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STP 8-A-02: LTC NEGOTIATION ANALYTICS (LNA) FINAL REPORT

Defense Logistics Agency
R&D Weapons System Sustainment Program
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Table of Contents

EXECUTIVE SUMMARY

The Long-Term Contract (LTC) Negotiation Analytics (LNA) project discovered that there is additional value that can be gained through LTC preparation, solicitation, and negotiation. While LTCs are already utilized by DLA contracting officers, the contract parameters that are solicited have historically not provided the best value to DLA. Through the analysis conducted by the LNA team and subsequent pilot phase testing, the LNA solution has evolved to recommend empirically derived contracting parameters that have been tested in market on a subset of items.

The LNA tool recommends the following key contract parameters for LTCs: Guaranteed Contract Minimums, Delivery Order Minimums and Maximums, and Estimated Annual Quantities. These contract parameters are calculated by sourcing historical demand for an item and using advanced forecasting techniques to create a probabilistic forecast of demand for one year. This forecast can then be extrapolated over the entire length of the contract, which is typically three base years and two option years.

Once a probabilistic forecast is created, the LNA tool conducts a cost/benefit analysis that weighs the cost of over-procurement against the potential value of guaranteeing higher quantities or dollar values. By creating a probabilistic forecast and weighing over-procurement against under-procurement, LNA solves the key issues that are currently being experienced by DLA with regard to the following:

- Demand variability on an item-by-item basis
- Inconsistent vendor pricing
- Guarantees of only one purchase order (which eliminates a majority of the value proposition supporting LTCs)
- Inefficient data sourcing and vendor comparison techniques

Considering these pain points, Accenture designed the LNA tool such that it can be incorporated into DLA's existing IT environment. LNA's calculations utilize SAS and Python software to perform data analysis and provide contract parameter data for DLA consumption in a user-friendly dashboard. Accenture has purposefully designed the dataset outputs as dashboard agnostic, allowing DLA the flexibility to choose which platform is suitable. These technical characteristics were utilized so that the tool can be incorporated into current pre-award and post-award solutions.

Once the tool was designed and developed, Accenture and DLA partnered to conduct a pilot phase analysis that tested the tool in-market with LTCs that were representative of various LTC characteristics. The results of the pilot phase have shown that compared to the status-quo contract parameters, LNA's contract parameters can provide immediate value to DLA, experienced through lower vendor quoted unit pricing.

The Accenture team recommends that DLA proceed with a production integration of the LNA tool into an existing analytics platform. The LNA tool can be used for recommended contract parameter data while creating an LTC solicitation, as well as when vendor responses are received so that any deviations from solicited data, along with comparisons of pricing data for different quantity ranges, can be analyzed.

INTRODUCTION

To support the warfighter, while staying mindful of fiscal responsibilities, DLA contracting officers create LTCs that allow DLA to procure material more frequently and in smaller quantities. These characteristics create the opportunity for DLA to experience shorter administrative lead times (since contract setup only occurs once) and lower overall inventory holding costs (since the coverage duration of an LTC is typically lower than that of a transactional contract). LTCs can also inherently allow vendors to provide lower unit prices for items given the guaranteed source of supply for the duration of the contract.

However, LTCs can only be mutually beneficial, and particularly valuable to DLA, if appropriate contract parameters (e.g., Guaranteed Contract Minimums) are set. The purpose of this short-term project was to design and develop a tool that would use industry-proven analytical techniques to determine the most advantageous contract parameters to solicit with DLA LTCs. In order to determine the appropriate contract parameters to solicit in LTCs, the LNA tool uses historical demand to create a probabilistic forecast that is evaluated and creates a set of recommended contract parameters.

Problem Statement

A foundational principle of LTCs is to buy smaller quantities more frequently to reduce average inventory and free up working capital. To date, a common practice at DLA is to only guarantee the first order under the LTC. With only one guaranteed order (and for a smaller quantity than would be ordered in a transactional buy), LTC suppliers often quote higher material prices to compensate for the reduced per-order volume, thus mitigating their own risk. The consequence of the increased price quotes is either higher material cost (if the price is accepted) or increased minimum order quantities to achieve a material price break – both of which reduce or eliminate the value proposition of an LTC.

Project Execution

The LNA project was executed in two phases. The first phase comprised of research, design, and development of the tool, and included the following tasks:

Design and Development Base Period

Task 1: Document “As-Is” Process Map
Task 2: Conduct Commercial Best Practice Research
Task 3: Develop and Document Analytical Approach
Task 4: Engage DLA End-User Community
Task 5: Set Up Capability Framework
Task 6: Develop Initial “To-Be” Process Mapping
Task 7: Develop Initial Transition Plan
Task 8: Develop Proof of Concept & Generate Results
Task 9: Engage DLA End-User Community and Finalize “To-Be” Process Map and Transition

Task 10: Perform a Benefit/Cost Analysis
Task 11: Develop Requirement Recommendations
Task 12: Produce Final Report

Once the project team developed the LNA solution and deemed that the tool could have a positive impact on DLA LTC procurement activities, the team conducted a pilot study that would serve to test this theory. The second phase of the LNA project involved executing the pilot study with actual DLA items. The pilot phase comprised of the following tasks:

Pilot Phase Extension

Task 1E: Collaborate with the existing DLA Technical Working Group to design the test procedure
Task 2E: Conduct the pilot study
Task 3E: Update the final report produced during the initial phase of the project
Task 4E: Provide a final transition plan for implementation into DLA's systems
Task 5E: Develop training materials on the use and maintenance of the LNA capability for Aviation and L&M Acquisition personnel
Task 6E: Develop an executive brief that summarizes the project execution, project outcome, and recommendations

Report Overview

This report contains summaries of the scope, accomplishments, deliverables, and recommended next steps for the areas of work associated with design, development, and pilot phase project activities. It provides a high-level overview and a catalog of the deliverables for the project, which can be used to point DLA Leadership to key documents and assets.

Accenture recommends that DLA integrate the LNA capabilities into LTC preparation, analysis, solicitation, and negotiation activities. LNA was developed to meet the needs of DLA and its contracting officers and has been shown to provide immediate value to DLA through the pilot phase activities (as shown in Task 10: Cost/Benefit Analysis). DLA can continue the progression of the LNA project through the next phase of the Research & Development project lifecycle by reviewing the transition plan and implementing the LNA tool into production.

Each task has been detailed in the sections that follow, with the exception of tasks 12 and 3E. These tasks include writing and updating the report and have been satisfied throughout the completion and submission of this document. Additionally, for instances where there was overlap in tasks, summaries have been consolidated into one section for clarity and readability.

The following deliverables and detailed sections are provided in the Appendix to the Final Report and have not been included within this document:

- *Transition Plan*
- *Executive Briefing*
- *Technical Approach Detailed Section*
- *Analytical Approach & Capability Framework Detailed Section*
- *Pilot Study Detailed Section*
- *Cost and Benefit Analysis Detailed Section*
- *Commercial Best Practice Research Detailed Section*
- *Dashboard Screenshots*
- *Solution Architecture Diagram*
- *As-Is Process Map*
- *To-Be Process Map*
- *User Feedback*

TASK 1: DOCUMENT AS-IS PROCESS MAP

Accenture engaged project stakeholders and end-user group representatives to collect information and document the current LTC solicitation preparation and execution processes.

Scope

Engage with DLA's acquisition personnel and the CPS project team to understand existing and planned changes to LTC pre-award negotiation processes in more detail, document all existing processes, and identify pain-points in those processes to enable identification of process stages where data-driven decision support can play a role.

Accomplishments

To establish a baseline order of operations and understand the impact of an enhanced LTC workflow, Accenture performed an "as-is" assessment of both the Aviation and Land and Maritime supply chains, focusing on LTC processes. At a high level, each MSC's LTC process involves:

- Gathering and analyzing market research
- Sourcing demand data
- Soliciting contract parameters to fit the needs suggested by demand data, and
- Adjusting those contract parameters as needed.

Specific details regarding the process flow for each supply chain can be found in the "As-Is Process Map" section of the Appendix to the Final Report.

Through the As-Is Process Mapping event, the project team was able to determine that many pain points that existed as a part of the LTC solicitation process. A primary impediment for end-users was that the data they received was located in technically disparate locations. Additionally, many end-users conducted individual research to validate the solicitation parameters that they were provided. This often led to unnecessary manual rework and confirmation of the most optimal contract parameters to solicit.

Deliverables Created

- "As-Is" Process Map

TASK 2: CONDUCT COMMERCIAL BEST PRACTICE RESEARCH

Accenture conducted commercial best practice research in the fields of demand forecasting, supply chain analytics, and advanced analytical techniques to design a model that best suited DLA's business requirement and utilized emergent technologies.

Scope

Review commercial best practices related to use of simulation and predictive or probabilistic analytics in acquisition, contracting, or similar business processes.

Accomplishments

The Accenture team reviewed commercial best practices in the fields of simulation and predictive or probabilistic analytics and their application to acquisition, contracting, or similar business processes. These best practices served as a guide for structuring an analytical approach and were tailored specifically to the uniqueness of DLA Aviation's supply chain.

The project team also utilized research from Accenture Procurement Services, which is the world's largest Sourcing & Procurement services provider. Accenture Procurement Services manages 35,000+ project per year across 190 commercial clients, totaling $314 Billion in spend. These services indicate the use of predictive analytics to support procurement as a clear differentiator across all spend categories for maximizing value to customers.

There are a handful of areas that were researched during planning for development of the LNA analytics capability. The first was understanding the structure and intent of a Long-Term Contract as a contracting vehicle between the supplier and distributor. More specifically, Accenture focused on Indefinite Delivery, Indefinite Quantity (IDIQ) contracts that are used most often by the Government.

The next area of exploration was understanding the data that is available and the techniques that can be used to confidently and accurately invest in the capability framework. Time series and transactional data are available to most businesses and are commonly used in probabilistic and predicative modeling. Additionally, Accenture reviewed different types of forecasting algorithms used in predictive modeling, such as Bootstrapping and exponential smoothing.

After researching the commercial best practices, Accenture developed a plan that addressed both Demand and Supply Planning when recommending optimal contract parameters.

Deliverables Created

- Best Practices Research

TASK 3: DEVELOP AND DOCUMENT ANALYTICAL APPROACH

Accenture analyzed data sources, business requirements, existing process activities, and technical resources to create an analytical tool that would recommend key LTC contract parameters.

Scope

Using the information from Tasks 1 and 2, develop and document an analytical approach appropriate for providing the recommended values for LTC negotiation parameters such as contract structure, minimum order quantities, and purchase guarantees. This documentation will include all requirements to develop an analytical tool to include identifying input metadata, variable characteristics, analytical techniques, required table structures, and functional use of the output in the final product.

Accomplishments

The LNA team identified key issues with the LTC solicitation data and processes and designed a solution that provides immediate value to DLA. The LNA tool addresses these issues by recommending empirically derived contract parameters. Summarized below are the analytical techniques used in this capability, as well as the data sourcing, contract parameters definition, capability framework, and the output for all visualizations.

Data Sourcing and Data Origination

Data sourcing originates in the DORRADW and Enterprise Data Warehouse (EDW), both of which reside within the DLA network. Within the capability framework, there are automated scripts that will source the data warehouses and pull appropriate data for the models. The DORRADW is used primarily for sourcing the historical demand data that is then fed into the forecasting algorithms. This data includes the historical demands along with the identification data such as date, order quantity and sales document numbers. The EDW data sourcing is used to source item characteristics such as AAC, RMC, ICR and other classification attributes. These attributes become important when defining their contract parameters because they can impact forecasting calculations.

Analytical Techniques & Key Parameters

The Minimum and Maximum estimated annual contract quantities are defined as the predicted annual spend on the contract (obligation authority). These parameters establish the value of the contract and can have negative impacts if they are not set correctly. For example, if the maximum value is set too low then there is a possibility of exceeding that value prematurely which would require another contract, leading to more cost to DLA. Additionally, large differences between the minimum and maximum values might lead a supplier to quote higher prices, or not bid at all because of their uneasiness in those values.

The guaranteed minimum quantity and value is the portion of the estimated annual that is guaranteed to be obligated over the base period of the contract. This value is calculated as the point on the estimated annual probability distribution where the Value-Cost function equals zero.

The model leverages Bootstrapping and Monte Carlo techniques which empirically derive demand distributions over a simulated time window. The Bootstrapping method is a statistical technique for estimating quantities about a population by taking the average quantity from multiple small data samples. This is accomplished by defining a sample size and then drawing those samples from the larger population. The number of repetitions should be as large as possible, given time resources, in order to minimize the variance to the statistics calculated on the sample of estimated values. In either case, the sample size and the number of repetitions should be chosen in order to ensure meaningful and confident statistics. To verify that the techniques used to estimate probability of a given demand profile accurately represents realistic probabilities, the model evaluates the expected probability of given value against actual values.

Deliverables Created

- Documented Analytical Approach

TASK 4: ENGAGE DLA END-USER COMMUNITY

Accenture interviewed the DLA end-user community (LTC contracting officers) to determine requirements for the LNA project and used their feedback to inform the final solution's design.

Scope

Coordinate with functional specialists to discuss the project and define functional use cases for the information produced by the analyses in Task 3 and to gather insights on the design and testing of the capability, such as which LTCs to use in the analysis. Interact with users across DLA Aviation's Strategic Acquisitions and Supplier Operations directorates to solicit feedback regarding the end users' preferred functionality and user experience.

Accomplishments

Once the As-is LTC process map baselined existing processes and defined research areas in which to inject data-driven decision support, the LNA project team worked with the stakeholder community to continue developing a robust solution. Stakeholder interviews were conducted and provided insight into existing LTC negotiation pain points and served as input to the To-Be process map creation. With the opportunities identified, the project team sourced necessary data from DLA's EBS system, including item attributes, requisition history, statistical and collaborative forecasts, and historical purchase requisition (PR) and purchase order (PO) data, to ensure alignment with existing process data capture.

Specific user actions were recorded, and areas of improvement were identified. These areas include pre-award data sourcing, data analysis and aggregation techniques, and the ability to evaluate counteroffers received from vendors. General and specific user feedback can be found in the "User Feedback" section of the Appendix to the Final Report.

TASK 5: SET UP CAPABILITY FRAMEWORK

Accenture, along with project stakeholders from the Aviation and L&M supply chains and the CPS team, developed the LNA solution's framework such that it utilized existing DLA approved software: SAS, Python, and Power BI.

Scope

Identify, develop and validate individual analyses of the identified contract parameters for use in the construction of the proof of concept for the analytical capability. Consult with the CPS project team regarding data that should be used for the analyses. The individual analyses will leverage existing DLA analytical platforms (e.g. SAS, Excel) as the basis for the business capability. These individual analyses will be the framework for the analytical tool that will be developed in Task 8.

Accomplishments

The capability framework considered existing DLA approved software and was developed in a manner that eases transition of the tool into production. This prospect played a role in Accenture's decision making when selecting the analytical and visualization platforms. Accenture wanted the tools and platforms to already be a part of the DLA infrastructure in order to give provide a seamless transition.

The algorithms and model were developed in Python. Python is a flexible programming language with advanced statistical libraries that allow for easy integration into any part of the DLA infrastructure. For LNA, Python was leveraged to conduct the bootstrapping and Monte Carlo modeling.

Data sourcing and other calculations utilized SAS. SAS is a software package that has been in use at DLA for a long time and is familiar to a lot of the DLA community. There are many different software applications that are available within the SAS environment and are already installed in the DLA infrastructure.

These two analytical platforms both have their individual advantages and disadvantages, but when they are used in unison, they provide all the computational power and flexibility that is needed for LNA.

Additionally, Accenture considered that the visualization software needed to be dynamic so that buyers could easily and reliability get to the information that they need. The analytical platforms and the visualization software for this project meet the project's requirements and provide the greatest flexibility to integrate with future initiatives.

Throughout the project, the Consumption Pull System (CPS) team was briefed on the development of LNA's analytical modeling and has been provided access to results. As the submission of this final deliverable, there are no deviations or additional considerations in the analytical approach to address CPS.

Deliverables Created

- Capability Framework

TASK 6: DEVELOP INITIAL "TO-BE" PROCESS MAPPING

Using the As-Is Process Map, along with project requirements and end-user feedback, Accenture developed an initial To-Be Process Map that illustrated an enhanced LTC preparation, solicitation, and negotiation process flow.

Scope

Gather feedback from the Acquisition stakeholders, then develop a "To-Be" Process Map proposing how and by whom the capability can be used within the larger pre-award negotiations and evaluations process.

Accomplishments

By implementing the LNA dashboard in production, DLA's supply chains can achieve an enhanced process flow that reduces complexities associated with soliciting LTCs. Accenture's proposed workflow combines existing processes from the Aviation and Land and Maritime supply chains with the LNA dashboard.

The enhanced process flow allows users to more efficiently and effectively collect information needed to solicit an LTC and analyze data necessary for a successful award. This process can be summarized in 3 steps:

1. Source Planning Data: The first step, source planning data, is included to allow end-users to gather information that is not included in the LNA dashboard and may be unique to their specific use case.
2. Source & Analyze Data from LNA Dashboard: The next step, Source and Analyze Data from the LNA Dashboard, is the step that is most impacted by the LNA solution. In lieu of gathering information from disparate sources and checking the validity of that data, as depicted in the "as-is" process flows, a user will now be able to see recommended parameters, along with data and visualizations to back up those parameters, in one location.
3. Solicit, Evaluate, and Prepare Award: The last step in the To-Be process map enables end users to solicit the proposal, evaluate counteroffers using the LNA dashboard's recommended quantity and value ranges, and prepare the award. Evaluating counter proposals is another specific step that is greatly impacted by the LNA dashboard because of the recommended "risk" or "confidence" ranges that are provided with the contract parameter recommendations.

TASK 7: DEVELOP INITIAL TRANSITION PLAN

Accenture considered the existing technologies and processes, along with LNA's enhancement features, to develop an initial transition plan that could immediately provide a positive impact DLA's LTC solicitations.

Scope

Create an initial plan to transition the analytical capability into DLA processes.

Accomplishments

As a part of the initial transition plan, Accenture recommended a full-scale production implementation because of the value that was expected to be seen in the cost-benefit analysis, feedback from end-users at the Aviation and Land & Maritime supply chains, and future value from material price breaks, as was expected to be seen during the Pilot Phase. Accenture recommended a pilot phase to serve as a pathway into a full-scale production solution that can either be implemented at the enterprise level or on a supply chain case-by-case basis.

TASK 8: DEVELOP PROOF OF CONCEPT & GENERATE RESULTS

Accenture developed back-end calculations and front-end dashboard display that conduct the LNA analysis and communicate the results to the end-user in dynamic, flexible views.

Scope

Develop a proof of concept of the analytical tool that will use the relevant acquisition data and the analytical approach laid out in Tasks 3 through 6. The analytical tool will calculate predictive measures for ideal contract parameters (e.g., minimum order requirements, and guaranteed quantities) and evaluate risk profile metrics based on those contract parameters to aid in contract development. The proof of concept shall also be tested and evaluated for precision in accordance with industry-standard evaluation metrics (e.g., mean-squared error).

Accomplishments

Contract Parameter Determination and Descriptions

The type of contract that is being used by DLA most often is the Long-Term Contract Indefinite Delivery Indefinite Quantity (IDIQ). This is a type of contract that allows for an indefinite quantity of supplies or services during a fixed period of time. The government will place a delivery order against a basic contract for individual requirements. Over the fixed period of time (Base Contract), there will have to be established Minimum/Maximum Annual Quantities, Guaranteed Minimum Quantities and Minimum/Maximum Delivery Orders (DO). DLA must operate within these specific parameters when placing orders and determining the contract value. In some cases, these contracts do not support DLA or its customers because of increasing or variable demand that require DLA to over or under procure with respect to their requirements. This problem is further reinforced by using broad-based business rules to derive these key contract parameters. By using empirically derived parameters unique to each item's history, more risk-appropriate values can be recommended.

Accenture uses a combination of Bootstrapping and Monte-Carlo techniques, along with a unique Value-Cost function, to recommend estimated annual and minimum guaranteed annual quantities and value. After empirically deriving these values, the model calculates each item's on-LTC coverage duration to provide a minimum and maximum delivery order quantity.

Dashboard Design

The LNA Dashboard was designed to enhance existing methods of gathering and visualizing data and increase efficiency and effectiveness throughout the LTC process. The LNA prototype uses advanced analytics and simulation techniques to recommend key LTC parameters for contracting, and a dynamic front-end displays ensures that the data is properly communicated to end-users.

Deliverables Created

- Proof of Concept Design and Results

Recommended Next Steps

Accenture recommends sharing the LNA proof of concept solution with Acquisitions and executive teams to promote a future implementation. The LNA tool can be integrated into DLA environments in a variety of ways, as outlined in the Transition Plan.

TASK 9: ENGAGE DLA END-USER COMMUNITY AND FINALIZE "TO-BE" PROCESS MAP & TRANSITION PLAN

Accenture engaged with DLA end-users to update the initial To-Be Process Map and develop a final version that considered end-users requirements along with DLA objectives.

Scope

Discuss the results of the proof of concept with the DLA Aviation Acquisition community. Update the "To-Be" Process Map and Transition Plan based on these discussions.

Accomplishments

Usability testing was conducted on a select group of end-users from both the Aviation and Land & Maritime Supply Chains. The purpose of the usability testing was to elicit feedback on the design of the LNA dashboard and to gauge the overall effectiveness of the solution.

Summary

Usability Testing was conducted on end-users that execute LTC contracts and other users that are familiar with acquisition planning and LTC processing. Users were given a brief overview of the project and then guided through the dashboard. Throughout testing, feedback was collected on the following information:

- Recommendations Provided
- Information / Tabs Shown
- Order of Operations
- Look & Feel
- Applicability to LTC Process
- Additions, Deletions, Enhancements
- Potential Time-Savings

As a result of the usability testing, Accenture was able to make improvements to the dashboard in an effort to better fit each end-user's requirements.

User Groups

To test that the LNA dashboard fit the needs of each type of end-user, user groups were created from interviews and with user journeys in mind. Through testing, Accenture discovered that the following five major types of end-users existed:

- **Single-NIIN Contract Executors** – Buyers that create and solicit single-NIIN LTCs
- **Multi-NIIN Contract Executors** – Buyers that create and solicit multi-NIIN LTCs

- **Data Explorers (Acquisition Planning)** – Acquisition planning team members that currently provide contract parameter recommendations to buyers
- **Data Explorers (Buyers)** – subset of buyers, roughly 10-15% of the total, that investigate and validate the contract parameter recommendations provided by the acquisition planning team
- **LTC Support / Monitors** – management level team members that provide oversight of LTC processes

Deliverables Created

- Final “To-Be” Process Map
- Final Transition Plan

Recommended Next Steps

Accenture recommends utilizing the To-Be process map to shape how future solicitations are created, analyzed, evaluated, and negotiated. The LNA tool has many features that can be beneficial to various processes associated with LTC creation and should be referenced to create optimal contracts for DLA.

TASK 10: PERFORM A BENEFIT/COST ANALYSIS

Accenture considered the costs of the R&D project and implementation of the LNA solution, as well as the benefits and cost-savings of the LNA solution derived from pilot phase results, to perform a cost and benefit analysis.

Scope

Using the results of Task 8 and 9, Accenture developed a methodology for estimating the potential benefit of broadly implementing the identified LTC negotiation support analytics within DLA. This analysis compared the status quo to the expected implementation results based on this sample subset of data used in Task 8.

Accomplishments

The following cost benefit analysis was conducted to inform DLA on whether or not to implement the LNA solution into production environments. To assess LNA's impact, the Accenture team analyzed historical data, input from current staff, and pilot study results. The Cost Benefit Analysis (CBA) determines the dollar value impact of implementing the solution by aggregating results from the pilot phase, utilizing findings from user interviews with the Aviation and Land & Maritime supply chain teams, and sourcing additional data from the Enterprise Data Warehouse (EDW) and DORRADW. The Accenture team used this data as inputs to set baseline LTC costs and determine future "to-be" costs within the LNA model, and then aggregated the data to conduct the CBA. Ultimately, Accenture found that DLA could realize substantial savings in excess of the total cost to implement LNA over a 5-year period.

Methodology

Utilizing historical data and outputs from the LNA model, the Accenture team developed a methodology for estimating the potential benefit of an LNA implementation at the enterprise level. The Accenture team quantified the status quo by soliciting contract parameters using business-as-usual processes, a business-rule based approach, for the pilot group of LTCs that served as the baseline scenario for the cost benefit analysis. The to-be state was then valued using the same group of pilot LTCs according to alternate solicitations using LNA-generated parameters.

Two versions of the cost benefit analysis are presented: 1) Limited only to the pilot group of LTCs and 2) Extrapolated for a range of possible, addressable long-term contracting actions across the major hardware chains of Aviation, Land, Maritime, and Industrial Hardware. Given the limited sample of LTCs ultimately included in the pilot study, a range of possible outcomes is presented to give DLA an estimate of potential savings based on various success rates.

Accenture found that by implementing the LNA solution, DLA could realize significant value and cost reduction to current LTC solicitation costs and vendor proposed unit pricing.

Cost of R&D Effort and Estimated Implementation

The following table summarizes costs associated with the LNA contract. The table accounts for costs to the agency for the LNA R&D effort as well as a rough estimation of what the implementation costs could be, though these values are highly speculative and would be dependent upon varying requirements. An estimated cost of training of end-users has also been included.

LNA Project Costs – Rough Order of Magnitude (ROM)*	
LNA Design and Development	$382,973
LNA Pilot Phase	$179,408
LNA Estimated Implementation	$200,000
Training	$5,000
Total	**$767,381**

**This ROM includes an estimate for LNA training and implementation that is variable and depends on the selected implementation pan.*

Savings - Pilot Study Results

The following table summarizes each of the LNA projects that received vendor responses, and includes their commodity type, the cost driver (determined after analyzing results), and potential year over year savings for that project. Though a relatively small sample size in comparison to the number of LTCs solicited per year, the LNA projects show that there is a variable, yet valuable amount of savings that can be harnessed through empirically-derived, probabilistic decision support tools.

LNA Project Summary				
Project	**Commodity Type**	**Cost Driver**	**Potential YoY Savings**	**% Savings**
SPE7MX-19-R-0123	Antennas, Waveguides, Related Equipment	Increasing Delivery Order (DO) Minimums	$ 117,065	4%
SPE7LX-R-106	Vehicle Furniture and Accessories	Increasing Guaranteed Contract Minimums	$ 278,052	67%
SPE4AX-19-R-089	Airframe Structural Components	Increasing Guaranteed Contract Minimums	-	-
SPE4AX-19-R-093	Pressure, Temp, and Humidity Measurement and Control	Increasing Delivery Order (DO) Minimums	-	-
SPE4AX-19-R-100	Miscellaneous Electrical Power and Distribution Equipment	Increasing Delivery Order (DO) Minimums	$ 203	1%

SPE4AX-19-R-101	Gas Turbines, Jet Engine and Components, Except Aircraft	Increasing Order Size (Delivery Orders)	-	-
SPE4AX-19-R-104	Cable, Cord, Wire Assemblies; Communication Equipment	Increasing Delivery Order (DO) Minimums	$ 56,148	27%
TOTAL		**Increasing Delivery Order (DO) Minimums**	**$ 451,468**	**12%**

As seen in the table above, the LNA projects experienced an average savings of 12% when compared to the status quo baseline costs. The primary cost driver for the majority of projects that experienced quantity-sensitive unit pricing was an increase (in precision and quantity) of the Delivery Order minimum, though increasing the Contract Guaranteed Minimum also had a positive value gain in some instances.

Return on Investment

The return on investment from the LNA project has been analyzed considering only the projects involved with LNA, and also analyzed considering the total number of LTCs solicited at the Aviation, Land and Maritime, and Industrial Hardware supply chains.

Analysis 1: Cost/Benefit Limited to Pilot Study

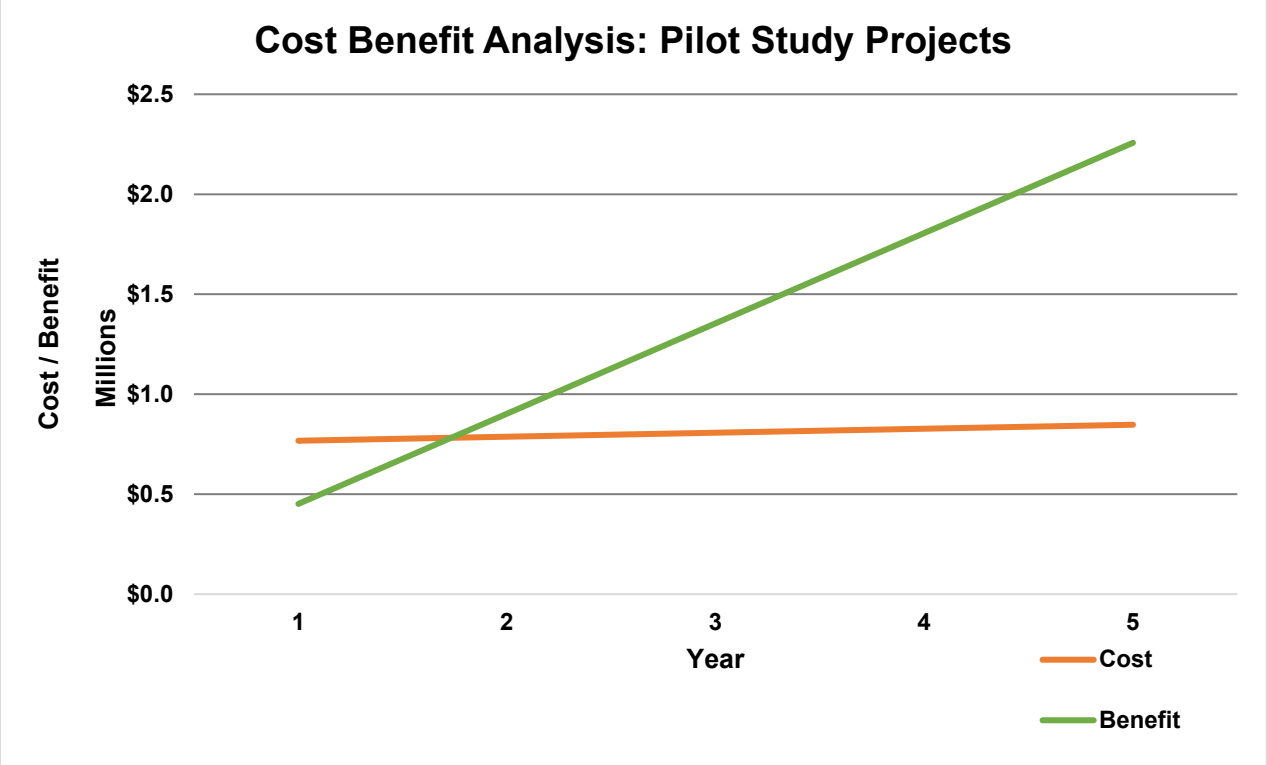
The first cost benefit analysis compares the cost of the LNA short-term project, including implementation, training, and ongoing maintenance to the benefit observed in the form of material price quote reduction from the pilot group of LTCs when leveraging LNA's contract parameter recommendations.

This analysis assumes an ongoing maintenance cost of $20,000 per year, or 10% of implementation costs. This is to address activities such as model revalidation/tuning, and visualization maintenance.

Year	Cost	Benefit
1	$ 767,381	$ 451,468
2	$ 787,381	$ 902,936
3	$ 807,381	$ 1,354,404
4	$ 827,381	$ 1,805,872
5	$ 847,381	$ 2,257,340

Year over Year Cost/Benefit

As shown in table 1, DLA's projected benefit of year over year savings for the group in aggregate increases at a much higher rate than the static maintenance cost of LNA.



Cost Benefit Analysis of Pilot Study

The figure above also emphasizes the savings growth over a 5-year period and reiterates the year over year savings to DLA. As a result of this analysis, LNA demonstrates a large potential value to DLA with a **payback period of 1.7 years when applied to a sample of just 7 LTCs.**

In other words, assuming an unlikely scenario where no other LTCs experience a cost savings, this R&D STP will have paid for itself within two years with the value delivered from the pilot LTCs.

These results further emphasis the importance of the R&D project lifecycle in that the potential upside can vastly outweigh the cost of investment. For LNA, this means that the investment into empirically-derived, probabilistic contract parameters could provide exponential savings to the LTC NIIN population.

Analysis 2: Cost/Benefit Analysis Scaled to the Aviation, Land, Maritime, and Industrial Hardware Supply Chain Group (an Enterprise-Level solution)

The second cost benefit analysis assumes that the LNA capability will drive value beyond the pilot group of LTCs, once implemented into production. Given the relatively small sample size of the pilot group, several assumptions are required to extrapolate the value to the enterprise.

First, only the major hardware chains are assumed to benefit from LNA, given the similarities in commodities and contracting procedures. Second, in the absence of contract solicitation specific data, ADV is used to approximate the yearly LTC value. Lastly, a sensitivity analysis is used to project a range of value based on a success rate for LNA yielding lower material price quotes.

To begin the analysis, Accenture sourced the ADV and NIIN counts for the previous three fiscal years at the aforementioned supply chains.

Fiscal Year	Supply Chain	Annual Demand Value ($M)	NIIN Count
2017	Aviation	312	8,501
2017	Industrial Hardware	25	7,549
2017	Land	131	8,623
2017	Maritime	84	3,293
2018	Aviation	370	6,035
2018	Industrial Hardware	31	2,960
2018	Land	133	912
2018	Maritime	71	811
2019	Aviation	270	10,125
2019	Industrial Hardware	28	2,114
2019	Land	412	2,955
2019	Maritime	53	481

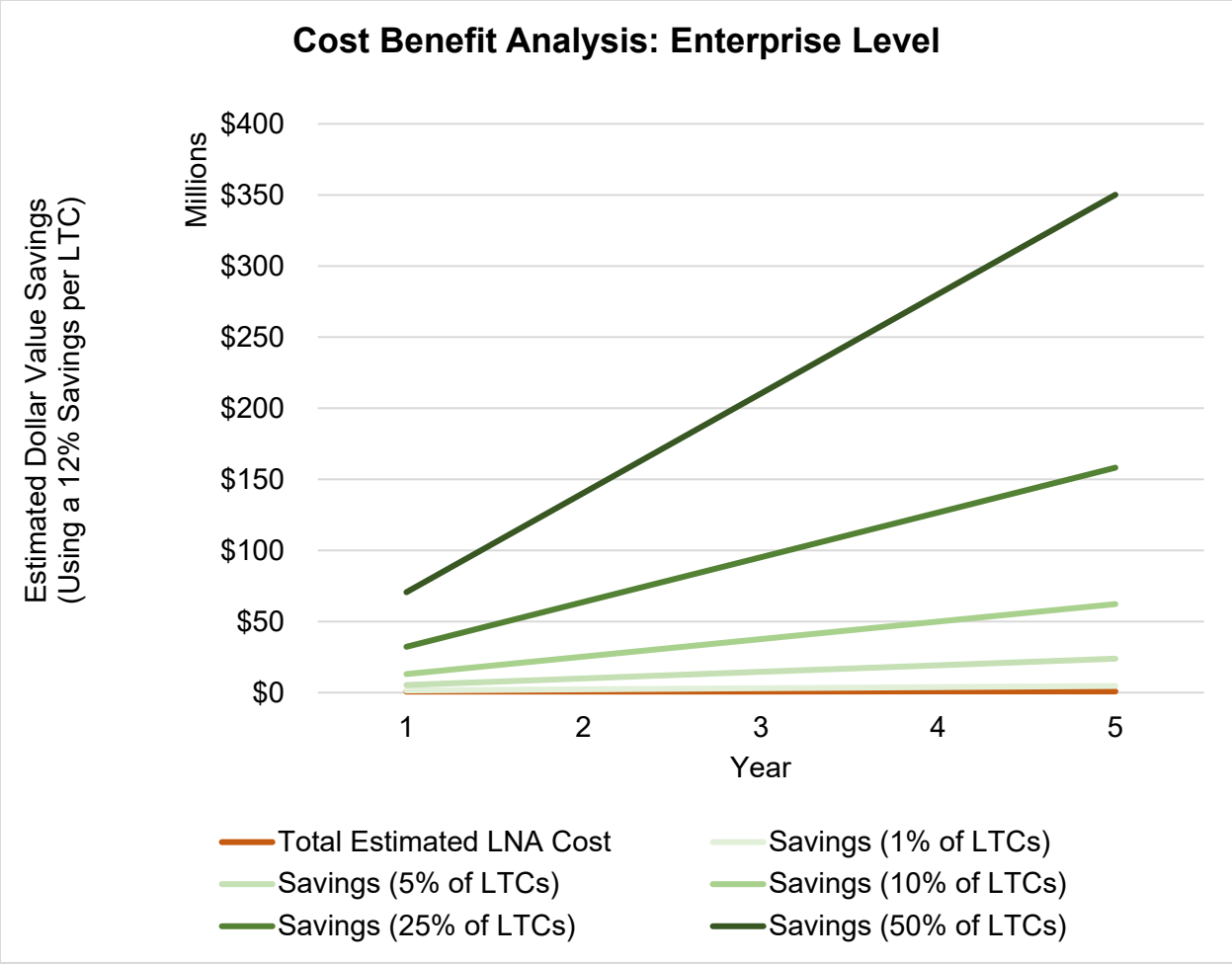
LTC ADV and NIIN Count by FY and Supply Chain (Data from DORRADW's ALL_LTC_NIIN)

This data was then aggregated at the yearly level for all three supply chains. Using the total count of all NIINs that could be placed on LTC, in conjunction with the ADV, Accenture was able to create a baseline population and dollar value of items that would benefit from LNA.

Fiscal Year	Annual Demand Value ($M)	NIIN Count
2017	551	27,966
2018	605	10,718
2019	763	15,675
Average	**640**	**18,120**

Average ADV and NIIN Count by FY

Next, Accenture used the pilot phase results to create a range of potential benefit (savings to DLA from LNA) outcomes. The range of addressable LTC value beings at 1% of the 3-year average hardware LTC ADV and increases to the observed pilot phase success rate of ~50% (4 out of 7 LTCs). The average percent savings from the pilot phase (12%) was then applied to the addressable LTC value at each step.



Cost/Benefit Analysis at Enterprise Level

As is shown in the figure above, the range of potential value to DLA at the enterprise level greatly outperforms the cost of the LNA R&D STP and implementation. The table below provides specific values, in terms of millions of dollars saved, when considering each of the "benefit" scenarios. Scenarios account for the percentage of the total LTC population that would elicit quantity-sensitive unit pricing.

Year	Cost ($M)	Benefit ($M) 1% of LTCs	Benefit ($M) 5% of LTCs	Benefit ($M) 10% of LTCs	Benefit ($M) 25% of LTCs	Benefit ($M) 50% of LTCs
1	0.77	0.77	3.84	7.68	19.19	38.38
2	0.79	1.54	7.68	15.35	38.38	76.76
3	0.81	2.30	11.51	23.03	57.57	115.15
4	0.83	3.07	15.35	30.71	76.76	153.53
5	0.85	3.84	19.19	38.38	95.96	191.91

Enterprise Level Year over Year Projections (% Benefit reflects the % of LTCs impacted)

Scenario 2's CBA illustrates that the potential benefit of LNA cannot be understated. At a conservative 1% success rate, applying LNA to just 1% of hardware LTCs with an average of 12% savings from LNA generated contract parameters, the potential value is $767k. This pays for the cost of the LNA R&D project, implementation, and training in the first year of production.

Assuming higher success rates, the LNA capability generates value ranging from $19M to $192M over the course of a traditional five-year LTC. This equates to a payback period ranging from 33 days to less than 1 day.

Scalability

The potential benefit of the LNA capability is increasingly obvious when scaled to the hardware supply chains at the enterprise level. The LNA algorithm developed during the pilot phase is flexible and ready to meet the solicitation and/or NIIN volume observed for these supply chains. This design ensure that no added cost for implementation, training, or sustainment is required.

Risk Analysis

As with all LTCs, there is an inherent risk that the forecasted demand does not satisfy the terms of the contract. Additionally, there also exists risk in all LTCs that the contract terms are too conservative and value is lost. Each of these issues exist with the solution that LNA proposes, however, this risk is present in current, business-as-usual processes. Unlike a business-rule based approach, LNA mitigates this risk because the tool is an empirically-derived decision support tool that leverages a probabilistic forecast in lieu of a deterministic, rules-based forecast.

The risk associated with increasing contract and delivery order minimums beyond requirements is mitigated further when an entire population is considered. Through a 10,000 NIIN sample, the LNA team was able to show that although individual contracts varied in the performance of LNA recommended parameters, the overall population's accuracy was a vast improvement from current operating tools (LNA's mean absolute error for the test population was < 1%).

Additional Value Considerations

In addition to the above analysis, it's important to note that there are other factors that could affect the overall value of the LNA project. The first consideration suggests that money saved can be used in more valuable ways if it is not unnecessarily committed or already spent. With regard to LNA, this means that by eliciting lower unit pricing, DLA will be able to use the money saved to replenish emergent areas of need or expanding inventory breadth for non-stocked or chronic MA degraders, which can have exponential long-term positive benefits. This savings can also apply to the contracting officers soliciting LTCs. By saving an hour or two per LTC, buyers will be able to contract more items per year and provide better support to the warfighter. Additionally, with the approval of the logic from the buying community, this capability will allow the Buyers to negotiate within their item's quantity ranges and alleviate the time it takes to get their Supervisor's approval in negotiations.

Another factor to consider is that there exists an appetite for more precise forecasting within DLA and DLA's vendors. Without this precision, incorrect forecasts can have negative down-stream impacts such as being in an over-procurement position or having lower confidence in the models that are used to generate forecasts. By improving the accuracy with which DLA forecasts, LNA

can positively influence buyers and vendor along with the relationship between DLA and its suppliers.

Finally, DLA could see department level value gained by implementing the LNA solution due to the leading-edge analytics methods that are being utilized, the interactive dashboard design, and capacity to scale. Each of these factors positively contribute to the perception that the DLA is not only relying on tried and true methods to support the warfighter, but also emerging technologies and innovations. The LNA solution could be used as a springboard for future R&D initiatives, and as the model for which an R&D project moves from the prototype phase to the production phase at the enterprise level.

Implementation Recommendation

The LNA Transition Plan outlines three viable options for implementation of the LNA solution into production environment. Each option includes a rough order of magnitude that defines an estimate of the level of effort required for each.

Deliverables Created

- Cost and Benefit Analysis

Recommended Next Steps

Accenture recommends using the cost and benefit analysis to gauge the appetite for a cost-savings across DLA supply chains. Though specific value is difficult to calculate due to the specific characteristics of each supply chain and commodity, the LNA tool has been proven to create cost-savings for DLA that outweighs the cost of the implementation.

TASK 11: DEVELOP REQUIREMENT RECOMMENDATIONS

Accenture developed LNA requirement recommendations that address the technical features that should be in place prior to implementation of the LNA solution.

Scope

Develop requirements recommendations to define the desired functional and technical states of the LTC negotiation support capability. The contractor will produce requirements documentation suitable for advancement through the J6 Front Door process.

Accomplishments

The following high-level requirements define the processes and platforms that must be in place for the successful use of the LNA tool. These requirements involve resources that are required for LNA to operate and additional features that will aid in LNA processing.

Recommended Technical Requirements

- The system must be able to support matrix processing
- The system must be able to display front-end data visualizations
- The system must be able to source and analyze data from DLA's existing databases
- The system must allow end users to dynamically view recommended contract parameter data

Long-Term Supportability Requirements

- The tool must be able to source demand history data, item attribute data, historical Purchase Order and Purchase Requisition data, along with other various data used in the LNA analyses
- The tool must be able to have a dashboard agnostic set of calculations and demand sourcing (back-end)
- The tool must be able to be used by multiple end-users at one time and in various locations

Deliverables Created

- Requirements Document

Recommended Next Steps

Accenture recommends approving the system requirements and software required are provided in the environment where DLA may intend to implement LNA.

TASK 12: PRODUCE FINAL REPORT

Accenture produced a final report that summaries the key project activities that occurred, analyzes project findings, and recommends next steps for the LNA solution.

**Please refer to the Report Overview section for details relating to the completion of Task 12.*

TASK 1E: COLLABORATE WITH THE EXISTING DLA TECHNICAL WORKING GROUP TO DESIGN THE TEST PROCEDURE

Accenture collaborated with the project stakeholder group to design a test procedure plan that identified project characteristics and provided metrics that were analyzed at the culmination of the project.

Scope

Collaborate with the existing DLA Technical Working Group that includes stakeholders from L&M, Aviation, and the Consumption Pull System to design the test procedure. R&D must approve the test procedure prior to proceeding.

- Identify end users from L&M and Aviation
- Determine representative NIINs and / or multi-NIIN long term projects that will be included in the test
- Identify quantitative and qualitative metrics to measure the success of the pilot study. These should include metrics regarding the LNA end user experience, the value of the LNA capability to DLA, the accuracy of the LNA dashboard results

Accomplishments

Participants

Accenture collaborated with project stakeholders and division chiefs at the Aviation and L&M supply chains to identify five end-users (two at Aviation and three at L&M) that participated in the pilot phase. Each buyer was asked to:

- Participate in dashboard training and provide initial feedback
- Provide usability and user-experience feedback throughout solicitations
- Provide data and sources used for the control group solicitations
- Provide the vendor responses received for each solicitation
- Provide recommendations for improvement of the solution as needed

NIIN Identification

Items to solicit were identified at Aviation through the AAA tool and were selected from an existing “Good Candidate” list. At L&M, items were selected from a list of items that were already planned to be executed. Initially, NIINs were also subjected to the following requirements:

- Targeting competitive NIINs
- Similar commodity type (e.g. FSC)

- Similar manufacturing processes
- Demonstrated price sensitivity to demand

Key Objectives and Initiatives

The LNA Pilot Phase sought to answer the following questions:

- **Unit Pricing** – did the LNA recommendations elicit lower pricing from vendors?
- **LTC Process Improvement** – was there an overall improvement to the efficiency and effectiveness with which solicitations were prepared, released, and evaluated when using the LNA dashboard?
- **Feedback** – would the feedback from Buyers lead to additional value?
- **External Circumstances** – did any circumstances outside of the pilot phase influence outcomes?

A successful pilot phase sought to prove that the sum of the factors below outweighs the cost of implementation:

- Aggregated Unit Price savings (LNA solicited Unit Prices – Existing Processes Unit Prices)
- Time savings
- Improved User Experience

Data Collection Plan

The following qualitative and quantitative data was captured to assess the value of LNA.

Quantitative Data:

- Historical Contract Parameter Data
- Historical Unit Pricing with Quantity Bands
- Solicited Contract Parameters
- Time-Spent on each Process Flow Step (Control and LNA)
- Proposed Quantities and Associated Unit Pricing Received from Vendors
- NIIN Control Group and LNA Group Differences

Qualitative Data:

- User Experience
- Design “Look and Feel”
- Effectiveness of Each Tab within Tool
- Overall Understanding of the LNA Capability
- Overall Impact to LTC Pre-Award Processes
- Interactions with Vendors
- Documents Used for Control Group Solicitations
- Suggested LNA Enhancements
- External circumstances

TASK 2E: CONDUCT THE PILOT STUDY

Accenture conducted the pilot study on a subset of items that were representative of various types of LTCs with end-users from the Aviation and L&M supply chains.

Scope

Conduct the pilot study:

- For LTC projects with similar NIINs, prepare and release solicitations for one using the current solicitation process and the other using the recommendations from the LNA dashboards.
- Test the algorithms and the dashboard to ensure acceptable performance and to ensure scalability.
- Collect and analyze metrics.
- Develop recommendations for implementation or include additional research required for implementation.
- Identify risk factors for implementation of the LNA capability

Accomplishments

In accordance with the LNA project plan that was discussed and agreed upon amongst stakeholders at the onset of the pilot phase, Accenture conducted the pilot phase to gather data on its key objectives and initiatives. Buyers from Aviation and L&M supply chains created solicitations that contained data from both existing sources and from LNA's recommendations. Vendors priced those solicitations and Accenture analyzed the results to determine a potential cost-savings to DLA. The pilot phase was then evaluated against key metrics, both qualitative and quantitative, to determine and inform an overall transition and recommendation plan.

Recommended Next Steps

Accenture recommends using the results from the pilot phase to support the path forward for LNA, as referenced in the Transition Plan.

TASK 3E: UPDATE THE FINAL REPORT PRODUCED DURING THE INITIAL PHASE OF THE PROJECT

Accenture updated the final report, created during the initial design and development phase, to include the results and recommendations from the pilot phase.

**Please refer to the Report Overview section for details relating to the completion of Task 3E.*

TASK 4E: PROVIDE A FINAL TRANSITION PLAN FOR IMPLEMENTATION INTO DLA'S SYSTEMS

Accenture created a final transition plan for the LNA solution that can be used by DLA to proceed with an implementation of the capabilities into existing DLA systems.

Scope

Provide a final transition plan for implementation into DLA's systems which details the time/level of effort to incorporate capability into AAA or as a stand-alone capability

Accomplishments

As outlined in the Transition Plan, Accenture recommends one of three potential approaches to integration of the LNA capability into Production. Though there are advantages specific to certain integration approaches over others, the LNA tool should be utilized to the extent that DLA determines possible.

Deliverables Created

- Transition Plan

Recommended Next Steps

The Transition Plan outlines various options that are available to DLA with regard to the future of the LNA solution and its capabilities.

TASK 5E: DEVELOP TRAINING MATERIALS ON THE USE AND MAINTENANCE OF THE LNA CAPABILITY FOR AVIATION AND L&M ACQUISITION PERSONNEL

Accenture created training and maintenance materials for the LNA solution that include sections on using the tool, data definitions, support for the calculations that are made, and technical details.

Scope

Develop training materials on the use and maintenance of the LNA capability for Aviation and L&M Acquisition personnel.

Accomplishments

Training materials were developed by Accenture and provide end-users and overseers of the LNA tool with information on how to download, access, interpret, and operate the LNA solution. The training materials show users how to interpret the data and dynamically update views within the dashboard. Additionally, users can reference the Training Materials to gain a better understanding of how the forecast and recommended contract parameters are developed.

Deliverables Created

- LNA Training Deck

Recommended Next Steps

Accenture recommends sharing the Training Materials with the Acquisitions personnel that will be operating as end-users to the tool.

TASK 6E: DEVELOP AN EXECUTIVE BRIEF THAT SUMMARIZES THE PROJECT EXECUTION, PROJECT OUTCOME, AND RECOMMENDATIONS

Accenture developed an executive briefing that provides a high-level overview of the LNA project along with recommendations and additional project outcomes.

Scope

Develop an executive brief that summarizes the project execution, project outcome, and recommendations.

Accomplishments

Accenture analyzed and summarized details related to the LNA project execution, outcome, and recommendations in the Executive brief document.

Deliverables Created

- Executive Briefing

Recommended Next Steps

Accenture recommends communicating the results of the pilot phase, along with the purpose and value of the LNA tool, to Acquisitions leadership.

APPENDIX

**The Appendix to the Final Report has been submitted as a separate, stand-alone document and includes remaining information not included in the Final Report.*