Predicting Adequacy of Supplier Responses for Multi-Year Government Contracts Based on Supplier Performance Metrics

by

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Submitted to the MIT Sloan School of Management and the Aeronautics and Astronautics Department in Partial Fulfillment of the Requirements for the Degrees of

Master of Business Administration
and
Master of Science in Aeronautics and Astronautics

In conjunction with the Leaders for Global Operations Program at the Massachusetts Institute of Technology

June 2015

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Predicting Supplier Response Rates for Multi-Year Government Contracts Based on Supplier Performance Metrics

by

David Allen Hahs

Submitted to the MIT Sloan School of Management and the Aeronautics and Astronautics Department on May 8, 2015 in Partial Fulfillment of the Requirements for the Degrees of Master of Business Administration and Master of Science in Aeronautics and Astronautics.

Abstract

Aerospace Company X (ACX) is a designer and manufacturer of advanced aerospace systems and its primary customer is the United States Government (USG). In order to reduce cost and minimize risk, both parties have embraced a multi-year contracting model in which productions agreements are signed for up to five-year periods. This allows for significant cost savings over single-year contracts while allowing for predictable production levels for ACX and its suppliers. At the time of this research, the company was soliciting bids from suppliers for the next five-year multi-year contract.

Since this is a sole-source situation, ACX must substantiate all costs to justify that the pricing is fair and reasonable. Costs of purchased hardware are substantiated through three primary means: competition, commerciality, and cost-price analysis. Competition is preferred because the pricing can be justified by free-market forces. However, due to intellectual property rights or unique capabilities, suppliers are often contracted as sole-source. The supplier then can claim commerciality (i.e. the part is for sale commercially) or submit for a complete cost review of material, labor, and overhead rates. In some cases the supplier will not release this data to ACX and a government agency performs the review. The success of the cost substantiation phase hinges on getting complete and accurate data from suppliers in a timely manner.

This thesis explores the challenges of obtaining cost data from suppliers and proposes recommendations that can be applied to general supplier management situations. First, a metric of proposal adequacy is developed and used to score the adequacy of each received bid. These scores are then analyzed to determine if there is any correlation with the existing enterprise ACX supplier rating system. Finally, recommendations for process improvements are made which focused on communication, IT systems, and standard work.

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Acknowledgements

I would like to thank the MIT Leaders for Global Operations program for its support of this research. A special thanks goes to my thesis advisors Roy Welsch and Deborah Nightingale for their ongoing guidance of this work throughout the internship and thesis writing effort.

I would also like to thank the employees of ACX for welcoming me to their company and making me feel like a member of the team. Everyone on the team works tirelessly to ensure that the procurement system at ACX is executed with the utmost integrity and compliance, and yet they always found the time to answer my questions, explain their work, or consider my recommendations. Specific thanks goes to the management team of MA, TH, SP and the analyst team of MK, TW, DP, and AS for their support throughout the internship. Additionally, the IT team of JK and JB were instrumental in ensuring that data needed for this research were available.

My time in the LGO program would not have been possible without the generous support of The Boeing Company. I am deeply grateful for the opportunity to further develop my engineering and management skills during these two years and am looking forward to my return to the working world this summer.

Finally, I would like to thank my family, friends, and classmates for their tremendous support and encouragement throughout my entire LGO experience. Thank you!
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Abbreviations

ACX     Aerospace Company X
BAM     Business Acquisition Manager
BAT     Business Acquisition Team
CID     Commercial Item Determination
CPA     Cost and Pricing Analysis
COPQ    Cost of Poor Quality
DCAA    Defense Contract Audit Agency
DOD     Department of Defense
DP      Delivery Performance
EOQ     Economic Order Quantity
ERP     Enterprise Resource Planning
FAR     Federal Acquisition Regulation
FFP     Fixed Firm Price
GAO     Government Accountability Office
IT      Information Technology
MIT     Massachusetts Institute of Technology
MYP     Multi-Year Procurement
PPM     Parts Per Million
RFP     Request for Proposal
RFQ     Request for Quotation
SAP     Systems Applications and Products (An enterprise software suite)
SM      Supply Management
SME     Subject Matter Expert
SPM     Supplier Performance Management
TINA    Truth in Negotiations Act
USG     United States Government
1 Introduction

1.1 Problem Statement

Aerospace Company X (ACX) is a sole-source supplier to the US Government for a complex aerospace system and the company is currently preparing a response to the customer’s Request for Proposal (RFP) for the next multi-year production contract. As part of this proposal development, ACX has sent Requests for Quotations (RFQs) to its major suppliers in order to generate an estimate of material costs during the five-year production period. Before ACX can submit their proposal to the Government, each of the supplier bids must be substantiated through one of three methods: Competition, Commercial Item Determination (CID), or Cost and Pricing Analysis (CPA). The successful submission relies heavily on the timely and accurate response of suppliers to the RFQs. In previous proposals, ACX has noted that suppliers often submit incomplete proposals and that this has caused significant rework. The goal of this thesis is three-fold: 1) to develop a metric to quantify the adequacy of a supplier proposal, 2) to measure the proposal adequacy of the suppliers participating in the current contract, and 3) to investigate root causes of inadequate responses and develop suggestions for increasing supplier proposal adequacy on future contracts.

1.2 Company Overview

ACX is a large supplier of aerospace products for both commercial and military markets. The company is a subsidiary of a larger firm, and ACX accounts for approximately 11% of the parent company’s annual revenue. ACX has operations in several states in the US and has begun to expand to several strategic international markets.
1.3  Project Goals

The goal of this project is to address the pressing need of ACX to receive complete and adequate bids from its suppliers in order to develop a fully adequate proposal for the US Government. The primary goal is to identify factors which may cause a supplier to submit an inadequate bid or no bid at all, and to make recommendations about how to address these factors in future contracts. A secondary goal is to assist the team during the bid review process and to develop tools and metrics to expedite the decision-making process of supplier selection.

1.4  Research Methodology

Research was conducted both on-site at ACX and on-campus at MIT. The author spent six months immersed in the Supply Management (SM) group at ACX, working alongside buyers, analysts, and managers to process incoming supplier bid data and observe the overall process. A bid scoring metric was developed in order to quantify the adequacy of a supplier bid, and this metric was used to assign an adequacy score to each received bid. This adequacy score became the response variable in the regression model described in Chapter 4. The results presented here focus on sole-source suppliers as they have the most stringent requirements for substantiation documentation, and have historically been the more time consuming for ACX to process.

The other inputs to the model were derived from the enterprise system that ACX uses to rate its suppliers. Each major supplier to the company is rated in three different categories: delivery performance, quality, and customer satisfaction. The numeric scores in each of the three categories determines the overall rating of each supplier on a scale of 1 to 4, with 1 being the highest possible. Data for each supplier are collected monthly and stored in an internal
database. A snapshot of this database was taken at the time that the supplier bids were received and this data was subsequently used in the regression model for proposal adequacy.

Additional insights were achieved through conducting interviews with ACX employees as well as with suppliers involved in the bidding process. The information collected from the interviews was used to complete a Pareto analysis of the reasons for inadequate bid responses. This analysis was then used to develop recommendations for how to address the most common issues in the future.

1.5 Thesis Outline

Chapter 2 describes the background of the defense industry, multi-year government contracting, and the regulations that govern the documentation required for prime contractors and their suppliers. Chapter 3 then explores the academic and industry research that has been developed in the field of supplier rating systems, along with a benchmarking study looking at how other companies approach supplier rating systems. Chapter 4 covers the data collection, model development, and results related to how well supplier proposal adequacy is predicted by the existing enterprise supplier rating system. Chapter 5 explores organizational issues that influence the way that ACX conducts business. The results and analysis from Chapter 4 and 5 are then used to develop a set of recommendations in Chapter 6 for ACX for use on future proposal efforts.
2 Current State

2.1 The Defense Industry

The defense industry is one of the largest industrial sectors in the world. In 2014, global defense spending reached a level of 1.5 trillion dollars [1]. Within this global market, the United States accounts for the largest spending by a wide margin, eclipsing China by a factor of four and spending more than the next 14 countries on the list combined [2]. However, the level of defense spending in the U.S. reached a peak in 2010 at the height of the Iraq and Afghanistan conflicts and has declined nearly 25% in the years since [3]. This has put significant pressure on both USG procurement officers and prime contractors to reduce costs, using instruments such as multi-year procurement.

2.2 Multiyear Procurement

Multiyear procurement (MYP) was first introduced to law in the Department of Defense Authorization Act of 1982 [4]. Prior to that time, the Department of Defense (DOD) was restricted to single-year procurement contracts, which had to be approved by Congress and exercised on an annual basis. The challenge with the single-year system is that it creates uncertainty for the prime contractors and their suppliers because there is no guarantee of follow-on contracts. Orders for raw materials and components must be placed on a yearly basis, which does not necessarily result in the most economic order quantities (EOQ).

Multiyear procurement was developed as a way to lower uncertainty and by doing so lower overall procurement costs. The lower costs can be attributed to two primary factors [5]:
• **Contractor investment in workforce and facilities.** Under a multiyear procurement, the contractor knows upfront what the sales volumes will be for the next 3 – 5 years. This allows them to invest in a stable workforce and to optimize the production facilities for operational efficiency.

• **Economic Order Quantity purchases.** With known sales volumes, the prime contractor is able to order raw materials and components up-front or throughout the contract life in the most economically viable manner. Many suppliers give volume-based discounts on their parts, and these volumes can be achieved by looking across multiple procurement years.

Not every DOD procurement qualifies to use the multiyear structure, however. The same legislation that defines the benefits to multiyear procurement also places significant limitations on the requirements for using such a structure, as summarized in Table 1 below [6].

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substantial Savings</td>
<td>Candidate programs should demonstrate that use of a multiyear contract will result in substantial savings in the total estimated costs when compared to the use of a series of annual contracts for the same procurement.</td>
</tr>
<tr>
<td>Stability of the Requirement</td>
<td>Candidate programs should demonstrate that the minimum needs to be purchased in terms of total quantity, production rate, and procurement rate is expected to be substantially unchanged during the multiyear contract period.</td>
</tr>
<tr>
<td>Stability of Funding</td>
<td>Candidate programs should have reasonable expectation that sufficient funding will be requested by DOD to carry out the contract and avoid cancellation over the proposed multiyear contract period.</td>
</tr>
<tr>
<td>Stable Design</td>
<td>Candidate programs should be able to demonstrate that they have technical risks that are not excessive over the multiyear period and that the items procured should be substantially unchanged during the multiyear period.</td>
</tr>
<tr>
<td>Realistic Cost Estimates</td>
<td>Candidate programs should demonstrate realistic estimates of contract cost and projected multiyear savings / cost avoidance through the use of a multiyear contract strategy.</td>
</tr>
<tr>
<td>National Security</td>
<td>Candidate programs should be able to show that the use of a multiyear contracting strategy will promote the national security interests of the United States Government.</td>
</tr>
</tbody>
</table>
For the purposes of this thesis, it is assumed that the categories of Stability of the Requirement, Stability of Funding, Stable Design, and National Security have already been addressed based on the fact that the DOD is actively soliciting a bid to ACX for one of its primary aerospace platforms. That leaves the categories of Substantial Savings and Realistic Cost Estimates as the responsibility of ACX to prove as the prime contractor.

### 2.3 Cost Substantiation Requirements

As described in Section 2.2, one of the primary responsibilities of a prime contractor in a multiyear contract negotiation is to prove that there is substantial cost savings for a multiyear scenario as compared to a series of single year scenarios, and that the costs are reasonable. These requirements are also dictated by the Truth in Negotiations Act (TINA), which states that all sole-source contract awards over $700,000 must contain certain cost substantiation documentation [7]. Under TINA, contract costs can be substantiated through three primary methods: competition, commercial item determination, and cost/price analysis.

Competition is the Government’s preferred method of cost substantiation, in which two or more companies compete for the same business. If the prime contractor can demonstrate that it has solicited multiple suppliers, that at least two of the suppliers have responded, and that the prime contractor has selected the lowest-cost supplier, then this is considered sufficient substantiation.

The main challenge with substantiation via competition is that oftentimes suppliers have unique capabilities or ownership of the intellectual property (IP) rights to the product they build. This creates barriers to entry for other would-be suppliers and creates a situation where sole-
source procurement is necessary. In these cases, the prime contractor must document further substantiation through either commercial item determination (CID) or cost/price analysis (CPA).

With CID, the supplier must prove that the same part is sold commercially (i.e. to non-government customers) or that the part is a slight modification to a part that is sold commercially [8]. The logic is that the commercial markets generate fair pricing because the lower-cost firms will be the ones that survive to provide goods and services. In order to claim a CID the supplier must submit with their bid a detailed CID worksheet which includes a description of the item, technical specifications, and detailed invoices. This information is then reviewed by an internal team at ACX consisting of representatives from procurement, engineering, and legal. The completed substantiation is then submitted to the USG customer for review and approval. This process is often subject to numerous iterations, both between the prime and supplier and the prime and the government. CID is the preferred substantiation method for most suppliers because it does not require the supplier to disclose any detailed financial numbers beyond those of sales invoices.

The alternative to CID is CPA. In these cases, the part is from a sole-source supplier but is not sold to commercial customers. These parts require a complete cost analysis including material, labor, and overhead expenses in order to determine if the profit margin is reasonable. An essential input to this analysis is the supporting documentation from each supplier, which is to be provided with the original bid. This documentation includes a proposal coversheet, cost summary spreadsheets, bills of materials, sub-contractor quotes or invoices, and a completed proposal adequacy checklist indicating that all documentation is complete. If this information is provided with the proposal, it is reviewed by an internal ACX team which will typically then schedule an on-site “fact-find” visit to verify the information. Alternatively, the supplier can
request that the government Defense Contract Audit Agency (DCAA) complete the fact-find, in which case the supplier submits materials directly to the DCAA and the DCAA completes the fact-find visit.

A summary graphic of the cost substantiation process is shown in Figure 1.

![Figure 1 - Cost Substantiation Options](image)

The Government Accountability Office (GAO) is the organization tasked with monitoring, investigating, and reporting the status of congressional spending. In 2008 the GAO conducted a detailed analysis of weapon systems procurement under multi-year procurement (MYP) and found that the current process used for awarding contracts “leaves questions about the appropriateness of some approved MYPs and the cost effectiveness of investments made for the risks assumed” [6]. The report also found that the Department of Defense (DOD) was not at the time tracking actual expenses against original projections, and therefore had no way to validate whether the purported cost savings were actually achieved. As a result of these findings, the GAO recommended a series of policies be put in place to bolster the integrity of the MYP
award process. These included improving guidance, providing third party validation of MYP estimates, implementing a centralized database for MYP information, and conducting after-action assessments of completed MYP contracts.

In the time since the GAO report was published in 2008, prime contractors and their suppliers have been under increasing pressure to fully justify the cost savings of their MYP programs. This has resulted in additional regulation and oversight placed on prime contractors and their suppliers. The regulations have become so convoluted that one prominent defense contracting professor has published an article titled “Why I Won’t Become a Prime Contractor”[9]. In the article, Kreiger offers a comparison of US government contracting and commercial contracting in order emphasize how burdensome the government processes have become. Specifically in the section related to proposals, he mentions how he has only had to submit one proposal in the commercial realm and that it was a single page. In comparison a typical fully-substantiated multi-year proposal can be up to 500,000 pages.

Barring any dramatic reform in the Federal Acquisition Regulations that would limit the documentation requirements, it is in the best interest of a prime contractor to ensure that the proposal submitted to the Government contains full cost substantiation for all manufactured and purchased parts. It is therefore critical to the proposal effort that the team receives complete cost substantiation data from suppliers in a timely manner during the bidding process.

2.4 ACX Supplier Rating System

ACX utilizes an enterprise-wide supplier rating system to monitor and track the performance of its suppliers. The rating system is an integral part of the overall production operating system and is aimed at facilitating and accelerating superior supplier performance. In
addition to using it as a monitoring system, ACX uses the rating system to recognize supplier 
excellence through awards and internal awareness.

The rating system comprises of three distinct categories: delivery performance, quality, 
and customer satisfaction. Each category has specific evaluation criteria, the results of which are 
rolled up to rate the supplier into one of four numbered categories (with Category 1 being the 
best). These scores are tracked on a monthly basis.

The Delivery Performance (DP) tracks supplier deliveries against required on-dock dates, 
with a score of 1.00 being perfect (100%). This score is the raw performance-to-plan data from 
ERP, modified to include underlying reasons for any discrepancies (i.e. if the delay is due to 
internal ACX processes, it does not count against the supplier’s rating). In order to be a 
Category 1 supplier, they must have 100% delivery performance for the last calendar year.

Supplier quality is tracked by a “rejected Parts per Million” (PPM) metric, and is 
measured at the time of delivery to ACX based on receiving inspection processes. The PPM 
score is tracked on both a 6-month and 12-month rolling average and in order to achieve 
Category 1 status, the supplier must not have any rejected parts in the last 12 calendar months.

The third component of the supplier rating is the Customer Satisfaction, which is 
intended to capture the internal stakeholder satisfaction with each supplier. The score is derived 
from surveys that are sent to internal stakeholders to evaluate the supplier in eight categories: 
cost, quality, delivery, ease of doing business, customer support, responsiveness, flexibility, and 
overall satisfaction. The maximum score for each category is 7.0 and in order to achieve Level 1 
status, the supplier must have an overall customer satisfaction score of 6.0. This is the most 
subjective of the three components that go into the supplier rating.
Suppliers are required to participate in the rating system as a contingency of their relationship with ACX, and there are additional incentives in place to encourage them to actively pursue higher rating levels. The main incentive is that the supplier rating scores are used as a primary input for sourcing decisions. Category 1 suppliers are given priority for new work packages, while lower ranked suppliers may actually lose existing work if they do not show improvement. Additional incentives such as more favorable payment terms and enterprise-wide recognition are also used to encourage suppliers to strive for higher rating levels.

This chapter has focused on the specific supplier rating system that is in-use at ACX and the implications that it has on ACX’s suppliers. The next chapter will explore how supplier rating systems have evolved in general and what systems are in use at other industrial companies.
3 Literature Review

3.1 Supplier Rating Systems

Supplier evaluation as a field was initially developed for the phase of supplier selection. Companies and academic researchers developed tools for evaluating supplier based on such factors as cost, quality, and technical risk. Only more recently have companies begun to apply similar methods to monitoring and controlling existing supplier relationships [10]. Supplier rating systems are a component of a broader field known as Supplier Performance Management (SPM). As described by Gordon, SPM is “The process of evaluating, measuring, and monitoring supplier performance and suppliers’ business processes and practices for the purpose of reducing costs, mitigating risk, and driving continuous improvement.” [11] The benefits for companies that evaluate their suppliers include increased quality, decreased safety stocks, and minimized risk. A study by the Aberdeen Group revealed that companies with robust SPM processes in place realized significant savings in price, on-time delivery, quality, and service as compared to companies without an SPM program [12]. At the same time, suppliers also benefit from robust evaluation. By obtaining information about their own performance and capabilities, the suppliers can work to improve their own operations and minimize cost. Additionally, the most highly-rated suppliers may have an advantage when negotiating contract extensions.

Many different methods of supplier evaluation have been used in industry. For manufacturing companies, the most common approach is to use scorecards driven by data from enterprise resource planning (ERP) tools [11]. These metrics may include such items as inventory levels, cycle times, quality measures, and supplier on-time delivery. However, it can be argued that these scorecards are derived from what data is easily available as opposed to what
data would actually be useful in making business decisions and driving continuous improvement activities. To combat this, researchers have argued for a more holistic approach by looking at the overall Cost of Poor Quality (COPQ). This includes not only the direct measures of quality and cost, but the more indirect expenses such as service calls, paperwork adjustments, and lost time.

It must be noted that the process of supplier evaluation does generate cost on the part of both the primary contractor and the supplier. Because of this, it is recommended that evaluations be developed which target specific segments of the supplier landscape. Beckman and Rosenfield [13] explore this topic and propose a framework that can be used to segment suppliers. They start by describing the spectrum of supplier-buyer relationships, ranging from arms-length to full ownership. Table 2 shows the complete spectrum, with the level of vertical integration increasing as one moves down the table.

Table 2 - Spectrum of Relationships with Suppliers or Customers

<table>
<thead>
<tr>
<th>Type of Relationship</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arm's-length relationships</td>
<td>Traditional, cost-based, free-market, short-duration, purchase-order-driven relationships</td>
</tr>
<tr>
<td>Modified vendor relationships</td>
<td>Value-added services (e.g., supplier managed inventories)</td>
</tr>
<tr>
<td>Long-term contracts</td>
<td>Long-term supply contracts</td>
</tr>
<tr>
<td>Nonequity-based collaborations</td>
<td>R&amp;D consortia, cross-marketing agreements, cross-production agreements, joint purchasing activities</td>
</tr>
<tr>
<td>Minority equity investments</td>
<td>Invest in supplier</td>
</tr>
<tr>
<td>Licensing agreements</td>
<td>Provide license to supplier in technology that host firm develops, but in which it wants to limit investments</td>
</tr>
<tr>
<td>Investment integration</td>
<td>Coordinate investment jointly</td>
</tr>
<tr>
<td>Joint ventures or strategic alliances</td>
<td>Allow firms to exchange certain goods, services, information, or expertise while maintaining a formal trade relationship on others</td>
</tr>
<tr>
<td>Asset ownership</td>
<td>Host firm retains ownership for critical assets in adjacent stages of the industry chain but contracts out all other aspects of ownership and control</td>
</tr>
<tr>
<td>Full ownership</td>
<td>Host firm fully owns activity</td>
</tr>
</tbody>
</table>

The approach looks at suppliers from the perspective of both volume and strategic importance and plots those two categories against each other, as shown in Figure 2.
For the purpose of supplier rating systems, it is recommended to focus on the suppliers in the Critical Strategic category first, followed by the Bottleneck and Leverage categories once the evaluation system is robust. Once the suppliers are targeted, there is an extensive effort required to determine what to measure, how frequently to perform the evaluations, and what incentives will be linked to the results.

### 3.2 Industry Benchmarking

In order to gain a better understanding of best-practices related to supplier rating systems, a benchmarking study was conducted using publically available information from 10 industrial companies. These companies span many industries, including aerospace, machinery, energy, automotive, as well as two large conglomerates. Each supplier rating system was evaluated to determine what categories were measured and what their respective weighting factors were. A summary of the findings is presented in Table 3.
Table 3 - Supplier Rating Systems Benchmarking

<table>
<thead>
<tr>
<th>Company</th>
<th>Industry</th>
<th>Quality</th>
<th>Delivery</th>
<th>Cost</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACX</td>
<td>Aerospace</td>
<td>33%</td>
<td>33%</td>
<td>--</td>
<td>Customer Satisfaction (33%)</td>
</tr>
<tr>
<td>Alcoa [14]</td>
<td>Metals</td>
<td>55%</td>
<td>35%</td>
<td>--</td>
<td>Responsiveness (10%)</td>
</tr>
<tr>
<td>Beechcraft [15]</td>
<td>Aerospace</td>
<td>60%</td>
<td>40%</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Boeing [16]</td>
<td>Aerospace</td>
<td>33%</td>
<td>33%</td>
<td>--</td>
<td>General Performance (33%)</td>
</tr>
<tr>
<td>Eaton [17]</td>
<td>Diversified</td>
<td>50%</td>
<td>50%</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Honeywell [18]</td>
<td>Diversified</td>
<td>20%</td>
<td>20%</td>
<td>--</td>
<td>Innovation (20%), Lead Time (20%), Payment Terms (20%)</td>
</tr>
<tr>
<td>MANN+HUMMEL [19]</td>
<td>Automotive</td>
<td>60%</td>
<td>40%</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>MTU Friedrichshafen [20]</td>
<td>Energy Systems</td>
<td>40%</td>
<td>23%</td>
<td>20%</td>
<td>Responsiveness (2.5%), Innovation (5%), Environment (10%)</td>
</tr>
<tr>
<td>Philips [21]</td>
<td>Conglomerate</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>Responsiveness (20%), Innovation (20%)</td>
</tr>
<tr>
<td>Rotex [22]</td>
<td>Bearings</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Textron [23]</td>
<td>Conglomerate</td>
<td>50%</td>
<td>50%</td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

While each company takes a unique approach to rating their suppliers, two categories are always present: Quality and Delivery Performance. Beyond that, the most common categories are Cost (30% of companies), Responsiveness (30%), and Innovation (30%). The distribution of component weights is suggestive of each company’s specific priorities. For example, Beechcraft and MANN+HUMMEL place higher emphasis on quality, while companies including Eaton and Textron place equal emphasis on all categories.
4 Analysis

4.1 Metric Development

In order to fit a model to the supplier response data, a method for quantifying the adequacy of a supplier proposal had to first be developed. The goal was to create a proposal rating system that would quantify the adequacy of a proposal on a $0 - 100$ scale, with $100$ being a fully adequate proposal and $0$ being an entirely inadequate proposal. The Federal Acquisition Regulations (FARs) define proposal adequacy through a 36-item Proposal Adequacy Checklist [24]. This was used as a starting point, but through internal discussions it was determined that there were elements of the proposal that were more relevant than others and that a weighted scoring system would be more appropriate.

At a high level, the two most important components of a proposal are pricing and substantiation documentation. Both elements are equally important, so each was given a maximum score of $50$ in the overall scale of $0 - 100$. Within each component, subcategories were defined and weighted based on their relevance towards the proposal effort. For the documentation, separate scales were developed depending on the type of substantiation (CPA, Assist Audit, or CID). An example of the scoring metric is shown in Table 4:

<table>
<thead>
<tr>
<th>Item</th>
<th>Points</th>
<th>Sub-Points</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All price points quoted</td>
<td>20</td>
<td>Multiply % of price points received by 20</td>
<td></td>
</tr>
<tr>
<td>Pricing entered to SAP</td>
<td>10</td>
<td>Score of 0 if only attachments were received, 10 if pricing was uploaded</td>
<td></td>
</tr>
<tr>
<td>Fixed Firm Pricing</td>
<td>10</td>
<td>Score of 0 if not FFP, 10 if FFP</td>
<td></td>
</tr>
<tr>
<td>Pricing is valid (no adjustments)</td>
<td>10</td>
<td>Multiply % of correct price points by 10 to get score</td>
<td></td>
</tr>
<tr>
<td>Documentation</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposal Adequacy Checklist</td>
<td>10</td>
<td>Score of 0 if not included, 10 if filled out correctly</td>
<td></td>
</tr>
<tr>
<td>Proposal Cover Sheet</td>
<td>10</td>
<td>Score of 0 if not included, 10 if filled out correctly</td>
<td></td>
</tr>
<tr>
<td>Cost and Pricing Data</td>
<td>20</td>
<td>Score of 0 if not included, 20 if all data is provided</td>
<td></td>
</tr>
<tr>
<td>Shipping Cost Template</td>
<td>5</td>
<td>Score of 0 if not included, 5 if filled out correctly</td>
<td></td>
</tr>
<tr>
<td>Terms and Conditions</td>
<td>5</td>
<td>Score of 0 if no attachments, 2 if exceptions taken, 5 if no exceptions</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
4.2 Data Collection

Supplier responses were received through an online portal maintained by ACX. Each supplier was responsible for uploading a response to their respective RFQ(s). Pricing could be entered manually into the portal or into a spreadsheet template that could subsequently be uploaded. All substantiation documents were to be submitted as attachments in the online portal and could be in any format, but were most commonly PDF, MS Word, or MS Excel.

Once the due date for the supplier response had passed, the pricing was automatically transferred from the online portal system into the internal SAP system. These data were then downloaded to a project-specific database for review and analysis. The attachments were collected using a publicly available image recognition script [25] and then manually reviewed by a team of ACX employees using a checklist of important proposal attributes. The results of this screening were used to calculate the proposal adequacy score of each supplier.

4.3 Results

The initial screening revealed a wide range in the proposal adequacy scores, as shown in Figure 3 below. A summary of the data is presented in Table 5. What is most striking about this data is that the average proposal score is relatively low, at 57.1 on a scale of 100. Additionally, the standard deviation of 30.1 suggests that there is high variation between the proposal scores. Not a single one of the suppliers submitted a completely adequate proposal (maximum score was 95.0), and 9 suppliers did not submit a proposal at all (score of 0.0).
The first observation from the data is that the highest score was a 95.0, meaning there was not a single supplier who submitted a complete proposal. For the sake of analysis, if a score of 80.0 is considered “passing”, then there would be 20 suppliers who meet the requirement (30%). The other main observation is that there is a large standard deviation (30.1) when compared to the mean (65.0). This can also be observed in the chart above in that there is a wide range of supplier scores. Before developing a regression model, the overall data characteristics
were observed, as well as the individual components that make up the supplier rating score. These proposal adequacy scores were then compared to the Supplier Rating metrics that ACX uses currently.

*Overall Category*

One of the questions related to Supplier Rating was whether the higher rated suppliers responded with more adequate proposals. To test this hypothesis, the average and median proposal score was plotted against Supplier Rating status for each of the 67 CPA suppliers, as shown in Figure 4.

![Proposal Adequacy Scores by Supplier Rating Category](image)

*Figure 4 - Proposal Adequacy Scores by Supplier Rating Category*

Based on the plot, the top rated suppliers (Category 1) submitted *less adequate* proposals than the three other categories. Additionally, there is very little difference between the proposal adequacies of the Category 2 and Category 3 suppliers, while the Category 4 suppliers are only slightly different. Internal suppliers had the best overall proposal adequacy. Much of this
behavior can be explained by looking at the sample sizes for each category, as shown in Figure 5.

![Figure 5 - Count of Suppliers by Category](image)

As can be seen in the plot, there was only one Category 1 supplier in the dataset. This single data point skewed the previous plot significantly because the one Category 1 supplier did not submit any documents. The same is true for the number of internal suppliers in the dataset.

Because there was very little perceived correlation between the supplier category and proposal adequacy, the individual components that make up the Supplier Rating score were explored.

*Delivery Performance*

The Delivery Performance (DP) tracks supplier deliveries against required on-dock dates, with a score of 1.00 being perfect (100%). This score is the raw performance-to-plan data from
ERP, modified to include underlying reasons for any discrepancies (i.e. if the delay is due to internal ACX processes, it does not count against the supplier’s rating). A plot of the DP against the proposal adequacy score is shown in Figure 6.

![Figure 6 - Proposal Adequacy Score vs. Delivery Performance (DP)](image)

Based on the chart, there is no obvious correlation between Delivery Performance and supplier proposal adequacy. The only conclusion that can be drawn is that a majority of the suppliers have a DP greater than 0.80, but that delivery performance does not necessarily relate to proposal adequacy.

**Quality**

Supplier quality is tracked by a “rejected Parts per Million” (PPM) metric, and is measured at the time of delivery to ACX. The PPM score is tracked on both a 6-month and 12-month rolling average. Figure 7 shows the supplier proposal adequacy against the 12-month PPM.
Figure 7 - Proposal Adequacy Score vs. 12-Month Parts per Million Defects

Again in this case, there is no obvious correlation between the PPM score and the proposal adequacy score.

Based on the two previous observations, the supplier’s current performance on schedule and quality does not appear to predict their submission of a fully adequate proposal.

Customer Satisfaction

The third component of the supplier rating is the Customer Satisfaction, which is intended to capture the internal stakeholder satisfaction with each supplier. The score is derived from 8-question surveys that are sent to internal stakeholders to evaluate the supplier in such categories as cost, quality, and ease of doing business. This is the most subjective of the three components that go into the supplier rating and is the most likely to capture items related to receiving adequate proposals. A plot of the supplier proposal adequacy against the Customer Satisfaction score is shown in Figure 8. It is important to note that not all of the suppliers in the
sample had Customer Satisfaction scores included, as this is a relatively new component of the supplier rating system.

![Customer Satisfaction Score vs. Proposal Adequacy Score](image)

**Figure 8 - Proposal Adequacy Score vs. Market Feedback Analysis (MFA) Score**

This chart does show a slight relationship between Customer Satisfaction score and proposal adequacy score, but the correlation is weak \((r \sim 0.05)\). The suppliers with higher Customer Satisfaction scores are more likely to have high proposal adequacy scores, but there are several suppliers with high Customer Satisfaction scores who submitted inadequate proposals. This indicates that the Customer Satisfaction score can give an indication about which suppliers are likely to respond, but it does not tell the whole story.

In order to quantify the effects that each category of supplier rating has on the overall proposal adequacy, a multivariate linear regression analysis was conducted. Only suppliers with Customer Satisfaction scores were included in the model, reducing the number of suppliers to 42. The results of the regression model can be seen in Figure 9.
The regression analysis indicates that none of the existing supplier rating categories are statistically significant in predicting the adequacy of a supplier proposal. This means that there is no "silver bullet" for targeting additional attention to those suppliers with certain ratings in order to increase proposal adequacy. Rather, it suggests that there may exist systematic reasons why suppliers do not submit fully adequate proposals.

4.5 Pareto Analysis

The conclusion of the regression analysis is that there is no single element of the Supplier Rating program that can predict the adequacy of a supplier proposal. Therefore one must look deeper to discover the root causes of inadequate proposals. In order to develop this, each of the suppliers was contacted and asked to explain why they had not responded or why they responded with incomplete information. The results are compiled into a Pareto chart, shown in Figure 10.
A summary of the response categories is provided below:

1. **Misunderstood Requirements**: Supplier did not understand that substantiation documentation was required at the time of proposal submission because in previous proposals this data was not required until after the proposal was sent to the customer.

2. **No-bid – Spares Only**: Supplier did not bid because all of their parts were spares-only.

3. **Missed Deadline**: Supplier missed deadline to submit bid through Supplier Portal

4. **Unresponsive**: Supplier did not respond to bid or follow-up phone calls

5. **Technical issues with Website**: Supplier encountered technical challenges with website, mainly involving access issues or template upload issues. These were not resolved by the bid deadline so the bids were never received.

6. **Assumed Competitive**: Supplier was unaware that bid was sole-source and therefore did not submit any substantiation documentation.

7. **Wrong Vendor Code**: Bid was sent to wrong vendor code

8. **Submitted via E-mail**: Bid was submitted via e-mail due to website issues or supplier not knowing how to use the website.

9. **Unable to provide FFP**: Supplier was unable to provide fixed firm pricing for the duration of the contract and therefore chose not to bid.

10. **Negotiating Concurrently**: Supplier is on an existing long-term agreement covering the duration of the current proposal.

11. **Negotiating In-Work**: Supplier is still negotiating previous contract terms and is not interested in discussing current proposal yet.
The Pareto analysis indicates that there is a wide spectrum of reasons given by suppliers for not providing fully adequate proposal documentation. However, closer examination reveals that the responses can be generally categorized into three categories:

a. *Communication:* This encompasses all of the reasons which were due to a breakdown in the communication between ACX and its suppliers (Pareto categories 1, 6, and 7).

b. *Information Technology:* Limitations in the IT systems prevented the supplier from being able to submit a fully adequate bid (Pareto categories 5 and 8).

c. *Supplier Strategic Action:* The supplier knew of the requirements and strategically chose to either not bid or to delay their submission (Pareto categories 2, 3, 4, 9, 10, and 11).

The insights gained from the supplier survey and Pareto analysis will be used as a basis for making recommendations in Chapter 6 of this thesis. Before making these recommendations, however, it is important to understand the context of the organizational processes through which decisions are made at ACX, which will be described in Chapter 5.
5 Organizational Review

The structure of the internal ACX organization provides key insights into how the interface with individual suppliers is managed. At the time of this research, an internal realignment was occurring in which the Supply Management (SM) group was being re-centralized after several years of being distributed to individual product centers. At the same time, efforts were underway at the corporate enterprise level to consolidate SM processes and to pool requirements at major suppliers in order to leverage volume discounts. In order to better understand the organization, a Three Lenses Analysis was completed based on the work of Ancona, et al [26].

5.1 Strategic Lens

The Supply Management organization is in state of re-organization. Previously, individual buyers were distributed to product centers. Each product center comprised of small functional groups aligned to a specific subsystem. A separate Commodity Management group reported to the core Supply Management group and was responsible for looking at the overall spend by commodity (composite, machined parts, etc.) and for making the overall strategic sourcing decisions across commodities. The new structure involves bringing the buyers back into the centralized group so that they are aligned directly with the Supply Management organization. This allows buyers to consolidate purchases across commodities and negotiate with suppliers for larger work packages. Chiang [27] presents a detailed analysis of how this structure can be beneficial for supplier negotiations.

In both structures, the author worked in the Commodity Management group. Commodity Management has an indirect link to the SM leader for the multi-year contract and primarily
interface with the commodity managers, compliance specialists, and the Business Acquisition Manager (BAM).

The buyers, who are the direct interface with suppliers, will now report through the VP of Supply Management rather than through individual product centers. This move is aimed at eliminating the possibility that multiple buyers are interfacing with the same supplier, which used to be the case under a product-centric organization. In the short term this is impacted the ability to process supplier bids because the multi-year team did not know which buyers were be assigned to which suppliers and parts. This may have contributed to some of the issues encountered while trying to receive timely bids from suppliers. There was also no robust communication system set up between the buyers and the current multi-year team. One of the biggest opportunities for the organization is to open up these channels of communication and get the buyers more involved.

5.2 Political Lens

The main political issue with this project was the tradeoff between satisfying the USG customer and maintaining relationships with suppliers. The customer preferred to have numerous contract options and full analysis to support each option, but doing so is very time intensive and costly for suppliers. Internal to ACX, the Business Acquisition Team (BAT) is responsible for representing the voice of the customer. Supply Management is responsible for bridging the gap between the BAT and suppliers to ensure that the customer needs are being met without undue strain on the suppliers. An example of this was seen early in the research, when the customer verbally communicated a new requirement to the BAT and later redacted it. Entirely new bid packages were almost sent out to every supplier on the contract, but at the last
minute the customer informed the team to continue with the old requirements. As a way to avoid this, one recommendation is that future work be contingent on written agreements between the BAT and the customer.

5.3 Cultural Lens

The current multi-year proposal effort is critical to ensuring the future of a major product line at ACX. However, there is a cultural norm of working long-term programs at a relatively slow pace. Since this is the latest of a string of multi-year contracts, there were many people (including those in senior leadership positions) who made the assumption that the contract would inevitably be awarded to ACX and who saw it as unnecessary to assign additional resources or to elevate the sense of urgency. There was very little widespread communication about the project, other than the fact that it was underway and mostly occurring in the background.

Conversely, ACX’s indisputably strong culture of supporting the warfighter can be leveraged to generate support for this project. Pictures of products being used in the field along with testimony from soldiers are displayed prominently throughout the facility. This willingness to support the customer is a common message that brings everyone together, and can be used as a central message when communicating with senior leaders about the importance of the multi-year proposal.
6 Conclusion

6.1 Key Findings

One of the biggest pain points for prime contractors during the government contracting process is completing full cost substantiation of sub-tier supplier bids. This research has presented a new method for measuring the adequacy of supplier bids in large-scale government contracts. This metric was used to measure the adequacy of supplier bids on a current multi-year contract at ACX and the scores were compared to the enterprise-wide supplier rating system. Finally, a survey of suppliers was conducted to determine the reasons for not responding or providing an inadequate response. These efforts have led to several key findings:

1. Most suppliers did not submit adequate documentation with original bids (75%)
2. Supplier proposal adequacy is not correlated with the existing supplier rating system.
3. Four major categories exist for improving supplier proposal adequacy:
   a. Communication with Suppliers
   b. Communication within ACX
   c. IT Systems
   d. Standard Work

6.2 Recommendations

The following recommendations were developed at the conclusion of the on-site portion of this research and were presented to the leadership team prior to leaving. Although they were developed within the context of ACX and the current multi-year proposal effort, the recommendations can also be extended to other supplier management situations.
1. **Improve Supplier Communication**

Many of the challenges that were encountered during the course of supplier bid evaluation stem from a communication breakdown between ACX and its suppliers. The communication was more extensive than during the initial phases of previous multi-year contract, but there are still several opportunities for improvement:

   a. **Ensure personal contact is made with each supplier prior to bid close date**

   One of the biggest surprises during this research was that when the team started calling suppliers in May (six months after the original RFQs were released), many suppliers were hearing about the proposal for the first time. While a strong effort was made to get suppliers to sign acknowledgement forms early in the process, many did not return the form or never received it in the first place. There were many reasons for this, including using the wrong supplier code in the computing system or having outdated contact information. Many of these issues could be addressed early in the process if personal contact was made with each supplier well before the bids were due. This recommendation is focused on establishing direct communication between the ACX buyer and the person at the supplier responsible for actually developing the RFQ response. The team took numerous steps to get the supplier executives engaged (i.e. Supplier Conference, airshow interactions, webcasts), but the information did not always flow down to the people at the suppliers who were responsible for actually doing the work. The electronic mailbox and website that the team set up were good tools, but the key is still to ensure personal contact at the working level.

   b. **Clearly distinguish between sole-source and competitive bids**

   This is probably the single biggest opportunity to improve first-time quality with sole-source supplier bids. Many of the suppliers were unaware that they were required to submit cost
substantiation documents because they thought that their bid was competitive. Upon review, it was discovered that the RFQs did not clearly distinguish the difference. Additionally, all of the bids in the first round were sent out as “bid-controlled” which is typically reserved for competitive bids. On future bids, it is strongly recommended that wording be added to the title page of the RFQ indicating whether the bid is competitive or sole-source. Additionally, it is recommended that bid control only be used for competitive bids.

c. Distribute documentation checklist with RFQ

A simplified documentation checklist may help alleviate some of the problems with missing document from suppliers. The checklist could be set up as a logic tree (i.e. “if competitive, use this checklist”, “if sole-source and claiming commerciality, use this checklist”, etc.). The Proposal Adequacy Checklist is good to ensure that the supplier follows the FAR requirements, but it is not specific to the exact documentation list that ACX requires.

d. Get Buyers involved early and maintain communication flow throughout

This is a general recommendation and one that is closely related to recommendation (a). The Buyer is the primary interface between ACX and the supplier, and it is in the best interest of everyone involved to keep both parties involved in the process. This starts with the outreach mentioned in (a), but it would also include items such as follow-up communication near the bid deadline and the ability to keep the Buyer in the loop with any questions coming from the suppliers. The electronic mailbox was used as a way to centralize communication and control the message, but this could be supplemented by the buyers reaching out to suppliers individually throughout the process.

e. Maintain contact information for all suppliers on bids
After screening through all the bids from the first round of RFQs, it was discovered that there was no comprehensive listing of the primary contacts for the suppliers. If there was a question for the supplier, the team had no way of knowing whom to call. This was partially the fault of the suppliers for not providing a primary contact information when requested, but it is also the fault of the internal team for not being persistent with following up. Not having correct supplier contact information was the cause of several suppliers not responding to the RFQ.

2. **Improve Internal Communication**

In addition to improving external communication with suppliers, there are several opportunities to improve internal communication.

   a. **Establish clear Roles & Responsibilities up-front**

   Early in the bid review process, there was confusion over who was responsible for what tasks. In particular there was a question of who was responsible for contacting suppliers in order to obtain missing documentation. The core proposal team did not have the resources to reach out to each of the suppliers and they lacked the established Buyer-supplier relationships that can be leveraged to get the required documents. The involvement of the purchasing groups was eventually expanded to help with the supplier communication, but the roles and responsibilities were never formally documented. Establishing and documenting these rules up-front would have gotten the larger team more engaged earlier in the process.

   b. **Maintain contact information for Buyers and their part assignments**

   This recommendation stems from the fact that most of the Buyer-part assignments were changed midway through the project due to the re-alignment of the purchasing group. This was a major one-time change and is not anticipated to be repeated. For the most part, the SAP master
tables accurately list the correct Buyer but there have been several instances where the purchasing manager will indicate a primary Buyer for large suppliers and that status is not reflected in SAP. This led to the proposal team maintaining separate Buyers lists in the proposal database (by supplier rather than by part) and there has been occasional confusion about which Buyers to contact with questions.

**c. Align resources before bids are received (dedicated team for screening)**

The bid screening process could have been significantly improved had there been a dedicated team responsible for both screening and follow-up. It took nearly two weeks after the initial bids were received before a screening team was assembled, comprised of the core supply management team, commodity management, and purchasing. The team made great progress over the course of a week to screen through the documents that were received from suppliers, but most of the team returned to their regular assignments as soon as the initial screening was complete. This left a small team of three people (none of whom were assigned 100% to the proposal) to filter through all the data and follow up with suppliers. This significantly slowed the pace of processing and opened up the opportunity to miss bid details.

**d. Minimize handoffs between functions (minimize e-Mail traffic)**

One of the biggest challenges with following up with suppliers was the seemingly endless trail of e-mails that were used as the primary communication method with both suppliers and Buyers. E-mails were used to follow up with suppliers and to get missing substantiation documentation, often through the buyers. Those attachments were then e-mailed to the respective subject matter expert (SME), who often returned it for further clarification. In one case, the author counted 19 electronic handoffs required to get a single completed form from a supplier, as shown in Figure 11 below.
Many of the handoffs were driven by turn-backs from the SME’s. If the documentation did not meet all the requirements of the SME, it would be sent back to the proposal team, which would then forward it to the Buyer who would then forward it to the supplier. At each step of the process, there was a potential for delay or loss of information.

A better way to approach this would be to reduce the barriers between the people who know the requirements (SME’s) and the people who need to respond with information (Suppliers). For example, the SME could communicate directly with the supplier to ensure the document is complete before it is submitted, or they could jointly call the supplier as a team to make sure everyone was aligned. An improved communication flow is suggested in Figure 12.
e. Minimize status, maximize work (automate where possible)

One of the consequences of having a small team working on the proposal was that the amount of time dedicated to updating weekly and daily status charts was significant compared to the amount of time actually making follow-up calls with suppliers. At one point there were three recurring weekly meetings, each of which required separate slide decks. Since each of these decks took approximately an hour to develop and another hour to present, at least 15% of the team’s time was spent on status updates. This can be significantly reduced through automation of the key metrics, such as CPA and DCAA fact find burn-downs and an effort to automate these reports is currently underway.

3. **Upgrade IT Systems**

Several of the challenges encountered during the bid screening process can be attributed to limitations with the IT systems. A major change for this multi-year contract was to use internal IT systems instead of a previously-used external application, with the primary goal of
having bid data loaded directly into the enterprise SAP system. In order to achieve this, a batch-load process was used to create the RFQs and distribute them to suppliers. This worked well for the distribution, but the issues started emerging when the bids came back and were essentially inaccessible to the screening team. This led the use of a series of work-arounds to gain access to pricing data, supplier attachments, and supplier comments from a proposal-level perspective.

The data was compiled into a database application which is now the primary source of data for the team.

\textit{a. Migrate Proposal Database application to Core IT}

The database was developed and is currently being maintained by the Supply Management IT team. This has worked for the purposes of initial screening, but there is an opportunity here to migrate the application to the Core IT department to make it more robust and an integral part of future proposals. The current application is very fragile and there are only two people with the ability to make any fixes should something go wrong. A more robust approach would be to have the Core IT group manage the database and release updates through a structured process. This would also allow for the implementation of a QCPC for turn-back collection to identify the system’s shortfalls and enable root cause analysis and correction.

\textit{b. Make supplier bid data readily accessible to Buyers}

One of the improvements made with this latest proposal was that all of the RFQs were batch-loaded into the system. However, the consequence of this strategy was that all of the RFQs went out under a generic buyer code rather than being assigned to a specific buyer. This meant that when the bids came back they went to this single code rather than out to the Buyers who were responsible for the parts. While the pricing data and notes could be individually accessed, the documents were only available through IT. The work around for this limitation
was to download all of the supplier documents and add them to a shared server which was accessible to everyone. This server was later migrated to the proposal database. It is recommended to establish a direct link between the supplier data and whoever needs to review the data (in this case the Buyers).

c. **Allow for manual updates in SAP for price exceptions and corrections**

The main advantage of using the internal IT system is that it links directly to SAP. When suppliers enter bids online, the pricing is fed into SAP and is visible throughout ACX and accessible to the USG customer. The problem is that the values in SAP cannot currently be updated in instances when the supplier made an input error (i.e. left off a decimal point or entered total proposal value as the unit price). The only way to fix the pricing is to label the bids as invalid and re-bid the supplier (which is complicated by the batch load process described above). The compliance team currently has the ability to update SAP data, but the method does not work for multi-year proposals because there is no way to specify a period-of-performance far into the future. This is being addressed by Core IT but merits a follow-up to ensure that the functionality is added.

d. **Fix technical glitches, eliminate system crashes**

This is a general recommendation to develop a system to actively track and address technical glitches with the internal IT systems and proposal database. The team received feedback from numerous suppliers that they encountered technical problems when trying to upload their pricing online. Then once pricing was received, the download into SAP had errors (i.e. some pricing was missing from individual years). There have also been many false-starts and re-installs required for the proposal database and this has tarnished its ability to function as a central
repository for all the data. Migrating the application to Core IT (see suggestion 3a) may also increase the robustness of the system.

4. **Develop and Implement Standard Work**

   **a. Implement workflow for Commercial Item Determination (CID) processing**

   This project is currently in-progress and is moving towards being implemented. Having a workflow for the CID process will greatly increase the visibility of each step. It remains to be seen if this will decrease the flow-time, but the big improvement here is that the team will be able to track which queues take the longest and what parts get stuck. Each stakeholder will also have a clear understanding of what they need to review and what action is needed.

   **b. Implement standard work for bid screening and data dissemination**

   One of the issues with the multi-year process is that it only occurs once every five years and often the business systems change between contracts, rendering any specific standard work obsolete. That being said, there is an opportunity to document the bid screening process through high-level standard work. An important aspect of the standard work is defining what information needs to go to which groups and when. This was an on-going challenge for the team and one that continues to evolve as requirements are clarified.

   **c. Integrate process with enterprise processes**

   Throughout the research at ACX, several references were made to an enterprise-wide process being developed for supplier bidding and selection. The effort defines standard processes and procedures to be used throughout the supply management organization but it does not currently address military contracting. There is an opportunity in the future to incorporate
the military FAR requirements into the project in order to further standardize the proposal process.

\[ d. \text{ Develop strategy for incorporating enterprise-level negotiations} \]

Another aspect of the company Supply Management consolidation effort is to negotiate at an enterprise-level with some of the largest suppliers. This was not taken into account on the current proposal, and all the bids were solicited based on proposal-specific terms and conditions. Going forward, there is a need to incorporate the enterprise-level negotiations and agreements into the multi-year process. Ideally this would simplify the workload for the proposal team because the supplier solicitations would only be updating pricing rather than addressing individual negotiations around terms and conditions.

6.3 Future Work

The recommendations contained in Section 6.2 are intended to be strategies which ACX can implement in the near term. Looking at longer term needs, there are several areas which would merit additional applied research:

- **Negotiation Execution**: Explore how negotiation teams are matched with suppliers and how the negotiations are executed within the overall enterprise context.

- **Supplier Rating System Alignment with Organizational Strategy**: Explore how the supplier rating at ACX aligns with the enterprise strategy and how the rating system drives supplier behaviors.

- **Automated Bid Processing and Supplier Selection**: Develop an automated process for evaluating supplier bids and making selections based on selection criteria.
References


