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Relationship of Source Selection Methods to Contract Outcomes: an Analysis of Air Force Source Selection

December 2015

Capt Jacques Lamoureux, USAF

Capt Michael Murrow, USAF

Capt Clinton Walls, USAF

Thesis Advisors: Dr. Rene Rendon, Associate Professor
Maj Karen Landale, Assistant Professor

Graduate School of Business & Public Policy

Naval Postgraduate School

ACQUISITION RESEARCH PROGRAM
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
NAVAL POSTGRADUATE SCHOOL

ABSTRACT

Budgetary concerns over the last decade have put increased pressure on federal agencies to improve efficiency and create cost savings. Accordingly, the Government Accountability Office (GAO) and other watchdog groups have increasingly scrutinized government source selections; GAO reports and procurement experts alike indicate opportunities for improvement in this area. To aid in this improvement initiative, our research focuses on the contract management process, with special emphasis on the source selection methods of tradeoff and lowest price technically acceptable (LPTA). Specifically, our data analysis explores the relationship of source selection methods to the contract outcomes of procurement administrative lead times (PALT) and contractor performance assessment reporting system (CPARS) ratings. The results of our analysis showed no statistically significant relationship between source selection method and contract outcomes. However, other variables, namely the number of evaluation factors and number of offers received, were shown to have a significant effect on PALT. At the conclusion of this MBA Professional Report, we present suggestions for further research to build upon these findings.

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ABOUT THE AUTHORS

Captain Jacques M. Lamoureux, M.B.A., PMP, CPSM, CFCM, is a Captain in the United States Air Force. His Air Force assignments include ACO contracting for F-22 LCMC at Wright-Patterson AFB; the 673rd Contracting Squadron at Joint Base Elmendorf-Richardson, AK; and the 386th Expeditionary Contracting Squadron, Kuwait. His education includes a B.S. in Management from the United States Air Force Academy, a M.B.A. from the Naval Postgraduate School with an emphasis in strategic purchasing and contract administration, and a M.B.A. from Oklahoma State University with an emphasis in business administration with a corresponding graduate certificate in business data mining.

Captain Michael R. Murrow, M.B.A., is a Captain in the United States Air Force. His Air Force assignments include the 771st Enterprise Sourcing Squadron at Wright-Patterson AFB, and the 7th Contracting Squadron at Dyess AFB. His education includes a Bachelor of Science in Business Management from Brigham Young University, and a Master of Business Administration from the Naval Postgraduate School. He and his wife, Natalie, live in Ohio and have two children.

Captain Clinton T. Walls IV, M.B.A., is a Captain in the United States Air Force. His Air Force assignments include the 374th Contracting Squadron at Yokota Air Base, Japan; and Headquarters, Air Force Recruiting Service at Randolph AFB. His education includes a Bachelor of Science in Economics from the U.S. Air Force Academy, a Master of Arts in Administrative Leadership from the University of Oklahoma, and a Master of Business Administration from the Naval Postgraduate School. He currently lives in Dayton, Ohio.

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LIST OF ACRONYMS AND ABBREVIATIONS

AFICA	Air Force Installation Contracting Agency
ADR	Alternative Dispute Resolution
AGNA	Armor Group North America
ASPA	Armed Services Procurement Act
BBP	Better Buying Power
CAR	Contract Action Report
CCA	Clinger-Cohen Act
CICA	Competition in Contracting Act
CO	Contracting Officer
CPARS	Contractor Performance Assessment Reporting System
DAU	Defense Acquisition University
DAWIA	Defense Acquisition Workforce Improvement Act
DFARS	Defense FAR Supplement
DOD	Department of Defense
DOS	Department of State
DV	Dependent Variable
EN	Evaluation Notice
EVM	Earned Value Management
FAR	Federal Acquisition Regulation
FASA	Federal Acquisition Streamlining Act
FBO	Federal Business Opportunities
FPDS-NG	Federal Procurement Data System-Next Generation
GAO	Government Accountability Office
IGCE	Independent Government Cost Estimate
IPT	Integrated Product Team
IV	Independent Variable
LPTA	Lowest Price Technically Acceptable
MDAP	Major Defense Acquisition Program
NCMA	National Contract Management Association
OJT	On-the-Job Training

PALT	Procurement Administrative Lead Time
PBA	Performance Based Acquisition
SBA	Small Business Act
TASC	Total Administrative Services Corporation
TINA	Truth in Negotiations Act
USACE	United States Army Corps of Engineers
USDAT&L	Undersecretary of Defense for Acquisition, Technology, and Logistics
WSARA	Weapon Systems Acquisition Reform Act

I. INTRODUCTION

A. BACKGROUND

The Department of Defense (DOD) accounts for a substantial percentage of the federal budget each year (Albano, 2013). Therefore, DOD acquisition professionals must focus on achieving best value for the government through pursuit of cost savings, while also adhering to stated regulations. In the past, Government Accountability Office (GAO) reports, professional journals, and acquisition magazines have identified a wide disparity within source selection processes; while some are best in class, others consistently fail to achieve the desired outcomes. For example, strengths of current source selection processes include the use of: engineering procedures in strategy definition, Integrated Project Teams (IPTs), Performance-Based Acquisition (PBA), and good communication techniques. On the other hand, risk assessments, source selection evaluation factors, schedule slips, and cost overruns are all areas of significant weakness (Maser & Thompson, 2013). In 1992, the GAO highlighted DOD contract management as high-risk; over two decades later, it is still a point of major concern (Albano, 2013). Moreover, the DOD inspector general identified 142 different deficiencies relating to contract management (Albano, 2013).

A more recent GAO (2010) report highlighted training, education, and experience level of the acquisition workforce as areas of concern. Each of these topics represents an opportunity for improvement and savings, particularly initiatives focused on education and training. However, this report only highlights a fraction of the potential cost savings within federal acquisition. As such, GAO, DOD, and Air Force Installation Contracting Agency (AFICA) investigators have all engaged in a thorough analysis of previous procurements in an attempt to identify areas for future savings. AFICA is an Air Force organization designed to analyze purchasing data and ultimately develop strategies for strategic sourcing (R. Westermeyer, personal communication, May 15, 2015). Strategic sourcing is an institutional level of acquisition where products and services are purchased at the enterprise level to drive down costs through economies of scale, demand management, and supplier integration (R. Westermeyer, personal communication, May 15, 2015).

The steps of the contract management process, which can be optimized to produce cost savings, are: procurement planning, solicitation planning, solicitation, source selection, contract administration, and contract closeout (Garrett, 2007); however, our research focuses primarily on the activities prior to contract award. Furthermore, the source selection process can be broken down into two contracting methods: sealed bidding and negotiations. Typically, sealed bidding is reserved for simple, well-defined requirements. The alternative, contracting by negotiation, is utilized for those acquisitions in which requirements are not simple or well-defined.

Contracting by negotiation is discussed in FAR 15.101 and is further broken down into two source selection methods. The first, tradeoff, allows the government the flexibility to weigh non-cost factors as part of an overall evaluation assessment. The second, lowest price technically acceptable (LPTA), requires the government to first rank all offers in reverse price order, then review them in that order until a technically acceptable offer is identified (FAR 15.101-2). Each acquisition is unique, and the appropriate method can only be selected after reviewing the complexity of the program and all pertinent risks (Shultz, 2015).

B.   PROBLEM STATEMENT

Currently, there is little empirical evidence identifying a relationship between source selection method and contract outcomes. This lack of reliable data on the subject has forced contracting professionals to rely heavily on experience and anecdotal evidence, which can lead to confusion. Consider, for example, the terminology involved in the discussion. Despite the specificity of the definitions provided in the Federal Acquisition Regulation (FAR), many top analysts—some of whom have published works on the topic—still confuse key terms. For example, *tradeoff* is often confused with *best value*, the overarching term describing the entire continuum of options available to contracting officers charged with ensuring greatest benefit to the government. This error is most prevalent in the private sector; however, even the Honorable Jacques Gansler—former Undersecretary of Defense for Acquisition, Technology, and Logistics (USDAT&L)—muddles the terms in a paper published for a U.S. Senate subcommittee (Levin, 2014).

Identification of this problem is not meant to be accusatory; instead, our aim is to recognize the need for empirical data that eliminates confusion on the subject of source selection methods and their related outcomes.

C.   PURPOSE STATEMENT

The purpose of our research is to empirically identify key relationships between the source selection methods and measurable contract outcomes. The motivation for our research stems from the lack of empirical evidence regarding this relationship, as well as from a desire to improve contract outcomes. Unnecessarily long lead times, protests, vague specifications, and cost and schedule overruns all plague defense acquisition. Ideally, an acquisition should strive to keep procurement acquisition lead time (PALT) as low as practical and Contractor Performance Assessment Reporting System (CPARS) ratings as high as possible. Positive contract outcomes are rooted in the procurement planning phase; it is in this phase that the procurement method, source selection method, and contract type are decided. Our research discusses the relationship of outcome variables to the chosen source selection method, with the ultimate goal of better understanding the implications of this decision facing acquisition teams.

D.   RESEARCH QUESTIONS

In this research, we answer the following questions:

1.   What is the relationship between the source selection method (LPTA versus tradeoff) and CPARS ratings?

2.   What is the relationship between the source selection method (LPTA versus tradeoff) and PALT?

3.   What percentage of procurements using the tradeoff source selection method is awarded based on non-price factors?

E.   RESEARCH BENEFITS AND LIMITATIONS

The principle benefit of our research is that it provides data relating to source selection methods and their subsequent contract outcomes. We accessed contract files containing all data necessary for complete statistical analysis. Historically, there has been a lack of empirical data on this subject; our research and analysis addresses this gap.

The main limitation of our research is the sample size of our data. Time and travel constraints limited our data collection to include the contract files from only two Air Force bases, as we discuss further in Chapter III. To broaden the scope of the research and reach more definitive conclusions, we would ideally have been able to access more contract files from additional installations, including those from defense branches other than the Air Force.

F.   ORGANIZATION OF REPORT

This first chapter presented the background, problem statement, purpose statement, research questions, and benefits and limitations of our research. In Chapter II, we provide a review of relevant literature regarding source selection methods, including guiding principles for the federal acquisition system, significant defense acquisition reform initiatives, an overview of the contract management process, pre-award acquisition decisions, and a description of each source selection method (LPTA and tradeoff) and their corresponding implications. In Chapter III, we explain the methodology used to conduct our research, which includes a discussion of Air Force contracting structure and systems together with a description of our data collection process and its unique elements. In Chapter IV, we describe our data, present the results, discuss our analysis, and make recommendations based on the findings. In Chapter V, we summarize our findings, present our conclusion, answer the research questions, and suggest areas for further research.

G.   SUMMARY

This chapter served as an introduction to our research, providing a brief background of source selections and their role in the acquisition environment. It also stated the problem to be addressed, the purpose of our research, and the research questions to be answered. Lastly, we stated the benefits and limitations of the research. In the next chapter, we examine academic journals, GAO reports, and other source selection texts in order to review the literature and increase understanding of federal contract management.

II. LITERATURE REVIEW

A. INTRODUCTION

The purpose of this chapter is to present a review of the literature concerning the federal contract management process, specifically regarding the role of source selection methods available to contracting officers. To ensure a comprehensive understanding of all relevant sources, the review incorporates information from federal regulations, the Government Accountability Office (GAO), and prominent contracting journals.

First, we cover the guiding principles for the federal acquisition system, followed by significant defense acquisition reform initiatives. Next, we discuss the government contract management process, before moving to pre-award acquisition decisions. Finally, we will explain the two source selection methods, lowest price technically acceptable (LPTA) and tradeoff, as well as implications of each.

B. GUIDING PRINCIPLES FOR THE FEDERAL ACQUISITION SYSTEM

Federal contracting is very different from commercial purchasing. A wide array of statutory and agency-instituted regulations restricts the actions of federal contracting officers, chief of which is the Federal Acquisition Regulation (FAR). This body of regulation provides instruction on the entire contract management process, from the initiation of procurement planning to the final steps of contract closeout. The FAR is a living document, which regulators still revise to this day, as new policies are introduced. However, regulators realize that the diverse scenarios contracting officers face far exceed the capacity of a single regulation. Therefore, the FAR instructs acquisition personnel to consider actions approved if not explicitly prohibited:

> In exercising initiative, Government members of the Acquisition Team may assume if a specific strategy, practice, policy or procedure is in the best interests of the Government and is not addressed in the FAR, nor prohibited by law (statute or case law), Executive order or other regulation, that the strategy, practice, policy or procedure is a permissible exercise of authority. (FAR 1.102(d))

The vast size of the federal government necessitates additional regulations to help establish policy. Subordinate to the FAR are various agency supplements, with the DOD maintaining the Defense Federal Acquisition Regulation Supplement (DFARS), which is one of the more robust versions. Each of the service branches has added another level of policy below the DFARS, and most contracting activities have issued several layers of policy memoranda below each service-specific supplement. However, as our research focuses on defense procurement, our analysis does not extend to the level of detail beyond the DFARS, therefore we have not included service supplements.

In addition to describing which actions are not permitted, the FAR explains the four basic principles of government procurement. We have listed each below.

1. Satisfy the Customer in Terms of Cost, Quality, and Timeliness of the Delivered Product or Service

Ultimately, the role of federal procurement is to augment organic government personnel and equipment in order to carry out the mission or function of the end user. In the DOD, the end user is typically the warfighter, and all acquisition actions should be structured to provide the necessary level of support for our nation's warriors, whether in garrison or abroad. Additionally, the FAR expands this concept by directing contracting officers to (1) use commercial items whenever possible, (2) conduct business with vendors that can demonstrate competence, and (3) seek out competition.

2. Minimize Administrative Operating Costs

Awarding a contract to a vendor is only one step in the contract management process. Depending on the size of the purchase, several weeks or even months of market research and source selection procedures may have taken place beforehand. Likewise, modifications, terminations, and contractor surveillance tasks can extend years beyond the effective date of a contract. Government officials should take every measure to streamline the processes before and after award in order to remain good stewards of taxpayer dollars.

3. Conduct Business with Integrity, Fairness, and Openness

Unlike profit-seeking firms, which are responsible only to shareholders or owners, federal institutions have additional mandates because of their reliance on taxpayer dollars. One such mandate is the requirement for transparency, which ranges from publicizing new solicitations online to fielding Freedom of Information Act requests on existing contracts.

4. Fulfill Public Policy Objectives

The final objective of government procurement is a set of policy agenda items established by Congress, which are not meant to directly affect the warfighter or the contracts themselves. The most prominent example is the small business set-aside program, which ensures that small, disadvantaged firms receive a portion of government contracts. In many cases, accommodating these goals often comes at the expense of price or schedule, although proponents argue that small companies are just as capable as are established defense firms. This objective of meeting Congressional agenda items through procurement was not an original goal of the federal government, but policymakers introduced and subsequently modified the objective later over the course of a series of acquisition reforms. The following is a brief summary of those reforms.

C. SIGNIFICANT DEFENSE ACQUISITION REFORM INITIATIVES

As the principles described in the previous section indicate, simultaneously achieving all federal procurement goals is typically not feasible. Instead, contracting officers frequently weigh different priorities against each other, resulting in a balance of results that vary among acquisitions. Originally, the government was chiefly concerned with receiving an efficient price in a generally equitable way (Manuel, 2011); over time, however, the objectives of public policy have changed. The following is a list of relevant legislation, along with an indication of which goal(s) they support.

1. Armed Services Procurement Act of 1947

The Armed Services Procurement Act (ASPA) of 1947 represents the DOD's first real departure from competitive acquisition during peacetime operations. Starting in the

18th century, federal regulations called for open solicitation of federal requirements, relying on market forces to obtain the best price and safeguard taxpayer dollars. However, after experiencing the increased demands of both world wars, officials realized that some items contained rigid delivery or performance requirements that made competition problematic or outright infeasible (Manuel, 2011). The ASPA applied only to defense agencies and still called for competition, but it included 17 exemption categories, allowing contracting officers much more latitude in procuring critical items.

2. Small Business Act of 1953

While the Small Business Act (SBA) was passed in 1953, the Hoover administration had laid the foundation more than two decades earlier (Bail, 2010). After the stock market crash of 1929, President Hoover formed the Reconstruction Finance Corporation to loan government funds to businesses, with the hope of jump-starting the economy. Over the next 24 years, the organization continued to evolve, giving rise to the Small War Plant Corporation and Small Defense Plant Corporation during World War II and the Korean War, respectively. The focus of the effort shifted from stimulating the economy to retaining wartime production capacity to ultimately guaranteeing that small businesses remained competitive in future government contracts.

Interestingly, the SBA has changed relatively little in the 62 years since its passage, considering the number of changes made to competition and commercial acquisition policy. For example, the original act provided for small business size standards that were specific to each agency, formed the Small Business Administration to help small business concerns, and focused on awarding contracts to small businesses, "even if awards were made at a higher rather than lower price" (Bail, 2010, p. 80). One significant revision came in 1978 when the federal government opted to reserve awards below $25,000 to small businesses—the precursor to today's small business set-asides.

3. Truth in Negotiations Act of 1962

After passing the ASPA, Congress closely monitored the effectiveness of negotiated contracts. During the 1950s, several GAO reports confirmed the military had overpaid by approximately $61 million in a five-year span (Williams, 1970). While the

DOD initially proposed an internal regulation scheme, Congress overruled the DOD's plan and passed the Truth in Negotiations Act (TINA), requiring contractors to submit and certify cost or pricing information when proposals exceed a specific threshold. The dollar limit has changed several times over the last several decades, as well as specific provisions of the law itself (Calhoon & Sybert, 2012). However, the intent of the law remains the same as when originally passed—ensuring government negotiators have the required information to effectively negotiate with contractors.

4.   Competition in Contracting Act of 1984

While the TINA helped improve negotiated contracts, legislators still felt that a return to open competition was in the best interest of the government. However, instead of returning to total competition, drafters agreed on *full and open* as opposed to *maximum* competition (Manuel, 2011). The former term describes competition as contracting officers understand it today: reasonable attempts to include vendors capable of performing as required in the contract. Maximum competition, an all-out attempt to receive as many bids as possible, is simply impractical, and ultimately does not result in additional cost savings. While the Competition in Contracting Act (CICA) also includes provisions for exemption, its total focus on competing contracts continues to influence the decisions of contracting officers today.

Interestingly, the CICA also formalized the concept of best value, introducing the tradeoff method in the process. A focus on keeping costs low led to the predominant use of sealed bidding to acquire government products and services (Lohfeld, 2015). The CICA's importance allowed contracting officers to consider different evaluation factors such as management or past performance in addition to price, even allowing the government to weigh them as significantly more important than price.

5.   Defense Acquisition Workforce Improvement Act of 1990

Despite the implementation of the CICA, examples of unreasonably high acquisitions persisted, with key inquiries led by the Packard Commission (Gates et al., 2008). Additionally, the growing amount of legislation from Congress and regulation from each of the component services required a dedicated acquisition workforce with

extensive training on mandatory policies. In 1990, Congress passed the Defense Acquisition Workforce Improvement Act (DAWIA), which (1) formed the Defense Acquisition University (DAU), (2) directed the services to create formal acquisition career paths, and (3) led to the implementation of several DOD instructions that continue to tailor the acquisition workforce (Gates et al., 2008). While previous legislation focused on contracting policy, the DAWIA was drafted specifically to shape and monitor the skills and capabilities of acquisition personnel.

6.   Federal Acquisition Streamlining Act of 1994

A mere four years after the implementation of the DAWIA, the federal government again decided to alter the nature of defense acquisition in a sweeping way. During the early 1990s, the Clinton administration led a major effort to review and respond to the cost of federal procurement, which was growing at an alarming rate (Barry, 1995). The research concluded that government-specific regulations made up a significant portion of contract costs; the TINA alone "add[ed] about a 20 percent premium to government contracts" (Barry, 1995, p. 124). For some firms, this complex web of regulations was simply not worth the effort, and they declined to do business with the government altogether (Barry, 1995).

In response, the Federal Acquisition Streamlining Act (FASA) aimed to harness the efficiency of the private sector by shifting to commercial specifications and relying on industry standards and market forces to ensure the best prices. To this end, the law created a preference for commercial products, established electronic posting of requirements, and allowed additional exemptions for contingency contracting—especially relevant after lessons learned during the first Gulf War (Barry, 1995). Additionally, the FASA mandated awards to small business concerns for purchases below the simplified acquisition threshold, but above the newly created micro-purchase threshold. Finally, the FASA created what we now know as simplified acquisition procedures, through a complete rewrite of FAR Part 13 and the repeal of 225 procurement statutes (Barry, 1995).

7. Clinger-Cohen Act of 1996

Originally passed as Divisions D and E of the 1996 National Defense Authorization Act, the Clinger-Cohen Act (CCA) included fixes to several FASA provisions, as well as enacted new policies (Sherman, 1997). Division D, originally known as the Information Technology Management Reform Act (ITMRA), fundamentally changed the way the DOD acquired information technology (IT) services by removing the General Services Administration's (GSA's) role as manager of IT acquisitions. Additionally, the ITMRA directed each service to create chief information officer (CIO) position to consolidate and report on IT issues.

Division E, also known as the Federal Acquisition Reform Act (FARA), included several significant changes as well. The FARA refined the concept of competitive range by allowing contracting officers "to limit the size of the competitive range to the greatest number of proposals that will permit efficient competition" (Rumbaugh, 2010, p. 24). This update considers the timeline of the contract management process in addition to transparency concerns; acquisition teams now have the flexibility to determine the appropriate priorities for each procurement. The FARA also introduced FAR 13.5, which was referred to as the Test Program for Commercial Items, and has recently become a permanent addition to the FAR (Sherman, 1997). One interesting note about the FARA is the timeline of its enactment—agency officials had not yet finished implementing the Federal Acquisition Streamlining Act (FASA). One analyst dubbed the entire process "Reforming [the] Reform" (Sherman, 1997, p. 1), as the flurry of new legislation outpaced the agency's ability to execute them.

8. Weapon Systems Acquisition Reform Act of 2009

Just over a decade after the Clinger-Cohen Act, Congress passed the Weapon Systems Acquisition Reform Act (WSARA), which deals specifically with Major Defense Acquisition Programs (MDAPs). With the overall goal of reducing cost and schedule overruns—estimated at $3.1 billion and 22 months per program—it also made improvements to contract performance monitoring (Berteau, Hofbauer & Sanok, 2010).

To this end, the WSARA created four new oversight positions, added more stringent criteria for advancing milestones, and supplemented reporting requirements to Congress.

As the record of legislation shows, the DOD has been tweaking acquisition procedures for decades, with no end in sight. While each change represents an incremental improvement in the acquisition process, regulators and industry players agree that more work remains. Of note, each piece of legislation ultimately rebalanced the four principles of the federal acquisition system.

9.   Better Buying Power

The most recent piece of acquisition reform, however, did not originate from Congress. The creation of Secretary of Defense Ashton Carter and USD(AT&L) Frank Kendall, Better Buying Power (BBP) was originally a re-emphasis of existing policies, which ultimately grew into a unique piece of reform (Kendall, 2014). When asked, Carter explained that the concept behind the improvements was always an iterative process; no one initiative can succeed in a vacuum (Kendall, 2014). Now in its third installment, the program lives on, building upon the same core principles that started five years ago (Kendall, 2010). One of those principles is the concept of affordability. The first version of the initiative stressed the importance of "targeting affordability and controlling cost growth" (Kendall, 2010), while the update two years later highlighted the need to "mandate affordability as a requirement" (Kendall, 2012). In the latest update, the focus has narrowed to "enforce affordability caps" (Kendall, 2014), but the emphasis on controlling costs is still present.

However, the importance of affordability cannot come at the expense of other acquisition objectives. As reformers are quick to point out, the goal is process improvement, not to "cut a percentage off the contractor's bid" (Hagen, 2014). Likewise, cheaper programs cannot come at the expense of warfighter capability. In fact, Carter and Kendall designed the original set of BBP initiatives around the opposite premise: the ultimate goal is to direct savings into operational accounts (Corin, 2013). Instead of buying fewer or cheaper items, the architects of BBP understood the need to buy *smarter*.

But what does buying smarter look like? In order to answer this question, it is important to understand how the government currently acquires goods and services. The following is a brief discussion of the contract management process.

D.   GOVERNMENT CONTRACT MANAGEMENT PROCESS

Regardless of the good or service, government contracting typically follows the same timeline of six basic steps (Garrett, 2007):

- procurement planning
- solicitation planning
- solicitation
- source selection
- contract administration
- contract closeout

Each of these steps represents a broad overview of fundamental functions, and can be as detailed or a brief as necessary. For example, an order for common printer toner certainly requires less contract administration than a multi-million-dollar construction effort. Nevertheless, each of the above steps is present in virtually all government acquisitions, even if only briefly.

1.   Procurement Planning

The first step in the contract management process is procurement planning. During this step, the buyer contemplates whether contracting is even necessary, often categorized as a make-or-buy decision (Garrett, 2007). While the government seldom produces physical goods organically, uniformed personnel are capable of performing many federal services. In these cases, analysts conduct internal cost–benefit analyses to determine the best approach to fulfill the need. Additionally, this step typically includes market research to define the need itself, as well as to understand the capabilities of potential bidders (Garrett, 2007). The implication of this step should not be understated. Procurement planning sets the foundation for three key decisions: contract type (fixed-

price versus cost-reimbursement), procurement method (sealed bidding versus contract by negotiation), and source selection method (LPTA versus tradeoff).

2. Solicitation Planning

Once the acquisition team decides to proceed with a contract, solicitation planning begins. During this step, the government documents the details of the contract, from evaluation criteria to length of the relationship with the contract winner (Garrett, 2007). While government officials must operate within the confines of procurement regulations throughout the process, policymakers have developed various acquisition techniques as part of the ongoing reform previously mentioned. Officials have introduced each new strategy in order to assist acquisition teams in procuring the right item in a fair and transparent manner. We discuss these in detail later; however, it is important to note that like procurement planning, this step has a significant impact on the success of the contract.

3. Solicitation

Solicitation formally begins once the government publicizes the request for goods or services. As firms review solicitation documents and present offers to the government, officials must be prepared to answer questions, provide additional information on the requirement, and amend documents as necessary. One important note concerning solicitation is the efficiencies gained by recent technological developments. For example, the introduction of FedBizOpps, the online government point of entry, allows contracting offices to publicize notices instantly from a computer, rather than mailing out dozens of packages to prospective bidders.

While a poorly conducted solicitation can negatively affect the contract management process, successful completion of this step hinges on the framework established during solicitation planning.

4. Source Selection

Source selection consists of applying the evaluation criteria stated in the solicitation to the offers received. Like the previous step, source selection requires an

adherence to the overall strategy selected in the initial phases of the contract management process. Depending on the size and complexity of the procurement, this may involve source selection boards, technical panels, and any other expert required to evaluate the offers received (Garrett, 2007). Further, the source selection may involve directly negotiating with one or more vendors on price, technical factors, or personnel. Finally, the acquisition team selects the winner during this step; it is the most vulnerable to protests from unsuccessful vendors.

Due to the visibility of source selections, senior officials have placed a specific emphasis on the step, with many of the previously mentioned reform efforts centered on source selection. However, source selection is actually an execution of the evaluation strategy. By the time the government has advanced to source selection, it is typically too late to make significant changes without regressing back to a previous step. Therefore, it is critical for acquisition teams to adequately perform the initial planning activities.

5. Contract Administration

Contract administration, like all other steps, is vital to the success of the contract management process. Moreover, the length of contract administration often dwarfs each of the other steps, particularly in multi-year contracts. Successful contract administration consists of adhering to procurement policy and enforcing the contract as written; often complications occur when one or both of the parties fail to follow the stated agreement. While change requests and modifications can occur in any contract, the key to effective contract administration is a clear contract that stipulates the expectations of each party.

6. Contract Closeout

The final step in the contract management process is contract closeout. This step includes confirming that all required work has been accomplished, as well as any other details related to the contract. On some occasions, performance is terminated early; this can occur due to either mutual agreement or a breach of contract by one of the parties (Garrett, 2007). Clearly, the preferred outcome is successful fulfillment of obligations by both the buyer and the seller. However, when complications do arise, they are often caused by decisions made before award. In fact, despite the abundance of guidance

concerning source selection and post-award actions, solicitation planning remains "one of the most critical functions in contract management" (Garrett, 2007, p. 24). In order to understand the significance of this step, one must recognize the choices available to acquisition teams before contract award.

E.   PRE-AWARD ACQUISITION DECISIONS

One useful analogy for describing the various alternatives available to contracting officers is a decision tree. While dozens of contract types, procurement methods, and source selection methods are available, decisions made early in the process narrow the field of future possibilities. For example, if an acquisition team determines a product or service to be other than commercial, the procedures offered under FAR 12 are no viable procedural options (FAR 12.102(a)).

1.   Contract Type

One of the first decisions available to acquisition teams is the type of contract used to procure a good or service. Covered in FAR 16, contract type influences not only the procurement method and source selection method, but the entire contract management process as well.

Fixed-price contracts, the first type, are characterized by generally firm prices. The total amount paid to the contractor is typically only adjusted to reflect incentive fees, economic adjustments concerning component pricing, or the use of a contract clause to cover an unforeseen situation (FAR 16.201). Since the contract price is generally determined before performance begins, the contractor shoulders most of the risk. If the effort costs more than originally planned, the contractor typically earns less profit, while the government may face little to no consequences.

In response, contractors typically factor this risk into their proposals, building in larger profit premiums for work that is complex or prone to unknown hazards. For this reason, fixed-price contracts are recommended for clearly defined goods and services, such as commercial-off-the-shelf items, or efforts that a contractor has performed in the past (FAR 16.104(l)).

In situations where the required work is complex, undefined, or otherwise difficult to estimate initially, acquisition teams may use the second type, cost-reimbursement contracts. Cost-reimbursement contracts differ from fixed-price contracts in that the government reimburses the contractor for all allowable, reasonable, and allocable costs incurred in performance of the contract (FAR 16.301-1). Since the government assumes significantly more risk under cost-reimbursement contracts, the profit premium afforded to contractors is typically lower under this arrangement (DFARS 215.404-71-3(c)).

While fixed-priced contracts are generally recommended for use whenever practical, cost-reimbursement contracts are only allowed after an extensive review of the requirement, the proposed contractor, and the contract administration team (FAR 16.301-3(a). Additionally, acquisition teams are prohibited from using cost-reimbursement contracts to procure commercial items, limiting their use to complex, uniquely governmental efforts.

2.   Procurement Method

After selecting the appropriate contract type, acquisition teams must determine the best procurement method for the acquisition. The two basic options differ primarily in the evaluation of proposals, yet the consequences of this decision are reflected in nearly every step of the contract management process.

Sealed bidding, the first method, consists of receiving vendor bids and selecting a contractor chiefly based on price, or price-related factors (Rosa da Silva, 2013). It is relatively simple, as contracting officers are simply responsible for determining the lowest bid price that conforms to the details of the solicitation. Sealed bidding has a prominent role in the history of federal contracting; until World War II, it was the preferred option for acquiring supplies and services (Rosa da Silva, 2013). However, sealed bidding relies almost entirely on price-related criteria, and severely limits discretion in choosing a contract type; only firm-fixed-price contracts and fixed-price economic price adjustment contracts are permitted (FAR 14.104). As sealed bidding only

allows a narrow range of acquisition decisions, it is not suitable for many of the complex good and services contracting officers are responsible for buying today.

The second method available is contracting by negotiation. This alternative was first introduced as part of the CICA under the broad concept of best value, and allows government officials to discuss proposal details with offerors after receipt of proposals. Contracting officers can negotiate in competitive procurements to determine the relative merits of various proposals; or, in noncompetitive instances, to discuss pricing (Rosa da Silva, 2013). Based on the wide discretion government officials have under negotiation procedures, each acquisition must have clearly stated evaluation criteria so vendors know how to shape their proposals. This range of available evaluation options is known as the best value continuum, and is explained in the following section.

3. Source Selection Method

In order to understand the differences in source selection methods, one must first review the best value continuum. Specifically, it is important to understand the two extremes of the continuum to assess the two conflicting goals of government acquisition. The first goal of contracting officers is to provide maximum quality to the end user. Delivery time, superior customer service, and innovative technical approaches are all examples of quality. Regardless of the contract type, procurement method, or source selection method selected by the acquisition team, the contract will always express some level of quality requirements in a contract, because an acquisition for insufficient goods or services is never in the best interest of the government. On the best value continuum, selecting the highest technically rated offeror represents a total commitment to quality (FAR 15.101-1(a)).

However, as part of instituting contract by negotiation, the CICA also placed restrictions on the method. Chiefly, the act requires federal officials to consider price in every acquisition, regardless of where it falls on the best value continuum (Rumbaugh, 2010). While acquisition teams have the discretion to weigh price as more or less important than other factors, the mandatory inclusion of price essentially precludes

evaluation criteria designed specifically to select the highest technically rated offer without regard to cost.

The second objective inherent in the federal contract management process is the need to ensure the efficient use of taxpayer dollars. Similar to quality, stewardship of public funds is required for all contracts, and is stated in the first guiding principle for the federal acquisition system. Maximum attention to price as an evaluation factor is known as LPTA, and it serves as the opposite extreme of the best value continuum.

Since an evaluation strategy aimed purely at selecting the highest technically rated offer without regard to cost is prohibited by statute, the full best value continuum is technically not available to acquisition teams. Instead, a modified version of the spectrum remains in its place, with two main options: LPTA and tradeoffs. The following is a brief explanation of each method, along with relative strengths and weaknesses.

F.   LOWEST PRICE TECHNICALLY ACCEPTABLE

Under LPTA source selections, the government first ranks all offers in reverse price order, and then reviews them in that order until a technically acceptable offer is identified. If an offer is found not to be technically acceptable, it is eliminated, and the government proceeds to the next lowest priced offer. Under this basic framework, acquisition teams are not authorized to accept a proposal other than the technically acceptable low offer (FAR, 15.101-2).

Unsurprisingly, the FAR recommends LPTA acquisitions when "best value is expected to result from selection of the technically acceptable proposal with the lowest evaluated price" (FAR 15.101-2(a)). More specifically, LPTA procurements are preferred when the requirement is well-defined and when the government does not anticipate a significant risk of contractor default (GAO, 2014). Since acquisition teams do not reward vendors for proposing technical approaches that exceed the minimum requirements, the strategy is recommended for requirements that will not require an innovative solution. Put another way, LPTA contracts are ideal for what private defense firm The Analytical Services Corporation (TASC) describes as the "acquisition of commercial or non-complex services that are clearly defined and expected to be low risk" (TASC, 2012, p.

2). For example, the GAO highlights the government's high usage of LPTA source selections in commercial acquisitions of fuel (2014). Even for large contracts, fuel is a relatively well-understood requirement for buyers and sellers, and as long as a vendor can meet the basic contract terms, there is no need to review quality factors among the offers.

As a source selection method, LPTA satisfies many of the federal acquisition guiding principles. As contracting officers are required to accept the lowest price offer that meets the government need, the customer's need is expressly satisfied in terms of cost, while timeliness and performance are ostensibly included as well. Additionally, because LPTA acquisitions tend to be simpler than tradeoffs, contracting offices can move more quickly through the six-step contract management process, reducing administrative operating costs. Finally, the generally inflexible nature of the LPTA source selection method does not grant contracting officers discretion, which serves as a guard against the appearance of favoritism, promoting the perception of integrity, fairness, and openness.

G.   TRADEOFF

By contrast, tradeoff acquisitions allow contracting officers the flexibility to weigh non-price factors as part of an overall evaluation assessment. Under this method, the acquisition teams have the flexibility to select other than the LPTA offer if the perceived benefits of a higher priced offer outweigh the additional cost (FAR 15.101-1(c)). This decision must conform to the evaluation criteria stated in the solicitation; however, the mere ability to weigh multiple components of an offer can be useful in complex, technical acquisitions.

As the GAO (2014) notes, tradeoffs are valuable when the past performance or technical capacity of a contractor is important; goods or services that require a contractor's experience throughout the acquisition process may warrant the use of the tradeoff method. These are most commonly found in complex acquisitions where the government anticipates unknown challenges in the future, that is, a specific need cannot be identified at the time of award, but the increased capability of qualified contractors may be beneficial. This dialogue of evaluation factors and their relative importance is

known as an integrated assessment, and is essentially "the crux of the entire source selection" (Slate, 2004, p. 38).

Compared to the LPTA method, tradeoffs emphasize providing maximum performance for the customer, although costs may increase as a result. However, acquisition teams rely on price competition among offerors to ensure fair and reasonable offers (FAR 15.402(a)(2)). Additionally, proponents of tradeoffs argue that the initial costs of a higher priced vendor are ultimately more efficient, as the incentive structure encourages vendors to avoid cutting costs that could jeopardize the effort after award. By this logic, the resulting contract is less likely to require modifications after award due to the contractor's increased capability. Finally, price competition is still typically present.

In terms of fairness and openness, tradeoffs certainly expose the government to the perception of internal bias. While tradeoffs are specifically structured to reduce this risk—for example, acquisition teams are required to state the relative importance of price versus non-price factors—the strategy ultimately carries the perception of less transparency.

H.   IMPLICATIONS OF EACH SOURCE SELECTION METHOD

While in some cases the choice between the LPTA and tradeoff source selection methods is clear, the majority of acquisitions require government teams to analyze the situation and weigh the relative benefits of each method against their costs. To understand this process, we have summarized the key implications of each method.

However, it is important to note that these conclusions are not necessarily representative of the entire population of federal contracts. Many of the findings come from GAO reports, which, while informative, are typically based on small sample sizes (15 to 20 contracts). In other cases, the conclusions are drawn from academic journals or sentiments of acquisition personnel (GAO, 2014), which also lack the statistical significance of a data analysis.

1. LPTA

The most significant weakness inherent in LPTA procurements is the potential for unrealistic pricing. The reliance on price as the final discriminator in LPTA source selections has a negative tendency to encourage a race to the bottom by competing vendors. The Department of State's (DOS's) contractor, Armor Group North America (AGNA), provides an excellent case study for this behavior, as the contractor's shortcomings were directly related to their unsustainable pricing structure (CWC, 2009). Rather than inexperienced management or unethical employees, the majority of contractor violations resulted from cost-cutting measures: lack of security vehicles, third country national personnel incapable of communicating in English, and shortage of employee uniforms (CWC, 2009). The AGNA example is particularly troubling because the DOS was not allowed to utilize tradeoffs for overseas security acquisitions at the time, requiring the use of an inappropriate source selection method.

In order to combat this, acquisition teams often employ cost realism: a methodical review of proposed pricing against the required performance to identify and respond to unrealistically low offers. Cost realism was originally designed as a technique to mitigate unrealistic pricing on cost-reimbursement contracts, where the potential risk to the government is the greatest, but contracting officers can also use cost realism language in fixed price contracts in to achieve the same result (Lohfeld, 2014). However, this solution must be pre-meditated; evaluating offers for cost realism without specifically stating so in the solicitation represents a departure from the source selection criteria, and a "fertile area for procurement protest" (Lohfeld, 2014).

Despite efforts to promote cost realism, the perceived threat to offerors of unrealistically low pricing by competitors is often enough to dissuade a bid, because the resources spent creating an offer appear to be a waste (CWC, 2009). Regardless of whether the government would have chosen these technically superior contractors, their presence increases the competitive nature of the acquisition, increasing government value. Removing them from the acquisition is not good for the government.

In other cases, the need to remain competitive may persuade firms to minimize their staff and research funding in order to reduce operating costs. As noted by TASC (2012), general and administrative (G&A) costs are typically the business expense eliminated, followed swiftly by research and development (R&D) funding. While large firms such as Lockheed Martin and Northrup Grumman typically have several projects to move personnel around, small firms may have to radically alter their entire operation to win bids, permanently reducing their potential technical innovation.

Further, among contractors who maintain their original staffing levels, there is no incentive to present a high quality product or service (Nichols & Totman, 2013). In fact, LPTA procurements actually discourage any level of effort beyond the stated minimum—quoting additional resources simply drives up the proposed cost without increasing the attractiveness of an offer. In a recent National Contract Management Association (NCMA) presentation, the organization advised vendors to bid for the absolute minimum level of work required and to cut supervisory personnel on LPTA projects, even though the strategy "could be deemed risky to some companies" (Calhoon & Sybert, 2012).

2.   Tradeoffs

Conversely, tradeoffs often suffer from the perception of increased costs. Ultimately, trading higher prices in exchange for a more robust technical proposal or superior past performance means paying some form of performance premium, as part of the integrated assessment process. While the acquisition team may be fully justified in paying a higher cost, outside observers—both public and private—may disagree. The GAO noted that, among best-value acquisitions, the percentage of tradeoffs declined steadily from 2009 to 2013, the period for which they analyzed the metric (2014). Additionally, DOD contracting officers and program managers echoed these findings, attributing the heightened use of LPTA to shrinking budgets caused by sequestration. From the industry perspective, this opinion is repeated; TASC has attributed the decline in tradeoffs to shrinking budgets (TASC, 2012). While the government is required to evaluate price reasonableness for all offers, preferably through the use competitive

proposals (FAR 15.305(a)(1)), the increased scrutiny brought on by the tradeoff method appears to influence source selection method nevertheless.

Additionally, the increased flexibility offered by tradeoff requires a pool of adequately trained personnel to successfully conduct the source selection. Unlike LPTA source selection, which only assesses the threshold of acceptability, acquisition teams must define and quantify each evaluation factor as part of each procurement's specific integrated assessment. The GAO noted that "developing non-cost factors that meaningfully discriminate between offers" can be particularly difficult (2010, p. 17). Their report also highlights the need to bring in personnel with specific expertise, citing a U.S. Army Corps of Engineers project where water flow experts were brought in to analyze the merits of different proposals (GAO, 2014).

Moreover, the requisite training cannot be accomplished by a new DAU offering. In interviews with the GAO, DOD officials stressed the importance of on-the-job training for acquisition personnel, specifically when deciding between the two source selection methods, as well as justifying the decision to select a higher priced offer (GAO, 2014). This is particularly relevant today because the DOD increased the size of the contracting workforce in the years leading up to fiscal year 2015. Training these new personnel in the nuances of tradeoffs will likely take decades.

Another consequence of the complicated nature of tradeoffs is the increased risk of protests from losing offerors. Within federal acquisition, two factors significantly increase the risk of protest: dollar value and agency discretion. As Carl Gebo, a partner at Adorno & Yoss (2009), explains,

> In negotiated procurements, the interaction between offerors and the agency can be far greater than in sealed bid procurements. In seeking clarifications, conducting discussions, and making presentations, suspicions of prejudicially different treatment thrive and add to the incentive to protest. The opportunity to influence those evaluations through those agency contacts is real and even part of the process. When looked at in retrospect, through the prism of a lost contract, offerors are inclined to believe that undue influence or unfair treatment occurred. (p. 30)

Based on the government's increased use of the tradeoff method for high-dollar acquisitions, particularly above $25 million, as well as the subjective nature of conducting an integrated assessment, the risk of protest(s) is much higher for these procurements.

Even among highly trained personnel who manage to avoid protests, tradeoffs can often be lengthy affairs, especially when compared to LPTA procurements. Developing meaningful criteria, effectively stating the evaluation methodology, and conducting the integrated assessment are all deliberate processes, resulting in longer procurements. During a GAO study, acquisition personnel echoed the measured pace of the tradeoff method, citing a typical timeline of 18 to 24 months for completion (2010). While the GAO based its findings on individual interviews rather than contract data collection, the point remains. This sentiment is echoed by industry, which discredits the LPTA method but grudgingly admits its streamlined efficiency (Lohfeld, 2015).

The final, and perhaps most troubling, drawback of the tradeoff method is the government's apparent lack of actually trading off price and non-price factors. In an FY2009 study, the GAO found that DOD contracting officers utilized the tradeoff method in 68% of their sample (2010). However, of these, the government selected a higher priced offer less than a quarter of the time. Even more troubling, selecting the non-low offer resulted in a protest rate of 72%, with nearly a third of protests resulting in either acquisition cancellation or changed award decision (GAO, 2010). Put simply, the government seems unwilling or unable to utilize the principal benefit of the tradeoff method. Given the increased time and training required, as well the increased risk of protests, the illusion of choice may not be in the government's best interest.

I.   SUMMARY

In this chapter, we have reviewed the context for the tradeoff source selection method. Prior to the CICA, the government typically utilized some version of LPTA, with a primary focus on acquiring goods and services at the lowest price. As government regulation evolved, so did the guiding principles of acquisition, resulting in objectives other than cost savings. The federal government introduced tradeoffs along with the best

value continuum as a way to encourage innovative solutions for complex procurement problems. Based on the relative strengths and weaknesses of the tradeoff method, it is typically advised for complex, developmental, less-defined procurements.

However, as discussed previously, many of these conclusions are drawn from incredibly small sample sizes, while others simply express personal experiences. In the next chapter, we explain the methodology of our study in order to test the validity of these claims using contract data.

III. METHODOLOGY

A. INTRODUCTION

In this section, we examine our process for collecting and analyzing relevant data to answer the research questions of this study. We hope that our approach can pave the way for future studies of this subject across all military branches. This section will provide a brief examination of the contracting structure and systems used in the Air Force. The subsequent sections explain the data collection method and the unique elements of our research.

B. CONTRACTING STRUCTURE AND SYSTEMS

This section provides an overview of the structure and systems used in the Air Force to carry out the contracting mission.

1. Base Operational Contracting

Within the Air Force, most installations include a contracting contingent (typically a fully staffed squadron) responsible for procurement needs across the base. Contracting officers (COs) and contracting specialists within the squadron are responsible for procurement planning, solicitation planning, solicitation, source selection, contract administration, and contract closeout for every acquisition (Garret, 2007). The discharge of these duties involves ensuring documentation of such actions is complete within the contract file and all associated databases.

2. Federal Procurement Data System–Next Generation

The Federal Procurement Data System–Next Generation (FPDS-NG) provides the platform for COs to report contract data to government officials. Within this system, each contract action has a corresponding Contract Action Report (CAR) that captures a significant amount of data relating to the contract, including dollar amount, length of performance, number of offers received, and the extent to which the purchase was

competed. These data are unique to each contract action and are submitted and maintained in the FPDS-NG system.

3. Federal Business Opportunities

Another valuable source of contract information is the government-wide point of entry, otherwise known as the Federal Business Opportunities (FBO) website (www.fbo.gov). Contracting squadrons upload solicitation documents to the website to inform potential contractors of government requirements. The solicitation, maintained on the FBO website, contains proposal preparation and submission instructions, states the evaluation factors that the source selection team will use to assess each proposal, and identifies which source selection method will be used to make the final award decision. The FBO database stores solicitations and all related amendments, as well as additional information associated with the requirement (e.g., drawings or specifications, answers to questions posed by potential vendors, etc.).

4. Contractor Performance Assessment Reporting System

The Air Force and other government agencies use the Contractor Performance Assessment Reporting System (CPARS) to report their periodic evaluations of contractor adherence to contract terms. This system stores contractor performance evaluations and supporting rationale for each contract. FAR Subpart 42.15 provides instructions for evaluating contractors based on the elements of cost control, technical, schedule, business relations, and subcontracting. Within these broad categories, the contractor is given an evaluation according to a Likert-style scale, which is discussed further in the next chapter. As demonstrated in the following sections and chapters, these ratings serve as a proxy rating of overall contract performance; higher ratings indicate compliance with contract requirements and positive performance.

C.   DATA COLLECTION

Although the aforementioned systems contain data relevant to our research, we needed access to more in-depth data that is not available in any system or database. As such, we traveled to two Air Force contracting squadrons to review their contract files

and extract the necessary data. Specifically, we captured contract outcome data from contracts that used the tradeoff source selection method and compared that information against the same data points gathered from contracts using the LPTA source selection method.

We focused our research on contracts awarded by the Air Force's 21st Contracting Squadron located at Peterson Air Force Base, and the 50th Contracting Squadron located at Schriever Air Force Base. We felt that the Colorado Springs area, where these bases are located, offered significant potential for gathering large amounts of data, due to the close proximity of the two bases. Also, Peterson Air Force Base is the headquarters of Air Force Space Command, and we knew that it would provide a sufficient mix of contracts likely to involve both tradeoff and LPTA procedures. With the help of the Air Force Installation Contracting Agency (AFICA), we contacted both bases to request that they identify contracts with the following criteria:

- available CPARS data

- high dollar amount, preferably valued above $700,000

- an equal number of contracts that utilized tradeoff and LPTA source selection methods

By coordinating with each point of contact, a sufficient number of contracts were made available to us upon our arrival at each base. Between the two installations, we accessed data from 33 contract files dealing with a broad range of requirements.

The five categories of data that we were interested in locating for our study were:

- basic contract information

- acquisition complexity

- environmental factors

- outcome variables

- other data (relating to discussions)

Basic contract information included the main identifying features of a contract, such as the contract number and description, as well as the buying organization (squadron). The North American Industry Classification System (NAICS) code and

Product Service Code (PSC) were also captured as further identifying characteristics for each contract.

Acquisition complexity was measured using such factors as contract type, set-asides used, length of contract, number of contract line items, and dollar value. In this section, we note the source selection method utilized, as well as the number and description of evaluation factors and subfactors. Industry involvement was measured by whether or not conferences were held in relation to solicitation and communication of requirements, how many offerors submitted proposals, and whether there were multiple awards or a single contract award. Incentive and award fee criteria, where present, were also relevant to the acquisition complexity measure.

Environmental factors included the number of reviews, as well as the utilization of Multi-Functional Independent Review Team support. Here we also gave each contract file a rating for level of documentation on a five-point scale where 1=well below average, 2=below average, 3=average, 4=above average, and 5=well above average. We also included an assessment of the state of the U.S. economy at the time of contract award, in order to assess the larger economic context of each acquisition.

Outcome variables were crucial to our study because they provided the dependent variables and basis for comparison of the two source selection methods. The PALT and CPARS ratings (further expounded upon in the next chapter) were the main factors used to evaluate contract outcomes. Other important measures of contract outcome included protest data, Earned Value Management (EVM) data, number of solicitation amendments, and earned award fee.

The last category of information, *other data*, included discussions between the government and vendors during source elections. For example, we looked at requests from the contracting office to offerors for clarifications of their proposals. When the source selection team notices a deficiency in an offeror's proposal, a deficiency report or an Evaluation Notice (EN) is issued to make the problem known. We counted the number of ENs, as well as the number of rounds of ENs, to better understand the quality of proposals as well as the effectiveness of the source selection. The final data point we

collected was the basis for award; if the contract was awarded on any basis other than cost or price, we noted the determining factor.

D.   UNIQUE ELEMENTS OF OUR RESEARCH METHOD

By working with our contacts at each base prior to our travel, we ensured that there would be a sufficient and equal number of contracts that utilized the two different source selection methods. If we had accessed a list of each base's contracts and requested specific contracts be made available, we might have encountered the problem of having too many sample cases of one source selection method and not enough of the other. Our contacts' prior knowledge of each contract helped us avoid that problem. By requesting their assistance, we also avoided the potential pitfall of pre-selecting contracts for evaluation only to find upon arrival at the base that those contracts had been closed and staged.

Another positive element of this approach, albeit intangible, was that it involved other contracting specialists and contracting officers who would otherwise not have taken part in the study. Sharing responsibility for this research helped to disseminate the thought process and goals of this research down to the squadron level. By involving others, they are now aware that AFICA is engaged in research that may streamline the procurement process and improve contracting operations. As contracting personnel communicate and transfer across squadrons, other installations will have an increased awareness of the data needed for future studies associated with this research.

One unfortunate finding was the lack of EVM data. Major defense systems acquisition programs would be more likely to employ EVM practices. Although Peterson AFB and Schriever AFB both managed high dollar contracts dealing with space systems, they dealt mainly with system support rather than system development; therefore, the level of complexity did not necessitate EVM processes. Thus, we were unable to capture EVM data from the contracts made available to us.

Another challenge of our research method was the sheer magnitude of the contract files to be examined. Some files were unexpectedly large, with portions stored in different locations within the office building. Several times, a member of our group

would begin examining the pre-award data for a contract only to subsequently discover that the award document was stored elsewhere. Each installation's security measures were unique, and this caused some delays in finding crucial documents. This was particularly the case at Schriever AFB. While this issue did not significantly impede our progress, it did slow the process and constrain our already limited time on site.

E.   SUMMARY

Overall, our data collection methodology accomplished the end goal of gathering a sufficient amount of data to examine our research questions. Colorado Springs provided an excellent location for our research; we were able to examine the contracts of two separate squadrons, which provided us with a mix of LPTA and tradeoff contracts and their corresponding outcomes. The next chapter presents the results of our data analysis.

IV. RESULTS AND RECOMMENDATIONS

A. INTRODUCTION

Once we collected the data mentioned in the previous chapter, we used statistical software to perform a series of analyses. In the following sections, we discuss the assumptions tested before we ran the program, followed by the results of the data analysis and conclusions to be drawn therefrom.

B. DATA DESCRIPTION

For this analysis, we used two main outcomes, or dependent variables (DVs): procurement administrative lead time (PALT) and Contractor Performance Assessment Reporting System (CPARS) data. PALT assesses *time to contract* by calculating the number of days between receipt of the requisition and contract award. It is a continuous variable. CPARS serves as a proxy measure of contract success or failure by using the ratings given to each completed contract. CPARS ratings are given in Likert-style responses where 1= unsatisfactory, 2=marginal, 3=satisfactory, 4=very good, and 5=excellent. In this case, we used only combined CPARS scores as the second dependent variable. Specifically, we searched for differences in CPARS ratings between LPTA and tradeoff source selections by examining the average CPARS rating for each contract. The average rating was composed of the most frequently recorded CPARS scores: CPARS quality ratings, CPARS schedule ratings, and CPARS business relationship ratings.

Our model has one independent variable (IV). Independent variables are those that can be manipulated by the researcher (or user) to evoke a change in the outcome, or DV. In this case, the IV concerns the source selection methodology used for the contract: LPTA or tradeoff. Source selection methodology is a choice made by the "user" (the integrated product team, which includes the contracting officer); hence it is considered an IV. Our IV is labeled LPTATO and it is a binary variable where 0=LPTA and 1=tradeoff.

Finally, there are three covariate variables. Covariates are secondary variables that can also affect the relationship of primary interest: the relationship between the IV and the DV. Specifically, covariates are variables *other than* the independent variable that

potentially affect the outcome variable, or DV. In this case, the covariates are (1) number of evaluation factors (NUMEVALFACTORS), (2) number of reviews (NUMREVIEWS), and (3) number of offers (NUMOFFERS). All are continuous variables. Theoretically, each of these covariates could affect the PALT positively (e.g., a larger number of any of the covariates could increase the PALT, or time to contract). In this case, we hope to parcel out the effects of the covariates in order to more clearly see the effect the contracting methodology (LPTATO) has on the outcome variables (PALT and CPARS ratings). It is worth noting that we wanted to use contract dollar value (VALUE) as a covariate, however VALUE did not pass the homogeneity of regression test (see paragraph 4 below), therefore we could not use it in the analysis.

1. Descriptive Statistics

Basic descriptive statistics for each variable are shown in Table 1. The table presents three figures for each variable: (1) the total for all the data, (2) the total for LPTA contracts, and (3) the total for tradeoff contracts.

2. Data Limitations

The data point NUMOFFERS, which proved to be an important variable, was collected from the Contract Action Report (CAR) on the Federal Procurement Data System—Next Generation (FPDS-NG). Taking this number from the CAR was more efficient and practical than counting each offer by hand; counting each offer ourselves would have proven to be an unwise use of our limited time available for data collection. The limitation with relying on the CAR, however, is that we became subject to human error that could have occurred at the time of initial entry into FPDS-NG. Information found in the CAR is only as good as the care taken to input the data. Using the CAR to count NUMOFFERS was the best approach; however, possible human error presents a limitation.

The more substantial limitation of our data is its sample size and distribution. With only 33 cases, the sample size is small to moderate; however, the distribution of cases by source selection method is unbalanced. Power calculations suggest the need for 14 cases for each method (i.e., 14 LPTA cases and 14 tradeoff cases) in order to achieve

adequate power (α = .05, β = .80). The data are unbalanced with respect to the number of cases for each contracting methodology. There are 10 LPTA cases and 23 tradeoff cases. This unbalanced design can cause ambiguity about the mean as the intercept and make assignment of sums of squares more difficult. There are, however, solutions to these issues. A weighted mean can be used in place of the grand mean[1] and the STATA software automatically handles the assignment of the sums of squares. Thus, we proceeded with our analysis despite these limitations.

Table 1.   Descriptive Statistics

Variable	Obs	Mean	StdDev	Min	Max
PALT (days)	**33**	**352.7879**	**334.3218**	**21**	**1019**
	10	216.4	198.8524	30	615
	23	*412.087*	*366.4262*	*21*	*1019*
Average CPARS Rating	**22**	**4.256061**	**.7717661**	**3**	**5**
	6	4.302778	.7895439	3	5
	16	*4.238542*	*.7904925*	*3*	*5*
Number of Evaluation Factors	**29**	**2.344828**	**.6695341**	**1**	**4**
	10	2	.4714045	1	3
	19	*2.526316*	*.6966923*	*2*	*4*
Number of Reviews	**26**	**9**	**6.734983**	**3**	**28**
	10	9.6	6.328068	3	25
	16	*8.625*	*7.154253*	*3*	*28*
Number of Offers	**33**	**5.666667**	**5.677074**	**2**	**22**
	10	3.2	1.549193	2	6
	23	*6.73913*	*6.475249*	*2*	*22*

Bold = total for all data, non-italicized = LPTA, italicized = tradeoff

3.   Analysis

Because our intent is to analyze differences in contract outcomes based on source selection methods, a group comparison statistical methodology is necessary. In other words, the source selection methods are divided into two groups, LPTA and tradeoff, and we seek to find if there are differences in contract outcomes between each group.

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[1] The grand mean would be the intercept in a balanced design.

We used a technique called multivariate analysis of covariance, or MANCOVA, to assess group differences. MANCOVA essentially creates a new dependent variable using the information from the given DVs (PALT and CPARS ratings). This new dependent variable is created in a way that maximizes differences between the grouping variable (LPTA or tradeoff source selections). MANCOVA addresses the following questions: Are mean differences among the groups on a combination of DVs (after adjusting for covariate effects) likely to have occurred by chance? Taken from another angle, is there a significant difference between the mean value for PALT and CPARS ratings in the LPTA acquisitions versus the mean value for PALT and CPARS ratings in the tradeoff acquisitions, once the effect of the covariates (NUMEVALFACTORS, NUMREVIEWS, NUMOFFERS) have been parceled out? MANCOVA examines the relationships between the DVs (PALT and CPARS ratings) and the independent variable (choice of LPTA or tradeoff methodology) while taking into account the effect the covariates might have on the DVs.

If differences in outcomes are found using MANCOVA, researchers typically choose to dig deeper into the differences using a univariate technique called analysis of covariance (ANCOVA). ANCOVA essentially performs the same "group differences" analysis as a MANCOVA; however, because it is univariate in nature, this method assesses one DV at a time (PALT *or* CPARS, rather than PALT *and* CPARS). This method helps researchers isolate where the difference is occurring (which IVs or covariates are affecting which DVs).

4.   Assumption Testing

Before conducting the MANCOVA, certain assumptions about the data were tested. First, we assessed multivariate normality by examining density graphs, determining multivariate skewness and kurtosis, and examining the Doornik-Hansen test for multivariate normality (Doornik & Hansen, 2008). For the DVs, both PALT and CPARS were deemed to be non-normal. Both variables were normalized via a logarithmic transformation. All of the covariates (NUMEVALFACTORS,

NUMREVIEWS, NUMOFFERS) also required a logarithmic transformation, after which they were deemed to be multivariate normal.

Second, we searched for outliers using Mahalanobis' distance, and found no significantly influential outliers in our data. Third, we assessed linearity by examining scatter plots of (1) the paired DVs, (2) all pairs of covariates, and (3) all pairs of DV-covariate combinations for each source selection method (LPTA and tradeoff, a total of 20 plots). The plots revealed that all relationships were linear in nature.

Fourth, we assessed homogeneity of regression by performing an analysis of variance (ANOVA, which is practically the same as an ANCOVA but does not contain a covariate variable) that included the independent variable (LPTA or tradeoff), each of the covariates (NUMEVALFACTORS, NUMREVIEWS, NUMOFFERS), and the interaction between the independent variable and the covariate. The interaction terms were not significant, which indicates that the relationship between the DVs (PALT and CPARS ratings) and the covariates is the same at both levels of the independent variable (LPTA or tradeoff). Hence, the assumption of homogeneity of regression is upheld. The covariate measuring the contract's dollar value (VALUE) failed this test; hence, it was dropped from further analysis.

Fifth, we checked for multicollinearity by assessing the pooled within cell tolerance for each DV (PALT and CPARS). Multicollinearity is not an issue for the DVs when the independent grouping variable tradeoff is used; however, it may be an issue for the LPTA group. For the LPTA group, NUMOFFERS is very highly correlated with PALT ($r = .94$). This suggests that this covariate may be measuring many of the same characteristics that the PALT dependent variable is measuring. This can be troublesome because the high degree of similarity makes the variables redundant. To account for this issue, we chose to perform the MANCOVA twice: once with NUMOFFERS included and once with NUMOFFERS excluded.

Finally, we checked for homogeneity of covariance matrices between groups (i.e., sphericity) using the multivariate test of means provided in STATA 12.1. This test checks whether or not population variances and covariances of both DVs (PALT and CPARS)

are equal for each of the independent variable groups (LPTA and tradeoff). The results showed that all grouping cells were homogenous. With all assumptions tested, we performed the MANCOVA. The results are provided in the following section.

C.   RESULTS

With all the aforementioned assumptions tested, we performed the MANCOVA analysis. The following sections outline the results, first with NUMOFFERS included, second with NUMOFFERS excluded.

1.   Results, Including Number of Offers

The results show no instances where source selection method (LPTA or tradeoff) produced significantly different contract outcomes. There were, however, covariates that produced different outcomes. Although not the focus of our research, we list them here and urge future researchers to examine these variables as covariates, as they capture some of the variance in the DV groups. Essentially, both the number of evaluation factors a solicitation contains and the number of offers it receives increase time to award (PALT). These results make sense because the PALT includes the time taken to select an awardee. This selection process involves evaluating each offer received in strict accordance with the evaluation factors set forth in the solicitation. Therefore, the selection process (and resulting PALT) will increase as more offers are submitted and as more evaluation factors are stipulated in solicitations. Table 2 shows the numerical evidence of this result. The italicized variables, NUMEVALFACTORS and NUMOFFERS, were the only ones that demonstrated a statistically significant effect on PALT.

Table 2.   MANCOVA Results with NUMOFFERS

Variable	Coeff	StdErr	t	P>|t|	95% CI	
PALT						
LPTATO	-.9154339	.513016	-1.78	0.100	-2.0332	.2023319
# Eval Factors	*3.456288*	*1.10602*	*3.12*	*0.009****	*1.046478*	*5.866098*
# Reviews	.0082172	.4027713	0.02	0.984	-.8693461	.8857806
# Offers	*.9032533*	*.3112962*	*2.90*	*0.013***	*.2249971*	*1.58151*
Constant	1.507324	1.058166	1.42	0.180	-.7982225	3.81287
CPARS						
LPTATO	.0447562	.1424067	0.31	0.759	-.2655213	.3550337
# Eval Factors	-.1412446	.3070169	-0.46	0.654	-.810177	.5276879
# Reviews	.1214624	.1118042	1.09	0.299	-.122138	.3650628
# Offers	-.0865176	.0864119	-1.00	0.336	-.2747929	.1017576
Constant	1.413526	.2937335	4.81	0.000	.7735361	2.053517
	* p<.10 ** p<.05 *** p<.01 Number of Observations = 17 Root Mean Squared Error: PALT = .86 CPARS = .24 R^2: PALT = .6266 CPARS = .1171					

DVs: PALT and CPARS ratings; statistically significant variables in italics; results shown in multivariate regression format

2.   Results, Excluding Number of Offers

Removing the effect of the potentially collinear variable NUMOFFERS, we find similar results. There are still no instances where source selection method (LPTA or tradeoff) produced significantly different contract outcomes. Number of Evaluation Factors (NUMEVALFACTORS), however, still produced significantly different results in PALT (the larger the number of factors, the longer the PALT). This is shown by the italicized row in Table 3.

Table 3. MANCOVA Results without NUMOFFERS

Variable	Coeff	StdErr	t	P>|t|	95% CI	
PALT						
LPTATO	-.1955875	.5627742	-0.35	0.734	-1.411387	1.020212
# Eval Factors	*2.660771*	*1.342889*	*1.98*	*0.069**	*-.2403637*	*5.561905*
# Reviews	.5984634	.4356733	1.37	0.193	-.3427515	1.539678
Constant	1.921261	1.31407	1.46	0.167	-.9176158	4.760138
CPARS						
LPTATO	-.0241939	.1246599	-0.19	0.849	-.2935053	.2451175
# Eval Factors	-.0650464	.2974628	-0.22	0.830	-.7076756	.5775829
# Reviews	.0649259	.0965058	0.67	0.513	-.1435622	.2734141
Constant	1.373878	.2910793	4.72	0.000	.7450391	2.002716
	* p<.10 ** p<.05 *** p<.01 Number of Observations = 17 Root Mean Squared Error: PALT = 1.08 CPARS = .24 R^2: PALT = .3646 CPARS = .0433					

DVs: PALT and CPARS ratings; statistically significant variables in italics; results shown in multivariate regression format

D. FURTHER DISCUSSION

The previous two tables show that evaluation factors and number of offers received are the only variables that significantly affect contract outcome. These two variables affected PALT, even though the CPARS ratings were unaffected (significantly) by either the IVs or the covariates. As a final analysis, we examined the relationships between the variables themselves. The correlations are shown in Table 4.

Table 4.   Correlations

Variable	PALT	CPARS	# Evaluation Factors	# Reviews	# Offers
PALT	**1.00**	*-0.3623*	*0.4694*	*0.5344*	*0.3333*
CPARS	0.2657	**1.00**	*0.1206*	*0.3161*	*-0.2882*
# Evaluation Factors	0.7319	0.2258	**1.00**	*0.5799*	*-0.2951*
# Reviews	0.3099	0.0912	-0.1722	**1.00**	*0.3650*
# Offers	0.9370	0.4951	0.6139	0.4753	**1.00**

Non-italicized, lower triangle=LPTA; italicized, upper triangle=tradeoff

These correlations confirm the previous findings, and should come as no surprise to anyone who has taken part in a source selection. For example, the highest overall correlation exists between PALT and NUMOFFERS (r=.9370), and between PALT and NUMEVALFACTORS (r=.7319) in an LPTA setting. This suggests that the bulk of the PALT is taken up by reviewing offers; the more offers that are submitted, the more time it will take to review those offers (thus increasing PALT). There is a high correlation between PALT and evaluation factors (second highest correlation found through correlation analysis). These two aforementioned high correlations demonstrate that there is potentially a large compounding effect of evaluation factors and number of offers on PALT.

The highest correlation found in the tradeoff setting exists between evaluation factors and NUMREVIEWS (r=.5799). The same amount of strong correlation between these two covariates was not noticed in the LPTA situation. These results also make sense; for tradeoff scenarios, source selection is more complex as each evaluation factor is weighed as a possible basis for award. The more factors present as possible bases for award, the more complex this determination becomes; thus, the process will likely require more reviews. In contrast, with LPTA, the decision ultimately comes down to price (provided the lowest priced offer is technically acceptable), and the process is more straightforward, thus requiring fewer reviews. Other noteworthy correlations in the tradeoff setting include the correlation between PALT and NUMEVALFACTORS (r=.4694) and also between PALT and NUMREVIEWS (r=.5344). These correlations

confirm that an increase in evaluation factors, and/or an increase in the number of reviews, will increase the PALT. The fact that this can be shown statistically should affirm the need to eliminate unnecessary levels of review or evaluation factors. Any increase to PALT should be for worthwhile evaluation.

It is also worth noting the highest instance of negative correlation found in the analysis. This exists between the two DVs, PALT and CPARS (r=-0.3623). The possible reasons for this observation are numerous, but the following scenarios provide possible explanations. A low PALT could mean that the contract awardee was quickly selected as a clear winner and that this contractor lived up to expectations by performing well. Conversely, a high PALT suggests that the decision was more ambiguous, with no clear winner. A decision made under the latter conditions would be more likely to result in selecting a less-than-optimal contractor. While this is educated speculation, more research needs to be conducted to confirm or negate this notion.

One last important observation from the correlation table is the positive correlation between number of offers and CPARS ratings in LPTA source selections (r=.4951). This correlation helps make the case that competition produces better outcomes. While nothing can be stated for certain here, this suggests that higher levels of competition will lead to the selection of high-performing contractors.

E.   RECOMMENDATIONS BASED ON FINDINGS

We are unable to make concrete recommendations for change based on our limited amount of data. The one recommendation we can make is that each requirement be fully understood in order to make the best decision as to whether the LPTA or tradeoff source selection method is more appropriate. In the solicitation planning phase, contracting personnel together with their customers should closely examine the number of evaluation factors and the number of planned reviews, with the understanding that these variables will affect PALT. This recommendation mirrors that of contract management expert Marge Rumbaugh to "limit evaluation factors to those that are critical to program success" (Rumbaugh, 2015, p. 12). The likely additional PALT should be weighed against the need for certain evaluation factors and reviews to determine which is

more important to the acquisition. In other words, the acquisition risk posed by conducting fewer reviews should be weighed against that of increased PALT. These recommendations also echo the policy memorandum issued by Shay Assad, then-director of Defense Procurement and Acquisition Policy (2011).

F.   SUMMARY

These results have served to mathematically confirm some basic assumptions of the source selection process. Also, the idea that one source selection method may lead to better outcomes than another was unsubstantiated by our analyses. We encourage further research efforts in this area to expand on these findings and possibly find other ways of predicting or improving contract outcomes. Having shown the results of our data analysis, in the next chapter, we draw conclusions and present recommendations, as well as answer our research questions.

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V. SUMMARY, CONCLUSION, AND AREAS FOR FURTHER RESEARCH

A. INTRODUCTION

The previous chapter included a brief discussion of some of the observed effects of source selection method on contract outcomes, namely PALT and CPARS ratings. In this chapter, we summarize our findings and present our conclusion from the data analysis found in Chapter IV, answer the original research questions, and make suggestions for future research.

B. SUMMARY

The goal of this research was to determine whether or not there is a relationship between the source selection methods, and the contract outcomes of PALT and CPARS ratings. We reviewed many professional journal articles and Government Accountability Office reports to better understand both methods. We also performed hands-on research by reviewing 33 contract files at Peterson AFB and Schriever AFB and collecting the data points indicated in Chapters III and IV; then we utilized statistical analysis to determine the effects of those data points on PALT and CPARS ratings. Our data collection method produced a sample size that was adequate for our purposes but too small to influence policy decisions regarding source selection. We have made some suggestions regarding information provided by our analysis, with the recommendation that our study results be expanded upon and retested with future research.

The main takeaway from our research is that PALT and CPARS are more affected by number of evaluation factors and number of offers received than they are by the source selection method used. The circumstances of each acquisition are different, and COs must exercise expert judgment in determining which source selection method to use. Both methods will prove successful as long as they are executed properly. Proper execution will work towards meeting the agency's contracting needs and increasing mission success while also safeguarding limited government funds.

C.   CONCLUSION

The limitation of our research was that the sample size we collected was small; thus, our conclusions must be read with that caveat in mind. The data analysis showed that the source selection process used did not significantly affect PALT or CPARS ratings. Only the number of evaluation factors and the number of offers received produced a statistically significantly effect. Correlation analysis confirmed the finding that the number of evaluation factors and the number of offers were positively correlated to PALT, indicating that PALT increases along with an increase in either factor.

D.   ANSWERING THE RESEARCH QUESTIONS

In Chapter I of this research, we posed the following questions:

1.   What is the relationship between the source selection method (LPTA versus tradeoff) and CPARS ratings?

2.   What is the relationship between the source selection method (LPTA versus tradeoff) and PALT?

3.   What percentage of procurements using the tradeoff source selection method is awarded based on non-price factors?

Questions 1 and 2 can be answered concurrently. The underlying finding of the data analysis was that the source selection process used did not significantly affect PALT or CPARS ratings. Only the number of evaluation factors and the number of offers received significantly affected PALT. In other words, PALT will increase as complexity of the acquisition increases. This is not to say, of course, that evaluation factors should be minimized in order to limit PALT. If an acquisition is worth conducting, it is worth taking the time to do it correctly; there is no sense in sacrificing quality of source selection to reduce lead time.

Contract performance, in the form of CPARS ratings, was not affected by any of the variables tested. This finding suggests that both source selection methods result in equal performance. From a common sense standpoint, this result makes sense, as there is no reason to suspect that contractors chosen with tradeoffs are inherently better than those chosen with the LPTA method—neither would the quality of contractor performance be expected to change as a result of variables such as the number of

evaluation factors. A contractor's performance is not tied to the procedures the agency uses to select them for contract award.

A reminder of our small sample size must accompany the answer to Question 3. Of the 23 contracts we sampled that used the tradeoff method, eight were awarded based on non-price factors. In other words, factors other than price were the basis for award for 34.8% of our tradeoff sample contracts. The remaining 65.2% ended up being awarded based on price, even though the tradeoff method was used. This finding is in line with the Government Accountability Office's finding, presented in our literature review; namely, that the government selected higher priced offers in less than a quarter of tradeoff examples observed (GAO, 2010). This is an interesting finding, although a much larger and varied sample size (i.e., from several installations) would be needed in order to draw any real conclusions about common practices.

E.   AREAS FOR FURTHER RESEARCH

A consistent challenge throughout our project was ensuring we would have enough data points to ensure adequate power for our statistical analysis. Our limited sample size opens the door for future researchers to collect more data, in the same manner as our study, to re-run the model. Specifically, we recommend that further research of this nature be conducted at other operational bases within the Air Force. From there, the research should expand to major weapon system acquisition bases. After that research has been conducted, the other military branches should duplicate these research efforts, both at the operational- and systems-levels. As stated previously, our hope is that this research serves as a starting point for a larger effort that eventually encompasses the entire defense acquisition field. With such a large data sample, the model will obtain adequate statistical power. Such a development would allow future researchers to draw more accurate and definitive conclusions as to the relationship between source selection method and contract outcomes. At that point, the findings may point to areas where the source selection process can be improved and cost or process savings realized across the Department of Defense.

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