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Buyer and Seller Perceptions of Integrating Artificial Intelligence into the Sole Source Contract Negotiations Process for Major Weapons Systems Acquisitions

December 2024

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Prepared for the Naval Postgraduate School, Monterey, CA 93943

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ABSTRACT

The emergence of artificial intelligence (AI) offers several opportunities that can assist the Department of Defense (DoD) in alleviating bottlenecks in the acquisition process. Buyers and sellers are arguably in the best positions to share insights on the applications of AI to modernize the acquisition process. This qualitative study explores potential opportunities where AI can be applied specifically to the 12-step sole source contract negotiations process aspect of defense acquisitions. The buyer organization (Eglin Air Force Base) and seller organization (ProPricer) provided feedback for this study to not only help explore where AI can be applied, but the willingness to adopt AI into their professions. Exploring these perceptions into the development and adoption of AI in the acquisitions and contracting process will contribute to furthering the academic conversation of AI implementation in the DoD, while also providing first-hand insights for policymakers, procurement officials, and defense contractors seeking to improve acquisition processes through technology solutions.

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and their two dogs, Benjamina and Rico, while their two cats, Theo and Tommy, stay home.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADA(A)	Assistant Secretary of Defense for Acquisition
AFLCMC	Air Force Life Cycle Management Center
AGI	Artificial General Intelligence
AI	Artificial Intelligence
CDAO	Chief Digital and Artificial Intelligence Office
DFARS	Defense Federal Acquisition Regulation Supplement
DL	Deep Learning
DoD	Department of Defense
FAR	Federal Acquisition Regulation
FY	Fiscal Year
GAO	Government Accountability Office
LLM	Large Language Model
ML	Machine Learning
NPS	Naval Postgraduate School
RDT&E	Research, Development, Test, and Evaluation

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I. INTRODUCTION

The Department of Defense (DoD) has been scrutinized for its cumbersome and complicated process for acquiring major weapon systems. The outcome is often a contract that falls months or years behind schedule and results in a product that exceeds original cost estimates (Government Accountability Office [GAO], 2023). Service heads have searched for a solution to speed up the process while ensuring procurement risks remain within an acceptable range (Thornberry, 2024). Accordingly, integrating artificial intelligence (AI) into acquisition practices offers a viable solution due to its potential to modernize cost analysis and contract negotiation process of major weapon systems.

The rapid evolution of AI easily outpaces the DoD's ability to adopt AI, provide governance and policy, and train acquisition professionals in AI's capabilities and ethical uses (Department of Defense [DoD], 2023). Understanding how AI can be effectively harnessed in these contexts and comprehending the buyer and seller perspectives could affect AI's successful implementation. Buyers and sellers are the primary end users of future AI-integrated acquisition systems, and understanding where they believe AI fits into the process will help ensure the integration effort captures the full capabilities and intent of such a program. Despite receiving much praise for the ability of AI to improve efficiency and supplement human data input and decision processes (West & Allen, 2018), there are also concerns that AI could result in catastrophic outcomes for society. The Center for AI Safety (n.d.) offered a concise warning via the following statement on AI risk: "Mitigating the risk of extinction from AI should be a global priority alongside other societal-scale risks such as pandemics and nuclear war." Despite the dire warning, Sam Altman, chief executive officer of OpenAI, which developed the dominant ChatGPT tool, testified to Congress that such an outcome could be mitigated with proper regulation at a national and global level (Zorthian, 2023). Still, there is a lack of research focusing on buyer and seller perceptions of AI within major weapon system acquisition structures. This knowledge gap poses a noteworthy barrier to realizing the applicability, acceptance, and confidence of AI to streamline and expedite the acquisition process.

Major weapon system acquisitions come with exceptional challenges due to system complexity, budgetary and regulatory constraints, and the multi-tiered process of research, development, test and evaluation (RDT&E; Baldwin & Cook, 2015). Acquisition professionals, both buyers and sellers, must accurately conduct cost analysis throughout the entire process, from contract negotiation to product life cycle and sustainment. The DoD relies on manual cost analysis by sifting through hundreds or thousands of pages of documents, historical contracts, and market research data to reach a cost estimate; this task not only consumes an immense amount of time but also requires an innate understanding of the process garnered through years of experience in the field (Vernez & Massey, 2009). Existing research has proven the capacity of AI to streamline mass data, offer detailed estimates, improve accuracy and predictive outcomes, and support decision-making, offering clear advantages over traditional human-dependent methods (Hughes et al., 2024). However, the lack of specific insights into how buyers and sellers perceive integrating AI into cost analysis and negotiations presents a notable obstacle to gaining the advantage of speed and accuracy.

Current research highlights obvious problems of a slow and constrained acquisition process as well as assessments of whether the DoD is even structured to acquire AI systems. Other research seeks AI as a solution to reducing fraud and increasing flexibility of DoD processes. A gap exists in understanding buyer and seller perceptions regarding AI integration in cost analysis and contract negotiations for major weapon systems. The warfighter demands cutting-edge technology that offers a tactical battlefield advantage—a reality offered only through a deliberate, yet currently slow and cumbersome, process between buyers and sellers.

A. PURPOSE

This qualitative study aims to explore buyer and seller perceptions on the feasibility and efficacy of integrating AI into the 12-step sole source process for major weapon systems acquisitions. AI rises above traditional software by employing a range of advanced algorithms, most notably machine learning (ML) and its subfield, deep learning (DL; SAS, n.d.). ML empowers AI systems to learn and improve independently through exposure to massive datasets, of which the acquisition field has decades' worth.

Analyzing patterns and relationships within these data allows the system to make predictions or decisions without requiring explicit programming for each scenario (International Organization for Standardization [ISO], n.d.). The transformative nature of AI, with its potential to act as an autonomous copilot or automate complex tasks, creates a significant knowledge gap for acquisition specialists accustomed to historical methods of cost and price analysis. This very gap, however, presents an opportunity to redefine traditional procurement practices to realize an increase in speed, efficiency, and effectiveness required of an agile military.

Buyers and sellers hold the greatest potential to leverage AI and modernize the sole source acquisition process. Their outlooks, concerns, and openness to AI help define the role of AI as it relates to DoD acquisitions. Addressing this knowledge gap furthers the conversation of AI implementation in the DoD and offers firsthand insights for policy-makers, procurement officials, and defense contractors seeking to improve acquisition processes through technology solutions.

B. RESEARCH QUESTIONS

To appropriately assess how AI could fit in the sole-source acquisition process for major weapon systems, it is important to acknowledge that contracts exist between two parties, buyers and sellers, thus the research team pointedly address each side individually before determining areas of shared sentiment and differences.

1. Primary Research Questions

(1) How do buyers perceive the potential applications of AI in the 12-Step Sole Source Process of Contracting for major weapon systems acquisitions?

(2) How do sellers perceive the potential applications of AI in the 12-Step Sole Source Process of Contracting for major weapon systems acquisitions?

The current state of contracting follows long-established guidelines and industry standards. To successfully implement an emerging and disruptive technology like AI requires an intimate understanding of end users' willingness to adopt it, and where they perceive its greatest value.

2. Secondary Research Question

(1) What other areas of concern should the DoD consider before implementing AI in contract negotiations?

C. SCOPE

This research first entails a comprehensive review of existing academic studies, government reports, and industry publications on AI applications in acquisition to realize current discussions around DoD and industry adaptations of AI. Secondly, we explore the attitudes and perceptions of government buyers and industry sellers through structured interviews. The interviews allowed perspective analysis of diverse stakeholders involved in the procurement chain, shedding light on the potential benefits, challenges, and implications associated with incorporating AI technology into cost analysis and contract negotiations within the DoD. These insights contribute to a more comprehensive understanding of how AI can be effectively leveraged within the realm of major weapon systems acquisitions.

D. ORGANIZATION OF THE STUDY

Chapter II, "Literature Review," offers basic definitions and functions of AI systems. In addition, it outlines current AI technology being utilized and explored within DoD acquisition offices. Finally, it provides a snapshot of current methods of cost and price analysis. It works to provide an understanding of AI, the acquisition system, cost and price analysis, and challenges in the government contracting realm.

Chapter III, "Methodology," provides a synopsis of the organizations interviewed, the questions posed, and limitations and challenges that occurred during the process. It provides readers with an understanding of how the research team selected organizations to interview, how responses to questions were gathered, and challenges that create gaps in the research.

Chapter IV, "Results," outlines the interviewee answers to the question prompts. This chapter compares the answers between buyers and sellers and analyzes similarities that can be explored when implementing AI into contracting. In addition, it compares any

differences between the buyers' and sellers' perspectives to examine the gaps between understanding how AI can be implemented across the spectrum of contracting.

Chapter V, "Conclusion," combines these ideas and provides suggestions for how AI can be implemented in the 12-Step Sole Source Contracting Process. Future research opportunities are also explored based on the limitations and challenges the research team experienced while collecting data to help generate more comprehensive information in the future when exploring how AI can further benefit DoD contracting and the acquisition system overall.

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II. LITERATURE REVIEW

For the past few years, AI has been at the forefront of many conversations on how it can impact the workforce, technology, and various other industries. The DoD's acquisition, procurement, and contracting process is no exception to the conversation. This section reviews the existing dialogue on how AI is applied to the acquisitions and contracting process in both the federal and private sectors and the challenges that could arise from implementing AI in the acquisition workforce.

A. DEFINING ARTIFICIAL INTELLIGENCE

AI is a type of machine that is utilized to mimic human intelligence, problem-solving skills, and learning abilities (IBM, 2023). AI theory dates to 1950, when computer scientist Alan Turing published *Computing Machinery and Intelligence,* which introduced the idea of ML (Turing, 1950). It wasn't until 1997 that AI garnered increased public interest when IBM developed Deep Blue, an AI computer that successfully defeated world chess champion Garry Kasparov in a six-game championship series (Gent, 2024). Gent further highlighted it wasn't until 2022 that OpenAI took the world by storm with the release of ChatGPT, which allowed the public to interact firsthand with AI. The result, a flood of AI, carefully integrated into nearly all aspects of everyday life. Discussions on the emerging opportunities in AI have also grown exponentially. In 2018, the Government Accountability Office (GAO) outlined various opportunities for the government to procure and utilize in various sectors, including cybersecurity, automated vehicles, and financial services (GAO, 2018). Since this report, technological advancements in AI have skyrocketed, notably through software programs such as ChatGPT 3 and ChatGPT 4 from the company OpenAI. Since the launch of ChatGPT 3, many companies launched their own versions of AI, including big players like Google, Apple, Samsung, and Microsoft. It is now cleverly integrated into online search engines, phone and computer applications, and entertainment platforms. Aside from the handy assistance provided by the AI integrated into common electronic devices, AI is revolutionizing the future of elite professions as well. The medical community has integrated AI to automate administrative tasks otherwise accomplished by physicians and

is even used for patient diagnosis and imaging analysis (Ellis, 2024). The American Bar Association indicated growing numbers of law firms capitalized on the ability of AI to quickly review trial documents, scour decades of case law, and provide feedback and error detection on written correspondence (American Bar Association, 2017). The Defense Advanced Research Projects Agency (2024), with the U.S. Air Force, developed and successfully flew an AI-piloted F-16 fighter jet in a simulated dogfight against a manned F-16. Due to the rapid development of generative AI, the government established the Chief Digital and Artificial Intelligence Office in 2022 to help manage AI Government integration. In 2023, President Joseph Biden released Executive Order 14110, *Safe, Secure, and Trustworthy Development and Use of AI,* and the DoD, along with various other federal agencies, issued guidance and strategy in the procurement of AI (The White House, 2023). These examples demonstrate that AI is here to stay; leveraging its capabilities in suitable industries will become the norm.

B. HOW DOES AI WORK?

AI refers to an overarching system of ML that utilizes neural networking to analyze sets that then generate varying types of information. AI is often referred to as ML, which further breaks down into other subsets such as DL and large language models (LLMs), as shown in Figure 1. For simplicity, the research team focused on defining how AI works through ML, DL systems, and LLMs.

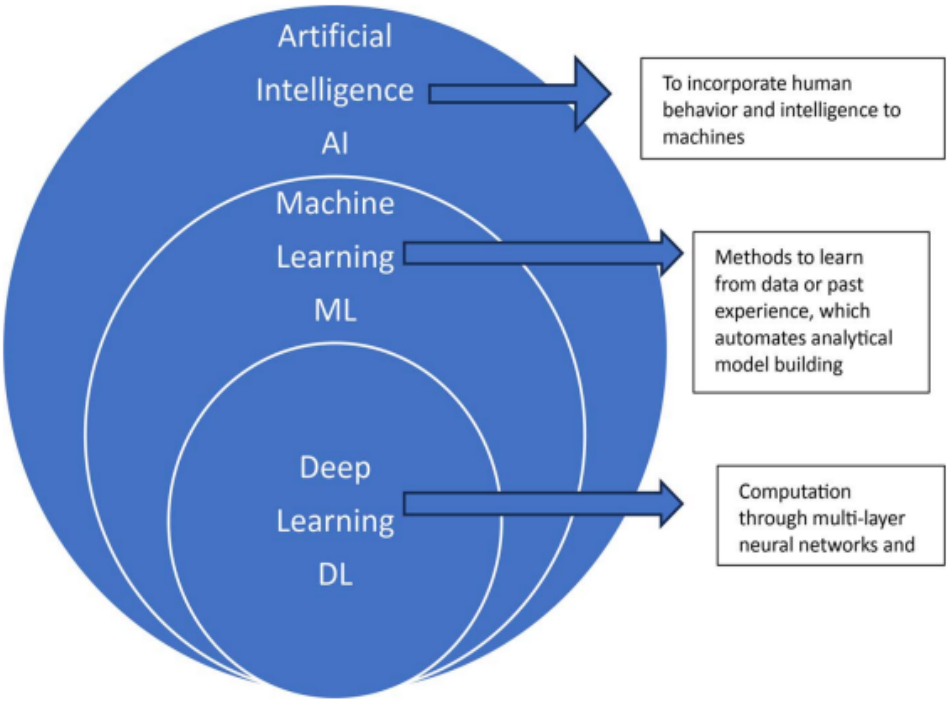

Figure 1. Artificial Intelligence Diagram. Source: Richie (2024).

C. SUBSETS OF AI

1. Machine Learning (ML)

ML represents a subset of the AI system that is trained to learn from sets of data to improve performance, and the ML system is then used to "produce predicted outcomes given new sets of data" (Johnson, 2021, p. 322). IBM (2023) stated that ML systems use varying data sets to identify patterns and relationships and then use these patterns to make predictions. For example, companies such as Amazon use ML systems to recommend products to customers based on their historical purchases and browsing history.

2. Deep Learning (DL)

Deep Learning (DL) is a subset of ML. The difference between ML and DL is the algorithms each subset uses to process data and learn (IBM, 2023). DL systems require larger data sets to develop what is called a "neural network" to analyze complex patterns and relationships in data (Liu et al., 2020). This neural network processes provided data and analyzes the data in a similar way to humans, which allows for intricate layers of interpretations or solutions based on the quantity of data provided (Richie, 2024). DL

models can take the data provided to learn and improve over time, which allows them to manage very complex problems.

AI learning is defined by three categories: supervised learning, unsupervised learning, and reinforcement learning (Allen, 2020; Kumar, 2020; Landgraf, 2021). *Supervised learning* is where models are offered labeled data sets, the input, and trained on correct desired results, the output. The model is trained until it can repeatedly assess an input and correctly correlate an output on its own (Allen, 2020; Kumar; 2020; Landgraf, 2021). Supervised learning requires a significant amount of detailed and categorized datasets, which can be costly and time-consuming (Allen, 2020; Landgraf, 2021). Meanwhile, *unsupervised learning* is self-organized learning where the data are not labeled, but the AI analyzes patterns or features to look for "hidden features" and "cluster the data in a way that makes sense" (Kumar, 2020). *Reinforcement learning* is neither supervised nor unsupervised learning; instead, AI algorithms learn to "react to environment on their own" (Kumar, 2020). Reinforcement learning can be utilized for products such as video games or simulated physics engines, where the model reacts to the environment and feedback provided after executing defined criteria (Allen, 2020; Kumar; 2020; Langraf, 2021).

3. Large Language Models

LLMs are also a subset of AI, focusing on producing human-like language for AI models. LLMs are trained to predict the next element in a sentence given the beginning of a sentence to simulate human language (Luitse & Denkena, 2021). The most well-known example currently is ChatGPT. LLMs often draw from neural networks that make AI increasingly indistinguishable from human-generated responses.

D. AI IN FEDERAL ACQUISITIONS

Applications of AI in the federal acquisitions process, namely the DoD, are still being widely explored. In June 2023, the DoD published *Data, Analytics, and Artificial Intelligence Adoption Strategy* outlining the necessity to explore the possibilities in which AI can be applied, but also to also develop an overarching "AI ecosystem" that will entail development and deployment of AI-enabled systems (DoD, 2023, p. 12). This strategy

includes exploring methods of acquiring AI-enabled systems to enhance operations and examining how AI-enabled systems can facilitate the defense acquisitions process. Ongoing challenges in the acquisition process, such as the speed of procurement, applications to the Joint Capabilities Integration and Development System (JCIDS) process, and opportunities in various aspects of contracting are arenas that can benefit from the application of AI (Walker et al., 2006). The independent advisor company, MITRE, outlined numerous possibilities for the utilization of AI in federal acquisitions. MITRE suggested AI could enhance the process of drafting government requests for information (RFIs), industry responses to RFIs, market research assessments, analysis of alternatives, and management plans. AI can also be used to assess program risks (Barlow et al., 2024). Other suggested opportunities include leveraging AI to examine past performance data on contractors and assessing responsibility determinations (Combs, 2024).

E. CONTRACTING CONSIDERATIONS

There are numerous opportunities under consideration, particularly by the USAF, that examine how AI can impact contracting and the overall contracting process. Currently, the USAF is utilizing the Contracting–Information Technology (CON-IT) system, which is a low-code software intended to standardize contract writing and reduce costs for the USAF (Sarmiento & Owen, 2022). However, the opportunities for AI to enhance the CON-IT technology and the acquisition of AI into contracting systems can demonstrate further benefits for the USAF through the 12-step process. Some suggestions include using AI to create comprehensive builder libraries, checking proposals for compliance, generating proposals for industry, scoring proposals, and estimating costs (Barlow et al., 2024; Trenchfield, 2022). The DoD's Chief Digital and Artificial Intelligence Office (CDAO) began a project to develop AI applications to assist with writing contracts and other aspects of the acquisition process through Tradewinds, a funding and development initiative focused on AI, ML, data analytics, and related digital tools (Cooper, 2023). Through CDAO's Tradewinds, the DoD has contracted with Trenchant Analytics to design a system that can write user requirements, solicitations,

and other transaction processes to create accurate and consistent documents (Bublak, 2024).

F. CHALLENGES

With the extensive implementation of AI being relatively new for the government and various businesses, it is not surprising that challenges such as proper data management and information security persist. The GAO (2023) identified that many federal agencies need to create refined guidance internal to their organizations and regulations that are in line with federal laws and more clearly define how AI is being used. The GAO (2023) also warned that incomplete or inaccurate data could not only inhibit the effective use of AI but could negatively impact DoD efforts. Thus, inadequately addressing the challenges and the risks that come with the implementation and utilization of AI could be detrimental to operations and cybersecurity management.

1. Risks

There are numerous risks that can come with utilizing AI in any process. Decisions made by AI must be supported and substantiated. Humans, for the time being, must be the final decision-maker in any suggestions or outputs provided by AI. An article in the *Harvard Business Review* suggested that for AI to be reliable and safe, organizations must first create a culture of high morality and sound ethics, ensure input data is cleansed and free of biases, validate models before full implementation to make sure there are no unintended results, attempt to train AI on human values, and ensure there is human oversight (McKendrick & Thurai, 2022).

2. Data Management

AI is only as good as the data that has been put into it (McKendrick & Thurai, 2022). AI requires a significant amount of data to be effective, and that data must be relevant, of high quality, and accessible (Johnson, 2021). As more AI programs are launched and data becomes more readily available, managing and ensuring data is accurate, relevant, and up to date will become even more critical. Poor data management will cause AI bias in which it will release inaccurate or incorrect information that can

significantly impact whatever industry AI is utilized in (Ahmadi & Bullock, 2023; Barlow et al., 2024).

a. AI Bias

AI bias refers to the systematic errors that can occur in AI and ML outputs. Biases can come from the type of data that are used to train AI, the design of the algorithms in AI technology, or the objectives set by the developers (Barlow et al., 2024; Rubenstein, 2021). Biases affect AI in the same way that biases cause humans to show favoritism towards certain solutions or to develop inaccurate predictions; this can be detrimental and costly to the government during the acquisition process. Biases in the acquisition process could impact evaluations and requirements applications that may impact which business contracts could be awarded. Risk mitigation methods to avoid this include using standardized data formats, implementing high-quality labeling and data curation, and creating data-sharing policies and regulations within the government.

b. AI Adoption

AI can present a big change to various organizations, and with change can come resistance in the workforce, especially if workers feel their job is at risk. Building a business culture willing to adopt new technology and integrating it into an organization's processes can be a significant challenge; developing an adoption strategy can be crucial to a successful process change. It is recommended by MITRE that to effectively integrate AI into a business, training employees and clearly identifying what tasks AI will absorb or assist with is critical to successful AI adoption (Barlow et al., 2024). Clarifying roles and preempting employee concerns can help address misconceptions that AI will replace humans; humans will still be vital to the business, as AI is simply there to enhance work outputs.

c. Adversaries

A unique challenge to the DoD is the role of adversaries in the adoption and application of AI. Adversaries are developing their own AI technologies, and the DoD must keep up with adversaries' AI capabilities (Sayler, 2020). In attrition, AI is software that is susceptible to cyberattacks and developing a system that is adaptable and resilient

to changing threats is vital to DoD interests (Johnson, 2021; Mun & Housel, 2021). As AI increasingly becomes part of our daily lives, the number of "hackable things" will also increase, given that AI is software based (Sayler, 2020, p. 34). Up to this point, AI has been primarily developed collaboratively in the private sector, meaning data currently used are shared across a multitude of channels, making the data accessible to anyone, including state and nonstate actors (Sayler, 2020). The Congressional Research Service, in a report to Congress, stressed the need to examine and develop security standards, especially regarding classified government information that might be used in AI technology (Sayler, 2020).

G. PRICE ANALYSIS

According to the Federal Acquisition Regulation (FAR), "Price analysis is the process of examining and evaluating a proposed price without evaluating its separate cost elements and proposed profit" (FAR 15.404, 2024). Additionally,

> The contracting officer is responsible for evaluating the reasonableness of the prices offered. The analytical techniques and procedures described in this subsection may be used, singly or in combination with others, to ensure that the final price is fair and reasonable. The complexity and circumstances of each acquisition should determine the level of detail of the analysis required. (FAR 15.404, 2024)

The methods and procedures vary based on the complexity and specifics of each acquisition, as "the Government may use various price analysis techniques and procedures to ensure a fair and reasonable price" (FAR 15.404, 2024).

H. COST ANALYSIS

According to the FAR,

> Cost analysis is the review and evaluation of any separate cost elements and profit or fee in an offeror's or contractor's proposal, as needed to determine a fair and reasonable price or to determine cost realism, and the application of judgment to determine how well the proposed costs represent what the cost of the contract should be, assuming reasonable economy and efficiency. (FAR 15.404, 2024)

Additionally, "The Government may use various cost analysis techniques and procedures to ensure a fair and reasonable price, given the circumstances of the acquisition" (FAR 15.404, 2024).

The competitive process entails evaluating and comparing proposals from multiple vendors or contractors to ensure that the best value is achieved. In FAR Part 6 (2024), "Competition Requirements," competition is divided into three categories, as shown in Table 1.

Table 1. Types of Competitive Negotiations. Source: FAR Part 6 (2024).

1	**Full and Open Competition** (FAR 6.100)
2	**Full and Open Competition After Exclusion of Sources** (FAR 6.200)
3	**Other Than Full and Open Competition** (FAR 6.300) Seven Reasons for Other Than Full and Open Competition listed in FAR 6.302 are: 1. Only one responsible source and no other supplies or services will satisfy agency requirements (FAR 6.302-1) 2. Unusual and compelling urgency (FAR 6.302-2) 3. Industrial mobilization; engineering, developmental, or research capability; or expert services (FAR 6.302-3) 4. International agreement (FAR 6302–4) 5. Authorized or required by statute (FAR 6302–5) 6. National security (FAR 6302–6) 7. Public interest (FAR 6302–7)

In specific acquisition scenarios, "Full and Open Competition" may not be practical or possible (FAR 6.100, 2024). In these cases, "Other Than Full and Open Competition" can be pursued when justified (FAR 6.200, 2024). FAR 6.302 outlines seven allowable reasons for using this approach, often leading to sole source acquisition. A sole source environment occurs when only one viable contractor or source can fulfill

the government's requirements. When one of these justifications applies, a sole source contract may be awarded without the competitive process. This approach is commonly used when time constraints, technical expertise, or unique resources are critical to meeting the government's needs, such as in cases of urgency or specialized industrial capabilities. In such environments, while competition is ideal, the unique nature of the requirement necessitates a direct contract award to a single source.

The acquisition process is known for its extensive regulations, particularly around ensuring fairness and value through competitive bidding. However, in specific cases, competition may be waived, leading to sole-source acquisitions when certain justifications are met, allowing the DoD to secure vital goods and services under circumstances where competition cannot be realized. This chapter has explored the conditions under which sole-source acquisitions are permitted, as well as the procedural requirements that guide them. With the evolution of AI, there is potential to streamline complex, labor-intensive processes by enhancing data analysis, cost estimation, and decision-making support.

To better understand how AI can be integrated into this process and its potential impact, the research methodology outlined in the next chapter describes the structured approach used by the research team to gather insights from key stakeholders. This includes interviewing both government buyers and industry sellers, who offer valuable perspectives on the perceived benefits and concerns associated with employing AI in sole source acquisitions.

III. METHODOLOGY

This chapter provides background about the organizations from which interviewees were recruited and explains why the organizations are relevant to this research. In addition, an outline provides insight on how the interviews were conducted and explains limitations to the research.

A. APPROACH

The research team conducted qualitative research to explore buyer and seller perceptions of integrating AI into major weapon systems acquisitions, using a 12-Step Sole Source Contract Negotiation Process. Table 2 outlines the 12 steps of contract negotiations when conducting noncompetitive negotiated acquisitions. A literature review highlights the current discourse on AI within the contracting and acquisition field. Next, the research team collaborated with Deltek/ProPricer, a government proposal pricing solution, leveraging their network to identify and connect with relevant buyers and sellers. Additional coordination with the Air Force Life Cycle Management Center (AFLCMC) at Eglin Air Force Base was conducted to ascertain if DoD organizations were exploring opportunities AI in contract negotiations. After receiving interview candidates from Deltek/ProPricer and AFLCMC, the research team interviewed individuals directly engaged in the development and acquisitions of AI technological applications in contracting. Finally, data was gathered and analyzed through these interviews to gain insights into their perspectives and experiences in the feasibility of AI applications in contract negotiations.

The literature review informed the research team's understanding of the conceptualization and application of AI in the context of acquisition and contract negotiations. Due to the newer nature of AI, existing research on AI within the scope of contract negotiations did not explore the more nuanced aspects of contracting processes and methodologies, such as the 12-Step Sole Source Contract Negotiation Process and the distinctive nature of acquisition systems using AI. This gap prompted collaboration with Deltek/ProPricer and AFLCMC, presenting the notion of integrating AI and

engaging with the human element to gather qualitative insights through current buyers and sellers exploring the topic.

B. HISTORICAL DEVELOPMENT OF 12-STEP PROCESS

Due to the complex nature of the acquisition process, delivering capabilities to the warfighter poses many challenges and often requires navigating through multiple layers of regulatory and procedural requirements. In a sole source environment, buyers and sellers go through repetitive processes that can often be frustrating and significantly slow down the acquisition timelines, ultimately delaying the delivery of major weapon systems to the warfighter (GAO, 2021). While bypassing federal regulations is not an option, there is room to think creatively and explore out-of-the-box solutions to streamline and accelerate the process.

The Medium Altitude UAS Division program office and the prime contractor, General Atomics Aeronautical Systems, developed a creative concept to speed up acquisition timelines and prevent delayed modernizations for the MQ-9 Reaper Program (Medium Altitude UAS Division & General Atomics Aeronautical Systems, 2020, p. 1). The innovative streamlined method by the Medium Altitude UAS Division and General Atomics Aeronautical Systems were in direct alignment with the 2018 memo from the Secretary of the Air Force for Acquisition which encouraged the acquisition community to develop, "creative concepts, processes, contracting strategies, sustainment plans, and cost estimating methods" (Medium Altitude UAS Division & General Atomics Aeronautical Systems, 2020, p. 1). The collaborative effort resulted in the development of the following acquisition objectives:

- Improve communications/understanding between the program office, contractor, and other stakeholders. Initiation of communications between the teams must occur as early in the acquisition process as possible, and communications should be maintained throughout the acquisition cycle.
- The program office and contractor teams, including other entities involved in the acquisition process—such as legal, pricing, the Defense Contract Management Agency (DCMA), the Defense Contract Audit Agency (DCAA), and other external stakeholders—should collaborate to achieve the planned acquisition timelines.
- Improve affordability.
- Reduce the difference between the proposal and negotiated settlement.

- Establish a repeatable process.
- Improve requirements definition.
- Increase transparency in program definition and basis of estimates.
- Improve the acquisition span times (e.g., audit turn times, length of negotiations, etc.).

C. 12-STEP SOLE SOURCE PROCESS

Sole source is when "the supplies or Services required by the agency are available from only one responsible source, or, for DoD, NASA, and the Coast Guard, from only one or a limited number of responsible sources, and no other type of supplies or services will satisfy agency requirements, full and open competition need to not be provided for" (FAR 6.302, 2024). Table 2 shows the 12 primary steps of a sole source acquisition.

Table 2. 12-Step Major Weapon Systems Cost/Price Analysis and Contract Negotiations Process. Adapted from Medium Altitude UAS Division & General Atomics Aeronautical Systems (2020).

Step	Activity	Description
1	Requirements Planning	Define the needs and objectives of the program, ensuring alignment with mission goals and budget constraints
2	Release Draft Letter RFP	Issue a preliminary version of the RFP to potential contractors for feedback on the scope, terms, and requirements
3	Approve Program/Project	Obtain approval from relevant authorities to proceed with the acquisition program, ensuring all requirements and resources are validated
4	Release RFP	Issue the official RFP to solicit formal proposals from industry contractors, outlining specific technical and contractual requirements
5	Receive Proposal	Contractors submit their proposals, which include technical solutions, cost estimates, and contractual terms in response to the RFP
6	Conduct Fact-Finding and Develop Technical Evaluation	Review the proposals to gather detailed information, clarify uncertainties, and assess technical compliance and capabilities

Step	Activity	Description
7	Complete Pre–Price Negotiation Memorandum (Cost/Price Analysis)	Analyze the cost and price elements of the proposal, ensuring they are fair, reasonable, and aligned with the project's budget
8	Receive Business Clearance	Obtain authorization from senior officials to proceed with contract negotiations, based on cost, pricing, and technical evaluations
9	Conduct Contract Negotiations	Engage with the contractor to negotiate the final terms, conditions, and pricing of the contract
10	Complete Final Price Negotiation Memorandum	Document the results of the contract negotiations, including agreed-upon prices and terms
11	Receive Contract Clearance Approval	Obtain final approval from appropriate authorities to proceed with awarding the contract
12	Award Contract	Finalize and officially issue the contract to the selected contractor, authorizing the start of work

D. ORGANIZATIONS INTERVIEWED

The research team interviewed two organizations that represent buyer and seller perceptions when procuring AI. The buyer organization is represented by AFLCMC at Eglin Air Force Base and the seller organization is represented by Deltek/ProPricer.

1. Buyer Organization: Eglin Air Force Base

The buyer organization included in this study is the contracting office for the AFLCMC, Air Force Materiel Command (AFMC) at Eglin Air Force Base in Florida. The AFLCMC is responsible for managing a variety of USAF weapon systems, including information technology, armaments, strategic systems, aerial platforms, and more (Air Force Life Cycle Management Center [AFLCMC], n.d.).

AFMC began discussions and training on how to develop and deploy AI solutions throughout the USAF, with the goal of being "AI-ready" by 2025 and "AI-competitive" by 2027 (Dietrick, 2024). Determining how to best integrate AI into the contracting process is an integral part of the USAF AI strategy. The individuals interviewed for this study are the contracting officers, pricing analysts, and members of the AFLCMC

currently working on developing AI solutions to facilitate USAF contracting programs focused on various systems to help with USAF's "AI-ready" goals. The interviewees were selected to provide insights into how AI can be better integrated in the contract negotiation processes.

2. Seller Organization: Deltek/Pro-Pricer

Deltek (n.d.) is a worldwide, project-based business that primarily deals in software and information solutions for a variety of sectors, including government, consulting, finance, project management, engineering, and more. Deltek's extensive experience working with the government in information technology in contracting and price analysis provides insights into how AI technology can apply to those processes. ProPricer, a software owned by Deltek, is a pricing and proposal software aimed at assisting organizations to build more comprehensive and accurate government contract proposals, while government versions of the software assist in proposal management (ProPricer, n.d.). The research team was introduced to ProPricer during Naval Postgraduate School's Contract Cost and Price Analysis course (MN3320/21) as a current software solution that enhances efficiency and productivity for government agencies and industry partners in proposal development and pricing to "save time, increase confidence, and secure more government contracts" (ProPricer, n.d.).

ProPricer software is intended to streamline proposals, to remove excessive manual inputs of contract and pricing data into spreadsheets, and to bridge communications between the government and contractors if all organizations use the same software (ProPricer, n.d.). ProPricer eliminates redundancy and significantly reduces monotonous and tedious tasks, simplifying the 12-Step Sole Source Contract Negotiation Process and the distinctive nature of acquisitions. The research team leveraged ProPricer's expertise in facilitating buyer–seller interactions through the negotiations process to identify participants for this research. Upon obtaining information about current ProPricer program users, the research team contacted buyer and seller units to invite their participation in the study. Potential interviewees were informed of the research team's background and roles and explained that research participation was voluntary. Prospective participants were then provided the questions in advance for

review before attempting to schedule interviews. This provided opportunity for interviewees to determine if they were interested in participation and allowed them to consider answers to the questions in advance.

Deltek, like many organizations, is exploring the application of AI in their software solutions, including their government contracting software. Deltek currently has ProPricer BOE Pro on the market, which is a cloud add-on software to their base ProPricer model that utilizes ML-based predictive text entry to craft basis of estimate (BOE) narratives against evolving requirements (ProPricer, 2023; Mebane, 2023). Deltek can provide insights into opportunities for applying AI into their contracting-based software, particularly about utilizing AI for the public and private sectors to navigate the proposal process, bridge communication, compare proposal options, and conduct realistic and thorough cost and price analysis.

E. DATA COLLECTION

The research team constructed two sets of 13 questions to align with each of the steps in the 12-Step Process. Table 3 highlights questions specifically created for the buyer organization, AFLCMC, while Table 4 provides questions that were designed specifically for the seller organization, Deltek/ProPricer.

Table 3. Buyer Organization Questions

Step	Activity	Question
1	Requirements Planning	How do you believe AI can aid in identifying and refining requirements for a major weapon system?
2	Release Draft Letter RFP	What role would AI play in drafting clearer and more comprehensive RFPs?
3	Approve Program/ Project	How might AI tools help evaluate and approve program proposals more efficiently?
4	Release RFP	What impact does AI have on ensuring the timely and accurate release of RFPs?
5	Receive Proposal	How do you envision AI improving the process of receiving and initially reviewing proposals?
6	Conduct Fact-Finding and Develop Technical Evaluation	In what ways do you think AI could improve the accuracy and efficiency of fact-finding and technical evaluations?
7	Complete Pre–Price Negotiation Memorandum (Cost/ Price Analysis)	How might AI aid in formulating pre-negotiation objectives and contract negotiation strategies?
8	Receive Business Clearance	How do you believe AI can facilitate the business clearance process?
9	Conduct Contract Negotiations	What benefits could AI bring to the negotiating table?
1	Complete Final Price Negotiation Memorandum	How can AI assist in finalizing price negotiations to ensure fair and reasonable price determinations?
11	Receive Contract Clearance Approval	How might AI expedite and enhance the accuracy of contract clearance approvals?
12	Award Contract	What role do you think AI could play in finalizing the awarded contract to ensure the best outcomes?
13	Comments/Remarks	Is there anything else we should discuss on the role of AI that we have not already discussed?

Table 4. Seller Organization Questions

Step	Activity	Question
1	Requirements Planning	In what ways would AI help in understanding and anticipating buyer requirements in the requirements planning stage?
2	Release Draft Letter RFP	How can I assist in interpreting draft RFPs to prepare more accurate and responsive proposals?
3	Approve Program/ Project	How can AI contribute to optimizing the approval process from the seller's point of view?
4	Release RFP	How can AI appropriately enhance your ability to respond to RFPs with comprehensive proposals?
5	Receive Proposal	How can AI contribute to optimizing the approval process from the seller's point of view?
6	Conduct Fact-Finding and Develop Technical Evaluation	How can AI assist in ensuring the BOEs are thorough and unbiased?
7	Complete Pre–Price Negotiation Memorandum (Cost/ Price Analysis)	What role can AI play in preparing for negotiations to meet pre-negotiation objectives?
8	Receive Business Clearance	How can AI help ensure that business clearances are received without delays? How so?
9	Conduct Contract Negotiations	How can AI support your negotiation strategy and execution?
10	Complete Final Price Negotiation Memorandum	In what specific ways can AI help in achieving a satisfactory outcome in price negotiations?
11	Receive Contract Clearance Approval	How can AI support you and ensure your contract clearance meets all necessary criteria?
12	Award Contract	How can AI facilitate a smooth and timely contract award process from your perspective?
13	Comments/Remarks	Is there anything else we should discuss on the role of AI that we have not already discussed?

The research team interviewed three personnel from AFLCMC, two contract specialists, and one contract price/cost analyst. Additionally, the research team interviewed two individuals from Deltek/Pro-Pricer, one product manager and the other from the director of product management.

The research team sought to maximize the time available to garner information from the interviewees. Before conducting the formal interviews, participants received the

interview questions via email to allow them time to prepare their responses. The interviews were conducted individually with the personnel at AFLCMC via Microsoft Teams video conference. The interviews with AFLCMC were recorded to ensure accurate transcription and analysis. The personnel at Deltek declined face-to-face interviews but offered written responses via email. This method allowed for the collection of detailed qualitative data, capturing the perspectives and experiences of stakeholders actively involved in contract negotiations using AI. Documenting the interviews enabled a thorough review and analysis of the conversations, allowing the research team to extract insights from the impact of AI integration on the negotiation process.

F. ANALYSIS

Upon gathering the data, the research team applied comparative analysis and pattern matching to examine the interview transcripts thoroughly. For AFLCMC, the process began with transcribing the recorded interviews and capturing details for analysis. For Deltek/ProPricer, the answers provided via email were examined.

The research was conducted by doing a comparative analysis of the responses to find commonalities and differences between a buyer and seller organization to help discover a range of opportunities when applying AI to the contracting negotiation process. This method allowed the research team to identify not only similarities and differences in perceptions, experiences, and opinions but also patterns and variations across the different stakeholder groups, such as between USAF units and civilian agencies.

The pattern matching process was not just about identifying recurring themes and patterns within the data, but also about comparing these against the expected patterns derived from the literature review and research questions. Theoretical assumptions were validated and then highlighted across discrepancies or unexpected findings.

Combining these two analytical methods ensured a comprehensive analysis of the qualitative data. Comparative analysis provided a detailed understanding of the differences and commonalities among stakeholders, while pattern matching allowed the

research team to test theoretical propositions systematically. This dual approach offered a meaningful perspective into the impact of AI integration on the negotiation process and opportunities to leverage when procuring AI technologies.

G. LIMITATIONS

The primary limitation of this study was the number of buyers and sellers available for interviews given the allotted research time frame. Interviewing one seller organization (ProPricer) and one buyer organization (AFLCMC) consumed the timespan available to the research team. Considering the busy schedules of these units and agencies and the interviews occurring near the end of the fiscal year, a historically busy period for the acquisition workforce, the scope was limited to maintain a manageable workload without compromising the quality of the data collected. The conversations and experiences shared by participants may not fully capture long-term impacts or potential future development. Consequently, the research findings reflect current perceptions and early-stage experiences, which might change as AI technology evolves and its application in contract negotiations mature.

The second limitation was the quality of answers provided by interviewees. While some individuals provided detailed and extensive information, other individuals provided short answers lacking detailing or simply offered no response. One individual provided answers generated by an undisclosed generative AI program rather than providing their own organic responses; that individual reported that they read through the AI generated answers and concurred with the responses. Due to these limitations, the overall depth has limited the overall comprehensive understanding of how the application of AI is feasible.

The third limitation was the timeframe in which interviews were conducted. Due to the research team's school schedule, interviews occurred in the summer of 2024, or the fourth quarter (Q4) of the fiscal year (FY2024). As Q4 is often the busiest time of year for many government and private organizations as they work to close out numerous types of transactions, finding available interviewees proved challenging. While organizations demonstrated interest, their end-of-year workload did not allow them sufficient time to participate in this research.

The fourth limitation was the "newness" of AI applications in the overall contracting process. AI and its capabilities are still being widely explored, especially in contracting. While the opportunities are seemingly endless, where the workforce stands in applying AI to contracting is still towards the beginning of its journey. Many of the answers, while provided by individuals on the front lines of developing these AI systems, are still widely hypothetical. As the combined knowledge and applications of AI progresses, the feasibility of integrating AI into the contracting and acquisitions workforce may change drastically.

H. CONCLUSION OF METHODOLOGY

Chapter III represented research methodology of conducting and analyzing the interviews. Buyer and seller organizations interviewed were explained, which was the foundation given their front-line research in developing AI programs for contract processes. The 12-Step Sole Source Contract Negotiation Process was explained, which served as the outline for determining interview questions. Lastly, limitations demonstrating the challenges and potential gaps in the data and analysis were explained. Chapter IV provides the outcomes, and a detailed analysis of the data collected.

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IV. RESULTS

This chapter summarizes the results of each interview into a singular, combined response for each organization. The research team interviewed three individuals for AFLCMC and two individuals for Deltek/ProPricer, however, their responses were combined into a singular response to represent their respective organizations. The responses are divided into two sections, one for AFLCMC, the buyer, and one for Deltek/ ProPricer, the seller.

A. AFLCMC RESPONSES

The AFLMC responses are combined responses from three buyers. They are gathered from a series of interviews over Microsoft Teams. Each response was carefully analyzed and compared across all buyers' answers, allowing for a detailed examination of perspectives and common themes. By integrating these insights, this approach offers a clearer understanding of how buyer teams perceive the integration of AI within contract negotiation in the 12-step process, highlighting both shared viewpoints and unique considerations.

(1) How do you believe AI can aid in identifying and refining requirements for a major weapon system?

One common theme is that AI can provide opportunities to help develop and maintain a history and knowledge database. Due to high turnover rates, especially in government offices, historical knowledge and experiences are often lost. In addition, there exists a significant amount of data that contracting specialists often must sift through to create the proper requirements. These data can come in the form of regulations and policies, or historical data from previous contracts. Reviewing all data can be a lengthy process, but the data can be sent to an AI module to analyze and examine, and its results can be held against the drafted requirements to determine if there are errors, missing requirement information, or existing capability overlaps. AI can help reduce the amount of time spent researching and reduce the number of ambiguities and mistakes, which will assist the buyer in developing a requirement that defines what they truly want.

(2) What role would AI play in drafting clearer and more comprehensive RFPs?

Another recurring observation is that many of the possibilities with AI in RFP creation are similar to those of requirements creation as listed in the previous question. AI can help define clearer requirements, develop a statement of work, and craft questions by utilizing data provided from policies, regulations, and historical knowledge libraries. In RFPs specifically, AI can help determine if requirements match the necessary parameters to be a fixed-price contract, refine the structure of the RFP, and refine contract line item numbers (CLINs). A second opportunity AI can provide in drafting RFPs is the ability to rapidly adjust the entire RFP as needed. AI can analyze the entire document and implement necessary changes instantly when an update or an error is detected, eliminating the need for manual searching and updates by a human. Utilizing AI helps reduce labor intensity and errors, and makes expectations clearer, which helps shorten the timeline to the RFP drafting process and potentially reduces costs.

(3) How might AI tools help evaluate and approve program proposals more efficiently?

Another reoccurring theme provided by the buyers is that program proposals can consist of hundreds of pages of proposal data, which can be highly detailed. This results in significant time consumption for contracting specialists when picking through the proposal and analyzing the data. Contracting specialists need to examine the price of proposals against a price analysis that is often in the form of complicated spreadsheets on top of evaluating if all the data within the proposal meets the RFP criteria. These data can be input into AI to do an analysis that determines if the proposal adequately meets the requirements, validates the accuracy of price analysis, or provides a summary of the proposal for initial reviews. You can also input questions into AI based on the relevance to your position (such as engineer, technical specialists, etc.), and AI can help find the answer to those questions without the individuals having to search the proposal manually. In other words, AI can help find a needle in a haystack.

Participants noted that a second capability that can be harnessed through AI when examining proposals is developing a workflow environment to bridge communication

between different departments and integrating AI into that workflow. This workflow environment would consist of collaborative efforts and documents through departments such as legal, engineering, and finance. AI can help sift through the information in this collaborative environment and present needed data that can help reduce the timeline of the collaborative process.

(4) What impact does AI have on ensuring the timely and accurate release of RFPs?

Based on insights gathered from interviews, AI can assist in ensuring the RFP is consistent, accurate, and clear at the very beginning. By developing an RFP that is clear and accurate from the beginning, and vetting it against relevant policies, the RFP can be released to industry more quickly. If the requirements are clear from the get-go, industry can develop their own proposals much more easily, accurately, and quickly—and with a product or service that better achieves what the DoD is looking for.

(5) How do you envision AI improving the process of receiving and initially reviewing proposals?

If contractors uploaded proposals into an AI portal with preestablished data norms, AI could examine the data and determine if the proposal meets the RFP criteria. Contracting personnel can also query AI by asking questions about the proposal to verify information and check for potential gaps. The AI portal can also determine how many members would be required for the evaluation team and what skill sets are required. Some contractors may propose unexpected terms or conditions; AI can identify those situations and determine if other parties need to be involved, such as pricing assistants or other suppliers.

(6) In what ways do you think AI could improve the accuracy and efficiency of fact-finding and technical evaluations?

When conducting fact-finding and developing technical evaluations, an acquisition team is established with evaluators that are subject matter experts to determine if the proposal meets the specifications outlined in the BOE. With turnover rates, new team members with less experience often must look for information within the hundreds of pages of the proposal. AI can be set up with the BOE and scoring criteria and

then look through proposals and make initial determinations on whether the proposals meet BOE or not. If AI discovers that the proposal does not meet scoring criteria, it can direct the evaluator team to that section of the proposal for further validation. AI can also offer databases of historical data on various contractors to assist in evaluations. It can look at historical data to help determine prior poor and good performances to help the technical evaluators decide. This can reduce the size of the technical evaluation team and reduce the number of hours it takes to evaluate proposals.

(7) How might AI aid in formulating pre-negotiation objectives and contract negotiation strategies?

Similar to the answers from Questions 1, 2, and 6, various sets of historical pricing and cost data can be input into AI modules and provide an analysis of trends in the change of cost and pricing, how much the units have spent in the past, and various other comparative data. AI can then provide insights on whether proposed costs from the contractors are reasonable and fair. AI can additionally help set the objectives for the buyer prior to entering negotiations based on historical data and trends from previous contracts. It can assist in pulling in various necessary document information to build the price negotiation memorandum (PNM), alleviating further manual labor from staff. This assists the buyer/government in alleviating a very cumbersome process and allows the negotiators to focus on contract negotiation strategies and determining which objectives to focus on before entering contract negotiations. The participants indicated that AI can be used as a type of role-playing asset, where users can input a variety of scenarios into the AI, and it simulates various possibilities in how contract negotiations may go. For example, AI can provide insights into what contractors may say or what positions they may take and give possible methods to counter those positions. This can help the buyer further prepare varying strategies for negotiations.

(8) How do you believe AI can facilitate the business clearance process?

AI can enhance the business process by drafting documents such as PNMs and other business clearance documents along with standardizing these templates to help prevent biases, mitigate human tendencies to manipulate information, and provide clearer comprehensive outputs. Using AI can help managers to focus on more critical pieces of

the process and gain business clearance faster. It can potentially make it obsolete to conduct the business clearance process manually.

(9) What benefits could AI bring to the negotiating table?

AI has the possibility of being utilized in real time. If the buyer and seller can come to agreement and input data into AI, then it can be brought into real-time negotiations to help determine the effects of varying offers and scenarios that the negotiators present. It can assist both the government and contractors by analyzing data, providing various scenarios, and offering possible win–win scenarios. It can streamline decision-making by presenting different contract terms and helping to find potential compromises for the buyer and seller. Applying AI tools can help the negotiators reach decisions faster and provide possible solutions that human negotiators may not have thought of otherwise.

(10) How can AI assist in finalizing price negotiations to ensure fair and reasonable price determinations?

AI can enhance price negotiations by leveraging historical data to compare past agreements and cost models, ensuring consistency and identifying deviations. Access to data repositories like the USAF KT FileShare, which houses prior contract records, would be a key data set to benchmark and train the model. AI can also streamline the drafting of complex documents, such as the PNMs, which typically require extensive collaboration, multiple reviews, and significant time. Automating parts of this process would increase efficiency and reduce delays by providing data-backed justifications for government positions and minimizing the iterative nature of manual reviews. AI's capacity to deliver fact-based insights can expedite the determination of fair and reasonable prices but would require a robust and accurate data set.

(11) How might AI expedite and enhance the accuracy of contract clearance approvals?

AI can significantly enhance the efficiency and accuracy of contract clearance approvals by automating administrative processes and leveraging institutional knowledge. By standardizing workflows based on historical data, AI can streamline

documentation, track negotiations, and generate key documents and clearance charts with greater speed and precision. Additionally, AI can anticipate likely questions from approval authorities, such as those related to data rights or cybersecurity, enabling better preparation and reducing the need for follow-up corrections that expend more time and resources. The benefits are like those suggested of the business clearance processes: minimizing manual burdens and allowing personnel to focus on critical decision-making tasks.

(12) What role do you think AI could play in finalizing the awarded contract to ensure the best outcomes?

AI can improve the finalization of awarded contracts by enhancing accuracy and reducing the need for corrections. Many contract modifications stem from omissions or unclear terms in the original documents, which AI can help prevent by ensuring consistency across proposals, statements of work, and negotiated terms. By tracking the negotiated conditions, clauses, and attachments, AI minimizes the risk of oversight, especially under tight deadlines, when contracting officers must finalize agreements quickly.

(13) Is there anything else we should discuss on the role of AI that we have not already discussed?

Utilizing AI tools in the 12-step process in contract negotiation presents both challenges and opportunities. A key concern arises from the growing volume of vendor-generated proposals enabled by AI tools. The DoD observed an approximate tenfold increase in proposals submitted for every RFI or RPF. The rise in submissions further cripples existing manpower limitations and slows down the process. To address this, the DoD must develop and implement AI capabilities to assist in proposal processing to keep pace with the private sector that is already benefiting from AI assistance. Another side effect of dealing with a large volume of responses is that one current practice is to reject all proposals outside the competitive range; however, doing so increases the likelihood of bid protests, potentially resulting in substantial delays due to litigation.

Additionally, AI has the potential to assist newer acquisition professionals who often struggle with determining the appropriate strategies, timelines, and regulatory

frameworks, leading to delays. AI tools can assist by automating regulatory compliance, identifying applicable laws, and mapping out acquisition timelines for less experienced contracting personnel. Lastly, AI-enabled systems, if integrated with government platforms such as SAM.gov, the Federal Procurement Data System, and indefinite delivery/indefinite quantity contracts, can significantly enhance market research. This would enable acquisition professionals to discover new vendors, products, and services aligned with their needs, while also providing insights into historical price trends.

B. DELTEK/PROPRICER RESPONSES

The seller responses section presents combined feedback from a series of email exchanges, with questions sent to sellers and responses provided by sellers. Each response was analyzed and compared across all buyer and seller interactions, allowing for a thorough examination of perspectives and common themes. By integrating these insights, this approach offers a clearer understanding of how sellers view AI's role within the 12-step contract negotiation process, showcasing shared insights and distinct perspectives.

(1) How do you believe AI can aid in identifying and refining requirements for a major weapon system?

AI can analyze historical data, procurement patterns, and stakeholder inputs to identify critical needs for weapon systems. It can propose optimized solutions that align with performance, cost, and mission objectives, helping to refine specifications and reduce the risk of scope creep. Predictive analytics can anticipate future requirements by identifying emerging defense trends, while natural language processing (NLP) can efficiently interpret large data sets and buyer documentation to uncover relevant specifications and gaps. Additionally, ML models offer adaptability by refining requirements in response to real-time changes in mission needs, enabling more precise and proactive planning.

(2) What role would AI play in drafting clearer and more comprehensive RFPs?

AI can automate the assembly of technical specifications and ensure their completeness using previous RFPs as templates. NLP algorithms can extract key information from drafts and identify essential compliance requirements, reducing oversight. AI-driven comparison tools can benchmark RFPs against similar documents, suggesting best practices and flagging inconsistencies or gaps for clarification. Additionally, narrative analysis can highlight ambiguities and recommend clearer language, minimizing misinterpretations during contracting. Automated document analysis further supports the process by generating targeted responses to specific RFP sections, enhancing both clarity and precision.

(3) How might AI tools help evaluate and approve program proposals more efficiently?

AI tools can enhance the evaluation and approval of program proposals by rapidly analyzing submissions against predefined criteria and identifying inconsistencies, incomplete sections, or noncompliance. ML models can score and rank proposals using historical data, which would speed up the review and decision-making process. AI can also complete document submission workflows, streamlining approvals and reducing administrative burdens. Predictive tools can estimate approval timelines and identify potential bottlenecks based on past patterns, improving planning accuracy. Additionally, AI-driven analytics ensure all compliance requirements are met prior to submission, minimizing the risk of delays, while real-time monitoring of reviewer feedback allows for the early identification of potential issues in the approval process.

(4) What impact does AI have on ensuring the timely and accurate release of RFPs?

AI can track and manage schedules, ensure deadlines are met, and automate reviews and approvals to identify holdups and recommend corrective actions. AI can also perform automated compliance checks to ensure proposals meet RFP requirements, reducing errors and omissions. It can also generate data-driven insights to tailor responses more precisely to RFP criteria. Automated templates streamline the structure and content

of proposals by leveraging elements from successful past submissions contained in historical data sets. Lastly, AI improves collaboration by integrating diverse inputs into cohesive final proposals, ensuring efficiency and consistency.

(5) How do you envision AI improving the process of receiving and initially reviewing proposals?

AI can improve the process of receiving and initially reviewing proposals by scanning submissions for compliance with RFP requirements, detecting missing documents or inconsistencies, and flagging potential issues for human review, thus expediting the screening process and reducing errors. Automated workflow systems track document status in real time, ensuring smooth progress and preventing delays. AI can also provide insights into learned common approval roadblocks and recommend strategies to avoid them in the future. The goal is to use AI to ensure submissions are error-free, enhancing approval speed; predictive models can alert sellers to potential rejection risks prior to submission.

(6) In what ways do you think AI could improve the accuracy and efficiency of fact-finding and technical evaluations?

AI-driven analysis tools can enhance the evaluation of technical feasibility and risk in proposal assessments. These tools provide a more comprehensive and accurate analysis by rapidly processing technical data, performance metrics, and other quantitative information, leading to quicker and more informed decision-making. AI can also identify biases in historical BOE data and adjust analyses to ensure accuracy. This process minimizes human error and enables evaluators to understand potential risks and technical complexities better.

Automated tools ensure that cost assumptions are backed by data-driven insights, strengthening estimates' reliability. ML models play a crucial role by continuously refining BOEs based on real-time cost data and market fluctuations, keeping estimates relevant and adaptable. Moreover, AI-based scenario analysis can stress-test estimates against various contract variables, helping to identify vulnerabilities and adapt strategies accordingly. This approach improves cost prediction accuracy, optimizes resource allocation, and supports more robust decision-making throughout acquisition.

(7) How might AI aid in formulating pre-negotiation objectives and contract negotiation strategies?

AI-driven analytics can enhance contract negotiations by simulating various scenarios, helping sellers prepare for possible outcomes. Data aggregation tools ensure that all pre-negotiation facts and figures are readily accessible and accurate, providing a solid foundation for strategy formulation. AI can analyze competitor pricing strategies, offering valuable insights influencing pricing tactics and negotiation leverage. Additionally, AI can identify optimal negotiation strategies based on historical success rates and specific contract terms. By simulating different negotiation scenarios and outcomes, AI enables teams to set realistic objectives, refine strategies, and anticipate potential counterarguments, ultimately improving negotiation effectiveness and outcomes.

(8) How do you believe AI can facilitate the business clearance process?

AI can automate the preparation and submission of documents for business clearances, ensuring compliance with policy and regulatory frameworks while expediting internal reviews and approvals. Predictive models can flag potential delays in the clearance process by analyzing past patterns, allowing for proactive adjustments. AI-driven compliance checks verify that all requirements are satisfied before submission, minimizing errors and increasing efficiency. Additionally, workflow automation streamlines internal review processes, reducing unnecessary delays and enhancing overall speed. AI tracks and logs each step throughout the process, providing a detailed audit trail that supports transparency and accountability.

(9) What benefits could AI bring to the negotiating table?

AI can offer real-time insights and recommendations during negotiations by analyzing the buyer's behavior and live data, strengthening the seller's position. Negotiation modeling tools simulate counteroffers and their potential impact on overall contract value, enabling more strategic decision-making. AI systems can track negotiation progress, identify areas where flexibility or compromise may be needed, and suggest optimal terms and counteroffers. By providing up-to-date analysis of pricing

trends, supplier performance, and contract terms, AI makes negotiations more data-driven and efficient, enhancing the likelihood of reaching favorable agreements.

(10) How can AI assist in finalizing price negotiations to ensure fair and reasonable price determinations?

AI can identify competitive pricing strategies and recommend optimal adjustments by analyzing real-time market data. Data-driven insights allow sellers to justify pricing based on market trends and past contracts, strengthening their position. AI-powered analysis can simulate various pricing scenarios, aiming to maximize profitability while aligning with buyer expectations. ML can inform real-time adjustments to pricing strategies by evaluating buyer behavior patterns during negotiations. AI also compares proposed prices against industry benchmarks, identifies potential cost-saving opportunities, and simulates the long-term financial impacts of different price points, ensuring fair and strategic pricing decisions.

(11) How might AI expedite and enhance the accuracy of contract clearance approvals?

AI can cross-reference contract requirements with internal documentation to ensure all necessary elements are complete and aligned. Compliance validation tools automatically check clearance documents against regulatory standards, streamlining the review process. AI provides real-time alerts when criteria are not met, allowing for immediate correction and minimizing delays. Predictive analytics assess the likelihood of clearance approval, highlighting potential risk factors early on. By automating legal and regulatory compliance checks, AI accelerates the clearance process and identifies anomalies or incomplete sections, ensuring that all conditions are met before final approval.

(12) What role do you think AI could play in finalizing the awarded contract to ensure the best outcomes?

Automated contract generation reduces administrative time during the award process by streamlining document creation and submission. AI can track the status of contract awards, identify potential workflow delays, and ensure that all required documentation is complete and promptly submitted to prevent holdups. Predictive tools

analyze past contract awards to forecast approval timelines and outcomes, providing insights that help manage expectations. AI also cross-references contract terms with the RFP, proposal, and negotiation outcomes to ensure accuracy. It verifies that all parties have met their obligations, flagging any discrepancies before contract signing, thus ensuring a smooth and accurate finalization of contracts.

(13) Is there anything else we should discuss on the role of AI that we have not already discussed?

Integrating AI with human expertise can create hybrid decision-making models that enhance the effectiveness of defense contracting. By combining AI's analytical capabilities with human judgment, these models can improve collaboration between buyers and sellers during negotiations. AI can support post-award contract management by monitoring contractor performance, ensuring compliance, and identifying potential issues early. Predictive analytics can anticipate future challenges and suggest solutions proactively, helping to maintain contract integrity over time. However, using AI in defense contracts also raises ethical considerations and data security concerns, requiring careful oversight to protect sensitive information and ensure responsible decision-making.

C. COMPARATIVE ANALYSIS

Table 5 compares the buyers' and sellers' responses to the 12-step contract negotiation process, offering specific answers for each step. Table 6 emphasizes shared sentiments and specific perspectives from both sides.

Table 5. Buyer and Seller Annotated Responses

AFLCMC SPECIFIC	PROPRICER SPECIFIC
1. Requirements Planning: Analyzes historical data, reduce errors, and refine/clarify requirements	**1. Requirements Planning:** Anticipates future needs, aligning specifications with objectives
2. RFP Creation: Ensures clearer RFPs with fewer errors	**2. RFP Creation:** Completes and optimizes RFPs using templates and NLP tools help
3. Proposal Evaluation: Identifies noncompliance items efficiently	**3. Proposal Evaluation:** Automates and standardizes workflows

4. Timely RFP Release: Ensures consistent, accurate, and timely RFPs early on **5. Initial Proposal Review:** Ensures compliance with RFP criteria **6. Fact-Finding and Technical Evaluation:** Improves accuracy by verifying technical specifications **7. Pre-Negotiation Objectives:** Analyzes trends to help develop negotiation strategy **8. Business Clearance Process:** Automates and standardizes clearance processes **9. Negotiation Support:** Gives simulated scenarios, finds win–win solutions **10. Price Negotiations:** Validates proposed prices against market trends and historical data **11. Contract Clearance Approvals:** Automates and standardizes document validation **12. Contract Finalization:** Tracks negotiated terms, ensuring consistent contract outcomes	**4. Timely RFP Release:** Tracks deadlines and manages schedules **5. Initial Proposal Review:** Creates predictive models to anticipate roadblocks **6. Fact-Finding and Technical Evaluation:** Refines cost estimates and reduces errors **7. Pre-Negotiation Objectives:** Conducts competitor pricing analysis **8. Business Clearance Process:** Ensures compliance with regulations **9. Negotiation Support:** Provides real-time insights support **10. Price Negotiations:** Compares pricing trends **11. Contract Clearance Approvals:** Standardizes compliance tools **12. Contract Finalization:** Aligns contract terms with proposals

Table 6. Shared Sentiments and Specific Perspectives from Buyers and Sellers

SHARED SENTIMENT
Requirements Planning: AI can analyze historical data and align requirements with mission goals, ensuring clarity and reducing errors. **RFP Creation:** AI assists both in refining and optimizing RFPs by leveraging previous documents and templates to reduce errors and ensure completeness and accuracy. **Proposal Evaluation:** AI supports evaluating proposals efficiently by automating compliance checks and identifying gaps or inconsistencies. **Timely RFP Release:** AI helps maintain acquisition timelines by streamlining processes and ensuring accuracy, reducing delays in RFP issuance and response.

Initial Proposal Review: AI can detect missing documents or inconsistencies and ensure proposals align with RFP criteria, reducing time spent in review.

Fact-Finding and Technical Evaluation: AI improves the accuracy of evaluations by analyzing technical data, providing insights, and reducing human error and biases.

Pre-Negotiation Objectives: AI integrates scenario planning, trend analysis, and strategy formulation, helping to prepare for negotiations.

Business Clearance Process: AI automates compliance checks and document preparation, minimizing excessive reviews and reducing bottlenecks.

Negotiation Support: AI-driven insights and scenario simulations can inform negotiation strategies and make more effective decisions in real-time.

Price Negotiations: AI can be used to validate pricing; buyers focus on reasonableness and consistency, while sellers align with market trends.

Contract Clearance Approvals: AI ensures compliance and consistency in documentation.

C**ontract Finalization:** AI can align final contracts with negotiated terms, reducing errors and ensuring all requirements are met.

Additional Insights: AI enhances hybrid decision-making, combining human judgment with data analytics to improve outcomes and collaboration between buyers and sellers.

Both buyers and sellers believe that integrating AI into the sole source process can improve efficiency, accuracy, and collaboration across all phases of the acquisition.

D. FINDINGS SUMMARY

These findings have the potential to reshape the sole source contract negotiation process. Both AFLCMC (buyer) and Deltek/ProPricer (seller) recognize the progressive potential of AI in the acquisition process. Collaborating with AI is crucial because it brings a lot to the table that humans alone cannot match. Figure 2 portrays AI's ability to quickly analyze data, identify patterns, and evaluate options, which helps buyers and sellers make better decisions. Acquisition personnel would benefit from the speed and accuracy of AI to aid human judgment, leading to more informed decisions and improved negotiation tactics, especially in a sole source environment where alternatives are limited. AI has the potential to dramatically decrease time spent across all 12 steps of the sole source acquisition process, which ultimately streamlines operations to deliver capabilities to the warfighter faster. AFLCMC and Deltek/ProPricer shared similar sentiments regarding areas of caution when integrating AI in the acquisition process, as shown in Figure 3.

Figure 2. Perceived Benefits of Integrating AI Into the 12-Step Sole Source Acquisition Process

Figure 3. Caution Areas of Integrating AI Into Acquisition Processes

E. RECOMMENDATIONS FOR FUTURE RESEARCH

The research team was limited to AFLCMC as the only buyer in the study. Including perspectives from other branches, such as the Army, Marines, Navy, Coast Guard, Space Force, and additional USAF units, could provide a more complete understanding of perceptions regarding AI use in contract negotiation within a sole source environment. Each branch may face different challenges and possess unique

experiences that offer valuable insights, potentially revealing branch-specific needs or strategies for AI implementation. Expanding the research this way would help ensure that the findings and recommendations are applicable across various branches.

Similarly, ProPricer/Deltek was the only seller in the study, limiting the scope of seller-side insights. Incorporating input from additional sellers would enhance the study's scope, offering a more comprehensive range of insights into how AI is perceived and applied on the seller side during sole source contract negotiations. Different sellers may have unique approaches and strategies with AI, potentially uncovering further strengths and challenges. The expanded perspective from other sellers would lead to a broader comprehensive analysis, contributing to potential findings applicable across a broader spectrum of industry players rather than being confined to the insights of a single seller.

V. CONCLUSION

This research project explored the primary research question on perspectives of buyers (AFLCMC) and sellers (Deltek/ProPricer) regarding AI's role in the 12-Step Contract Negotiation Process in a sole source environment to explore the feasibility of implementing AI. The research team's findings indicate that AI's integration into the process can be welcomely received as common perceptions center around AI's ability to streamline the process, from requirements planning to contract finalization.

A. BENEFITS OF AI USE

Buyers and sellers recognize AI's substantial benefits to the acquisition process in a sole source environment. AI's capacity for rapid data analysis can significantly enhance the acquisition process by accelerating decision-making and quickly processing vast amounts of historical, regulatory, and market data for the contracting team. As a result, AI leads to streamlining the 12-step contract negotiation process in a sole source environment by reducing manual and repetitive workload, ensuring timely delivery of major weapon systems to the warfighter.

B. CONCERNS REGARDING AI USE

While AI offers significant benefits, it raises concerns among buyers and sellers. Incorporating AI into the DoD's contracting processes requires careful consideration to ensure compliance, data security, and ethical use. The effectiveness of AI use in the 12-step contract negotiation process in a sole source environment will depend not only on the quality and security accessibility of data but also on comprehensive governance guidance, training for acquisition professionals, and clear strategies to mitigate risks associated with AI bias, compliance failures, and data vulnerabilities. Additionally, buyers and sellers conclude that human interaction will remain significant in the 12-step contract negotiation process in a sole source environment. AI will never wholly replicate the relationship management and ethical decision-making that humans provide.

C. RECOMMENDATIONS

The research team recommends the following to effectively implement AI in the 12-Step Sole Source Contract Negotiation Process:

- *Relevant and clean databases:* For AI to effectively work in streamlining processes and providing sound recommendations, any data input into AI must be relevant, accurate, and up to date. Buyer and seller perceptions continually demonstrate that AI can help them in conducting the manual and administrative aspects of contracting, such as finding relevant policies and historical data, as well as standardizing many processes. However, for this to be achieved, there must be well-managed databases that facilitate AI's ability to be accurate and reasonable. If this is lacking, then the effective use of AI, along with trust from the user, will be nonexistent.
- *Transparency between buyers and sellers:* While AI can be helpful in many aspects, buyers and sellers need to be able to collectively understand how they are each using AI in the process. Sharing the data and information that they feasibly can input into their own AI models helps foster trust between buyers and sellers, mitigate bias, and further streamline the contracting process.
- *Collaboration between buyers and sellers:* Additional collaboration and understanding of AI can further enhance AI roles and capabilities. Buyers and sellers have a lot of overlaps in their perceptions of what AI can do for them. Through collaboration and coordination, AI systems can be developed that meet the needs of both the buyers and sellers, further facilitate the contracting process, and improve the overall procurement of systems.
- *Administration and role-playing:* Further exploring how AI can assist with manual administrative processes in contracting, as well as how effective AI can be with role-playing negotiations should be further explored. Real-time solutions drawing from an array of experiences and historical knowledge that humans may not consider could facilitate more win-win solutions in contracting.
- *Keep the human involved:* AI will not be able to completely replace humans in the contracting process. Negotiations can be complicated, and AI may not achieve a satisfying solution on its own. There is also the potential for errors. Humans need to be involved in every step of the process, validating and ensuring accuracy of AI outputs. While AI can help with administrative tasks and fact-finding, human-to-human interaction remains key in negotiations.

The research team noted positive perceptions from both buyers and sellers in the feasibility of integrating AI into the 12-Step Sole Source Contracting Process. The buyer and seller organizations had many overlapping viewpoints regarding how AI can be

applied to the process and many of the differences remain applicable to both parties. Through further development and exploration of AI applications in contract negotiations and acquisition system, implementation of AI is a feasible and welcome change when done in a way that integrates both buyer and seller needs.

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