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Leveraging Artificial Intelligence to Streamline and Automate Procurement Requirements Documents

June 2024

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Prepared for the Naval Postgraduate School, Monterey, CA 93943.

ACQUISITION RESEARCH PROGRAM
DEPARTMENT OF DEFENSE MANAGEMENT
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ABSTRACT

This study examines how artificial intelligence (AI) can enhance the Department of Defense's procurement procedures by focusing on creating requirements documents for small acquisitions under the simplified acquisition threshold. Inspired by research from Naval Postgraduate School alumni, the project explores current and potential AI technologies, identifies document types in which AI could impact, and suggests a contracting branch as a suitable testing ground for AI applications due to its low-threat environment and immediate impact potential. Discussions with stakeholders and contracting experts reveal that AI can improve the quality of requirements documents, often inadequately prepared for contracting agencies. The United States Air Force leads in AI adoption, utilizing machine learning and robotic process automation. Expert engagements demonstrate AI's immediate and scalable applications, promising cost, and time reductions. AI is seen as a transformative force in government contracting, offering efficiency and innovation, and reshaping how contracts and procurement are managed. Its ability to streamline tasks and provide insightful data analysis heralds a significant modernization in public sector operations.

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LIST OF ACRONYMS AND ABBREVIATIONS

AI	Artificial Intelligence
AFIT	Air Force Institute of Technology
AFLCMC	Air Force Life Cycle Management Center
AFMC	Air Force Materiel Command
AFPET	Air Force Petroleum Agency
AFRL	Air Force Research Laboratory
CDD	Capability Development Document
COR	Contracting Officer Representative
DAU	Defense Acquisition University
DEAMS	Defense Enterprise Accounting and Management System
DFARS	Defense Federal Acquisition Regulation Supplement
DOD	Department of Defense
FAR	Federal Acquisition Regulation
FARA	Federal Acquisition Reform Act
FASA	Federal Acquisition Streamlining Act
GAO	Government Accountability Office
ICD	Initial Capabilities Document
IGCE	Independent Government Cost Estimate
IGE	Independent Government Estimate
IOT	Internet of Things
KR	Key Result
LLM	Large Language Models
LOE	Lines of Effort
MIT	Massachusetts Institute of Technology
ML	Machine Learning
NIST	National Institute of Standards and Technology
NLP	Natural Language Processing
NPS	Naval Postgraduate School
OMB	Office of Management and Budget
PALT	Procurement Acquisition Lead Time

PIID	Procurement Instrument Identifier
PK	Air Force contracting
PNM	Price Negotiation Memorandum
PRP	Procurement Requirement Package
PWS	Performance Work Statement
PZIBB	AFMC/AFLCMC Base Support Contracting Branch
QASP	Quality Assurance Surveillance Plan
RFP	Request for Proposal
RPA	Robotic Process Automation
SAF/AQC	Deputy Assistant Secretary of the Air Force for Contracting
SAT	Simplified Acquisition Threshold
SBIR	Small Business Innovation Research
SOO	Statement of Objectives
SOW	Statement of Work
SRD	System Requirements Document
UEI	Unique Entity Identifier
USAF	United States Air Force
WSS	Weapons System Specification

I. INTRODUCTION

Artificial intelligence (AI) has become a transformative force in the modern world, affecting various aspects of daily life and industry. In health care, AI algorithms assist in diagnosing diseases with greater accuracy and speed than ever before, while in the automotive industry, autonomous driving technology promises to revolutionize transportation. AI's impact on the job market is profound, automating routine tasks and demanding a shift in the workforce toward more AI-centric skills. Ethically, AI presents challenges in terms of privacy, decision-making, and bias, necessitating rigorous oversight. As AI continues to evolve, its potential to enhance human capabilities and address complex global issues grows, marking a significant epoch in technological advancement and societal change. This capstone project examines how the transformative force of AI can be used in the realm of Department of Defense (DOD) acquisition programs. "Historically, government's culture has emphasized compliance and manual processes that have prevented innovation, making it difficult to meet increasing workloads as technology advances" (Sybert, 2021). This project builds off previous research and focuses on ways to enhance the efficiency of the development process of a procurement requirement package (PRP) under the simplified acquisition threshold (SAT) using AI. These efficiencies will minimize essential man-hours and streamline total contracting time.

Four years ago, Kory Krebs (2020) completed his thesis assignment at the Naval Postgraduate School (NPS) with a project titled, *How Can the DOD Adopt Commercial-Style Artificial Intelligence for Procurement?* His thesis explored the critical role of comprehensive training for program managers in the DOD to enhance the efficiency and effectiveness of acquisition processes, emphasizing the integration of standardized documentation and advanced technological tools like artificial intelligence. The year before, Vladislav Skots (2019), another NPS student, authored his thesis, *Application of Artificial Intelligence in the Department of Defense to Enhance the Contracting Process Timeline*. In his discussion, Skots highlighted the frequent criticism faced by the DOD for its sluggish and complex processes, which fail to address the warfighter's needs promptly. He also pointed out that AI contract management software has demonstrated the ability to

enhance efficiency and speed within the private sector. On page 70, Skots specifically highlighted an area for further research by suggesting the use of "a contracting unit that deals with low-value, low-impact contracts" to analyze the feasibility of deploying AI systems (Skots, 2019). The concept of utilizing AI to address the training gaps commonly encountered in requirements development was the inspiration behind our thesis.

As contracting professionals, we understand "low-value, low-impact" contract actions refer to agreements that involve minimal financial consideration and are not expected to have significant operational or strategic consequences. These contracts are often categorized as non-mission critical and are subject to less stringent oversight and administrative requirements due to their lower risk and complexity. For instance, they might include routine purchases of supplies or services that fall below a certain monetary threshold, making them exempt from more elaborate procurement processes. Such contracts are designed to be cost-effective, ensuring that the government can procure necessary goods and services without unnecessary expenditure or delay. In the context of this project, we have set the "low-value" threshold, referring to purchases beneath a specified cost, in alignment with the SAT. This threshold is delineated in the Federal Acquisition Regulation (FAR) 2.101 as being $250,000.

While not as flashy as major weapons systems procurements, it is important to note that smaller contract actions hold significant importance due to several factors. First, they represent the majority of contracting activity, providing a consistent flow of opportunities for small businesses and new market entrants. These contracts can serve as entry points, allowing companies to establish a track record and credibility within the federal system. Additionally, they contribute to the broader goal of equitable procurement, supporting economic diversity and inclusion. The meticulous nature of government contracting, with its emphasis on compliance with regulations and cost principles, ensures that even low-value contracts adhere to high standards of accountability and performance. This rigorous process, while sometimes seen as an extra cost or risk, actually maintains the integrity of the contracting system and protects both the government's and contractors' interests. In essence, every contract, regardless of size, plays a role in the larger ecosystem of federal

procurement, supporting economic activity and the efficient operation of government services.

Our team of contracting professionals, drawing from a diverse range of experiences within both Air Force and Army acquisition processes, recognized a widespread systemic issue that appears to be prevalent across many contracting offices: contracting offices receive substandard requirements documents from organizations they support. This observation suggests a common challenge affecting efficiency and effectiveness throughout the DOD contracting community. This incomplete or inadequate documentation hinders the progression to the solicitation phase, leading to additional work and unnecessary steps for both the contracting office and the requiring activity. Such rework can add significant time to the overall procurement timeline, accrue additional costs, and ultimately impact the warfighter and the mission. Building on the research from Krebs and Skots, we intend to examine how using AI can assist requestors with identifying and completing procurement documentation prior to contracting office submission. As Skots suggested, we believe starting with "low-value, low-impact" contracts to test the feasibility of using AI in procurement can lead to significant improvements throughout the DOD acquisition community (Skots, 2019) and led us to the development of our research questions: How can AI be leveraged to support the development of requirements packages for procurement initiatives under $250,000? and How can the DOD leverage the adoption of AI by the private sector to enhance procurement processes?

The DOD recognizes the potential of AI to enhance capabilities across a wide spectrum of military operations, which is driven by the need to maintain a competitive technological edge over adversaries. During the unveiling of the DOD's AI adoption strategy in 2023, Deputy Defense Secretary Kathleen Hicks stated, "as we focus on integrating AI into our operations responsibly and at speed, our main reason for doing so has been straight forward: because it improves our decision advantage" (Clark, 2023). The DOD's AI adoption strategy underscores the shift from traditional decision-making and processes, emphasizing the integration of AI to improve decision superiority on the battlefield and in support roles. AI facilitates superior battlespace awareness, adaptive force planning, and efficient enterprise operations, aligning with the DOD's goal of leveraging

technology for decisive advantages (Clark, 2023). Challenges such as interoperability, data management, and the need for a skilled workforce are being addressed through department-wide guidance and an agile approach to AI development and application. The DOD's focus on AI underscores its potential to support and protect U.S. service members, improve operational effectiveness, and ensure the United States maintains a competitive advantage in the field of emerging technologies. The DOD's agile approach aims to continuously deploy data analytics and AI capabilities for enduring decision advantage, reflecting a commitment to responsible and human-centric adoption of AI.

Pilot tests across government and industry demonstrate that AI has a big future in contracting. The Government Accountability Office (GAO) has highlighted the necessity for comprehensive guidance to inform AI acquisitions, ensuring that the DOD can effectively integrate commercial sector advancements into military operations (Ludwigson, 2023). As AI technologies continue to evolve, the DOD is poised to adapt its acquisition strategies, ensuring that AI capabilities are harnessed to support the United States' defense objectives now and in the future.

According to the *Appian* article "AI in Procurement: 3 Ways to Improve Government Acquisitions," Ben Allen (2023) states "it is important to recognize that AI is a tool that complements human decision-making rather than replacing it. Striking the right balance between AI and human expertise is key to harnessing the full potential of AI and driving positive mission outcomes for all stakeholders." This paper will show how AI can transform and streamline the early stages of DOD procurements. Specifically, we are focusing on the creation of requirements documents, where AI can automate the generation of the necessary documents, ensuring that they are comprehensive and that they adhere to regulatory standards. For small-dollar acquisitions (under the SAT), which are often duplicated without a standard integrated program team, this AI-powered capability can assist in drafting packages by generating text akin to human input. This improves accuracy and reduces the time, effort, and cost associated with manual processes. The scope of this project involves researching the capabilities of AI to improve the early phases of government procurement. It encompasses an examination of current methodologies, active engagement with key participants, the choice of an appropriate contracting agency, and the

pinpointing of pertinent AI innovations. To begin, we examine the procurement process and why requirements documents are important.

A. IMPORTANCE OF PROCUREMENT REQUIREMENTS DOCUMENTATION

The procurement process within the DOD is governed by a comprehensive framework that includes the FAR, the Defense Federal Acquisition Regulation Supplement (DFARS), and service-specific supplements. These regulations provide uniform policies and procedures to guide the acquisition process, ensuring transparency, fairness, and compliance with legal and regulatory requirements.

Procurement requirements documents are crucial in DOD contracting as they define the specific needs and expectations for services or products to be acquired. These documents serve as the foundation for all subsequent steps in the procurement process, ensuring that all parties have a clear understanding of what is required. A well-crafted requirements document helps streamline the acquisition process by providing a clear roadmap for contractors to follow, which can lead to more accurate and competitive bids. It also facilitates better communication between the DOD and contractors, reducing the likelihood of misunderstandings and disputes. Moreover, these documents help in risk management by identifying potential challenges early in the process, allowing for the development of mitigation strategies. In essence, procurement requirements documents are vital for the successful acquisition of services and products that meet the DOD's stringent standards for quality, cost-effectiveness, and timeliness, and align with mission and operational needs, regardless of the size of the effort. The development of these documents is a meticulous process that involves several key steps to define the needs and expectations clearly.

For complex, high-dollar acquisitions, it begins with the Initial Capabilities Document (ICD), which outlines the initial need or opportunity identified by the DOD. Following the ICD, the Capability Development Document (CDD) provides a detailed description of the capability gaps and the performance attributes required to address those gaps. The System Requirements Document (SRD) then translates these capabilities into a

comprehensive set of detailed requirements that potential contractors must meet. Finally, the Weapons System Specification (WSS) is developed to provide a complete, precise description of the technical and operational characteristics of the proposed system.

Under the SAT, the guidelines for procurement are crafted to make the process more efficient and to minimize administrative expenses. Detailed in FAR Part 13, these simplified acquisition methods include utilizing the government-wide commercial purchase card for small-scale purchases and the solicitation of quotations. These quotations, while not formal proposals, may result in a legally binding agreement once the government approves the order. It is crucial to recognize that for transactions not surpassing the SAT, agencies must employ these streamlined procedures wherever feasible, adhering to FAR 13.002(g)'s directive to conduct acquisitions in a manner that is most appropriate, effective, and cost-efficient given the specific context of each purchase.

The acquisition process is a comprehensive and meticulous journey that necessitates extensive market research. This research is pivotal in grasping the full spectrum of industry capabilities, which in turn shapes the government's strategy for procuring services or products. Such an in-depth understanding is indispensable for the formulation of a Statement of Work (SOW), Performance Work Statement (PWS), or Statement of Objectives (SOO). These documents are instrumental in delineating the government's precise requirements and expectations from potential contractors.

A SOW is a detailed narrative that defines the scope of work required for a particular project or contract. It outlines the specific tasks to be performed, the deliverables to be provided, and the timelines to be adhered to. Similarly, a PWS describes the desired outcomes and standards of performance, focusing on what the end results should be rather than how the work should be done. On the other hand, a SOO presents a broader picture, outlining the overall objectives and goals to be achieved without detailing the means of accomplishment.

In conjunction with these documents, a Quality Assurance Surveillance Plan (QASP) is developed. The QASP serves as a proactive measure to ensure that the contractor's performance aligns with the government's standards. It establishes the criteria

for acceptable performance and delineates the methods for monitoring and evaluating the contractor's work against the stipulated benchmarks. The QASP is a critical tool for the government to maintain control over the quality of the services or products received, and it provides a structured approach for addressing any discrepancies or deficiencies in the contractor's performance.

Overall, these documents provide a structured approach that ensures the government's needs are met with precision and efficiency. Through rigorous market research and the development of clear, detailed contractual documents, the government can effectively communicate its needs and safeguard the quality of the services or products acquired. This process not only facilitates the achievement of the government's objectives but also promotes accountability and transparency in public spending. The meticulous crafting of SOW, PWS, SOO, and QASP documents reflects the government's commitment to excellence and its dedication to fulfilling its duties with the utmost integrity and effectiveness.

Whether over or under the SAT, these documents collectively guide the acquisition strategy, informing decisions on contract types, whether fixed-price or cost-reimbursement, and the appropriate incentives to motivate contractors to achieve desired outcomes. The DOD emphasizes the importance of performance-based acquisitions, where the focus is on the outcomes rather than the specific way the work is performed. This approach encourages innovation and efficiency among contractors, fostering a competitive environment that can lead to better value for the DOD.

Procurement requirements documents in DOD contracting are not just bureaucratic paperwork; they are strategic tools that shape the acquisition process, ensuring that the DOD can fulfill its mission-critical objectives efficiently and effectively. The careful crafting of these documents reflects the DOD's commitment to accountability, performance, and innovation in its contracting practices. Understanding the intricacies of the procurement process is fundamental to harnessing the potential of AI effectively. Requirements documents serve as the blueprint for the entire procurement cycle, detailing the needs and expectations that must be met. By thoroughly understanding these documents, specific areas where AI can provide the most benefit can be identified. For

instance, AI can analyze vast amounts of data to predict market trends, optimize supply chains, and even assist in the creation of more accurate and comprehensive requirement specifications. Furthermore, AI can streamline the procurement process by automating routine tasks, such as document analysis and vendor selection, which not only saves time but also reduces the likelihood of human error. As organizations continue to integrate AI into their procurement strategies, it is essential to maintain a clear understanding of the underlying processes and documents that govern procurement activities. This ensures that AI is used not just as a tool for efficiency, but as a strategic asset that can lead to more informed decision-making and ultimately, a stronger competitive edge in the market.

The integration of AI into the requirements drafting phase is a testament to the DOD's commitment to modernization and innovation. By harnessing the power of AI, the DOD can not only enhance the efficiency and effectiveness of its procurement processes but also maintain a strategic advantage in the rapidly evolving landscape of defense technology. As AI continues to mature, its applications within the DOD are likely to expand, further transforming the procurement landscape and setting a precedent for other government agencies to follow.

B. THESIS STATEMENT

The capstone project shines a light on the prevalent deficiencies that plague the initial stages of drafting requirements for procurement processes governed by the SAT. It is imperative that the documents outlining these requirements are meticulously crafted, embodying a level of detail and structure that upholds the stringent criteria of quality, efficiency, and efficacy indispensable for defense-related procurements. Regrettably, our investigation reveals that such standards are seldom met. A pattern has emerged where these critical documents are cobbled together by individuals lacking proper training, often resorting to the expedient method of repurposing content from preceding documents. This practice results in documents that fall short of the necessary clarity and detail, leaving the contracting team in a precarious position: they must either forge ahead with ambiguous directives or consign the documents back for further refinement.

Our research builds upon the foundational work of Krebs (2019) and Skots (2020), delving into the practicality of employing AI to refine the process of generating requirements for government procurements that fall below the SAT threshold. We propose a novel approach that could revolutionize the drafting phase, ensuring that the resultant documents are not only comprehensive but also conducive to the contracting team's needs. Our paper hypothesizes that by integrating AI into this phase, we can significantly elevate the caliber of the requirements documents. Furthermore, we suggest a pragmatic strategy to pilot this integration on contracts deemed "low-value, low-impact," thereby minimizing potential risks. This method presents an opportunity to test the waters in a controlled environment, allowing for the careful evaluation of AI's efficacy in enhancing the procurement process. By doing so, we aim to establish a more streamlined, accurate, and efficient method of requirement generation that could serve as a benchmark for future defense acquisition endeavors.

C. GOVERNMENT CONTRACTING BACKGROUND

The history of government contracting in the United States reflects the evolution of administrative needs and policies and mirrors the growth and development of the nation itself. The article "Understanding the Past: A History of Government Contracting" outlines the steps taken to form the government contracting system we know today (Federal Contracting Center, 2023). It explains that from the republic's early days, when private individuals provided goods from their own reserves due to a lack of formal procurement rules, to the enactment of the Purveyor of Public Affairs Act in 1795, the journey has been extensive and transformative. This act marked the beginning of regulated federal contracting, allowing the government to purchase specific goods and resources needed to fulfill its duties (Federal Contracting Center, 2023).

The article explains that as the country expanded and its needs grew more complex, the mechanisms for government contracting evolved accordingly. According to the article, the Civil Sundry Appropriations Act of 1861 introduced the concept of publicized procurement activities, laying the groundwork for more transparent and competitive bidding processes. The 20th century saw significant legislative advancements with the

passing of the Armed Services Procurement Act in 1947, which continued the sealed bidding acquisition process, a method that uses public posting of bids, awards, and competitive bids to ensure fairness and best value for the government (Federal Contracting Center, 2023).

Additionally, the article explained how the Sherman Act of 1980 was a pivotal moment for smaller businesses and labor groups, as it provided security against monopolistic practices by larger corporations according to the article. This act prohibited organizations from colluding to create monopolies and controlled interstate commerce to promote competition and economic justice (Federal Contracting Center, 2023).

The article outlines how the FAR, which provide the rules and processes for the acquisition of goods and services by the U.S. federal government, was first enacted in 1984 (Federal Contracting Center, 2023). It represents a comprehensive set of regulations that govern federal procurement processes, ensuring that purchases are made fairly and efficiently. Over the years, the FAR has been updated and amended to adapt to the changing landscape of government procurement, including technological advancements and policy shifts.

"Understanding the Past: A History of Government Contracting" continues to discuss other acts that have been of significant importance to government contracting. First, further reforms came with the Federal Acquisition Streamlining Act (FASA) of 1994, which revolutionized government contracting by simplifying the procurement system. FASA's significant changes included increasing the use of commercial products and services, raising the threshold for requiring cost or pricing data, simplifying procedures for routine purchases, and enhancing small business access to federal contracting opportunities. Following closely was the Federal Acquisition Reform Act (FARA) of 1996, which aimed to remove barriers in the procurement process. These acts collectively contributed to a more efficient and inclusive government contracting environment (Federal Contracting Center, 2023).

Throughout its history, government contracting in the United States has been shaped by the needs of the times, from wartime demands to the push for technological

innovation and economic equity. The system has evolved to balance the interests of the government, the private sector, and the public, ensuring that the procurement of goods and services is conducted in a manner that is legal, ethical, and beneficial to the nation's growth and security. The history of government contracting is not just about laws and regulations; it is about the ongoing effort to meet the nation's needs in the most effective and equitable way possible.

The use of AI in government contracting has evolved significantly over the years as well and is poised to earn a position on the significant events in contracting timeline. Initially, AI applications were limited to basic tasks such as identifying unobligated funds and assisting with contract closeouts. However, with advancements in technology, AI's role has expanded to include more complex functions like aiding in the writing of contracts and accelerating the federal acquisition process. In *Federal News Network*, Jory Heckman (2023) discusses how the defense department has been developing an AI-powered tool, Acqbot, to streamline contract writing, reflecting a broader trend toward integrating AI to enhance efficiency and decision-making in government operation.

The history of government contracting is not just a tale of laws and statutes; it is also a story of adapting to technological advancements and societal changes. From the early days of supplying goods for wars to the current multifaceted process that supports a wide range of industries, government contracting has been a crucial element in the nation's development and security. It has evolved from a rudimentary system to a complex field characterized by strategic policies and regulations that aim to balance efficiency, fairness, and economic growth.

D. CAUSES AND EFFECTS OF POOR REQUIREMENTS DOCUMENTATION

Poor requirements documentation can lead to a cascade of negative outcomes, affecting various facets of project execution and delivery. The causes of inadequate documentation often stem from unclear goals and expectations, insufficient communication channels, and a lack of standardization in document creation. Program managers often find themselves inadequately trained and ill-equipped to manage the

substantial workload they face. These deficiencies can result in ambiguous contract terms, which may lead to disputes over scope and deliverables. Furthermore, the absence of detailed requirements can hinder the ability of contractors to accurately estimate costs and timelines, potentially causing budget overruns and project delays.

The effects of poor documentation are diverse and can significantly impact the efficiency and success of government projects. For instance, unclear or incomplete requirements can lead to misinterpretation, resulting in products or services that do not meet the needs of the agency. This misalignment may necessitate costly revisions and rework, straining already limited resources. Additionally, poor documentation can impede effective oversight and accountability, as it becomes challenging to assess contractor performance against ill-defined criteria.

Moreover, the lack of precise requirements can contribute to legal disputes, where the government or the contractor may face litigation due to misunderstandings or unmet contractual obligations. This not only leads to additional expenses but also diverts attention from the primary objectives of the contract. In the broader context, these issues can erode trust between government agencies and contractors, potentially deterring quality vendors from participating in future contracts and diminishing the overall competitiveness of the procurement process.

To mitigate these risks, it is crucial for government agencies to invest in robust requirements documentation practices. This includes adopting standardized templates, ensuring thorough stakeholder engagement in the requirements gathering process, and implementing rigorous review and approval procedures. Our group believes this also includes adopting AI technology to assist with this process. By prioritizing clear and comprehensive requirements documentation, government entities can enhance the clarity of contracts, improve contractor performance, and ultimately deliver better value to the public. Such proactive measures are essential for maintaining the integrity and effectiveness of government contracting processes.

E. CHALLENGES IN THE REQUIREMENTS DRAFTING PHASE

Creating requirements for federal contracts is a complex task that requires a deep understanding of FAR principles and clear writing guidelines. John Byrnes (2023) outlined key components of a well-written requirements document in his Eminent Future article. He emphasizes the need to eliminate ambiguity in contract language, use active voice, employ short sentences, and carefully choose words. Byrnes also suggests focusing on contract structure and considering each contract's unique aspects. Additionally, he stresses the importance of clearly defining roles and responsibilities to avoid confusion during contract execution. Byrnes highlights the necessity of legal compliance to protect the public interest and ensure the government receives the desired outcomes. Lastly, he notes the importance of considering potential contract modifications and ensuring clarity in statements of work to avoid hindering contractor performance (Byrnes, 2023).

Another significant issue is the balance between the need for rapid procurement and the necessity for clear, detailed requirements. The SAT is designed to streamline the acquisition process. However, this can sometimes lead to less rigorous market research and a lack of competition, potentially resulting in the selection of supplies and services that do not fully meet the DOD's needs. Furthermore, the pressure to stay within the SAT can lead to the fragmentation of contracts to avoid exceeding the threshold, which is prohibited under FAR 13.003(c)(2). This can complicate contract management and oversight. Additionally, the simplified procedures may not always align with the complexity of DOD requirements, especially when it comes to specialized services or supplies that are unique to the military's needs. The evolving nature of technology and the dynamic requirements of defense services further complicate the definition of requirements. These factors underscore the importance of careful planning and clear communication between contracting officers and stakeholders to ensure that the simplified acquisition process effectively supports the DOD's mission.

Another challenge is the dichotomy between the expertise of contracting teams and program offices. Contracting teams are well-versed in the legal and procedural frameworks that govern the acquisition of goods and services. They ensure compliance with laws and regulations, which is crucial for the legitimacy and fairness of the procurement process.

However, their focus on regulation may lead to a gap in understanding the current market dynamics, trends, and innovations, which are essential for making informed purchasing decisions that provide value for money.

On the other hand, program offices, which are responsible for defining the requirements of what needs to be procured, often have a deep understanding of the market. They are attuned to the latest developments, competitive pricing, and the quality of products and services available. This knowledge is vital for identifying the best possible options and for negotiating favorable terms. Yet, their grasp of the intricate procurement procedures may not be as strong, potentially leading to challenges in navigating the complex regulatory environment.

This disconnect can result in inefficiencies and missed opportunities. Bridging this gap requires a concerted effort to foster cross-functional collaboration, where contracting teams and program offices share knowledge and work closely throughout the procurement process. By doing so, organizations can leverage the strengths of both groups to achieve a procurement strategy that is both compliant and market-savvy, ultimately leading to better outcomes. According to a *Deloitte* article by Joe Mariani, Jason Myers, and Scott Palmer (2023), AI has the capacity to mitigate this disconnect by distilling vast data sets into concise, digestible market research summaries. The article explains how these summaries can expedite the contracting team's comprehension of intricate details, thus fostering more informed decision-making. Furthermore, the application of AI to create a system that allows requirement owners to specify their needs, which AI then translates into practical documents, could markedly streamline the procurement timeline (Mariani et al., 2023).

The authors suggest that AI can greatly enhance decision-making because it can analyze data much faster and more accurately than humans. Moreover, AI can help maintain compliance with procurement regulations by automatically checking that documents meet all legal requirements. They identify that by automating these tasks, AI can help reduce the administrative burden on both procurement professionals and program offices, allowing them to focus on more strategic aspects of their roles. The authors have suggested that documenting is one of the most time-consuming tasks across the federal

government, and AI can significantly reduce the time needed to create and process procurement request documents (Mariani et al., 2023).

F. CHAPTER SUMMARY: LEVERAGING AI FOR TRANSFORMING DOD PROCUREMENT UNDER SAT

This chapter introduced the potential of AI to transform DOD procurement under the SAT by automating the creation of requirements documents, enhancing decision-making through data analysis, ensuring compliance with regulations, and reducing the time and effort associated with manual processes. It identified poor requirements documentation as an effort worth pursuing as a follow-on to the research conducted by Krebs and Skots. As AI technology continues to evolve, it is likely to become an integral part of procurement efforts, offering a more efficient, accurate, and streamlined approach to acquiring goods and services for the DOD.

The next chapter details our literature review and focuses on the utilization of AI to enhance the development of requirements documents packages by analyzing scholarly articles and other academic resources that explore various AI techniques applied in this domain. It establishes how AI has been leveraged to address challenges, highlighting advancements in natural language processing (NLP), machine learning (ML), and other AI methodologies that contribute to more efficient and accurate requirements elicitation and analysis. It assesses the effectiveness of AI tools and techniques and discusses the implications of these findings for both practitioners and researchers. The chapter also identifies gaps in the current literature, such as the need for more empirical studies to validate the effectiveness of AI applications in real-world settings. The literature review summarizes the insights gained from the surveyed literature and provides an overview of the state-of-the-art in AI applications for requirements documents development. It underscores the potential of AI to revolutionize this field, while also acknowledging the limitations and challenges that need to be addressed to fully realize this potential.

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II. LITERATURE REVIEW

The advent of AI has ushered in a transformative era for numerous sectors, and the domain of DOD contracting is no exception. The intricate process of generating requirements documents, a critical component in the contracting procedure, stands to benefit significantly from the integration of AI technologies. This literature review aims to explore the multifaceted role of integrating AI into the federal government and the DOD acquisition process documents. By examining various AI methodologies, such as NLP and ML, and their application in the context of DOD contracting, this review provides an overview of current advancements and the potential trajectory of AI in this field. It mentions case studies where AI has been successfully implemented, examines the challenges and limitations faced with AI, and discusses the ethical considerations and best practices that should guide the deployment of AI in sensitive governmental operations. Ultimately, this review serves as a foundational piece for stakeholders seeking to understand the impact of AI within DOD contracting, offering insights into how this technology can be harnessed to serve our research goals.

A. AI UTILIZATION IN THE ACQUISITION PROCESS

AI technologies are now being used to simplify the collection and analysis of large data sets, a task that is typically difficult and prone to errors when done manually. The DOD's 2023 Data, Analytics, and Artificial Intelligence Adoption Strategy highlights the importance of integrating AI to maintain a decision-making edge on the battlefield. The strategy outlines several interdependent goals supporting the DOD AI hierarchy of needs (Figure 1). This hierarchy emphasizes the crucial importance of establishing a foundation of high-quality data. This foundation allows subsequent layers to leverage insightful analytics, thereby fostering responsible AI. It further highlights the indispensable role of enablers in bolstering this hierarchical structure (Department of Defense, 2023).

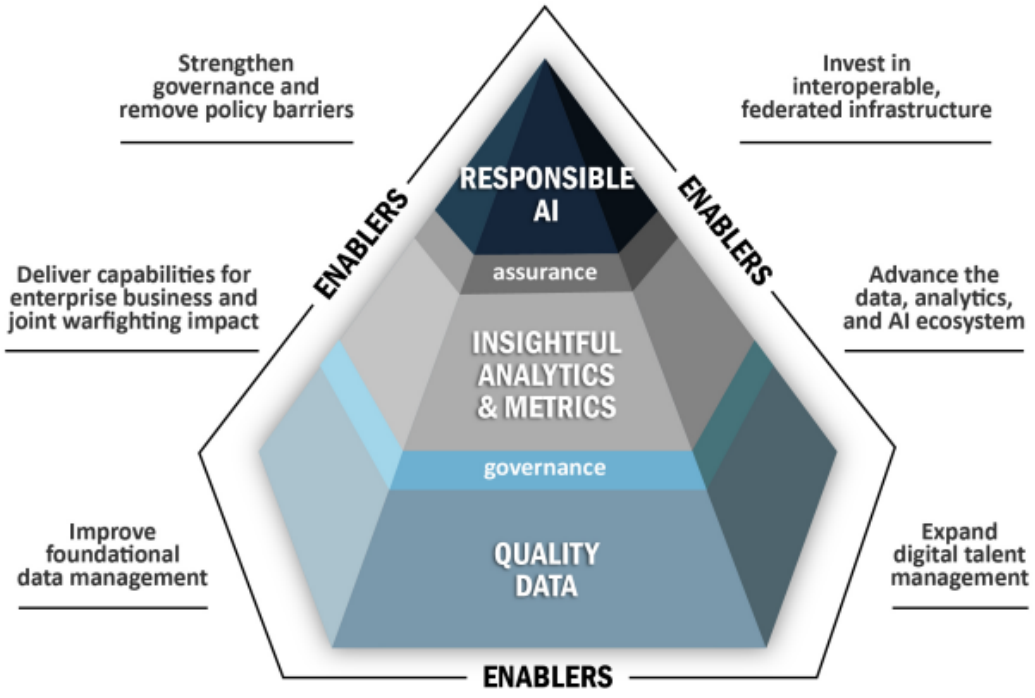

Figure 1. Strategic Goals and the AI Hierarchy of Needs.
Source: Department of Defense (2023).

This strategy underscores the importance of AI-enabled systems in accelerating commanders' decisions and improving the quality of those decisions.

Furthermore, a prototype AI-powered contract-writing tool, called "Acqbot," has been developed to expedite the federal acquisition process, showcasing a proactive approach to modernizing antiquated systems. The DOD's partnership with the Massachusetts Institute of Technology (MIT) through the AI Accelerator program is another significant step, focusing on fundamental research and rapid prototyping to address the ethical considerations of AI and advance defense capabilities. These initiatives reflect a broader trend towards leveraging AI for superior battlespace awareness, adaptive force planning, and efficient enterprise business operations, ensuring that the DOD remains at the forefront of technological innovation in defense contracting and operations.

Moreover, AI has been employed to facilitate the decision-making process by providing predictive analytics and risk assessments. By analyzing historical data, AI can predict potential issues with certain requirements or conflicts that may arise, allowing for

proactive measures to be taken. This predictive capability is crucial for the government to maintain compliance with regulations and to ensure that projects are feasible and align with policy objectives.

Another significant application of AI in this context is NLP, which enables the conversion of unstructured text into structured data that can be more easily analyzed and acted upon. NLP tools can interpret language, understand the context, and extract meaningful information. This can be particularly useful in standardizing the interpretation of requirements across different departments and agencies.

AI-driven automation has also been introduced to manage workflow. Automation tools can track changes, manage versions, and ensure that all stakeholders have access to the most current documents. This reduces the administrative burden and allows government employees to focus on more strategic tasks.

Additionally, an AI platform developed by Google, known as Gemini, is a cutting-edge large language model (LLM) capable of engaging in natural language conversations. In his *DevSet* article, Christoph Schaller (2023) described one area of application for Gemini is in the realm of defense contracting where the platform can be used to foster collective intelligence among defense contractors. He explains that Gemini possesses the ability to accumulate insights and best practices, creating a knowledge base that benefits all stakeholders. Further, the platform plays a pivotal role in enhancing collective intelligence among defense contractors by serving as a central hub for data analysis and decision-making. The author states that by integrating advanced technology with human expertise, Gemini facilitates a collaborative environment where complex challenges can be approached with innovative strategies which allows the platform to analyze vast amounts of data with precision and speed and allows for the identification of patterns and insights that might otherwise be overlooked. He indicates that this supports the development of strategic solutions that are informed by a comprehensive understanding of the operational landscape (Schaller, 2023).

The author goes on to discuss the collective intelligence fostered by Gemini; that it is not just about data processing, but about creating a shared knowledge base where

information is continuously updated and made accessible to all relevant parties. He recognizes this ensures that all members of the defense community are working with the most current and accurate information, leading to better outcomes in project execution and mission fulfillment. Additionally, the platform's support for rapid acquisition and advanced technology integration means that defense contractors can stay ahead of the curve, adapting to new threats and opportunities with agility and foresight (Schaller, 2023).

He summarizes by explaining that in essence, Gemini's AI platform is a force multiplier for defense contractors, enabling them to leverage the power of collective intelligence to navigate the complexities of modern defense landscapes. It represents a significant step forward in the application of AI to national security and defense, promising to enhance the capabilities of military leaders and their teams in protecting and serving their nations (Schaller, 2023).

Moreover, the DOD's AI adoption strategy aims to leverage AI for superior battlespace awareness, adaptive force planning, and efficient enterprise business operations, which are crucial for maintaining a competitive advantage in technology. By investing in interoperable, federated infrastructure and advancing the data, analytics, and AI ecosystem, the DOD has created a conducive environment for collaboration. This approach allows for the seamless sharing of information and resources, which is essential for coordinated efforts across various departments and agencies.

In 2019, the DOD asserted their goal of ensuring ethical, transparent, and accountable use of AI technologies. This commitment to responsible AI fosters trust among stakeholders, which is paramount for effective collaboration. Through AI-powered platforms, team members can work on documents simultaneously, with AI algorithms suggesting edits, flagging inconsistencies, and ensuring that all contributions align with the overall objectives (Department of Defense, 2019).

In terms of compliance, AI systems have been developed to assist with ensuring contracting documents adhere to federal laws and regulations. These systems can cross-reference documents against legal databases to verify compliance, thus mitigating the risk of legal challenges or project delays. This includes the integration of advanced algorithms

capable of parsing and understanding complex legal language and cross-referencing these findings with an extensive database of existing federal statutes and regulations. Additionally, AI systems are designed with a compliance-by-design framework, which embeds legal and regulatory compliance into every stage of the AI system's life cycle, from initial design to deployment and beyond. This proactive stance is bolstered by continuous monitoring and auditing mechanisms that ensure ongoing adherence to legal standards. Furthermore, transparency and explainability are key tenets of these AI systems, allowing for clear understanding and justification of how they operate and make decisions in compliance with the law. This is critical not only for maintaining legal compliance but also for fostering trust among users and stakeholders. The development of such AI systems is guided by a growing body of federal AI governance policies, including recent executive orders and legislative actions that outline requirements for safety, security, privacy, and equity in AI applications.

Lastly, the integration of AI into the acquisition process has enhanced the training and support available to government employees. By automating the creation and analysis of complex documents, AI technologies have streamlined workflows, allowing for more efficient allocation of human resources to critical thinking and decision-making tasks. This shift has led to a more dynamic and responsive training environment where government employees can engage with up-to-date, relevant content tailored to their specific roles and responsibilities. For instance, a 2023 article written by the Artificial Intelligence Community of Practice (2023), developed in partnership with the Stanford University Institute for Human-Centered AI, provides a comprehensive program that equips participants with the knowledge needed to critically implement and govern emerging technologies.

Similarly, the DOD's AI education strategy focuses on educating and training its workforce to deliver AI capabilities at scale, recognizing AI as a human-centric endeavor and prioritizing the development of a world-class AI practitioner workforce. Furthermore, generative AI algorithms have been employed to streamline document intake and verification procedures during onboarding, reducing manual efforts and minimizing errors, thereby enhancing the overall efficiency of the training process as outlined by Archita

Nayak in a Harbinger Group article (2023). The author defines how the generative AI framework also provides guidance on using generative AI safely and securely, which is crucial for civil servants and government organizations (Nayak, 2023). Additionally, according to a 2022 *Littler* article, new AI training requirements established by the Office of Management and Budget ensure that federal government agency employees responsible for various critical functions receive appropriate AI training, further supporting the integration of AI into government operations (Gokturk et. al., 2022). These initiatives demonstrate a clear commitment to leveraging AI for the betterment of government employee training and support systems, ensuring that the workforce is prepared to meet the challenges of the 21st century.

In conclusion, AI is being leveraged to address challenges in the DOD procurement process by improving efficiency, accuracy, predictive capabilities, and compliance. It has transformed the way data are collected, analyzed, and managed, leading to more effective and streamlined government operations. The ongoing advancements in AI promise even greater improvements in the future, as the technology continues to evolve and adapt to the needs of the federal government.

B. AI INTEGRATION IN FEDERAL GOVERNMENT FUNCTIONS

AI has been progressively integrated into various functions of the U.S. federal government, enhancing efficiency and decision-making across multiple agencies. For instance, the National Oceanic and Atmospheric Administration (NOAA) employs AI to analyze urban heat islands, aiding in the protection of the public from extreme weather conditions. The Department of Veterans Affairs has implemented AI to process feedback from veterans, categorizing comments to improve service delivery. In the realm of intellectual property, the U.S. Patent and Trademark Office utilizes AI to assist examiners in searching for relevant documents and prior art during the patent application process. According to a 2023 White House press release, Government Innovation Chairwoman Nancy Mace has also stated, “federal agencies are attempting to use AI systems to enhance border security, to make air travel safer, and to speed up eligibility determinations for

Social Security disability benefits —just to name a few use cases" (Committee on Government Oversight and Accountability, 2023).

She further discusses the apprehensions about AI replacing white-collar workers due to its ability to perform routine tasks much faster than humans. However, she addresses these concerns by pointing out that eliminating these mundane tasks allows humans to focus on tasks that AI cannot perform (Committee on Government Oversight and Accountability, 2023).

Chief AI Officers (CAIOs) play a crucial role in driving AI success across federal agencies, balancing innovation with operational risks, and managing budgets and procurement for AI projects. Their efforts are pivotal in implementing AI strategies that enhance public services and maintain U.S. leadership in technology.

Moreover, the federal government has established guidelines and standards for the safe development and use of AI, promoting research and collaboration to address potential risks. Workforce development plans are in place to integrate AI technology, ensuring that the federal workforce is prepared for the changes AI brings. These initiatives reflect the government's commitment to leveraging AI to better serve the public across healthcare, transportation, environmental management, and benefits delivery, while establishing strong guardrails to ensure the safety and rights of individuals are not violated.

AI's transformative potential of AI to reshape critical facets of governmental functions is vast and complex, presenting a challenge to fully comprehend. Nonetheless, the government is taking a proactive stance in fostering this groundbreaking technology. The establishment of AI.gov is a testament to the United States' acknowledgment of AI's substantial contributions to enhancing public sector services, including the DOD's procurement processes (The White House, n.d.).

While the Biden administration has made significant progress in promoting the development and application of AI, AI.gov underscores an essential consideration: the necessity of implementing stringent safeguards to counterbalance the risks tied to AI utilization. It is crucial to safeguard both public sector interests and personal liberties. The performance of AI systems is intrinsically linked to the integrity of the data they utilize. In

her 2023 C4ISRNet article, Elisabeth Gosselin-Malo discusses how generative AI, which evolves with increased data input, presents an escalated threat of being compromised by hostile entities aiming to expropriate or tamper with data (2023).

According to the 2023 Microsoft Digital Defense Report, cyberattacks, frequently orchestrated by state-backed espionage or propaganda campaigns, affected 120 nations in 2022. This report outlines the primary objectives of these incursions are to pilfer sensitive information, surreptitiously surveil communications, or skew the distribution of information. Further, these malevolent operations could be significantly expedited through the deployment of AI technologies, underscoring the imperative for stringent cybersecurity protocols in the context of AI deployment (Burt, 2023).

C. AI USE IN INDUSTRY

The history of AI in industry is a fascinating journey of innovation, transformation, and ongoing evolution. In *History of Artificial Intelligence*, Zephin Livingston details the evolution of AI from its inception in the mid-20th century as simple automated machines to its current state as complex systems capable of learning and decision-making. The author discusses how the first significant leap in industrial AI came with the development of expert systems in the 1980s, which were designed to emulate the decision-making abilities of human experts. However, Livingston explains, these systems were limited by the need for extensive rule-based programming and were eventually overshadowed by the rise of ML in the mid-2010s (Livingston, 2022).

ML, an integral component of AI, has catalyzed a paradigm shift across industries by facilitating autonomous systems that learn from data, discern patterns, and make informed decisions with minimal human oversight. This transformation heralded the widespread incorporation of AI into diverse sectors, encompassing manufacturing, healthcare, finance, and beyond. Within the manufacturing realm, AI has refined production workflows, bolstered quality assurance, and heightened operational efficiency. The health care sector benefits from AI through a spectrum of applications, from diagnostic algorithms to tailored medical treatments, substantially improving patient outcomes. The

financial industry has embraced AI for its contributions to algorithmic trading, anomaly detection in security, and the automation of client services.

The swift progression of AI technology has been driven by remarkable growth in computational capabilities and the abundance of data. The surge of sensor technology and the Internet of Things (IOT) has produced an immense pool of data, which AI systems harness to enhance precision and functionality. Furthermore, the widespread availability of AI tools and platforms has empowered small to medium-sized businesses to adopt AI technologies, spurring innovation and competitive dynamics.

A McKinsey survey conducted in December 2022, which included 1,492 participants from various regions, industries, and business sizes, indicates that AI adoption has surged over the past 5 years. Michael Chui, a partner at the McKinsey Global Institute states, "in 2017, 20 percent of respondents reported adopting AI in at least one business area, whereas today, that figure stands at 50 percent" which is represented in Figure 2 (Chui, 2022).

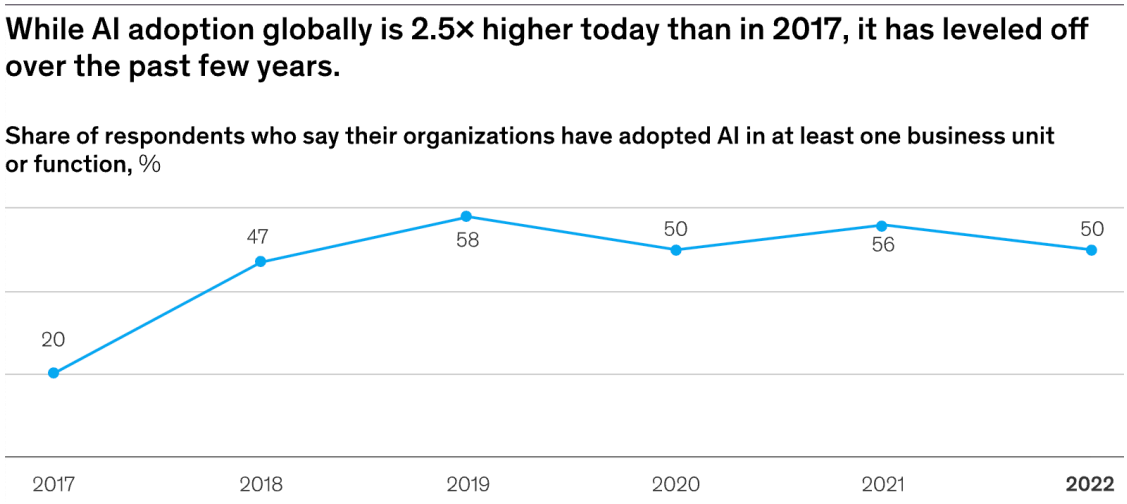

Figure 2. Timeline of AI Adoption. Source: Chui (2022).

Nonetheless, AI's rapid integration into the industrial landscape has not been devoid of obstacles. Ethical issues, such as the potential for job displacement and privacy infringement, have ignited discussions on the judicious application of AI. Moreover, the

uneven distribution of AI adoption across different areas and sectors prompts reflection on the equitable dissemination of technological advancements.

It is evident from his article, *History of Artificial Intelligence*, that Livingston believes AI's role in industry is poised for significant expansion. He suggests that anticipated advancements in areas such as quantum computing and neuromorphic chips are about to greatly expand the possibilities. According to Livingston, the ongoing evolution of AI is expected to be a pivotal force in reshaping industries by enhancing efficiency, driving innovation, and facilitating comprehensive transformation across various sectors. Ultimately, the journey of AI in the industrial realm is more than a series of technological achievements; it reflects human creativity and a relentless pursuit of progress (Livingston, 2022).

D. IDENTIFYING KEY FOCUS AREAS

Our literature review determined the DOD acquisition community can leverage industry's use of AI in several transformative ways. By adopting AI technologies that have been proven in the commercial sector, the DOD can enhance its operational efficiency and decision-making processes. This can be achieved through the integration of AI in logistics and supply chain management, predictive maintenance of equipment, and the analysis of large data sets for strategic insights. Furthermore, the DOD can benefit from the agility of the private sector in AI innovation, adopting rapid prototyping and iterative development methodologies to stay at the forefront of technological advancements.

While the literature revealed the explosive trajectory in AI utilization in all facets of government operations, what it did not indicate were ways AI can be leveraged immediately in a DOD service specific contracting operation to improve the generation of requirements documents in the acquisition process.

The literature revealed how collaboration with industry can facilitate the transfer of innovative AI applications to the defense sector, such as autonomous systems, cybersecurity defenses, advanced simulation and training environments, and ways to improve procurement activities Additionally, the DOD can leverage industry expertise in data analytics to improve intelligence gathering and reconnaissance missions. By

partnering with tech companies, the DOD can gain access to proprietary algorithms and ML models that can significantly enhance the capabilities of defense systems. Moreover, the DOD's acquisition strategies can be informed by industry best practices in AI governance, ensuring ethical and responsible use of AI technologies.

The DOD's AI adoption strategy and recommendations from the GAO highlight the importance of department-wide guidance to inform AI acquisitions, reflecting key factors identified by private sector companies (Ludwigson, 2023). Joseph Clark summarizes the strategy in his 2023 DOD News article stating, "the strategy prescribes an agile approach to AI development and application, emphasizing speed of delivery and adoption at scale, leading to decision advantage outcomes" (Clark, 2023). The DOD acquisition community stands to gain immensely from the industry's AI advancements, provided there is a structured approach to adopting these technologies that aligns with the department's mission and ethical standards. The synergy between the DOD and the private sector is crucial for maintaining a technological edge in defense capabilities.

As our research progressed, it became increasingly clear that a more targeted approach would be necessary to effectively bridge the gaps in literature. We realized we needed to focus our literature review and interviews on our search for the path to best test how AI can improve efficiencies in the requirements generation process in "low-value, low-impact" contractual efforts. We started at the federal level and learned that the federal government is actively employing AI to enhance governance, innovation, and risk management across various agencies. Importantly, a recent policy issued by the Office of Management and Budget (OMB), as part of President Biden's executive order 14110 released in 2024, mandates federal agencies to implement safeguards when using AI in ways that could impact Americans' rights or safety. This includes rigorous assessment, testing, and monitoring of AI's impacts, mitigating algorithmic discrimination, and ensuring transparency in AI applications (The White House, 2024). The executive order stated agencies are directed to address AI risks by December 1, 2024, with a focus on applications in critical areas such as health care, education, employment, and housing. Moreover, the federal government leverages AI in a wide array of use cases, including transportation and environmental management, while establishing strong guardrails to keep

people safe and protect their rights (Executive Order No. 14110, 2023). Our team believes these steps reflect the government's commitment to leading by example in the responsible use of AI, promoting its benefits while managing potential risks.

From the federal level, we recognized we needed to find a DOD service-specific organization to focus on. We learned that the acquisition processes within the various branches of the military are tailored to meet their unique operational needs and objectives. For instance, based on discussions in among our graduate school peers, we learned the Navy often employs a regional contracting approach, which allows them to manage acquisitions that are geographically dispersed, supporting their maritime operations. In contrast, our personal experiences identify the Army and the Air Force typically utilize an installation-level approach, which can be more centralized and focused on the specific needs of each base or installation. This difference in approach can influence other management practices, such as project management and contractor surveillance, ensuring that each service's acquisition strategy aligns with its mission and logistical requirements. Moreover, the DOD has established policies and guidelines, such as DODI 5000.74, Defense Acquisition of Services, which provide a framework for acquiring services efficiently while managing costs and streamlining the acquisition process. These policies are periodically reviewed and updated to reflect the changing nature of technology and the lessons learned from past procurement.

The team's service-specific decision was aided by an Air Force initiative rolled out on January 23, 2024, and included a section regarding technology and digital transformation. It was announced by C. Anthony Braswell, the director of contracting for the Air Force Life Cycle Management Center (AFLCMC). In his message to the Air Force contracting (PK) workforce, he advised that AFLCMC/PK leadership had charted a way forward for specific improvements aligning direction from the deputy assistant secretary of the Air Force for Contracting (SAF/AQC), the Air Force Materiel Command (AFMC), and AFLCMC. Braswell's team identified three unique lines of effort (LOE) to coincide with those improvements, with leads and action officers assigned to each key result (KR). Our research team was drawn to LOE #2 – information technology and digital transformation – and specifically key result #2 – implementing an AI use case. This KR

aligned directly with what we wanted to accomplish with our research – transformation of an existing acquisition process (in our case, streamlining and automating procurement requirements document generation) and discovering a way to utilize AI in the very near future to implement a use case. Braswell closed his message by reiterating the Air Force mission of "fly, fight, and win in air, space, and cyberspace" and charged the contracting workforce to keep "the vision of being mission-focused business leaders driving modernization, readiness, lethality at the front of our minds and in our work this year."

This initiative, along with other Air Force projects we uncovered, and the fact that two-thirds of our team consists of Air Force contracting professionals, led us to focus on the United States Air Force (USAF). Once we identified a USAF base support operational contracting branch issuing dozens of acquisition contracts under the SAT each year our decision was made and our path for further research was clear.

E. CHAPTER SUMMARY: A LITERATURE REVIEW OF THE TRANSFORMATIVE ROLE OF AI IN DOD ACQUISITION

This chapter touched on the multifaceted role that AI plays within the DOD acquisition process. Our literature review investigated the details of AI application across various federal government sectors, highlighting the transformative potential it holds for enhancing operational efficiency and decision-making capabilities. The utilization of AI in industry was examined, illustrating its pivotal contribution to driving innovation and maintaining competitive advantage. Through the literature review, our group was able to identify and focus on a specific contracting branch within the USAF and discover specific AI technologies that can be built upon and implemented today. The discovery of USAF initiatives to execute digital transformation at the speed of relevance gave us the path we were looking for to apply AI technology in what Krebs termed, "low-value, low-impact" contracts today. As we stand on the cusp of an AI-driven era, it is imperative that we continue to refine our understanding and application of this groundbreaking technology within the defense sector for contracting applications and beyond. This chapter serves as a call for continued scholarly inquiry and strategic implementation of AI, ensuring that the United States remains at the forefront of this revolutionary tide.

Chapter III delves into the qualitative methodology employed to uncover the common themes affecting our contracting offices and presents our findings. We used a multifaceted approach, incorporating personal experiences, in-depth interviews with government procurement professionals, and consultations with industry experts to gain a comprehensive understanding of the current challenges. Through these methods, we identified key roadblocks and concerns faced by contracting offices, such as insufficient standardized training, inefficient acquisition planning, and the labor-intensive nature of requirements drafting and PRP development. Furthermore, this chapter explores the potential of AI technologies to address these issues. By analyzing the insights gathered, we outline practical ways to leverage AI for document selection, review processes, and overall efficiency improvements. Our findings highlight the promise of AI in transforming government procurement practices, providing a roadmap for future integration of these advanced tools to mitigate existing challenges and enhance the effectiveness of contracting operations.

III. METHODOLOGY

Properly developing a research methodology was critical. Following informal discussions with industry specialists, contract specialists, and advisors, we identified a gap: existing contract record systems lack the capability to accurately capture the manhours expended in the requirements drafting phase. DOD acquisitions systems focused on capturing procurement acquisition lead time (PALT) as a measure of effectiveness for contracting offices. According to the Defense Acquisition University (DAU), PALT is "the amount of time required to complete the actions leading to contract award. It begins when the approved requisitioning document is received in the contracting activity and lasts until a contract or order is awarded" (DAU, n.d.). Moreover, the wide variety of procurement types under the SAT presented challenges in correlating data, given the significant differences in effort required for commodities versus services procurement. Therefore, a qualitative research methodology was determined to be best suited.

A. QUALITATIVE RESEARCH APPROACH

Our qualitative research approach was twofold, aiming to provide a comprehensive understanding of the current state and future potential of AI in PRP development and the requirements drafting phase within government contracting.

The first phase focused on gathering and analyzing the general understanding and perceptions of contract specialists regarding PRP development and the requirements drafting phase. To achieve this, we employed a qualitative approach consisting of personal observations, real-life experiences and semi-structured interviews.

We began with personal observations in various contracting offices to understand the day-to-day operations and challenges faced by contract specialists. These observations allowed us to witness firsthand the intricacies involved in the PRP development process and the requirements drafting phase. We paid close attention to the workflows, tools used, and common pain points that specialists encounter, such as time constraints, the complexity of requirements, and compliance with regulatory standards.

Throughout our research, we also drew upon the personal experiences of contract specialists and requestors to identify common roadblocks and derive meaningful conclusions. By engaging with individuals who have hands-on experience in PRP development and the requirements drafting phase, we gained valuable insights into the practical challenges they face daily. These professionals shared specific instances of inefficiencies, such as the repetitive nature of drafting similar requirements and the difficulties in ensuring comprehensive compliance with regulatory standards. Their firsthand accounts highlighted the critical pain points that AI could potentially address.

Following the observations, we conducted semi-structured interviews with a diverse group of contract specialists. These interviews provided deeper insights into individual experiences and perspectives. We explored the specific challenges they face in drafting requirements, such as managing ambiguous or incomplete information, ensuring accuracy, and meeting deadlines.

Additionally, we sought to explore contract specialists' familiarity with AI technologies and their openness to integrating AI into their workflows. We posed questions about specific AI tools and technologies, such as NLP and ML, and their potential to automate routine tasks, improve accuracy, and facilitate compliance. The feedback collected provided valuable insights into how AI could be tailored to meet the unique needs of the contracting process.

The second phase of our research targeted professionals in the AI industry to discuss the feasibility and applicability of AI in the requirements drafting phase and PRP development process. We conducted in-depth interviews with AI experts, including program developers and industry leaders. These discussions focused on the current capabilities of AI technologies, advancements in NLP, and the potential for AI to automate and enhance various aspects of the requirements drafting process. We explored technical challenges, such as data quality, integration with existing systems, and the need for customized AI solutions tailored to government contracting needs.

AI professionals provided insights into the technical capabilities of AI, such as the ability to analyze large data sets, generate accurate and comprehensive documents, and

identify inconsistencies or gaps in requirements. We also discussed potential implementation challenges, including data privacy concerns, the need for training and change management, and the importance of maintaining human oversight in AI-assisted processes.

To gather practical recommendations, we asked AI experts to share best practices for integrating AI tools into the PRP development workflow. This included strategies for data management, the importance of iterative testing and validation, and approaches to ensure ethical and responsible use of AI. The feedback from AI professionals helped us identify key factors for successful AI adoption and provided a roadmap for future implementation efforts.

By combining perspectives from both contract specialists and AI professionals, we aimed to construct a well-rounded view of how AI can be effectively leveraged to address the specific needs and challenges of the requirements drafting phase and PRP development process in government contracting. This comprehensive approach enabled us to identify potential benefits, anticipate obstacles, and develop strategies for integrating AI into the contracting workflow, ultimately enhancing efficiency, accuracy, and compliance.

B. DATA COLLECTION METHODS

Data was collected through a comprehensive approach involving personal observations, structured interviews, and extensive online research. Participants included contract specialists from the Army and Air Force, as well as AI professionals from various industries. Each group provided invaluable insights into the existing gaps in the requirements drafting phase and PRP development process, highlighting the growing opportunities for AI integration.

Interview questions:

1. Does your office use a standard template to generate procurement requirement documentation required for request for proposal or request for quote?

2. Which functions are involved in procurement documentation?

3. Do you believe requestors understand the contract process and their role in developing contract required documents such as market research and independent government cost estimates?

4. How much time is spent in acquisition planning meetings to identify agency need, scope, and pre-solicitation information? Do you believe the time spent is adequate for a successful procurement?

5. Do you believe AI could be utilized to streamline the acquisition process? If yes, how so?

6. If using AI to generate documentation was an option, which documents or requirements would be ideal candidates?

7. Would you like to offer your professional opinion on the use of AI?

C. DATA ANALYSIS

Two qualitative research approaches were employed to examine the interviews and analyze the interview questions. First, a narrative analysis was conducted to interpret the interviewees' feelings, understanding, and behaviors within their areas of expertise. This method allowed us to capture the personal experiences of the participants, providing a deeper insight into their professional challenges and perspectives. Additionally, the narrative analysis helped clarify their views on the broader focus areas of the study, including the application of AI in the PRP development process.

Second, a thematic analysis was performed on both the interview transcripts and the follow-up written responses to the interview questions. This approach involved identifying, analyzing, and reporting patterns or themes within the data. Through this analysis, we were able to uncover common themes and trends that highlighted the recurring issues and opportunities perceived by the participants.

The results of these analyses were aligned with our expectations and did not present any surprising findings. The narrative analysis revealed a consistent acknowledgment of the current gaps and inefficiencies in the requirements drafting phase and PRP

development process, while also indicating a strong interest in leveraging AI to address these challenges. The thematic analysis further reinforced these insights, showing clear consensus on the potential benefits of AI integration, such as enhanced accuracy, efficiency, and compliance.

By utilizing both narrative and thematic analyses, we were able to obtain a comprehensive understanding of the participants' experiences and views. This dual approach ensured that we captured both the depth and breadth of the data, providing a robust foundation for our conclusions and recommendations.

Several common themes emerged from the interviews. First, the application of the FAR and the standardization of PRP varied significantly between contracting offices. Even within the same branch of service, one contracting office could have entirely different standards from another. This lack of uniformity was not surprising given that both the Army and Air Force have adopted installation-based contracting solutions rather than regional or national approaches.

Templates and samples used for PRP development were often tailored to the specific needs and common procurements of each contracting office, resulting in minimal standardization across different service offices. In some cases, these templates exceeded the requirements set forth by the FAR or the DFARS, reflecting the interpretations and preferences of senior contracting officials. This variability underscores the need for more consistent and streamlined practices to enhance efficiency and compliance across the board.

All contracting offices interviewed confirmed the use of standard templates and samples. These templates and samples were available for various types of procurements, whether for commodities or services, and for procurements of differing magnitudes. However, it was determined that these templates and samples lacked accompanying instructions. There was no documentation to assist the requestor in selecting the appropriate template or sample for a specific procurement.

Furthermore, the development of the independent government estimate (IGE) relied heavily on market research and industry billing standards. For instance, it is not appropriate

to request custodial services for a building based on an hourly rate when the industry standard is to bill based on square footage. This reliance on market research and industry standards highlights the need for better guidance and standardized practices to ensure accuracy and consistency in procurement requests.

Secondly, all contract specialists agree that there is insufficient standardized training for requestors. Based on interviews, 100 percent of requestor training falls under the responsibility of the contracting office. A significant time investment for contract specialists during the requirement drafting phase involves educating the requestor and supporting the development of the PRP. It is important to note that educating requestors and developing PRPs typically falls outside the role of the contract specialist. The time spent by contract specialists on educating requestors, reviewing, and correcting procurement documents reduces the time available for procurement actions, thereby impacting their ability to meet timelines for other assigned procurements. Standardizing training for requestors is supported by all contracting personnel interviewed. While Contracting Officer Representatives (CORs) are typically assigned as requestors, CORs are required to complete training to be considered acceptable for the role. However, COR training for post-contract award administration does not necessarily prepare the COR for performing pre-award contract documentation.

Regarding acquisition planning meetings to identify agency needs, scope, and pre-solicitation information, all interviewees agreed that acquisition planning does not receive the attention it truly needs. Acquisition planning for large-dollar, high-visibility projects is often scrutinized, while small procurements below the SAT are believed to be simple actions that do not necessitate an acquisition planning meeting with all stakeholders. However, all those interviewed felt that time could be saved if acquisition planning were a requirement rather than arbitrary. The reluctance to prioritize acquisition planning may stem from the DFARS, which mandates acquisition planning for procurements over $10 million. Anything less than $10 million is subject to local policy.

Lastly, contract specialists believe that AI could be beneficial in the requirements drafting phase and PRP development. An AI system focused on document selection and review could reduce the education and review burden on the contract specialist. While AI

would not completely replace human involvement, the potential time-saving aspect is attractive.

D. CHAPTER SUMMARY: UNLOCKING AI POTENTIAL IN REQUIREMENTS DRAFTING AND PRP DEVELOPMENT

Discussions with AI professionals revealed common themes. After explaining the requirements drafting phase, the necessary documentation, and the standards for a complete PRP, AI professionals agreed that there is an opportunity for AI. From bots to LLMs, AI can support the requirements drafting phase and PRP development today, not in the future. The technology is currently available.

Having identified the potential uses of AI to streamline and expedite the procurement process, Chapter IV delves deeper into the practical implementation of these AI solutions. This chapter provides a comprehensive analysis of ongoing initiatives and projects that are actively incorporating AI into procurement activities. We explore current efforts, detailing specific use cases and the technologies being deployed, as well as anticipate future developments and innovations that are on the horizon. By examining both present and emerging applications of AI, Chapter IV aims to offer a robust framework for understanding how AI can revolutionize the procurement process, enhance efficiency, and address the challenges identified in previous chapters.

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IV. APPLICATION AND IMPACT OF AI IN REQUIREMENTS DRAFTING

In this pivotal chapter, we delve into the collaborative heart of our research, spotlighting the key partner whose insights and expertise have been instrumental in shaping our study. Their seasoned perspective on the current state of requirements documents reveals a landscape ripe for innovation, where the traditional methods of capturing and managing requirements are increasingly seen as inadequate for the dynamic demands of modern projects. Through a series of guided interviews and discussions, we uncover their candid views on the potential of AI to revolutionize this domain. They envision AI not just as a tool for automation, but as a transformative force capable of enhancing clarity, precision, and foresight in requirements documentation. Furthermore, we explore the specific documents that stand to gain the most from AI's capabilities, identifying those that, if reimagined through the lens of advanced technology, could significantly elevate the efficiency and effectiveness of the entire requirements life cycle. This chapter, therefore, sets the stage for a profound exploration of AI's role in redefining the parameters of successful requirements management.

Our investigation uncovered a significant gap in the availability of standardized tools and templates essential for the execution of activities related to the definition and documentation of Air Force requirements. The deficiency of such standardized documents is a major impediment, obstructing the contracting offices' capacity to streamline their processes and carry out their duties efficiently. Without a uniform set of tools and templates, there is a risk of inconsistencies and delays, compromising the effectiveness of the Air Force's operational readiness and negatively affecting cost, schedule, and performance of contractual efforts. This situation underscores the urgent need for the development and implementation of comprehensive, standardized support mechanisms facilitating a more efficient and coherent approach to managing Air Force requirements, especially low-cost, low-impact ones. The establishment of such systems would not only improve the workflow within contracting offices but also contribute to the overall mission

success by ensuring that all requirements are clearly defined, meticulously documented, and promptly addressed.

A. INTRODUCTION TO BASE SUPPORT CONTRACTING

The Base Support Contracting Branch (PZIBB) represents a small, but critical node supporting operations at Wright–Patterson Air Force Base, OH, particularly for transactions falling under the SAT. They handle contracts for various tasks, including maintaining weather sensors embedded in runways, procuring technical training seminars, managing the base's cable and internet services, ensuring the base Christmas tree is decorated and lit annually, and providing potable water for runners in the Air Force marathon. With an estimated 95% of their annual contract awards dedicated to procurements under the SAT, PZIBB stands as a significant entity for our research focused on streamlining acquisition processes. The absence of program managers and a cohesive integrated program team (IPT) within the organizations that PZIBB support is a notable characteristic that can impact the efficiency and effectiveness of procurement activities. Contracting professionals within PZIBB often assume dual roles, not only in their capacity as acquisition experts but also in aiding organizations to articulate their requirements prior to initiating the acquisition process. The reliance of various organizations, such as the Air Force Petroleum Agency (AFPET), the Air Force Institute of Technology (AFIT), and the Air Force Marathon (AFM), on non–procurement specialists like administrative assistants, professors, and event organizers to develop requirement packages, underscores a gap our research can fill. These individuals, while integral to their respective domains, possess limited procurement knowledge, which can lead to inefficiencies and suboptimal procurement packages.

The slogan "need to buy, call PZI" reflects a recognition of PZIBB's central role in acquisitions but also highlights a disconnect between the perception and reality of the acquisition process, particularly the knowledge gap among those tasked with building requirements packages. Our research offers insights into potential areas for improvement through the incorporation of AI, aiming to enhance the overall efficiency of PZIBB's procurement process.

During our interviews with PZIBB's contracting experts, it became evident that the process of generating requirements documentation needs enhancement. Despite PZIBB offering training and templates, organizations frequently continue to submit recycled content. This content is often sourced from previous buys or external materials that superficially align with their needs. A prevalent trend observed is the request for sole-source acquisitions, which is pursued despite the commercial availability of the desired products or services. This approach, as emphasized by PZIBB, leads to suboptimal documentation that undermines the efficacy of market research and the formulation of robust acquisition strategies. The ramifications are significant, manifesting as escalated costs, unmet deadlines, and the partial fulfillment of requirements. To illustrate the complexity of the documentation process, PZIBB presented Appendix A, a requirements document checklist. This checklist, resembling a menu of potential requirements documents, details an impressive array of up to 25 distinct documents that may comprise a single acquisition package. Such a checklist serves as a testament to the intricate nature of acquisition processes and stresses the necessity for meticulous documentation. It is imperative that organizations recognize the importance of thorough and precise requirements documentation, as it is foundational to the success of any acquisition endeavor. However, these organizations are rightly focused on their mission, not contracting paperwork. This is where AI has the potential to assist, a point on which PZIBB contracting professionals agree. By addressing deficiencies in current documentation practices, AI can streamline the acquisition process, reduce unnecessary expenditures, and ensure complete satisfaction of requirements, thereby enhancing the overall efficiency and effectiveness of organizational procurement activities.

B. MAXIMIZING THE IMPACT OF AI ASSISTANCE ON REQUIREMENTS DOCUMENTATION

In our endeavor to harness the transformative potential of AI, we concentrated our efforts on pinpointing a subset of key documents. These documents were chosen with the strategic intent of amplifying the value of AI in supporting the needs of the stakeholders in PZIBB. Through collaboration with the PZIBB team, we ascertained that the SOW, IGE, and market research reports stand out as the pivotal documents in this context. Not only do

these documents form the cornerstone of project planning and execution, but they also represent areas where PZIBB has observed a consistent need for improvement. By focusing on enhancing the quality and comprehensiveness of these documents, we aim to provide PZIBB's requirement owners with AI solutions that can significantly elevate the standard of their operational outcomes and ultimately aid the PZIBB contracting office. The SOW is instrumental in clearly defining project objectives and deliverables, ensuring all parties have a mutual understanding of the expected results. The IGE serves as a critical financial blueprint, guiding budgetary allocations and fiscal accountability. Meanwhile, market research provides invaluable insights into industry trends, competitive landscapes, and potential risks, informing strategic decision-making. By improving these documents, we not only address the immediate concerns highlighted by PZIBB but also lay a strong foundation for AI to bring about a more profound impact on future projects. Our initiative is poised to revolutionize the way PZIBB approaches document adequacy, transforming potential weaknesses into strengths that drive success.

In the realm of contract management, the SOW, PWS, or SOO are foundational documents that delineate the scope of work for a specific contract. These documents are indispensable as they lay out the tasks that need to be executed, the deliverables that are expected, the schedule for these deliverables, and the precise standards and benchmarks that will steer the contractor's efforts. Their significance cannot be overstated; they provide a lucid and comprehensive depiction of the required work, thereby mitigating potential misunderstandings and conflicts. Moreover, they ensure that the entity requesting the service has their requirements met to their satisfaction.

AI can greatly enhance this process. For instance, a 2023 Government Contractors Association article suggests AI can assist in drafting these critical documents by suggesting content based on past successful contracts, thus ensuring comprehensiveness and reducing the likelihood of omissions. The article states that AI algorithms can analyze large data sets to predict potential risks and suggest mitigation strategies, making the documents more robust. Furthermore, AI can facilitate real-time collaboration among stakeholders, allowing for dynamic updates to the SOW, PWS, or SOO as project needs evolve (Government Contractors Association, 2023).

AI can also play a pivotal role in monitoring contract execution. By employing ML techniques, AI systems can track the progress of deliverables against the timeline, alerting managers to delays or deviations from the plan. Predictive analytics can forecast future performance based on current trends, enabling proactive adjustments. Additionally, AI-powered tools can evaluate the quality of deliverables against the established criteria, providing objective assessments that can guide contractor performance and support dispute resolution.

The IGE represents the government's own projection of potential costs or pricing that a contractor might incur to fulfill a contract successfully. Crafted autonomously from any contractor's bid, the IGE's primary purpose is to safeguard the government's interests, ensuring that it incurs expenses that are both fair and reasonable for the services procured. For contracting officers, the IGE is indispensable for corroborating the bids submitted. It encompasses a thorough analysis and a supporting narrative that underpins its formulation, thereby guaranteeing that the estimate is both exhaustive and precise.

Moreover, the independent government cost estimate (IGCE) is a concept that parallels the IGE, albeit with a specific focus on service acquisitions. It serves as a standard for assessing contractor proposals and aids in both budgeting and strategic planning. These estimates are handled with the utmost confidentiality and are integral to preserving the procurement process's integrity and equity.

AI can significantly enhance this estimate generation and documentation process. For instance, AI can analyze historical data to predict costs more accurately, identify patterns and anomalies that might affect pricing, and automate the narrative generation to support the IGE, ensuring consistency and reducing human error. AI can also assist in the comparison of contractor bids against the IGCE, highlighting discrepancies and providing a data-driven basis for decision-making. Furthermore, AI can maintain the confidentiality of these estimates by implementing advanced security protocols, thus upholding the sensitive nature of this information.

AI can also significantly enhance market research by automating the collection, analysis, and interpretation of vast amounts of data related to government needs and

supplier capabilities. For instance, AI algorithms can sift through procurement databases to identify patterns and trends that indicate the most reliable suppliers. ML models can predict future market conditions by analyzing historical data, helping agencies to anticipate changes in supplier capabilities and product availability. AI can also facilitate the understanding of complex industry practices by processing and summarizing large volumes of industry-related documents and reports.

Moreover, AI-driven sentiment analysis can gauge public opinion on potential suppliers or products, which is invaluable for government agencies aiming to procure services that align with public interest. NLP tools can interpret the terms and conditions associated with different suppliers, ensuring that agencies fully understand the commitments they are entering into. This level of analysis can lead to more competitive procurement processes by highlighting opportunities for negotiation and better contract terms.

In terms of collaboration, AI can act as a central hub that consolidates input from various members of the acquisition team, ensuring that all decisions are informed by comprehensive, up-to-date data. By automating routine tasks, AI frees up human team members to focus on more strategic aspects of market research, such as relationship building with suppliers and the development of innovative acquisition strategies.

Furthermore, AI can assist in shaping acquisition strategies by providing simulations and predictive models that forecast the outcomes of different approaches. This can help in crafting solicitation terms that are more likely to result in successful contract awards. For example, AI could simulate the impact of different budgeting strategies on the government's ability to attract high-quality suppliers, or it could predict how changes in market trends might affect the availability of certain products or services.

In summary, AI has the potential to transform government acquisitions by providing a level of speed, efficiency, and depth of analysis that is unattainable through human efforts alone. Its ability to process and make sense of large data sets can lead to more informed decisions, better value procurement, and ultimately, more successful outcomes for government agencies and the public they serve. In essence, AI acts as a force

multiplier in contract management. It not only has the potential to streamline the creation and maintenance of critical documents but also enhances oversight and execution. Jory Heckman summarizes in his 2023 Federal News Network article that by integrating AI into the contracting process and augmenting human capabilities, government agencies and contractors can achieve a higher level of understanding and adherence to their mutual responsibilities and expectations, leading to more successful project outcomes (Heckman, 2023).

C. AI'S TRAJECTORY AND IMPACT ON AIR FORCE CONTRACTING

The swift proliferation of AI technologies has been a transformative force across multiple industries, and its adoption within the Air Force's procurement mechanisms marks a significant evolution. This comprehensive analysis explores the intricate technical proficiencies and foundational reasoning behind the application of AI specific strategies in crafting SOW, IGE, and market research reports. The integration of AI into these processes also facilitates a more dynamic approach to handling the complexities of modern procurement, allowing for adaptive strategies that can respond to rapidly changing market conditions and technological landscapes. Moreover, the utilization of AI in developing these critical documents underscores the Air Force's commitment to modernization and innovation, ensuring that procurement practices not only meet current demands but are also future-ready. This section delves deeper into how AI methodologies are reshaping the development of procurement documentation, setting a new standard for excellence within the Air Force's operational framework.

The realm of computing has undergone a swift and profound transformation, becoming an integral component of our everyday existence. This integration is so seamless that it belies the technology's relatively recent emergence in the historical timeline. Simanta Shekhar Sarmah (2019) provided a detailed exploration of this technological timeline in the *International Research Journal of Engineering and Technology*. Sarmah stated that a mere 8 decades have elapsed since the esteemed British mathematician and pioneering computer scientist, Alan Turing, introduced the principles of ML. The author explained how ML, a subset of AI, harnesses the power of data and algorithms to emulate

the cognitive learning capabilities of humans. Further, Turing's groundbreaking work laid the foundation for the development of techniques to decrypt Enigma, the complex cipher employed by the German forces throughout the World War II. His seminal contributions not only played a crucial role in the wartime efforts but also catalyzed the momentum of research within the field of computer science. This surge in scholarly activity set the groundwork for a series of revolutionary breakthroughs that would reshape the technological landscape (Sarmah, 2019). Turing's legacy is evident in the vast array of ML applications that permeate various sectors today, from health care diagnostics to financial forecasting, demonstrating the far-reaching implications of his early work.

As we reflect on the strides made since Turing's era, it is clear that his vision of machines capable of learning and evolving has been realized to a remarkable extent. The trajectory of computing, once a speculative science, has ascended to become a cornerstone of modern innovation, continually pushing the boundaries of what is possible. Turing's foresight in envisioning the potential of ML has been validated by the transformative impact it has had on society, underscoring the profound influence of his intellectual pursuits. Indeed, the advancements in computing we witness today are a testament to the enduring power of Turing's original concepts, which have expanded beyond their initial scope to encompass a future he only could have imagined. Sarmah (2019) encapsulated this journey, chronicling the pivotal moments that have led to our current state of technological sophistication. As we navigate the complexities of this digital age, it is essential to acknowledge the historical context of these developments, recognizing the pioneers like Turing who charted the course for the digital revolution we continue to experience.

AI has transitioned from a futuristic concept to a present-day marvel, offering opportunities that appear boundless. In 2022, Max Roser highlighted how that same year marked a significant milestone in this journey, showcasing the vast potential of AI. The once clear demarcation between the realms of science fiction—epitomized by ominous figures like Skynet and the Terminator—and tangible reality is now increasingly obscure. This convergence is highlighted in Figure 3, which depicts the remarkable evolution of AI's language and image recognition capabilities over the last 20 years. As illustrated in

Figure 3, since 2015, AI systems have not only matched but exceeded human abilities in several domains. These systems demonstrate superior performance in deciphering handwriting, interpreting spoken words, identifying images, and even surpassing humans in tests measuring reading comprehension and language understanding.

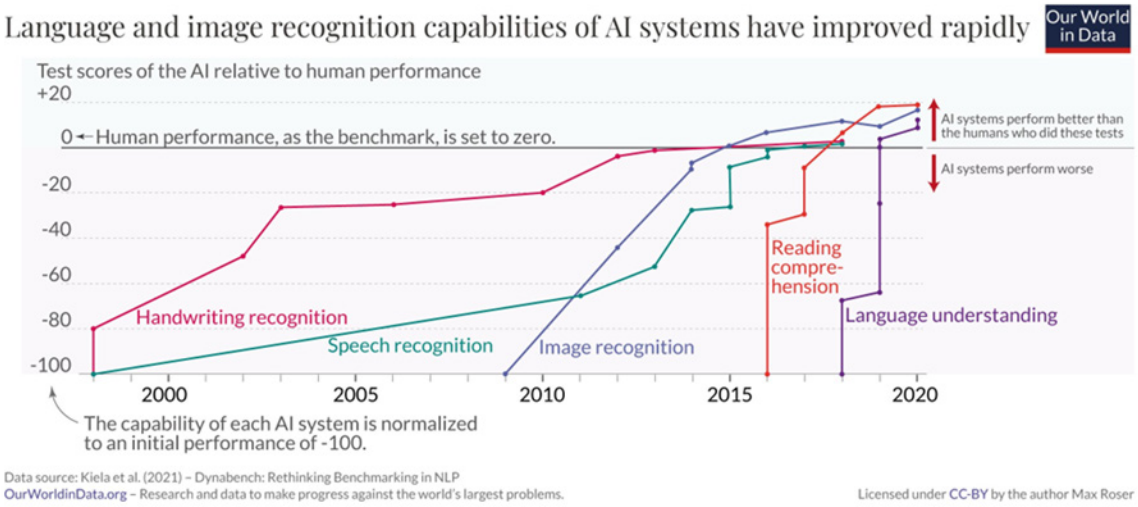

Figure 3. Improvement of Recognition Capabilities of AI Systems. Source: Roser (2022).

This rapid advancement underscores a pivotal shift in cognitive tasks, where machines are beginning to rival human intelligence. The implications of such advancements are profound, affecting various sectors from health care to finance, and raising important questions about the future of work, ethics, and the very nature of human–machine interaction. As AI continues to evolve, it challenges us to reimagine the boundaries of technology and its role in shaping our world. The trajectory of AI's development suggests a future where its integration into daily life is seamless, and its contributions are indispensable. It beckons humankind to consider how it will adapt to and harness the power of AI to enhance our capabilities and address the complex challenges of the 21st century.

AI has made astonishing progress, eclipsing human expertise in a variety of fields. The most recent AI Index report by Stanford University presents compelling evidence of

this, showing that AI systems have surpassed human performance in intricate tasks like image classification, visual reasoning, and mastering the nuances of the English language (Fell, 2024). This leap forward is particularly impressive given the intricate nature of these tasks, which were previously believed to be solely within the realm of human cognition.

The shift from academic to industrial production of ML models marks a significant transition, with a surge in collaborations between industry and academia. This symbiosis has catalyzed the evolution of AI, fostering an environment where innovation thrives. Despite its triumphs, AI continues to encounter hurdles in complex cognitive areas such as advanced mathematical problem-solving and visual commonsense reasoning. Nevertheless, the pace of progress is relentless, with models based on GPT-4 making remarkable headway in solving a substantial portion of competition-level mathematical problems, edging ever closer to human performance benchmarks.

These developments indicate that AI's proficiency is not merely on par with human abilities but is also surpassing them in certain respects, thereby transforming our understanding of machine potential. With such advancements, AI is poised to redefine the capabilities of machines, presenting new frontiers for exploration and application. In light of these advancements, the pertinent question arises: What are the capabilities of these machines, and how might they serve the U.S. Air Force contracting community? The potential applications are vast and varied, but our team was committed to finding answers.

D. INTEGRATING AI SOLUTIONS

Terry Schooley is the of chief of contracting within the Air Force Life Cycle Management Center's program execution group, where she also serves as the chief action officer for Braswell's LOE #2, which is centered on information technology and digital transformation. This initiative places a significant emphasis on the deployment of an AI use case as a key outcome. During a comprehensive guided interview, Schooley shed light on two innovative pathways being pursued for the incorporation of AI in contracting processes: the employment of robotic process automation (RPA)—commonly referred to as "bots"—and the utilization of LLMs (interview with the authors, March 5, 2024).

Bots are designed to relieve personnel from repetitive and routine tasks, such as filling out forms, crafting templates, and applying fixed evaluation criteria. On the other hand, LLMs are sophisticated systems that leverage ML algorithms and depend on extensive, precise databases to function effectively. Schooley provided insights into the potential of these AI technologies to enhance the preparation of requirement documentation. She highlighted the intricate challenges involved in constructing and sustaining comprehensive databases that house all the critical data necessary for both bots and language models to extract information.

Furthermore, Schooley delved into the current tools that are being employed in the field, underscoring their relevance and application. In response to inquiries regarding the strategic long-term integration of AI instruments in optimizing the procurement cycle, Schooley articulated a forward-looking vision. She envisaged the development of an advanced system capable of automatically generating all requisite procurement and contractual documents upon the specification of requirements for diverse equipment and services, ranging from a sophisticated scanning electron microscope to the acquisition of a new aircraft.

This system would not only streamline the procurement process but also ensure a higher degree of accuracy and efficiency in contract management. The adoption of such AI-driven methodologies signifies a transformative step in the realm of contracting, potentially setting a new standard for the industry. Schooley's insights underscore the pivotal role that AI is poised to play in the future of contracting, marking a shift towards more dynamic, responsive, and intelligent procurement strategies that align with the evolving technological landscape.

In light of these findings, Schooley recommended a discussion with Travis Simmons, the AFLCMC contracting technical director stationed at Robins Air Force Base, GA. Simmons is at the forefront of the Air Force's initiatives involving RPA for his insight on the potential benefits of utilizing bots to streamline the preparation of requirements documentation (interview with authors, March 5, 2024). From our conversation with Schooley, it was clear that she believes that the scale of a project should not be a determining factor in the decision to implement AI solutions in the procurement process.

She articulated her perspective with a compelling example, stating that if a set of tools proves to be effective for a project valued at $20 million, then those same tools should be equally effective for a major ACAT I program or for projects that fall below the SAT. Furthermore, Schooley underscored the unavoidable progression towards AI technology, highlighting the necessity for a fundamental understanding of AI concepts across all levels of the contracting community. This forward-thinking approach suggests a paradigm shift in the procurement process, where the integration of AI could lead to more efficient, scalable, and adaptable practices, irrespective of the project's magnitude.

E. RPA: BOTS

In a communication to the AFLCMC's contracting workforce in April 2024, Braswell expanded upon the transformative capabilities of RPA. He delineated the substantial impact RPA holds for revolutionizing operational methodologies. Braswell underscored the criticality of adopting innovative strategies that streamline procedural workflows and maximize time utilization. The utilization of RPA, he stated, offers a substantial opportunity to bolster productivity, precision, and operational efficiency within the multifaceted spheres of the acquisition sector. This insightful message prompts a pivotal question: Is it feasible to employ automated systems to aid in the development of essential requirements documentation such as the SOW, IGEs, and market research? By automating routine tasks, professionals could redirect their focus towards more strategic initiatives, thereby enhancing the overall quality and responsiveness of the contracting process. Furthermore, the precision of bots could reduce errors and inconsistencies, ensuring a higher standard of document accuracy. The potential for RPA to assist in these areas not only aligns with Braswell's vision but also poses a compelling case for the broader adoption of automation technologies in government contracting and beyond. As organizations contemplate the integration of RPA, they must consider the balance between human expertise and machine efficiency to optimize the synergy between both entities. The future of contracting could very well hinge on the successful melding of human ingenuity and robotic precision, leading to unprecedented levels of efficiency and effectiveness in the acquisition domain.

Simmons, who leads the Air Force's RPA integration team, provided an in-depth explanation of the operational mechanisms behind bots (interview with the authors, April 11, 2024). These bots, essentially software incarnations of robots, are designed to enhance efficiency by automating monotonous tasks traditionally performed by humans. Functioning as virtual assistants, they engage with various applications and systems at a user interface level, performing actions such as clicking on-screen buttons, inputting login details, and extracting text from documents in PDF format.

He further delineated the distinct roles of AI and RPA, emphasizing that AI encompasses technologies like NLP and ML, which are geared towards tasks necessitating a degree of intelligence akin to human cognition. In contrast, RPA is tailored for the automation of repetitive, rule-based tasks that do not require such cognitive capabilities. AI systems are adept at handling complex decision-making processes and analytical tasks, leveraging their ability to interpret and process unstructured data. On the other hand, RPA systems excel in the execution of time-intensive, manual tasks, albeit limited to structured data environments.

Moreover, Simmons highlighted that while AI has the capacity to make autonomous decisions based on data analysis and learning, RPA operates strictly within the confines of predefined instructions. This fundamental difference underscores the complementary nature of AI and RPA: AI ventures into the realm of simulating human-like decision-making and problem-solving, whereas RPA streamlines workflows by automating straightforward, laborious tasks. Together, they form a synergistic duo that can significantly optimize operational efficiency and productivity within various sectors. By integrating both AI and RPA, organizations can harness the strengths of each to address a broad spectrum of challenges, from data management to strategic planning.

Simmons highlighted the current use of RPA products within the Air Force as an example of bots' capabilities. The DORAbot is a determination of responsibility assistant, which streamlines the process of vetting contractors. By simply inserting a contractor's unique entity identifier (UEI) into an email's subject line and addressing it to DORA, one can swiftly retrieve the contractor's accountability details from SAM.gov. This information is then automatically transferred into a modifiable Word document, enhancing efficiency

and accuracy. Another bot is the payment log bot. It interfaces directly with the Defense Enterprise Accounting and Management System (DEAMS), extracting data for a specified procurement instrument identifier (PIID) and seamlessly integrating it into an Excel spreadsheet. This bot is particularly advantageous for finalizing contracts or monitoring contract payments. Furthermore, the price negotiation memorandum (PNM) bot is a remarkable tool that transcribes and organizes data from a contractor's proposal into the PNM memo format. This not only saves considerable time but also minimizes the likelihood of human error.

RPA technology can assist with the tedium of routine tasks, such as verifying contractor responsibility or retrieving payment records, thereby allowing them to dedicate their cognitive skills to tasks that necessitate human creativity, analytical thinking, and strategic decision-making. However, RPA's reliance on structured data presents a challenge. It cannot think or learn. It is tailored for the automation of repetitive, rule-based tasks only. However, as Simmons explained, there are distinctive roles that AI and RPA play in the technological landscape. AI is designed to mimic human cognitive functions, delving into complex decision-making and problem-solving tasks that require learning and adaptation. This technology is at the forefront of creating systems that can think, learn, and make informed decisions in a manner similar to humans. On the other hand, RPA is focused on automating repetitive and rule-based tasks that are typically time-consuming for humans. By streamlining these workflows, RPA enhances efficiency and allows human workers to focus on more strategic tasks that require human ingenuity and creativity.

Our findings via our research, our conversation with Simmons, and our discussions with the PZIBB contracting team indicate that, although a supporting database is not yet in place to fully support integrating bots into the acquisition process, these technologies represent a major leap forward. Additional challenges, such as funding, standardization, maintenance, and growth potential, exist, but the existing data hints at a promising future. With appropriate user inputs, bots could potentially pre-populate requirements documents with organization-specific information, communicate with the finance department to generate a purchase request, and route documents–including the final requirements package–to the contracting team, signifying a leap forward in procurement efficiency and

precision. Appendix C provides an example of a SOW template provided by PZIBB, in which large sections could easily be completed by a bot given the correct information from a structured database and accurate user inputs at the beginning of the process.

Our recommendation on the deployment of automated bots is straightforward. The RPA integration team works in close partnership with the PZIBB office to develop a repository for standardized requirements documents. This database, serving as a single source of truth, is essential for maintaining consistency and ensuring efficient document handling. Importantly, the database also allows for stylization to accommodate the different defense departments' preferred output formats.

Following the creation of this repository, the next step involves establishing an interactive dashboard. This platform serves as a collaborative space where various organizations can engage and initiate the process of constructing their specific requirements. The dashboard is designed to streamline communication, enhance transparency, and facilitate a more cohesive approach to requirement building across different entities while consolidating all the AI tools being created.

Robotic automation presents an exciting technological advancement, offering significant improvements in efficiency and accuracy. However, to meet our objective and answer our primary research question of how AI can assist requiring activities in developing adequate requirements packages, bots are only part of the solution. Indeed, they are poised to become a transformative element in our approach to work and productivity. Braswell closed out his April email with the statement, "Interestingly, 70% of this email was written using AI which is the second objective under this LOE–bots are just the beginning!"

F. NLP, ML, AND DEEP LEARNING

Bots represent the brawn, while NLP and ML are the brains. A 2024 *ProjectPro* article explained how NLP and ML are both crucial subfields of AI, but they focus on different aspects of how machines can emulate human abilities. The article explained how NLP is focused on the way humans speak

The article identified that NLP deals with how computers interact with humans using natural language which allows machines to comprehend, interpret, and produce human language in a meaningful and practical manner. On the other hand, as the article explained, ML is a broader field that deals with the ability of machines to learn from data; it involves developing algorithms that can improve their performance at a given task over time without being explicitly programmed for that task. ML algorithms can identify patterns, make decisions, and predict outcomes based on data (ProjectPro, 2024). Figure 4 highlights how AI, NLP, ML, and deep learning are interrelated.

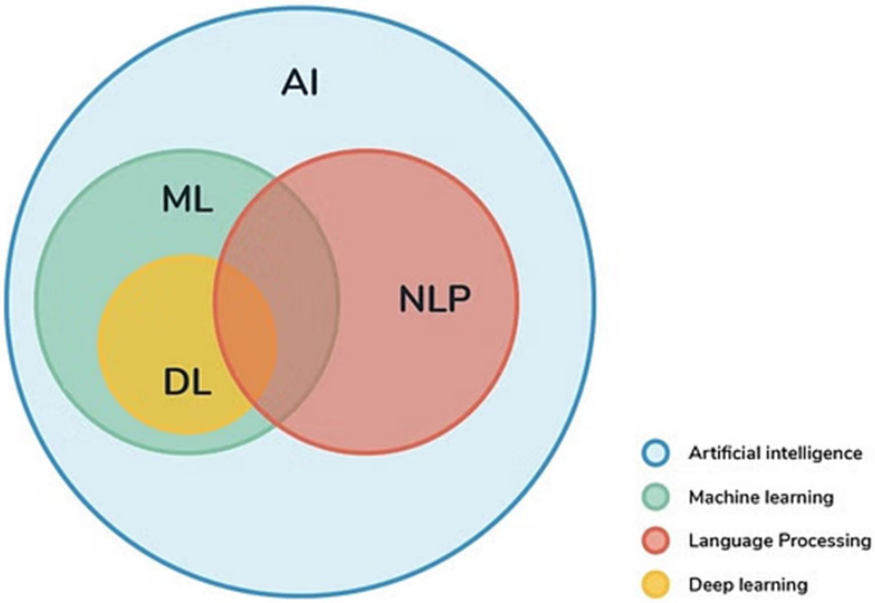

Figure 4. AI, NLP, ML, and Deep Learning Relationship. Source: ProjectPro (2024).

As illustrated in Figure 4, while NLP can be seen as a specialized application within ML focused on language, not all ML is related to language. The *ProjectPro* (2024) article explained how ML can be applied to a wide range of problems, such as image recognition, predictive analytics, and even playing games. Further, NLP techniques often rely on ML algorithms to process and analyze large amounts of language data. For example, an NLP system might use ML to understand the context of words in a sentence or to translate text from one language to another (ProjectPro, 2024).

In essence, ML provides the foundation for machines to learn from experiences (data), while NLP applies these learning capabilities specifically to the nuances of human language. Both fields are interconnected and often overlap; for instance, NLP systems frequently use ML techniques to improve their language processing capabilities as evidenced in the ProjectPro article. However, the primary distinction lies in their application focus: ML is about learning from data, while NLP is about understanding and generating human language. Understanding the differences between these fields is essential for anyone interested in AI, as it guides the selection of appropriate techniques and tools for solving various problems (ProjectPro, 2024).

The *ProjectPro* (2024) article explained how deep learning and ML are often considered to be interchangeable even though they have different uses. It stated that while ML relies on labeled images to accurately classify data, deep learning processes new images through various layers of the neural network to identify features and make decisions, similar to how the human brain works. These networks consist of layers of interconnected nodes or "neurons," with each layer designed to perform specific transformations on the input data, gradually extracting higher-level features and patterns.

Deep learning's ability to learn hierarchical representations of data makes it particularly powerful for tasks that involve recognizing patterns or making predictions based on large and complex data sets. Its impact is evident in the modern digital world, with applications ranging from voice-activated assistants to sophisticated medical diagnostics, and it remains a vibrant area of research and innovation. The journey of deep learning reflects the dynamic nature of the field of AI and its capacity to evolve and adapt to new challenges and opportunities.

In his book *Deep Learning*, John Kelleher (2019) simplified the concept of a deep learning model as a series of multiplications, additions, and nonlinear mappings. Despite this apparent simplicity, deep learning models have surpassed human champions in various tasks. For instance, in 1997, IBM's "Deep Blue" computer defeated grandmaster Gary Kasparov at chess, showcasing the capabilities of deep learning in strategic decision-making. Similarly, in 2011, IBM's "Watson" computer competed on Jeopardy and outperformed two of the show's most successful human contestants, Ken Jennings and

Brad Rutter (IBM, n.d.). These achievements underscore the potential of deep learning to process and analyze vast amounts of information, providing real-time insights and solutions.

To learn about the brains of our objective, we spoke with Paul Hankins, a cybersecurity network engineer within the AFLCMC fighters and advanced aircraft directorate and an AI subject matter expert (interview with authors, April 1, 2024). His focus on developing AI solutions for the Air Force is part of a broader initiative to integrate cutting-edge technologies into defense and business strategies. By leveraging ML, deep learning, and NLP, Hankins is not just staying ahead of adversaries but also shaping the future of military defense mechanisms and the way the Air Force does business. He was eager to share his research work in the realm of utilizing AI in the procurement process with our team.

When asked if anything is being worked on today to expedite the pre-award requirements process, Hankins responded affirmatively. His team is developing an AI engine that would include preloaded workflow models with various requirements outlined for procurement. The model, he explained, would extract information from numerous resources, including websites, URLs, documents, PDFs, PowerPoints, and more. The current understanding of AI is based on LLM, which require training for the AI to understand the desired output. His team is creating a workflow model with specific characteristics in mind and would then "train" the AI with the necessary information for the output. As the tool accumulates more reference material, it gains more information to base answers on, leading to more thorough and inclusive outputs.

Hankins described what the workflow models would achieve. He likened it to interpersonal communication, explaining that when we communicate with each other, we need to be specific for the other person to understand us and respond appropriately. AI operates similarly; for humans to receive an appropriate response from AI, they must ask specific questions. Often a dialogue with the AI is necessary for it to understand the intent and narrow down the scope. For this reason, training with a model is much more efficient than trying to manually guide the AI to define the desired result.

Training the AI would involve "feeding" it with a vast amount of information on acquisitions. This would include the FAR, DFARS, every supplement, National Institute of Standards and Technology (NIST) documents, historical contracting information, White House and Congressional publications, the archive of documents contained within the ePublication, and many other sources. Once the AI has this information, a requirement request could be submitted, and the AI could generate documentation based on the data it received from these sources. Hankins suggested a model where the government owns the system, but a contractor provides support to keep the AI "fed," sustained, and operational, while the government contracting team utilizes the tool.

AI can significantly enhance SOWs, market research and IGEs for procurement efforts by automating data collection and analysis, providing comprehensive insights into the commercial market space, and offering a quick overview of the marketplace for specific products or services. These tools can improve the specification of procurement requirements using recommendation algorithms, promote competition, and optimize pricing through NLP models. Additionally, AI can aid in contractor oversight using computer vision and ML, automate the capture of federal procurement data, and streamline task performance by automating standard intake forms. By incorporating AI into procurement processes, the DOD can achieve more efficient and effective market research and cost estimates, leading to better-informed decisions and potentially significant cost savings. Furthermore, AI adoption in procurement aligns with strategic recommendations to prioritize AI for mission success and to embed responsible AI practices into procurement activities.

Our findings during our interaction with Hankins were significant. He stated he could build us a model for use within the PZIBB branch within 3 days. However, it would not be cost effective. Utilizing all the time and resources required to build and maintain a system with such a small scope is not feasible in the long run. In the context of this project, though, the recommendation is to take the time and devote the resources to test the viability of such a system. Simmons's bots together with Hankins's computer brain would provide a system capable of producing more than adequate requirements documents for PZIBB.

G. COMMERCIAL SOLUTIONS

In January 2024, City Innovate, a small business based in San Francisco, was selected by AFWERX for a Small Business Innovation Research (SBIR) project focusing on automating the development of complex request for proposal (RFP) packages. AFWERX, the "innovation arm of the Department of the Air Force and powered by the Air Force Research Lab…brings cutting edge American ingenuity from small businesses and start-ups to address the most pressing challenges of the [Department of the Air Force]" (AFWERX, n.d.).

City Innovate underwent a name change and reorganization on May 9, 2024, and is now known as Authorium, a name that "better reflects the federal, state, and large local government agencies that rely on the platform to improve their ability to author critical documents and serve as an authority on complex government processes and services" (Newswire.com, 2024).

According to their website, Authorium is the leading provider of document process automation for government agencies, offering a comprehensive solution for complex document-centric processes. They claim their platform significantly reduces the time needed to produce complex document sets that are crucial for government agency process flows, including procurement, contracts, grants, and budgeting. Additionally, documents produced using Authorium's platform come with built-in intelligence to convert hidden data in government documents into structured data for insertion into systems of record. They maintain that their platform helps the government solve urgent problems 50% to 70% faster without compromising compliance, insight, and oversight. Authorium advertises their tool as perfect for busy agencies with a mandate to do more with less, such as Air Force contracting offices like PZIBB. They promise solutions purpose-built for government that focus on speed, compliance, insight, and accountability, which sounds ideal for generating the requirements documents we are researching (Authorium, n.d.).

Our team spoke with Josh Goldstein, Authorium's Director of Business Development, in April 2024 to discuss his company's tool, Document Process Automation. He explained that the innovative Document Process Automation platform is a cloud-based,

no-code solution that significantly streamlines the creation of document collections for use in government operations such as procurement. Equipped with native project management features, robust collaboration functions, and seamless compatibility with current government infrastructures, the platform revolutionizes the way foundational tasks are managed (interview with authors, April 4, 2024).

The biggest bottleneck, as he explained, is the back-and-forth between contracting and requirements owners to define and develop the requirements package. With 15 million RFPs scattered across dozens of government systems, the question arises: how can that data be utilized to limit the time needed to develop the package? One of the major challenges has been that every office believes solicitation development should commence at various stages depending on the contract type and other characteristics. Therefore, developing a tool that allows the ability to start from any step has been a focus.

Additionally, the adoption rate has followed a bell curve according to Goldstein–the early adopters understand and are enthusiastic, but another group views AI with skepticism and is hesitant to use it. Authorium is focused on solving core problems and using AI to assist. An essential aspect of this tool is its ability to be trained to understand organization-specific language, which may differ from that of a similar organization's requirements. The tool can be instructed, for example, to handle a situation in a specific way based on the office's practices.

Finally, when it comes to the preparation of market research and IGEs, the Document Process Automation tool contains a market research module. This module is specifically designed to enhance the efficiency and effectiveness of market research within the DOD. This innovative tool enables direct engagement with vendors to collect comprehensive data on available solutions and their costs, facilitating a more informed decision-making process. The Challenge-Based Approach, proprietary to Authorium, further refines market research by authoring challenge statements, publishing them to the vendor community, and evaluating submissions in a phased manner. This approach has been successfully utilized by agencies like the California Department of Motor Vehicles, demonstrating its effectiveness in modernizing government operations through technology. Our team was excited to learn about the capabilities of this project and our recommendation

is to procure a commercial solution, such as the Authorium tool, and deploy it with a small scope at a "low-cost and low-impact" Air Force contracting agency, such as PZIBB.

The success of Authorium's SBIR III award and research highlights the importance of leveraging industry tools. It is evident that the government should actively seek to capitalize on existing tools being developed by industry. We recommend not only continuing to award similar research and development contracts to small businesses but also exploring other tools available in the market and finding ways to adapt them for government use. This approach can lead to significant advancements in government capabilities and efficiency.

H. CHAPTER SUMMARY: EMBRACING AI IN AIR FORCE CONTRACTING

The comprehensive data and expert testimonies presented in this chapter clearly demonstrate a readiness and eagerness within the Air Force contracting community to embrace AI technologies. The unanimous support from respondents and the PZIBB team underscores a collective anticipation for the efficiency and advancements that AI can bring to their operations. The insights from Schooley shed light on the transformative potential of bots and ML, aligning with the Air Force's proactive approach to digital innovation. Simmons's expertise on RPA and the synergistic role of NLP, ML, and deep learning further elucidates the dynamic capabilities of AI as both a workhorse and a cerebral force. Hankins's offer to develop an AI model encapsulates the forward-thinking attitude necessary to navigate the complexities of AI integration. Goldstein's innovative solutions offer a promising future for AI usage. As we move forward, the subsequent chapter delves into the challenges that accompany the implementation of AI.

The next chapter explores the challenges of implementing AI in DOD contracting, including data quality, system integration, ethical and legal considerations, and staffing shortages. Security concerns and the need for department-wide guidance are also discussed. Despite these challenges, a unified approach focusing on strategic planning and cultural evolution is crucial for leveraging AI's benefits in defense contracting.

V. ANTICIPATED CHALLENGES TO IMPLEMENTING AI

Implementing AI within the DOD poses numerous challenges that must be addressed. These include ensuring the availability of high-quality data, integrating existing contracting systems with new AI technologies, addressing ethical and legal considerations, and having personnel skilled in AI-related fields. Additionally, security, privacy, cost, and resource allocation concerns must be carefully managed. Finally, ensuring not only the availability and effective utilization of department-wide guidance but also widespread acceptance of new AI processes presents a significant challenge that must not be overlooked.

One of the recurring themes in our interviews was the concept of "garbage in, garbage out," as mentioned by Schooley (interview with authors, March 5, 2024), Simmons (interview with authors, April 11, 2024), and Goldstein (interview with authors, April 4, 2024). This idea emphasizes that the quality of AI outputs is only as good as the quality of the input data. If the data fed into AI tools are unreliable or invalid, the results will be similarly flawed. As AI transforms how we conduct business, a primary concern is the reliability of the data we use. Implementing procurement data standards can significantly enhance the reliability of our data, ensuring that AI-driven insights and decisions are based on accurate and trustworthy information.

The Air Force utilizes multiple contract writing systems across its installations, each with its own advantages and disadvantages. At Wright–Patterson Air Force Base, there is currently a transition from the outdated ConWrite system to the more modern CON-IT system. This transition has been challenging, but the capabilities of CON-IT far outweigh the difficulties. CON-IT places substantial emphasis on procurement data standards, recognizing that these standards directly impact the AI tools being developed. However, in addition to the challenges of transitioning between ConWrite and CON-IT, there is concern that future tools utilizing AI will face similar challenges. While these new AI tools are expected to save significant time in the future, the challenges of transition, implementation, and knowledge gaps are major concerns.

Implementing AI-related tools in government contracting also raises several ethical and legal concerns. One primary concern is bias in AI algorithms, which can lead to discriminatory outcomes. For example, if historical data used to train AI models reflects bias, the AI may perpetuate or even exacerbate existing inequalities. Ensuring fairness and transparency in AI decision-making processes is crucial to mitigate these risks. Additionally, privacy concerns arise due to the potential for AI systems to process sensitive personal data. Protecting this data and ensuring compliance with privacy regulations is essential. Moreover, there are questions regarding liability and accountability when AI makes decisions autonomously. Determining who is responsible for errors or harm caused by AI systems is a complex legal issue that requires careful consideration. Overall, addressing these ethical and legal concerns is essential to ensure the responsible and effective implementation of AI in government contracting.

The complexity and size of the DOD pose significant hurdles, including the integration of expensive technologies and the scarcity of qualified personnel with expertise in AI. The DOD must also contend with its historically arduous acquisition and procurement processes, which can be slow and inflexible compared to the dynamic nature of AI development. Lindsey Sheppard discussed how the DOD must overcome these obstacles in her 2020 Council on Foreign Relations article. She explained how recommendations have been made to "modernize procurement procedures for software, reform hiring authorities, and shorten security clearance processing time, actively invest in areas the private sector ignore–such as machine learning system test and evaluation–and be prepared to demonstrate to internal and external audiences a return on investment in AI infrastructure development" (Sheppard, 2020). Additionally, she maintained the DOD faces institutional roadblocks, such as a shortage of skilled employees in science, technology, engineering, and mathematics fields and challenges in attracting and retaining talent; the department's acquisition and procurement process needs to become more adaptable to leverage flexible contract vehicles like other transaction authorities effectively. Finally, she stated that security concerns cannot be overlooked. These AI systems can be vulnerable to cyberattacks, and the sensitive nature of government data makes security a top priority. Ensuring the security and integrity of AI systems in

government contracting is essential, but it is also a challenging endeavor that requires robust cybersecurity measures (Sheppard, 2020).

While the above concerns are considerable, one of the biggest concerns is the need for department-wide guidance to inform acquisitions, as highlighted in a report by the GAO. This report underscored the necessity for a unified approach to understanding mission needs, making a business case, and tailoring the contracting approach to AI technologies (Ludwigson, 2023). Additionally, the DOD's AI adoption strategy emphasizes the importance of accelerating the adoption of AI capabilities to maintain a competitive advantage, which requires an agile approach to development and application (Clark, 2023). Given people's natural resistance to change, having change leaders in appropriate roles can significantly accelerate this endeavor.

A. CHAPTER SUMMARY: OVERCOMING CHALLENGES AND EMBRACING TRANSFORMATION

While the challenges are significant, they are not insurmountable. Success hinges on a unified approach that includes meticulous strategic planning and a commitment to evolving the DOD's organizational culture. It necessitates a shift in mindset not only to incorporate advanced technology but also to fundamentally reimagine existing processes and policies. By doing so, the DOD can fully leverage AI's capabilities, leading to more efficient, effective, and forward-thinking mechanisms. This transformation, though complex, is essential for maintaining a competitive edge in an increasingly digital battlefield. The journey toward AI adoption in DOD contracting is as much about technological innovation as it is about cultural and procedural evolution, ensuring that the benefits of AI are fully realized in the service of national defense.

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VI. CONCLUSION

Our capstone project builds on the foundation of research conducted by Krebs (2020) and Skots (2019), whose insightful theses have illuminated the path for integrating AI into the DOD's procurement processes. By focusing on the development of requirement packages, we have explored the practical applications of AI, aiming to revolutionize the preliminary phases of government procurement. Our investigative journey led us to identify cutting-edge AI solutions that are not only theoretically sound but also practically applicable in today's fast-evolving technological landscape.

Our project's scope was ambitious yet meticulously defined; we sought not just to theorize but to implement AI in a way that tangibly benefits a contracting unit within the DOD. Skots's (2019) recommendation to focus on contracts of low cost and impact was particularly instrumental in guiding our research direction. This approach allowed us to concentrate on a segment of procurement that, while often overlooked, holds significant potential for efficiency gains through AI integration. Herein, we present a summary of our findings and recommendations.

A. FINDINGS AND RECOMMENDATIONS

Question 1: How can AI be leveraged to support the development of requirements packages for procurement initiatives under $250,000?

Finding 1: Through a comprehensive evaluation of current procedures and active engagement with key stakeholders, we have pinpointed AI solutions that are poised to optimize the requirements documentation development process. Our findings suggest that AI can play a crucial role in streamlining operations, reducing expenses, and alleviating the workload on staff. Moreover, the implementation of AI promises to enhance transparency and operational efficiency, which are critical components in the stewardship of public resources.

Recommendation 1: The practical implications of our research are profound. By harnessing the capabilities of AI, the DOD can expect to see a transformation in the way requirement packages are developed. The automation of routine tasks, the predictive

analysis of procurement trends, and the facilitation of decision-making processes are just a few examples of how AI can add value to the procurement ecosystem.

Question 2: How can the DOD leverage the adoption of artificial intelligence by the private sector to enhance procurement processes?

Finding 2: Our project has demonstrated that the adoption of AI in procurement is not a distant possibility but a present-day reality. The technology exists, the need is evident, and the benefits are clear. It is now up to the Air Force to take decisive steps towards embracing AI, thereby setting a precedent for innovation and efficiency in government contracting.

Recommendation 2: It is important to acknowledge that our project is but a steppingstone in the ongoing journey of technological advancement within the Air Force and the DOD. Continuous research, adaptation, and implementation are necessary to keep pace with the rapid development of AI and its application, not only to the procurement process but to all aspects of the DOD and public sectors.

B. CALL TO ACTION FOR AI INTEGRATION IN DOD PROCUREMENT PROCESSES

In light of our findings and recommendations, we urge stakeholders within the Department of Defense to take immediate and decisive action towards the integration of artificial intelligence in procurement processes. The demonstrated potential of AI to enhance efficiency, reduce costs, and improve transparency underscores the necessity for its adoption. By leveraging AI, the DOD can significantly transform its procurement landscape, setting a new standard for innovation and operational excellence. We call on decision-makers to prioritize the implementation of these AI solutions, ensuring that the department remains at the forefront of technological advancement and continues to uphold its commitment to effective stewardship of public resources.

C. CONCLUSION

Through a comprehensive evaluation of current procedures and active engagement with key stakeholders, we have pinpointed AI solutions that are poised to optimize the

requirements documentation development process. Our findings suggest that AI will play a crucial role in streamlining operations, reducing expenses, and alleviating the workload on staff. Moreover, the implementation of AI promises to enhance transparency and operational efficiency, which are critical components in the stewardship of public resources.

The practical implications of our research are profound. By harnessing the capabilities of AI, the DOD can expect to see a transformation in the way requirement packages are developed. The automation of routine tasks, the predictive analysis of procurement trends, and the facilitation of decision-making processes are just a few examples of how AI can add value to the procurement ecosystem.

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APPENDIX A. REQUIREMENTS DOCUMENT CHECKLIST

EXHIBIT A – Complete Requirements Package Checklist

*The Requiring Activity shall fill-out this checklist and forward it to your Contracting Office with a **complete** requirements package.*

1. Requirement Title: _____ **Purchase Request #** _____
Requiring Organization: _____ **Phone:** _____ **POC:** _____

2. Attachments Checklist. The requirements package shall include the following items/coordinations, as applicable. Send files electronically via CCaR, DEAMS or FRC to the Contracting Office. **Contract lead times do not begin until a complete package is submitted**. Highlights indicate whether requirements typically apply to a supply, service, all requirements or either, if applicable

- ☐ a. Requirements Package Checklist – *this sheet.*
- ☐ b. Requirements Approval Document (RAD) – *all service requirement over SAT – use XP RAD approval process.*
- ☐ c. SOO/SOW/Performance Work Statement (PWS) – *must be performance-based unless otherwise justified.*
- d. Technical Requirement Document (TRD) - *identifies requirement specifications.*
- ☐ e. Quality Assurance Surveillance Plan (QASP) – *identifies how Government will monitor performance, if applicable.*
- ☐ f. Independent Government Estimate (IGE) – *aides in budget forecasting for and helps determine the reasonableness of a contractor's proposal (estimated costs for the base plus all option years must be included).*
- ☐ g. AF Form 9 or other Funding Document - *must be provided for all procurements – one form 9 per requirement.*
  Note: *for task order requests against existing contracts – Form 9 must follow CLIN structure of basic contract.*
- ☐ h. Contracting Officer Representative (COR) Nomination – *COR must be trained prior to award.*
- ☐ i. Market Research - *identifies recommended and potential sources.* (**See page 2 for Market Research Summary**)
- ☐ j. Workload Estimates – *projects estimated workload to aid potential offerors develop adequate bid proposals, if required.*

Include the following items *only if determined necessary* for the individual requirement.

- ☐ k. Justification and Approval (J&A) Document (i.e., FOE, LSJ) – *required for most sole source, limited source or brand name reqs*
- ☐ l. Completed Security DD Form 254 (Industrial Security Office) - *if security requirements require SECRET or greater.*
- ☐ m.Ozone Depleting Statement - *documents that ozone depleting components are not involved – usually on funding document.*
- ☐ n. Use of Non-DoD Contracts - *documents use of non-DoD (including GSA) instrument is best procurement vehicle.*

The requiring activity is responsible for coordinating & documenting the following, if applicable.

- ☐ o. Base Supply - *must document if not available through normal base supply channels – usually done on funding document.*
- ☐ p. Civil Engineering (TRIRIGA) – *required for any modifications to real property.*
- ☐ q. Civil Engineering Space Utilization Office – *potential need for licensing agreement with contractor when providing office space.*
- ☐ r. Manpower - *requiring activity must have manpower authorization before requesting contractor employees.*
- ☐ s. Audio Visual – *may need to check with 96 CS if purchasing a new CODEX for VTC.*
- ☐ t. Safety Office – *required on any PWS with work on the installation.*
- ☐ u. Environmental Management Office – *required on any PWS with work on the installation.*
- ☐ v. Anti-Terrorism Office – *required on any PWS with work on the installation.*
- ☐ w.Government Furnished Property Office – *required if Government anticipates providing Gov't owned property or equipment.*
- ☐ x. Communications Squadron - *required if involves base network, servers, and/or procurement of IT services & supplies.*
- ☐ y. Software Licensing Manager - *required when obtaining software licenses.*

3. Contract Invoicing & Payment (DFAR Part 232.7)

- ☐ Identify DoDAAC to be used by the contractor when submitting invoices via WAWF: _____
- ☐ Ensure inspectors/acceptors for the DoDAAC listed above are identified and registered in WAWF.

4. Contract Type (FAR Part 16.2)

Default contract type is **Firm Fixed Price**. Objection? Yes ☐ or No ☐
Any objection must be discussed/justified with the Contracting Officer when submitting request.

5. Performance Based Services Acquisition (PBSA). IAW AFI 63-138 & FAR Part 37, all services requirements over the Simplified Acquisition Threshold ($250K) per year must be performance-based to the maximum extent possible.

Default is PBSA. Objection? Yes ☐ or No ☐

Any objection must be discussed/justified with the Contracting Officer when submitting request. The requiring activity is required to nominate individuals who will serve as Contracting Officer Representatives (CORs) who will monitor contractor performance and submit reports to the Contracting Officer on a scheduled basis. There are specific training requirements for CORs prior to award.

Contracting Officer Representative: _____ COR Trained? Yes ☐ or No ☐
Contracting Officer Representative: _____ COR Trained? Yes ☐ or No ☐

6. Public Disclosure of Information (FAR Part 24.2)

Does any part of the requirements package (PWS/DD254/etc.) contain information that, if released, would be harmful to the government? Yes ☐ or No ☐

7. Inherently Government Functions (FAR Part 7.5)

Does any part of this requirement include inherently governmental functions? Yes ☐ or No ☐

8. Organizational Conflict of Interest (OCI) (FAR Part 9.5)

Does any part of this requirement include an OCI? Yes ☐ or No ☐

9. Consolidation of Previous Efforts. (FAR Part 19.2)

If this requirement is a consolidation of previous efforts, the requiring activity shall indicate the previous Contract Number(s). Otherwise, enter N/A. _____

10. Personal Services (FAR Part 37.104)

Does any part of this requirement involve personal services as defined in FAR Part 37? Yes ☐ or No ☐

11. Contractor Performance Assessment Reporting System (CPARS). (FAR Part 9.104)

If the value of this requirement exceeds $1M, it is likely that a CPARS report must be completed on an annual basis. The requiring activity shall identify the individuals who will serve as the Reviewing Official, Assessing Official and Assessing Official Representative who will complete this report.

Otherwise, enter N/A. _____

12. Market Research Summary (FAR Part 10 & your completed Market Research document)
- Market Research Document is complete/signed and provided? Yes ☐ or No ☐
- Requirement is Commercial? Yes ☐ or No ☐
- Requirement is under a Mandatory use Program? Yes ☐ or No ☐

DAF Launchpad - Home (dps.mil)
NAICS _____ (North American Industry Classification System (NAICS) U.S. Census Bureau)
PSC/FSC_____ (Product and Service Code Manual | Acquisition.GOV)

Did your MR support a Small Business Set Aside? Yes ☐ or No ☐
- If yes, Have you identified at least Three SB vendors on the MR for your NAICS Yes ☐ or No ☐
- Have you atch'd Reps & Certs for the vendors as a SB under your NAICS Yes ☐ or No ☐

-- Use SAM.gov find CAGE code for the MR document, download Reps and Certs for each.
Did your MR support dissolving the SB set-aside? Yes ☐ or No ☐

Does the SOO/TRP/Technical Requirements Document (TRD), or SOW/PWS identify required standards such as TAA compliance, NIAP compliance, other (list specific required guidance for inclusion into the Solicitation
Is there a list of APPROVED Products by regulation/guidance? Yes ☐ or No ☐ Attach to MR doc
Is your required item an "or equal" requirement? Yes ☐ or No ☐
-- if Yes, are the salient characteristics fully documented in the TRD? Yes ☐ or No ☐

Restricting Competition Market Research
Is your Product/Service a Brand Name or Sole Source? Yes ☐ or No ☐
Have you completed the J&A/LSJ/FOE, matching your Acq strategy DAFFARS Templates by FAR Part --(FAR 8-GSA, FAR 13- Open Market, or FAR 16 – IDIQ such as NASA SEWP)
Is the J&A/LSJ/FOE supported w/written guidance & matcing the TRD/SOO/SOW/PWS Yes ☐ or No ☐
Have you purchased this item/service previously? Yes ☐ or No ☐
-- Were any prior awards (Two within 3 Yrs) identified on the Market Research doc Yes ☐ or No ☐

13.Billing DoDAAC _____
Billing address _____
(must correspond the DoDAAC's info according to the DoDAAC's Database https://dodaac.cce.af.mil/Search2.aspx)
Billing POC _____
(person who has the right to accept invoices in WAWF under the Billing DoDAAC)
Shipping DoDAAC _____
Shipping address _____
(must correspond the DoDAAC's info according to the DoDAAC's Database https://dodaac.cce.af.mil/Search2.aspx)

Additional Customer Input:

By signing below, the Requiring Activity representative declares that the checklist has been completed in an accurate manner and required coordination has taken place and AFTC is authorized to pursue the requirement request.

Signature and Date:	

APPENDIX B. FILE ITEM CHECKLIST

FILE ITEM CHECKLIST

Buyer/CO/PM:		**BOA and Order Number:**	
Contract Value:		**Service or Supply:**	
Contract Type:		**If Service, Sev or Non-Sev:**	
GFP, CFE, Tooling:		**If Service, SCLS Apply?**	
> 70% Subcontracted:		**CDRL:**	
Options:		**DCAA/DCMA:**	
Funding Yr/Color:			

A complete Requirements Package is required to be submitted to Contracting prior to release of the Request for Proposal. It must include, at minimum:

Requirements Document (i.e., SOW/PWS and CDRLs (as applicable))
Funding (Must have one: Certified PR, Planning PR, MIPR, Availability of Funds Memo, or Expectation of Funds Memo)
PM Notes
Market Research Memo

For Services, it must also include:

QASP or PBSA Non-Applicability Memo
Non-Personal Services Memo
Non-Inherently Governmental Functions Memo

Tab 1a.1 ☐ **Statement of Work(s)/Performance Work Statement (SOW(s)/PWS(s)**
Tab 1a.2 ☐ **Certified Purchase Request**
Tab 1a.3 ☐ **Availability of Funds Memo**
Tab 1a.4 ☐ **Requirements Approval Document (RAD)**
Tab 1a.5 ☐ **Option Questions for PM and PM Response**
Tab 1a.6 ☐ **Contractor Notice of Intent to Exercise Option**
Tab 1b ☐ **New Start Validation/ New Start Memo**
Tab 1d ☐ **Modification Authority MFR**
Tab 1d ☐ **PM Notes (AKA Buyer Notes/RFP Questionnaire)**
Tab 2a ☐ **Business Strategy Review**
Tab 2b ☐ **Life Cycle Management Plan**
Tab 2c ☐ **Quality Assurance Surveillance Plan (QASP)**
Tab 2c ☐ **Memo stating DCMA is COR and MOA is QASP**
Tab 2e ☐ **Request for Pricing Assistance**
Tab 2e ☐ **Request for Pricing Assistance Waiver**
Tab 3 ☐ **Market Research by PM**
Tab 4 ☐ **DD2579 – Small Business Coordination**
Tab 6 ☐ **J&A D&F**
Tab 8e ☐ **D&F for CPFF order or CR Line Item**

Tab 8f ☐ **D&F for T&M** (RC-135 O&A contract)
Tab 8h ☐ **D&F for Inclusion of Options**
Tab 8i ☐ **D&F for Exercise of Options**
Tab 8l ☐ **Non-Personal Services Memo Certified by PM**
Tab 8n ☐ **Waiver of Performance Based Procedures Memo/Non-PBSA Approval**
Tab 8r.1 ☐ **Excessive Pass Through**
Tab 8r.2 ☐ **EVMS Class Deviation**
Tab 8r.3 ☐ **Service Contract Labor Standards Waiver**
Tab 8r.4 ☐ **Commercial Item Determination (CID)**
Tab 9 ☐ **Contract Data Requirements List (CDRLs)**
Tab 12 ☐ **Request for Proposal**
Tab 17 ☐ **Contractor's Proposal/Correspondence/Fact-Finding**
Tab 17 ☐ **Confirmation of Negotiations**
Tab 19 ☐ **Equal Employment Opportunity (EEO) Pre-Award Compliance**
Tab 26 ☐ **Technical Evaluation**
Tab 28 ☐ **Subcontracting Plan**
Tab 32 ☐ **FAPIIS**
Tab 32 ☐ **SAM**
Tab 32 ☐ **Representation and Certifications from SAM**
Tab 32 ☐ **NIST Assessment**
Tab 34 ☐ **GFP Memo**
Tab 34 ☐ **GFP Compliance Checklist**
Tab 34 ☐ **GFP Class Deviation**
Tab 39 ☐ **Overtime Memo**
Tab 45 ☐ **Field Analyst and/or ACO Pricing Comments**
Tab 46 ☐ **Audit Reports/Recommendations**
Tab 48 ☐ **Certificate of Current Cost or Pricing**
Tab 50 ☐ **PPNM with Attachments (spreadsheets, WGL, rates by year)**
Tab 50 ☐ **PNM with Attachments (spreadsheets, WGL, rates by year)**
Tab 50 ☐ **Fact-Finding Correspondence (if available)**
Tab 52 ☐ **PCO Memo**
Tab 53 ☐ **DD254** (if applicable)
Tab 56 ☐ **Legal Review and resolution of all comments**
Tab 57a ☐ **ConWrite Buy Plan and Milestones**
Tab 57b ☐ **FPDS and Validation**
Tab 57c ☐ **ConWrite Check for Errors**
Tab 58a ☐ **Letter/Email Transmitting Documents for Contractor Signature**
Tab 58b ☐ **Misc. Correspondence regarding Exceptions to Document** (as applicable)
Tab 58c ☐ **Letter/Email Evidencing Contractor's Execution of Document**
Tab 58d ☐ **Email Evidencing Award Distribution**
Tab 58e ☐ **Distribution Checklist**
Tab 59 ☐ **Business Clearance Form**
Tab 59 ☐ **Contract Clearance Form**

Tab 59 ☐ **Range Request MFR** (if applicable)
Tab 59 ☐ **Additional Negotiation Range Request MFR** (if applicable)
Tab 59 ☐ **All PCO Review Comments and Responses**
Tab 59 ☐ **All CRA Review Comments and Responses**
Tab 62 ☐ **Contract Document**
Tab 69 ☐ **COR Memo/Documentation**
Tab 73 ☐ **Wage Determinations**

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APPENDIX C. STATEMENT OF WORK TEMPLATE

(From AFLCMC/PZIBB)

Statement of Work (template)

For

Please put item name here that you want contracting to buy

I. ***Background:***

Please explain in approximately one paragraph which organization you are from, what product you need, and why it is important that your organization receives it.

II. ***Minimum Technical Requirements:***

Please list all the factors that will be used to evaluate this requirement. These should include the minimum threshold requirements and objective requirements when needed. Please note that: This part should be a list of all **needed** and **important** characteristics that your item **must** have. Everything on this list will be used by contracting and by the technical evaluator when evaluating proposals for your requirement.

III. ***Training****:*

Please state if you require the contractor to provide training to use the product. **N/A if this section does not apply to your requirement.**

IV. ***Installation****:*

Please state if you require the contractor to install the product. **N/A if this section does not apply to your requirement.**

V. ***Delivery:***

Please state the delivery address, including DODAAC, you would like this product delivered to.

VI. ***Lead Time:***

Please state the number of days after award that your organization will allow the contractor to fulfill the requirement. If you do not have an absolute deadline date, please state "We require this item by the earliest possible delivery date."

VII. Warranty:

Please include if you would like a warranty on the product. N/A if this section does not apply to your requirement.

VIII. Delivery Procedures – Commercial Vehicles:

This is standard language that must be included in all SOWs

a. All vehicles larger than a large pick-up truck are required to be inspected by the Wright-
Patterson Air Force Base Commercial Vehicle Delivery Gate (CVDG) prior to entering the installation. Vehicles to be inspected include, but are not limited to, the following:

1. Step van/panel truck
2. Tractor/trailer, box and flatbed containing cargo
3. Tanker trucks
4. Box trucks
5. Tour buses
6. Garbage/recycled waste trucks
7. Concrete trucks/mixers, dump trucks
8. Cranes, recreational vehicles, petroleum tanker

This inspection will be conducted at Gate 26A located off State Route 235.

b. The following are exemptions to vehicles utilizing the CVDG:

1. If the vehicle has the product inside (concrete and asphalt trucks) and timely delivery is necessary due to product deterioration it does not need to enter the CVDG. To bypass the CVDG, the contractor shall submit a list containing drivers' names, social security numbers and the state in which the driver's license is held for those drivers who will be entering the base. This shall be accomplished 24 hours prior to requested entry time. If entry is requested on Monday, this list must be submitted by Friday at 1630 hours. All lists shall be submitted to the 88th ABW/CE Directorate contract inspector. The only gates that may be used under this exemption shall be 15A, 26A, 38A, and gate 1B. If the driver's name is not on the list, he/she will not be allowed access to the installation through these gates and the base will not assume liability for denied access.

2. If a delivery vehicle must exit, and then re-enter the base to complete its route, the vehicle shall be resealed upon exiting the base. After initially passing through the commercial vehicle delivery gate, trucks shall be resealed at Gates 15A, 38A and 22B. The resealing of the trucks will allow them to continue to any other area of the installation (Areas A, B,

or Kittyhawk) without reprocessing through the CVDG. To receive resealing assistance, the drivers shall physically stop at one of the three authorized gates and request the installation entry controller to reseal their truck and provide the next location of their delivery. The controller will reseal the truck and give the delivery driver a pre-clearance form. The driver shall present the pre-clearance form to the entry controller at the next point of installation entry. This reentry can be through any base gate.

Vehicles may be subject to an inspection at any of installation entry control points during a directed random antiterrorism measure (RAM.) Any commercial vehicle, regardless of size, can be directed to the CVDG at the discretion of the installation entry controller.

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