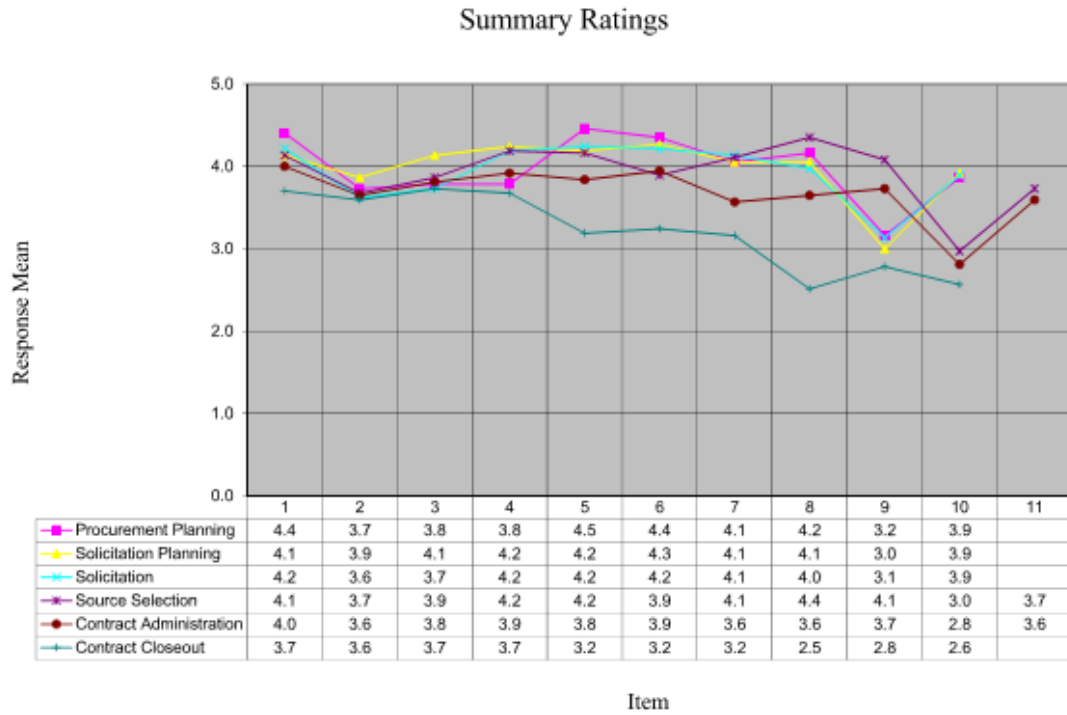


Figure 10. Summary Ratings of CMMM Six Key Process Areas

E. KEY PROCESS AREA ANALYSIS

To follow is a detailed analysis of the process maturity level of each key process area.

1. Procurement Planning

Figure 11 depicts the average response scores for the 10 questions related to the Procurement Planning key process area. Although we assigned a Structured maturity (Level 3) to Procurement Planning, it is evident from the chart that questions two through four and question nine scored lower than the others. Questions two through four relate to whether the organization has a standardized and well-documented procurement planning process and whether it leads to an acquisition plan that presents a roadmap for the

procurement (Rendon, 2015). Question nine relates to the application of “efficiency and effectiveness metrics” in evaluating the procurement planning process, and it is apparent this is not something the AFNWC organization does on a consistent basis if at all (Rendon, 2010b, p. 35).

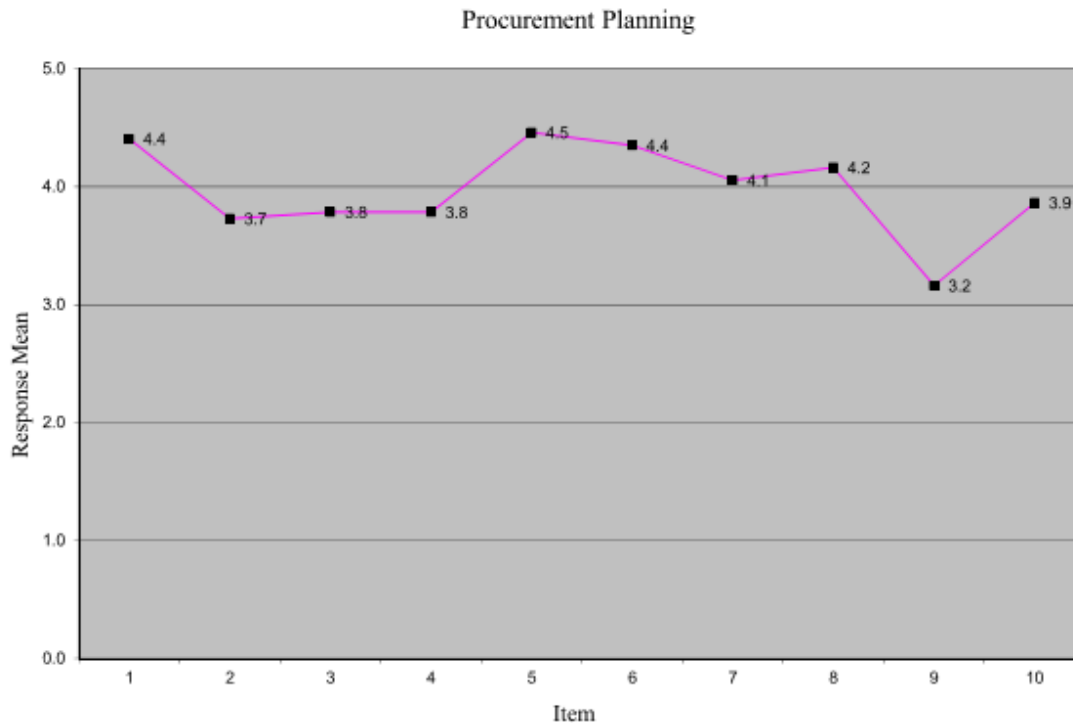


Figure 11. Procurement Planning Summary Chart

2. Solicitation Planning

Figure 12 illustrates the average response scores for the Solicitation Planning key process area. We also assigned a Structured maturity (Level 3) to this process area, but, similar to Procurement Planning, questions two and nine scored lower than the other questions. Once again, it is evident that within the AFNWC, while at a Structured level it possesses standardized processes, senior leadership does not require the consistent use of the process for Solicitation Planning nor does the organization consistently use efficiency or effectiveness metrics to evaluate the solicitation planning process.

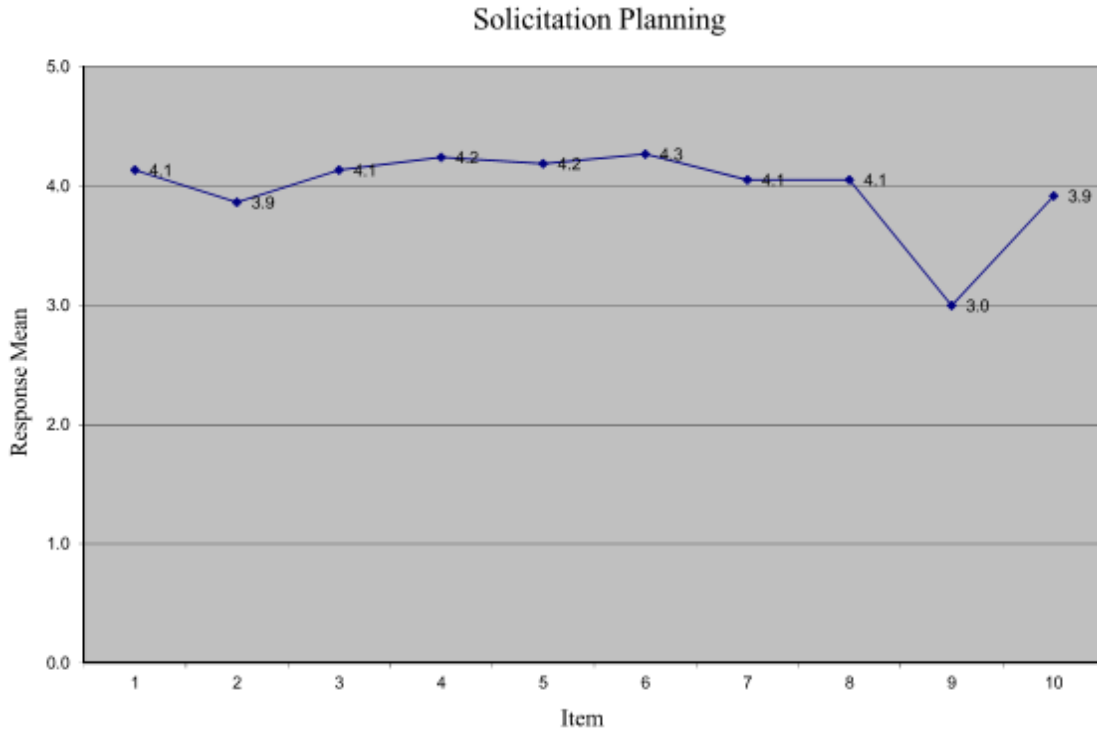


Figure 12. Solicitation Planning Summary Chart

3. Solicitation

Figure 13 illustrates the average response scores for the Solicitation key process area. Once again, we assigned a Structured maturity (Level 3) to this process area, but, similar to Procurement Planning and Solicitation Planning, questions two, three and nine scored lower than the other questions. This tells us that the AFNWC does not consistently use a standardized, well-documented solicitation process, and the organization does not consistently use efficiency or effectiveness metrics to evaluate the solicitation process.

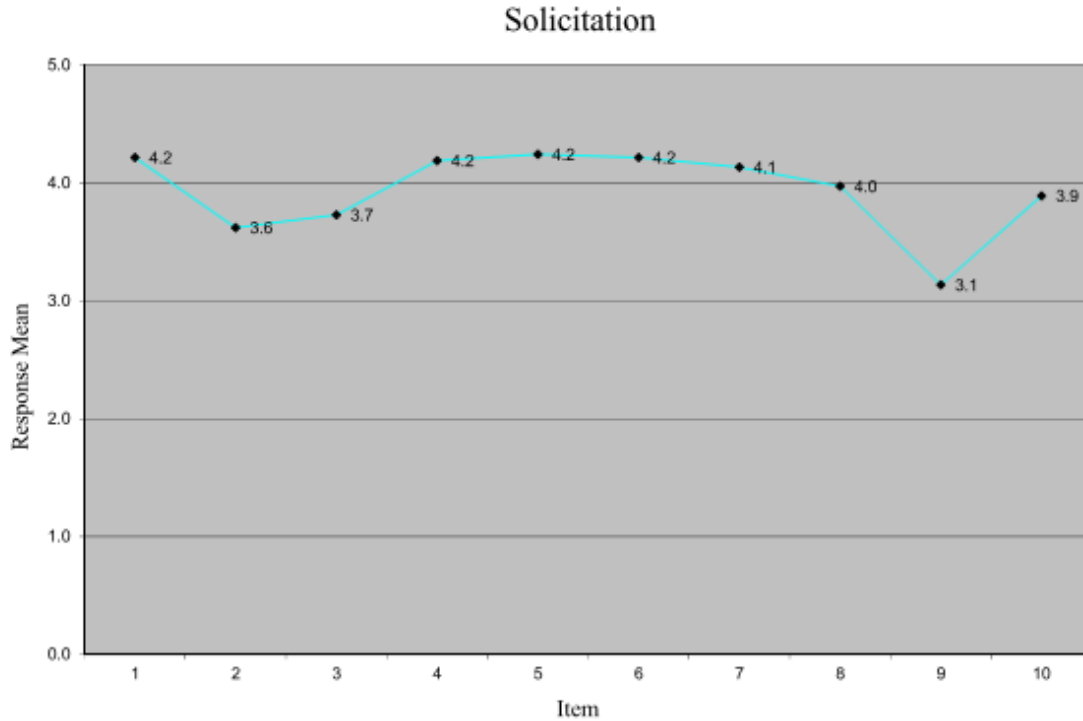


Figure 13. Solicitation Summary Chart

4. Source Selection

Figure 14 illustrates the average response scores for the 11 questions related to the Source Selection key process area. We also assigned a Structured maturity (Level 3) to this process area, but it is apparent from the chart, that several questions received lower scores than in previous process areas. Questions two and three relate to standardized, well-documented processes for Source Selection, and the lower scores tell us that the AFNWC does not have standardized processes in place for this process. Question six relates to the comparison of proposal prices to Independent Government Estimates (IGEs) (Rendon, 2015). In this case, the lower score tells us that the organization does not consistently use IGE's to determine price reasonableness. For this process area, question ten has the lowest score, but it is equivalent to question nine on the previous charts and relates to whether the AFNWC organization uses efficiency or effectiveness metrics to evaluate the source selection process (Rendon, 2015).

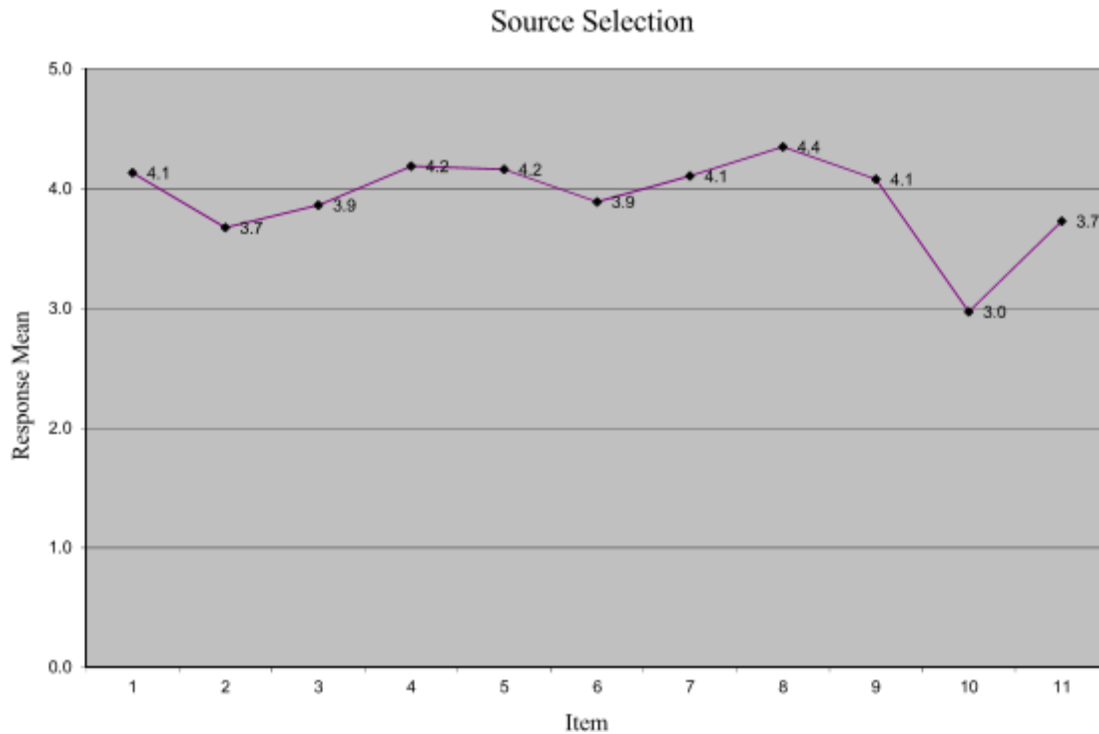


Figure 14. Source Selection Summary Chart

5. Contract Administration

Figure 15 illustrates the average response scores for the 10 questions related to the Contract Administration key process area. We assigned a Basic maturity (Level 2) to this process area. Although the scores are lower overall than the four previous key process areas, there is still a trend evident on questions two and three in particular. As with the previous key process areas, questions two and three relate to whether the AFNWC is using standardized, well-documented processes for contract administration. The lower scores tell us that the organization does not consistently use standardized processes. As with the Source Selection process area, question ten relates to whether the AFNWC organization uses efficiency or effectiveness metrics to evaluate the contract management process. The low score indicates that the AFNWC is not consistently utilizing metrics to assess this Contract Administration.

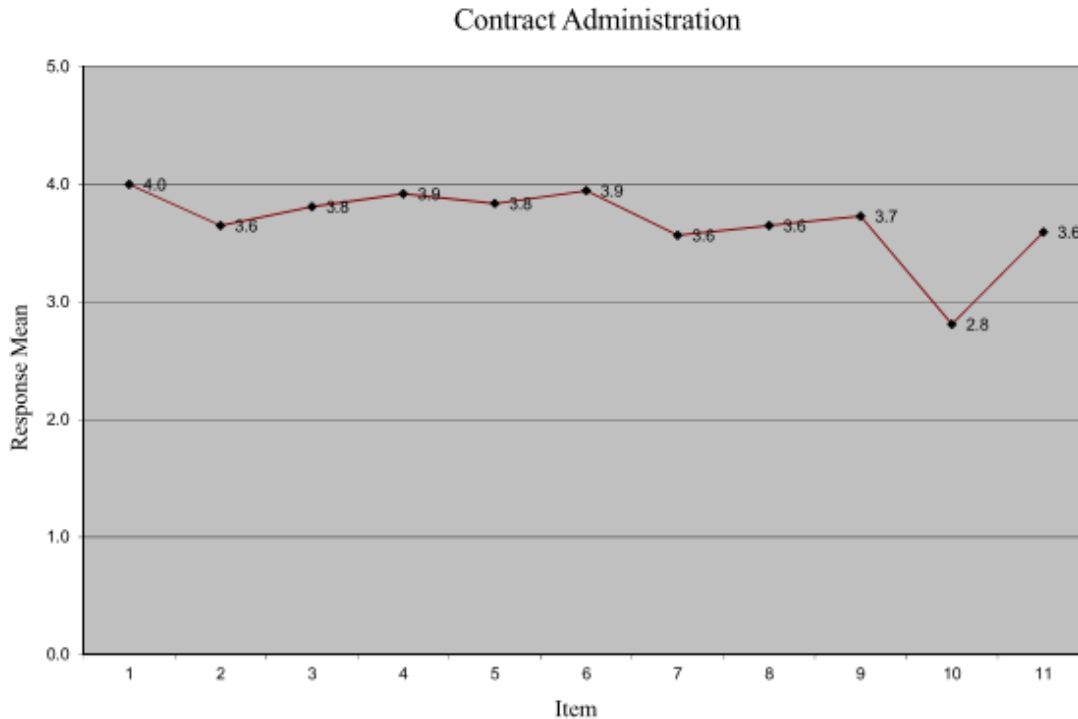


Figure 15. Contract Administration Summary Chart

6. Contract Closeout

Figure 16 illustrates the average response scores for the 10 questions related to the Contract Closeout key process area. We assigned a Basic maturity (Level 2) to this process area. The lower scores suggest that this process area receives less attention than others. Although the scores are lower overall than the five previous key process areas, there is still a trend evident on questions two, three and ten in particular. As with the previous key process areas, questions two and three relate to whether the AFNWC is using standardized, well-documented processes for Contract Closeout. The lower scores tell us that the organization does not consistently use standardized processes. Question ten relates to whether the organization uses efficiency and effectiveness metrics to evaluate the Contract Closeout process. Once again, the low score indicates that the AFNWC is not consistently using metrics to evaluate the Contract Closeout process.

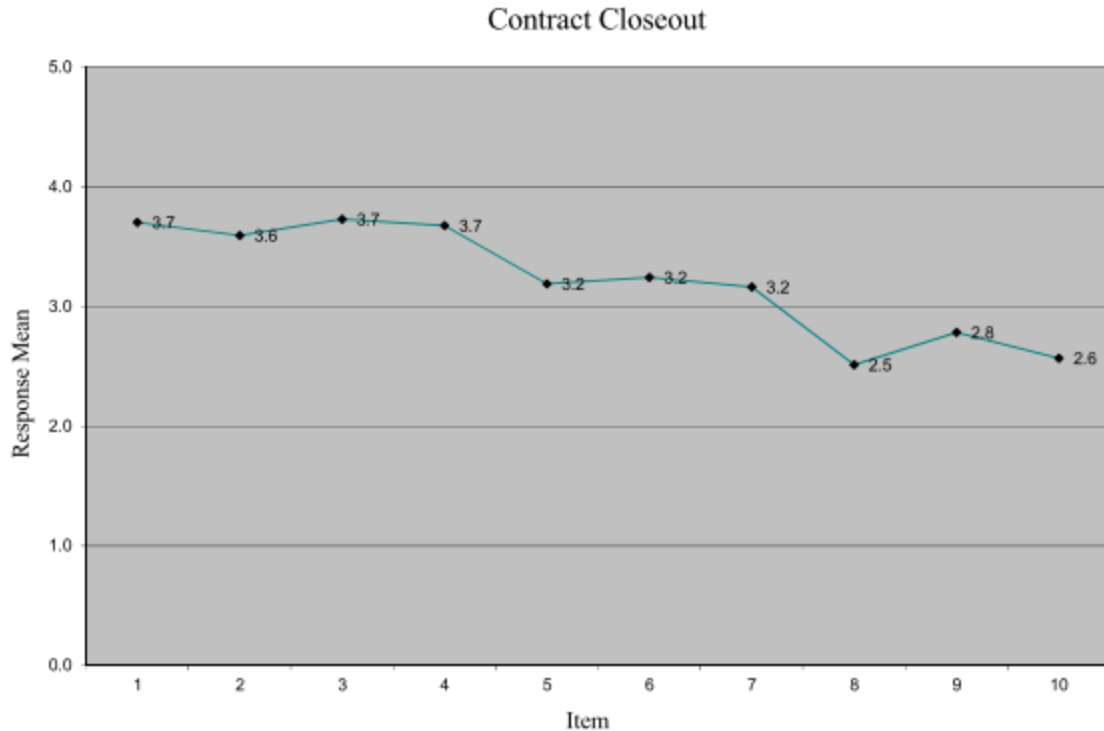


Figure 16. Contract Closeout Summary Chart

F. PROCESS ENABLER ANALYSIS

“How an organization performs in the key process areas and the extent to which the key practices incorporate best practices determine the organization’s contract management process capability maturity level” (Rendon, 2011, p. 39). Best practices are incorporated in process enablers. This section will provide an assessment of the process enabler items.

1. Process Strengths

The first three survey questions in each key process area relate to the Process Strength enabler (Rendon, 2011). Process Strength determines how well the workforce accepts the contract management processes and the level of standardization and documentation within the organization (Rendon, 2011). (As illustrated in Figure 8, the corresponding survey questions are 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 6.1, 6.2, and 6.3.)

Based on the results of our survey analysis, the means for Process Strength were highest in the Procurement Planning, Solicitation Planning, Solicitation, and Source Selection key process areas. Although the means were lower in the other key process areas, no mean was below 3.5 indicating that the AFNWC’s contract management processes are mostly standardized and adhered to by the workforce.

2. Process Results

The fourth survey question in each key process area as well as the sixth and seventh survey questions in the Source Selection process area relate to the Process Results enabler (Rendon, 2015). The Process Results enabler measures the success of outcomes in each key process area, and from our assessment, the “Solicitation Planning process activities includ [ing] determining procurement method, developing evaluation strategy, and developing solicitation documents” indicate a stronger use of Process Results best practices (Rendon, 2015, p. 1498). Our assessment also indicates “a stronger use of Process Results best practices in ensuring appropriate evaluation standards and criteria and in maintaining integrity in the proposal evaluation process,” which are activities related to Source Selection (Rendon, 2015, p. 1493). (As illustrated in Figure 8, the survey questions are 1.4, 2.4, 3.4, 4.4, 4.6, 4.7, 5.4, and 6.4.)

AFNWC statistical means for process results enablers were highest in the Solicitation Planning, Solicitation, and Source Selection key process areas suggesting that these areas receive a higher level of preparation to ensure successful outcomes. The averages for the other key process areas were not significantly lower indicating that the AFNWC does a sufficient job planning for successful outcomes in all process areas.

3. Management Support

Management Support is assessed by question five of the survey in each key process area. Management Support assesses the involvement of senior level management in process input as well as the approval of key process decisions and contract management documentation (Rendon, 2011). (As illustrated in Figure 8, the corresponding survey questions are 1.5, 2.5, 3.5, 4.5, 5.5, and 6.5.)

Based on our analysis, the means for the management support enabler are highest for Procurement Planning, Solicitation Planning, and Solicitation, indicating that senior level management support and oversight is strongest in these areas. The Contract Closeout key process area received a relatively low mean indicating that this is not a process which receives much support from management.

4. Process Integration

Process Integration is measured by survey questions six, seven, and eight in the process areas of Procurement Planning, Solicitation Planning, and Solicitation. Process Integration is measured by survey questions eight and nine in the area of Source Selection, questions six, seven, eight, and nine in the area of Contract Administration, and question seven in the area of Contract Closeout (Rendon, 2015.) Process Integration determines how well processes are integrated across key process areas and between different functions, such as “the use of cross-functional source selection teams” (Rendon, 2015, p. 44). (As illustrated in Figure 8, the corresponding survey questions are 1.6, 1.7, 1.8, 2.6, 2.7, 3.6, 3.7, 3.8, 4.8, 4.9, 5.6, 5.7, 5.8, 5.9, 6.6, and 6.7.)

Our survey analysis indicates a higher level of Process Integration among the Procurement Planning, Solicitation Planning, and Source Selection key process areas. Statistical means are higher in these areas while Contract Administration and Contract Closeout in particular displayed lower averages for this process enabler indicating a weaker use of Process Integration best practices, such as integrated product teams to evaluate contractor performance and managing contract changes in the post-award process areas (Rendon, 2015).

5. Process Measurement

The final two survey questions in each key process area relate to Process Measurement as well as question eight in the area of Contract Closeout (Rendon, 2015). “Process Measurement best practices [include] using efficiency and effectiveness metrics in process evaluation” (Rendon, 2015, p. 47). (As illustrated in Figure 8, the corresponding survey questions are 1.9, 1.10, 2.9, 2.10, 3.9, 3.10, 4.10, 4.11, 5.10, 5.11, 6.8, 6.9, and 6.10.)

The statistical averages for process measurement were highest in the Procurement Planning, Solicitation Planning, and Solicitation key process areas indicating that the AFNWC tracks these areas more closely than others. Of note, Contract Closeout was significantly lower than the other areas implying that this is not a process area that management closely monitors.

Now that we have analyzed the results of our survey and assigned a maturity rating to each AFNWC key process area as well as analyzed the process enablers and assessed their contribution to each process area, we will provide a comparison of our findings to AFNWC current process metrics. We will then present recommendations for the AFNWC to implement improvements throughout their contract management process.

G. AFNWC CURRENT PROCESS METRICS

This section presents the AFNWC's current process metrics and provides an analysis of how those metrics compare to the AFNWC's CMMM assessment results. The metrics obtained for this study are reported to AFMC by each of the centers within the five-center construct, including the AFNWC. Aside from these metrics reported to AFMC, no additional process metrics unique to the AFNWC were obtained for this study.

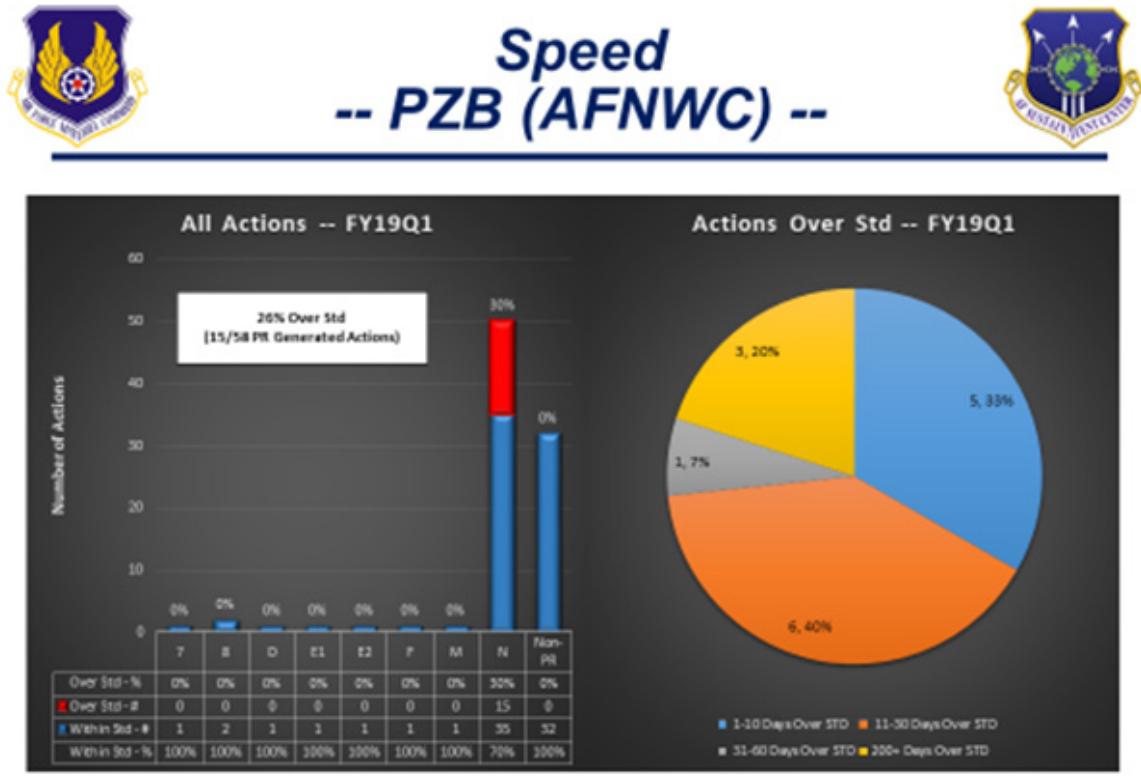
1. Procurement Action Lead Time (PALT)

The primary metric reported to AFMC is a measure of Procurement Action Lead Time (PALT) for contract actions based on type of procurement and dollar value. No other post-award metrics are included or tracked by the center or any of the branches of AFMC. The PALT cycle standards were developed by the Air Force Sustainment Center (AFSC/PK) and vetted through the PK working group and adopted by Air Force Material Command (AFMC). The metrics are tracked through the contract writing system Procurement Desktop 2 (PD2) and the Computer Information Delivery System (CIDS/J041) computer system. AFSC is tasked with gathering the metrics and quantifying them for inclusion in a quarterly report to AFMC headquarters.

Figure 17 presents AFSC/PK Cycle Standards' current metric standards used for completion of actions based on the type of acquisition and the corresponding dollar value.

It includes separate PALT lead time days for competitive actions, source selection, non-competitive actions, delivery orders, modifications, and undefinitized contracting actions (UCAs) The first column relates to the cycle code and type of action that is contemplated and defines the dollar threshold for each of the actions. The final sets of data show the standards assigned for calendar days from commencement to completion of the acquisition. For example, as shown in Figure 16, for competitive procurements valued greater than the current TINA threshold (\$2M), the solicitation development metric is 25 days from time of requirement receipt to completion of solicitation development. The Proposal Development metric is 45 days from solicitation posting to receipt of proposal. The next tracked metric is Evaluation process and is 15 days from receipt of proposal to completion of evaluation. The Negotiation process is then tracked from completion of evaluation to negotiation completion at a standard of 25 days. The last metric tracked is the award process, which includes completion of all computer-based inputs and signatures given a standard of 10 days. Therefore, the standard PALT for a competitive procurement, valued at over the current TINA threshold is 120 days.

number of days for processing. Using the same example as the Cycle Standard, Column 2 is competitive actions over the TINA threshold. Over standard days there were 0% for FY19, quarter 1. It shows the number of actions over the standard number of days at 0, and the number of actions within standard days at 2, with a total of 100% within standard for that contract action type.



13

Figure 18. AFSC/PZB Speed to Contract.
Source: D. Stark, email to author (13 May 2019).

3. Effectiveness

Figure 19 shows PZB (AFNWC) effectiveness as measured against the standard PALT for FY18, quarter 4 at AFNWC. Effectiveness is measured by the difference between the sum of the allowed days and the sum of the actual days. The number of days allowed is calculated by multiplying the count of actions by the number of days allowed

by the cycle standard. The actual number of days is calculated by totaling the number of days from the date of procurement inception to the date of award. It illustrates that 18% of the actions were completed over the average standard process time set by AFMC. A positive total reflects effectiveness, i.e., work is being accomplished in less time than the cycle standard allows. The metrics presented for both AFMC and AFNWC show us that the number of actions accomplished for each fiscal year have increased slightly year over year. It also shows us that the numbers that were processed in over-the-standard days has increased as well, but the increases do not correlate proportionately. As an example, column six is the competitive action over the TINA threshold. The metrics show that the actions of that type for FY18, quarter 4 were allowed a standard total of 360 days and the actual number of days taken was 390 days.

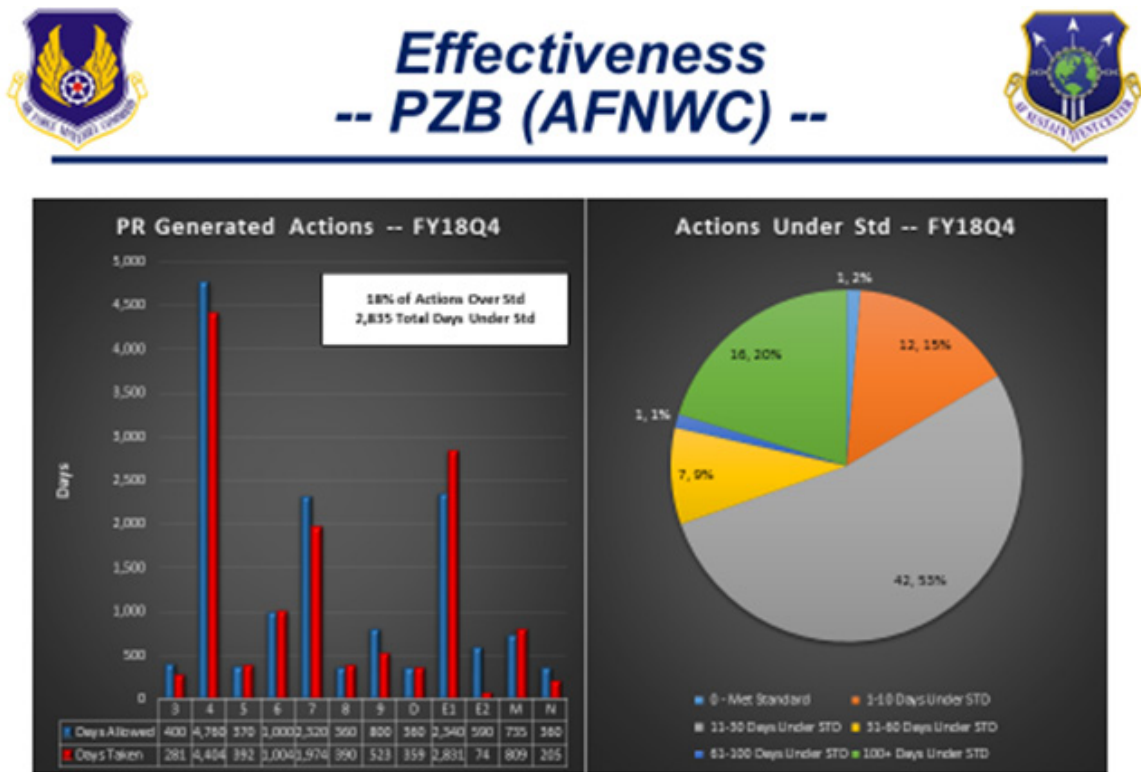


Figure 19. AFSC/PZB Effectiveness Comparison to PALT.
Source: D. Stark, email to author (13 May 2019).

H. ANALYSIS OF METRICS COMPARED WITH CMMM ASSESSMENT RESULTS

The AFNWC's limited use of metrics correlates with the findings of the CMMM assessment. The AFNWC's contract management maturity levels for Procurement Planning, Solicitation Planning, Solicitation and Source Selection are rated Structured (Level 3), while Contract Administration and Contract Closeout are rated Basic (Level 2). At the Structured and Basic levels, the use of metrics is limited. The development and use of organizational process metrics to aid in decision-making is a characteristic of the higher maturity levels of Integrated (Level 4) and Optimized (Level 5), which are levels the AFNWC has not yet attained.

As seen in Figures 17 and 18, AFMC has developed standard efficiency and effectiveness metrics for PALT. These metrics assess AFNWC performance against defined AFMC standards, although it is not apparent whether the AFNWC uses these metrics to support decision-making analysis at the organizational level. In addition, AFNWC does not have a center-based system of metrics. The absence of the use of metrics at the AFNWC is further exemplified in the CMMM results for the process measurement key process enabler. The pronounced fall in the statistical mean for question nine in particular indicates a weakness in process measurement and demonstrates the need for integration of analysis metrics by AFNWC management. Furthermore, the AFNWC does not have metrics for post-award activities. In the key process areas of Contract Administration, the AFNWC could measure PALT for modifications, the number of days to process requests for payments, and the number of days to determine acceptance of delivered supplies and services. In the key process area of Contract Closeout, the AFNWC could track the timeliness of closeout actions measured against standards, the number of days to make final payment, and the timeliness of contractor performance assessment reports. Since the AFNWC does not have any post-award metrics, perhaps this is why the CMMM assessments are rated at a lower maturity level for post-award key process areas.

Now that we have presented the AFNWC current metrics and provided a comparison to our CMMM survey assessment, we will present our recommendations for AFNWC's contract management process improvement.

I. RECOMMENDATIONS FOR CONTRACT MANAGEMENT PROCESS IMPROVEMENTS

The previous sections discussed the current state of the AFNWC's contract management process capability as determined by the CMMM assessment. We also discussed the AFNWC's internal metrics and compared to the CMMM assessment results. This section will build upon that benchmark and present recommendations to the AFNWC for improving the process maturity for each of the six contract management key process areas. These recommendations are intended to provide the AFNWC with a process improvement roadmap to follow in order to advance each key process area to the next level of maturity.

1. Procurement Planning, Solicitation Planning, Solicitation, Source Selection

The AFNWC's contract management maturity level for the pre-award processes are assessed as Structured (Level 3). At the Structured level, AFNWC's pre-award processes are characterized as being fully "established, standardized, and mandated" throughout the AFNWC (Rendon, 2010b, p. 14). The AFNWC has developed formal documentation for these processes and standards, some of which may be automated (Rendon, 2010b). The AFNWC "allows tailoring of mandated pre-award processes and documents in consideration of the unique aspects of each contract" (Rendon, 2010b, p. 14). Furthermore, AFNWC senior leadership is involved in "providing guidance, direction, and approval of key contracting strategy decisions, related contract terms and conditions, and pre-award documents" (Rendon, 2010b, p. 14).

In order to achieve the next higher maturity level of Integrated (Level 4), AFNWC should use the assessment results to guide process improvement initiatives and ensure these pre-award processes are "integrated with other organizational core processes, such as cost control, schedule management, performance management, and risk management" (Rendon, 2015, p. 1498). In addition, the AFNWC should ensure representatives from the contract's "end-users and customers are included as integral members of the project team" and engaged in the pre-award processes (Rendon, 2015, p. 1498). Furthermore, AFNWC management should establish efficiency and effectiveness metrics to assess the pre-award

process and use these metrics to aid in contract management decision-making (Rendon, 2015). AFNWC should commit resources to establish training initiatives aimed at increasing the maturity level of the pre-award processes. Training should be based on the competencies established in the CMBOK, specifically in CMS 2.0 Pre-Award, specifically 2.1 Develop Solicitation, and CMS 3.0, Award specifically, 3.1 Form Contract.

These recommendations apply to procurement planning activities such as requirements analysis, verifying availability of funds, acquisition planning, and conducting market research. Examples of solicitation and solicitation planning activities in which these recommendations apply include developing the statement of work, developing evaluation criteria and contract terms, conducting risk analysis, finalizing the acquisition strategy, advertising procurement opportunities, conducting solicitation and pre-proposal conferences, and amending the solicitation. Examples of source selection activities in which these recommendations apply include receipt and handling of proposals, evaluating offers, conducting negotiations, selecting the source, preparing source selection documentation, and debriefing offerors.

2. Contract Administration and Contract Closeout

The AFNWC's contract management maturity level for the post-award processes are assessed as Basic (Level 2). At the Basic level, AFNWC's post-award processes are characterized as "having established some basic processes and standards within the organization, but these processes are required only on selected complex, or high visibility contracts, such as those meeting certain dollar thresholds or contracts with certain customers" (Rendon, 2010b, p. 13). The AFNWC has developed some formal documentation for post-award processes and standards; however, they are not "established or institutionalized throughout the entire organization" (Rendon, 2010b, p. 13). Furthermore, at the Basic maturity level, "there is no organizational policy requiring the consistent use of these processes and standards on other than required contracts" (Rendon, 2010b, p. 13).

In order to achieve the next higher maturity level of Structured (Level 3), the AFNWC should use the assessment results to guide process improvement initiatives and

ensure these post-award processes are “fully established, institutionalized, and mandated” throughout the AFNWC with “formal documentation being developed for post-award process area activities” (Rendon, 2015, p. 1498). In addition, the AFNWC should also allow “the tailoring of processes and documents, with consideration for the unique aspects of each contract, such as contract strategy, contract type, terms and conditions, dollar value, and type of requirement” (Rendon, 2015, p. 1507). Furthermore, AFNWC “senior management should be involved in providing guidance, direction, and even approval of key post-award strategy decisions related terms and conditions, and post-award documents” (Rendon, 2015, p. 1507). AFNWC should commit resources to establish training initiatives aimed at increasing the maturity level of the post-award processes. Training should be based on the competencies established in the CMBOK, specifically in CMS 4.0 Post Award and 4.1. Perform Contract and 4.2. Close Contract.

These recommendations apply to Contract Administration activities, such as monitoring contractor performance, assessing compliance with the terms of the contract, managing contract changes, and managing the contract payment process. Examples of contract closeout activities in which these recommendations apply include validating contract completion, making final payment, and evaluating contractor final performance.

3. Recommendations for AFNWC’s Internal Metrics

The analysis of AFNWC’s internal metrics indicated limited use of PALT-based metrics to support pre-award activities, and no indication of metrics used to support post-award activities. It is recommended that integration of efficiency and effectiveness metrics into the AFNWC decision-making processes would support attainment of higher levels of contract management process maturity. In particular, AFNWC would benefit by establishing efficiency and effectiveness metrics to support the post-award key process areas of Contract Administration and Contract Closeout. For example, AFNWC should establish Contract Administration metrics such as PALT for modifications, length of time to process requests for payments, and length of time to determine acceptance of delivered services. Example metrics for Contract Closeout activities include timeliness of closeout

action measured against standards, number of days to make final payment, and timeliness of contractor performance assessment reports.

J. SUMMARY

In this chapter, we presented and discussed the methodology we used to select our survey participants and the means by which we deployed the survey and collected and analyzed the data. We then illustrated our research findings and discussed the implications our analysis reveals about the maturity of the AFNWC's contract management processes. Next, we introduced the metrics the AFNWC currently tracks and provided a comparison to our CMMM survey assessment. Finally, we offered recommendations to the AFNWC to help them improve their process maturity levels in each of the key process areas. We also offered recommendations for improving AFNWC's internal metrics. Our final chapter provides a summary and conclusion of our research and presents areas for further research.

THIS PAGE INTENTIONALLY LEFT BLANK

V. SUMMARY, CONCLUSIONS, AND AREAS FOR FURTHER RESEARCH

A. INTRODUCTION

In this chapter, we will summarize the background and the purpose of our research. We will then provide a summary of our assessment of the contract management process maturity of the AFNWC based on the answers to our research questions as well as the conclusions we drew when comparing our analysis to current AFNWC organizational metrics. Lastly, we will recommend areas for further research.

B. SUMMARY

In 2018, the DoD obligated approximately \$459 billion in supplies and services; this represents a 12% increase from DoD obligations in 2017 (usaspending.gov, 2018). As the DoD budget continues to increase, the amount of funds obligated increases, and, as a result, contracting professionals are dealing with more contract actions than ever before. The 2019 GAO high-risk report shows us that the DoD contract management function still remains on the list after almost 20 years and that the areas of workforce turnover, services acquisition, and operational contract support remain topics of concern (GAO, 2019). The OIG also included contract management on its “Top Management Challenges for Fiscal Year 19” due to the DoD’s difficulty meeting schedule, cost, and performance expectations for major weapon systems in spite of DoD efforts to improve these programs (DoD OIG, FY19). Up to this point, the DoD’s response to the identified contracting deficiencies of the contract management function has been more training for the contracting workforce (Rendon & Winn, 2017). What is missing is a focus on process capabilities. Organizational contract management process assessments are essential to an organization’s success (Rendon, 2008). By assessing a firm’s capability and maturity levels, senior leadership can work to identify and implement process improvements directed at areas of deficiencies (Rendon, 2008). The purpose of our research was to determine the contract management process capability of the AFNWC using the CMMM and to provide results and recommendations to augment and improve the current contract management processes of the AFNWC.

C. CONCLUSION

Through our research and assessment of the AFNWC contract management processes, we were able to answer the following research questions.

a. *What is the maturity level of each contracting key process area within the AFNWC?*

The AFNWC's contract management maturity levels for the pre-award processes of Procurement Planning, Solicitation Planning, Solicitation and Source Selection are assessed as Structured (Level 3). The organization is performing at a Basic (Level 2) maturity level for the post-award processes of Contract Administration and Contract Closeout.

b. *Based on the results of the analysis, how can the AFNWC improve its maturity levels for each contracting key process area?*

In order to achieve the next higher maturity level of Integrated (Level 4) for Procurement Planning, Solicitation Planning, Solicitation and Source Selection, the AFNWC needs to ensure that process procedures are established and integrated for each of the pre-award activities that were rated at Structured (Level 3). Establishing effectiveness and efficiency metrics, and formalizing their documentation availability and use will allow the center to incorporate that information into the planning and decision-making processes.

For the post-award processes assessed at Basic (Level 2), formal processes and procedures need to be established, and senior leadership must require their use on a consistent basis for all contract types and values. Training to ensure organizational awareness and proficiency as well as establishment of metrics for tracking and standardization of processes will be required to achieve Structured (Level 3).

c. *How do the process maturity levels compare to the current AFNWC metrics?*

The AFNWC PALT metrics are tracked and reported to AFMC through AFSC. The CMMM survey rated the pre-award activities assessed as Structured (Level 3). Standards for PALT are formalized by AFSC, and the automated results support the current contract management processes rating for Procurement Planning, Solicitation Planning, Solicitation

and Source Selection. The pronounced fall in the statistical mean for question nine related to process measurement in particular indicates a weakness in the availability of process metrics and shows the need for integration of the analysis metrics by AFNWC management. This would support the achievement of the next level of maturity by integrating the currently established processes using the metrics and organizing formal documentation and training. It is further noted that all internal metrics are pre-award, and there are no post-award metrics captured or reported, thus confirming the Basic maturity level assigned to post-award activities.

D. AREAS FOR FURTHER RESEARCH

Based on our research findings, we offer recommendations for areas of further research.

As a starting point, we recommend the conducting of interviews with AFNWC employees who responded to the survey related to those questions that asked for further comments. More-detailed insight from survey respondents will help to identify areas that could use further training and organization. Secondly, we recommend comparing the survey results with the results achieved from other Air Force organizations to determine if there are trends not noted in the assessment along with other opportunities for education, training or synergies. Next, we recommend the research of physical records held by the organization to identify actual practices of the workforce versus the reported data from the CMMM model metrics and survey. Subsequently, we recommend a reassessment of the workforce once the processes, procedures, and training measures have been put into place and allowed to mature. Our final recommendation is to conduct further assessments examining the demographic data of the survey participants such as years of experience and DAWIA level certifications to determine if there is a correlation between those and the assessed organizational maturity levels.

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF REFERENCES

- Ahern, D., Clouse, A., & Turner, R. (2001). *CMMI distilled: A practical introduction to integrated process improvement*. Boston, MA: Addison-Wesley, p. 4.
- Blue Ribbon Commission on Defense Acquisition. (1986). *A formula for action: A report to the president on defense acquisition*. (1986). Washington, DC: The Commission., p. 29. Retrieved from <https://apps.dtic.mil/dtic/tr/fulltext/u2/a171632.pdf>
- Committee of Sponsoring Organizations of the Treadway Commission. (2013). *Internal control, integrated framework, executive summary*. Durham, NC: Author. Retrieved from <https://www.coso.org/Documents/990025P-Executive-Summary-final-may20.pdf>
- Defense Acquisition University. (2019). Certification and core plus development guides. Retrieved from <http://icatalog.dau.mil/onlinecatalog/CareerLvl.aspx>
- Defense Acquisition Workforce Improvement Act, 10 U.S.C. Chapter 87 (1990).
- Deming, W. (1986). *Out of the crisis*. Cambridge, MA: Massachusetts Institute of Technology, Center for Advanced Engineering Study.
- Department of Defense Inspector General. (2019). *Fiscal year 2019 top management challenges*. Alexandria, VA: Author.
- Department of the Air Force. (2012). Hill Air Force Base—Air Force Nuclear Weapons Center, Intercontinental Ballistic Missile System Directorate. [Fact Sheet] Retrieved from <https://www.hill.af.mil/About-Us/Fact-Sheets/Display/Article/397069/air-force-nuclear-weapons-center-intercontinental-ballistic-missile-systems-dir/>
- Department of the Air Force. (2015). Air Force material command [Fact Sheet]. Retrieved from <https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104481/air-force-materiel-command/>
- Department of the Air Force. (2016, 23 November). *Air Force Nuclear Weapons Center (AFMCMD 421)*. Retrieved from <https://static.e-publishing.af.mil/production/1/afmc/publication/afmcmd421/afmcmd421.pdf>
- Department of the Air Force. (2019). Kirtland Air Force Base—Air Force Nuclear Weapons Center [Fact Sheet]. Retrieved from <https://www.kirtland.af.mil/Units/Air-Force-Nuclear-Weapons-Center>

- Eisenhardt, K. (1989). Agency theory—an assessment and review. *Academy of Management Review*, 14(1), 57–74. Retrieved from <https://doi.org/10.5465/AMR.1989.4279003>
- Blue Ribbon Commission on Defense Acquisition. (1986). *A formula for action: a report to the President on defense acquisition*. (1986). Washington, DC: Author. Retrieved from <https://apps.dtic.mil/dtic/tr/fulltext/u2/a171632.pdf>
- Garrett, G., & Rendon, R. (2005a). *Contract management: organizational assessment tools*. McLean, VA: National Contract Management Association.
- Garrett, G., & Rendon, R. (2005b). Managing contracts in turbulent times: The contract management maturity model. *Contract Management* (pp. 48–57). Retrieved from <http://search.proquest.com/docview/196328540/abstract/7E4B51682CF4296PQ/1>
- Garrett, G., & Rendon, R. (2015c). Improving the U.S. Federal Acquisition workforce, part 2 of 3—contract management process maturity: The key for organizational survival. *Contract Management*, 55(6), pp. 78–81, 83–87. Retrieved from <http://search.proquest.com/docview/1722657295/>
- Government Accountability Office. (2009). *High-risk series: An update* (GAO-09–271). Washington, DC: Author. Retrieved from <https://www.gao.gov/new.items/d09271.pdf>
- Government Accountability Office. (2014). *Standards for internal control in the federal government* (GAO-14-704G). Washington, DC: Author. Retrieved from <https://www.gao.gov/products/GAO-14-704G>
- Government Accountability Office. (2019). *DoD’s high-risk series: substantial efforts needed to achieve greater progress on high-risk areas* (GAO-19–157SP). Washington, DC: Author. Retrieved from <https://www.gao.gov/products/GAO-19-157sp>
- Kelman, S. (2001). Putting contracting at the core. *Government Executive*, 33(11), 16. Retrieved from <http://search.proquest.com/docview/204310079/>
- Lee, L., & Dobler, D.W. (1971). *Purchasing and materials management: text and cases*. New York, NY: McGraw-Hill.
- NCMA. (2019). *The contract management standard* (2nd edition). Retrieved from https://www.ncmahq.org/docs/default-source/standards-certification-files/the-contract-management-standard14f69cfa4b784548b5e25e1be4b3b85e.pdf?sfvrsn=21a3568_0
- NCMA. (2017) Contract Management Body of Knowledge competency chart. Retrieved from <https://www.ncmahq.org/standards-certification/contract-management-body-of-knowledge-cmbok>

- Nieto-Rodriguez, A., & Evrard, D. (2004). *Boosting business performance through programme and project management*. Brussels: PriceWaterhouseCoopers.
- Power, M. (1996). Making things auditable. *Accounting, Organizations and Society*, 21(2).
- Power, M. (2007). *Organized uncertainty*. Oxford, UK: Oxford University Press.
- Rendon, J. M., & Rendon, R. G. (2016). Procurement fraud in the U.S. Department of Defense: Implications for contracting processes and internal controls. *Managerial Auditing Journal*, 31(7), p. 754
- Rendon, R. G. (2008). Procurement process maturity: Key to Performance measurement. *Journal of Public Procurement*, 8(2), 200–214. Retrieved from <https://search-proquest-com.libproxy.nps.edu/docview/223184988/fulltextPDF/DDA5B51218D4B43PQ/1?accountid=12702>
- Rendon, R. G. (2010a). Critical Success Factors in Government Contract Management. pp. 2–4. Retrieved from https://calhoun.nps.edu/bitstream/handle/10945/40257/Rendon_Critical_Success_Factors_2010.pdf?sequence=1&isAllowed=y
- Rendon, R. G. (2010b). *Contract management process maturity: empirical analysis of organizational assessments*. (Report No. NPS-GSBPP-09-039). Retrieved from Calhoun: The NPS Institutional Archive: <https://calhoun.nps.edu/bitstream/handle/10945/642/NPS-GSBPP-09-039.pdf?sequence=1&isAllowed=y>
- Rendon, R. G. (2010c). *Professionalization of the U.S. defense acquisition workforce: progress, problems and future directions*. Retrieved from https://calhoun.nps.edu/bitstream/handle/10945/40376/Rendon_Professionalization_Paper3-5.pdf?sequence=1&isAllowed=y
- Rendon, R. G. (2011). *Assessment of Army Contracting Command's Contract Management processes (TACOM and RDECOM)*. (Report No. NPS-GSBPP-11-008). Retrieved from <https://calhoun.nps.edu/bitstream/handle/10945/24419/NPS-GSBPP-11-008.pdf?sequence=1&isAllowed=y>
- Rendon, R. G. (2015). *Benchmarking contract management process maturity: a case study of the U.S. Navy*. Emerald Group Publishing Limited. Retrieved from https://calhoun.nps.edu/bitstream/handle/10945/57703/Rendon_Benchmarking%20contract_2015.pdf?sequence=1&isAllowed=y
- Rendon, R. G. (2016). Assessment of Navy contract management processes. *Proceedings of the Thirteenth Annual Acquisition Research Symposium*, 2. Retrieved from <https://apps.dtic.mil/dtic/tr/fulltext/u2/1016812.pdf>

- Rendon, R. G., & Rendon, J. M. (2015). Auditability in public procurement: an analysis of internal controls and fraud vulnerability. *International Journal of Procurement Management*, 8(6).
- Rendon, R. G., & Winn, T. (2017). Competency in contract management. *Contract Management; McLean*, 57(12): pp.66-80. Retrieved from https://search-proquest-com.libproxy.nps.edu/docview/2074384562?rfr_id=info%3Axri%2Fsid%3Aprimo
- Section 809 Panel. (2019). *Advisory panel on streamlining and codifying acquisition regulations*. Retrieved from https://section809panel.org/wp-content/uploads/2019/01/Vol3_Summary_Letter-size.pdf
- Snider, K., & Naval Postgraduate School Monterey CA. (1996). *DAWIA and the price of professionalism*. Retrieved from <http://handle.dtic.mil/100.2/ADA487827>
- Thai, K. (2004). *Introduction to public procurement*. Herndon, VA: National Institute of Government Purchasing.
- USA Spending. (2018) Data archives. Retrieved from <https://www.usaspending.gov/#/explorer/agency>

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
Ft. Belvoir, Virginia
2. Dudley Knox Library
Naval Postgraduate School
Monterey, California