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Issues With Access to Acquisition Data & Information in the Department of Defense: Doing Data Right in Weapon System Acquisition

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Panel 8. Data Policies, Procedures, & Access: Illuminating How Acquisition Information Moves Within the Department to Support Analysis & Decision Making

Wednesday, May 4, 2016	
3:30 p.m. – 5:00 p.m.	<p>Chair: Mark Krzysko, Deputy Director, Acquisition Resources and Analysis, OUSD (AT&L)</p> <p>Discussant: Ralph DiCicco, Acquisition Chief Information Officer (CIO), United States Air Force</p> <p><i>Issues With Access to Acquisition Data & Information in the Department of Defense: Policy & Practice</i> Megan McKernan, Defense Research Analyst, RAND Jessie Riposo, Senior Operations Researcher, RAND</p> <p><i>Issues With Access to Acquisition Data & Information in the Department of Defense: Doing Data Right in Weapon System Acquisition</i> Nancy Moore, Senior Management Scientist, RAND Megan McKernan, Defense Research Analyst, RAND</p>



Issues With Access to Acquisition Data and Information in the Department of Defense: Doing Data Right in Weapon System Acquisition

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Abstract

Acquisition data lay the foundational role for decision-making, management, and oversight of the weapon-systems acquisition portfolio for the Department of Defense. How to effectively and efficiently spend these dollars has been a top priority for the Better Buying Power initiatives led by the Office of the Secretary of Defense (OSD) and the Under Secretary of Defense for Acquisition, Technology, and Logistics. The OSD asked RAND to help identify how available data can help assist defense-acquisition decision-making. In particular, we documented factual information on 21 information systems that contain acquisition data. This builds on our earlier work (Riposo et al., 2015, *Issues With Access to Acquisition Data and Information in the Department of Defense: Policy and Practice*, RAND RR-880; and McKernan et al., 2016, *Issues With Access to Acquisition Data and Information in the Department of Defense: A Closer Look at the Origins and Implementation of Controlled Unclassified Information Labels and Security Policy*, RAND RR-1476) by exploring in more detail the data that support decision-making.

Introduction

Acquisition data¹ lay the foundation for decision-making, management, and oversight by the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L])

¹ Acquisition data are vast and include such information as the cost of weapon systems (both procurement and operations), technical performance, contracts and contractor performance, and program decision memoranda. These data are critical to the management and oversight of the \$1.5 trillion portfolio of major weapon programs by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD[AT&L]).



of the weapon-system acquisition portfolio for the Department of Defense (DoD). Acquisition data help to inform, monitor, and achieve several DoD objectives, including

- promoting transparency in spending
- understanding and achieving cost control
- visualizing the distribution of defense spending
- achieving small-business goals
- identifying and preventing fraud, waste, and abuse
- conducting analyses for improved decision-making
- compiling and tracking items in various processes
- archiving decisions

It is critical for personnel managing acquisition execution and oversight to know what data resides within DoD as well as what questions can, or cannot, be answered with that data (Table 1).

Table 1. Acquisition Data Can Answer Some Defense Questions, and Not Others (RAND)

Acquisition Data Can Answer	Acquisition Data Cannot Answer
How much do we spend acquiring weapons and services in DoD?	Where can we access certain technologies?
How long does it take to field a weapon system?	What key suppliers may need help given spending decreases?
What are the key costs of what we buy for DoD?	How well does spending align with requirements?
Who do we buy from?	What value is gained from spending?
Where is our spending geographically located?	How is the health of the defense industrial base?
Why are costs and schedule increasing?	What is the quantity adjusted cost growth for a specific acquisition program?
How competitive is our supply base?	How do the acquisition schedules of a large number of acquisition programs compare over time?
How well does DoD meet small business goals?	What is the workload of various parts of the acquisition workforce (e.g., contracting)?
What can we learn from past acquisition failures/successes?	Which government and non-government personnel are working specific acquisition programs?

How to effectively and efficiently spend taxpayer dollars allocated to the Department of Defense has been a top priority of the Better Buying Power (BBP) initiatives led the Office of the Secretary of Defense (OSD) and the USD(AT&L). In BBP 2.0, the USD(AT&L) specifically acknowledged the need to streamline decision-making by “promptly acquiring relevant data and directing differences of opinion to appropriate decision-makers. Our managers cannot be effective if process consumes all of their most precious resource—time” (Kendall, 2013, p. 2).



Currently, much weapon-system acquisition data is collected based on policy directive, congressional reporting, and the need to meet USD(AT&L)'s statutory authorities. These information requirements largely reside in the Department of Defense Instruction (DoDI) 5000.02 (2015). This data-management strategy fails to address the complete managerial prerogatives of the USD(AT&L) and the Better Buying Power initiatives. Additionally, siloed reporting of acquisition data may not fully support the USD(AT&L) decision-making processes. Data requirements have generally been developed from a particular functional perspective resulting in a data "ecosystem" characterized by individual collections of data that are functionally stovepiped and disjointed, each with different rules for collection, retention, and access.

Approach

In earlier work (Riposo et al., 2015; McKernan et al., 2016), we identified the issues associated with managing and sharing Controlled Unclassified Information (CUI) within the DoD. In this analysis, we examine issues with managing and accessing the sources of that data. Specifically, the OSD asked us to consider

- What data are available to help assist in defense acquisition decision-making?
- Where do acquisition data reside?
- Who can access the information?
- Can we get access to these data for acquisition-related purposes?

To answer these questions, we held targeted discussions with acquisition information system managers, supplemented these discussions with reviews of official policy documentation and other open sources on the information systems and their contents, reviewed literature on master data management to understand practices in commercial data management, and augmented our findings with RAND knowledge of using these data systems. Through these methods, we accomplished four tasks.

What are the major weapon system acquisition data domains? We accomplished this task by reviewing various federal-wide, OSD-wide, and Service-level information systems and their data elements in order to identify where the data that supports current information requirements in DoDI 5000.02 reside. We focused first on a broad look at the enterprise acquisition landscape as a whole, then particularly on sources of acquisition information that support the USD(AT&L) through the Defense Acquisition Executive Summary (DAES) and Defense Acquisition Board (DAB) secretariat, Director, Acquisition Resources and Analysis (D, ARA). Our sponsor, deputy director of Enterprise Information, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Acquisition Resources and Analysis Directorate, provided the list of information systems to examine for this analysis.

What are the functional communities or major users that weapon system acquisition data domains support within the DoD? We identified, through discussions with the information managers of the 21 information systems, major users of DoD acquisition data within the OSD.

What are the providers of weapon system acquisition data for USD(AT&L) decision-making? We also identified, through discussions with information managers, who is providing acquisition data to OSD information systems in order to inform USD(AT&L) decision-making on defense acquisition.



What are some recommendations for improving the acquisition data environment? In this task, we provide recommendations that would improve the quality of acquisition data, ease of access, efficiency of collection and use, and the ability to link data through common data elements.

Background on Acquisition Data in the Department of Defense

Acquisition data and information take on a wide variety of forms within the Department of Defense and include such information as the cost of weapon systems (both procurement and operations), technical performance, contracts and contractor performance, and program decision memoranda. These data can be characterized as both “structured” and “unstructured.”² They are critical to the management and oversight of the \$1.5 trillion portfolio of major weapon programs by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics.

This data may be for statutory, regulation, policy, or other reasons. DoDI 5000.02 (2015, Enclosure 1, pp. 47–58) provides a detailed list of “statutory and regulatory requirements at each of the milestones and other decision points during the acquisition process.” This does not encompass all of the requirements, but is a centralized source for many of them. Some of the information requirements are to measure cost, schedule, and performance of weapon systems, while others examine testing, cybersecurity, requirements, budgeting, alternatives, and technology readiness.

The information resides throughout the DoD at all levels, from program offices in the Services to various offices within OUSD(AT&L). It can be found in decentralized locations (e.g., individual computers) and centralized locations (e.g., information systems). The DoD also uses data that reside in various federal information systems. There is a plethora of acquisition-related data sources that are now available. The data elements within these information systems vary. Some data elements³ are unique while others may overlap, depending on different definitions. The timeframes for the various data elements are non-stationary, meaning, for example, that one information system has data from 1960 to current, while another may only have data from 2010 to current. Acquisition data are stored in information systems with differing platforms and hardware: architectures, software, and interfaces; vendors; and databases. There is varying accessibility and security requirements (depending on the data being stored) in the information systems.

Enterprise Information within the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Acquisition Resources and Analysis Directorate categorizes the data into various business areas including Research and Development

² According to the *PC Magazine Online Encyclopedia*, structured data are “Data that can be immediately identified within an electronic structure such as a relational database.” Unstructured data are “Data that are not in fixed locations. The term generally refers to free-form text such as in word processing documents, PDF files, e-mail messages, blogs, Web pages and social sites” (“Structured Data,” n.d.-b).

³ According to the *PC Magazine Online Encyclopedia*, a data element is “The fundamental data structure in a data processing system. Any unit of data defined for processing is a data element; for example, ACCOUNT NUMBER, NAME, ADDRESS and CITY. A data element is defined by size (in characters) and type (alphanumeric, numeric only, true/false, date, etc.). A specific set of values or range of values may also be part of the definition” (“Data Element,” n.d.-a).



(R&D), Requirements, Budget, Contracting, Contract Performance, Financial Execution, Program Cost/Schedule/Performance, Human Capital, and Acquisition Oversight/Portfolio Management.

Many factors affect how acquisition data is collected and stored. There are multiple, changing conditions that affect the management of acquisition data. Information owners and managers may need to consider whether a current architecture can support additional statutory requirements, administrative changes, or security policy changes. Technological advancements may also be implemented to improve

- Collection efficiency
- Quality of the data
- Aggregation of the data
- Ease of access/use of the information system and its data
- Analysis of data
- Archiving data for future analysis/education

These same factors can also affect the development of various acquisition systems. Acquisition information systems were created, evolved, or repurposed based upon data needs and legitimate reasons (e.g., statutory needs). They have been developed with varying architectures and interfaces. They also require analysts with cross system-analytic skills. They are also difficult for users to navigate effectively, and can take years of consistent access and use to fully understand and master. Most systems are built for reporting, not analysis. Compliance and tracking has been a priority. Acquisition information systems and the data they contain may be designed to answer today's current questions, but inflexible to answer tomorrow's questions.

This analysis found that there are also barriers to the use of each system and cross use between the information systems. Access procedures are complicated and generally consist of many steps that may not ultimately guarantee access. There are varying access procedures and permissions between and sometimes within systems. The federal systems have much data available to the public, but DoD systems are mostly restricted. New users can have great difficulty establishing and maintaining access (how to, where, who, what?). Full access to acquisition information systems enables analysts to maximize use of data. The owners and managers of the data have found that balancing security and access needs is difficult.

Background and Findings on Deep Dives of Acquisition Information Systems

As part of this effort to understand acquisition data opportunities,⁴ we conducted “deep dives” on a set of information systems. In this section, we summarize the information we gathered through our deep dives. We reviewed 21 federal-wide, OSD-level, and Service-level information systems and their data elements in order to identify where are some of the acquisition data or information that supports current requirements in DoDI 5000.02. We reviewed five federal-level information systems, 12 OSD-level information systems, and

⁴ By “data opportunities,” we mean identifying data that can potentially be used for analysis of various defense acquisition questions.



three Service-level systems (one Army, one Air Force, and one Navy). Of the 21 systems, at least one study-team member had previous knowledge of 11. For five systems, a study-team member had limited prior or current knowledge; and for the final five systems, no one from the RAND study team had knowledge from use. We worked with our sponsor, ARA/EI, on whether to pursue access to the information systems for this effort, ultimately deciding not to do so.

We did not rely exclusively on access to the information systems in order to conduct the deep dives. We also collected official documentation as available, and requested additional materials from those managing the information systems. We had some level of open-source materials for all but two systems. Finally, we relied heavily on discussions with the information managers, particularly on the information systems for which we had little or no knowledge and open-source materials were not available. We were able to conduct discussions for all but one information system. The results of this study depend on the variety of information we were able to collect.

We verified the deep-dive information with information managers in early 2016 in order to ensure that the deep dives contain the latest available information. Nevertheless, we found that the information in these systems is constantly changing as policy, technology, and other things change. Consequently, it is best to consult the information systems directly for the most up-to-date information.

As stated previously, we gathered additional information for these deep dives through discussions with information managers. The information that we gathered from the discussions covered the following main topic areas:

- Basic details on the acquisition information system
- Types of questions answered with this information system
- Owner, manager, and host of the information system and data in that information system
- Statute or policies that led to the creation of the information system or provide the reason the data in the system is collected
- Characterization of the data in the information system
- Security and access restrictions governing the information system
- Characterization of the users
- Strengths and weaknesses of the information system or data in that information system

Basic Details on the Acquisition Information Systems

For each of the 21 information systems, we gathered basic factual information including the official abbreviation, date that the system entered service, the access point for the information system, whether the system is open to the public or is restricted, the functional business area the system supports, and the purpose. These systems cover a wide variety of functional business areas including

- Research and development (R&D)
- Requirements
- Budgeting
- Contracting
- Contract Performance



- Financial Execution
- Program Cost /Schedule/Performance
- Human Capital
- Acquisition Oversight/Portfolio Management

Some systems cover multiple business areas.

Types of Questions Answered by These Information Systems

Decision-makers and analysts working in defense acquisition need to understand the type of questions that can be answered with the structured and unstructured data in these information systems. They also need to know what questions cannot be answered. We asked information managers to identify some of the questions that can be answered from the data in these information systems.

Owner, Manager, and Host of the Information System

Additional factual information that we collected on these information systems included the owner, manager, and host of these systems. The owner is the office responsible for oversight of the information system. It is sometimes different from the manager of the system who may be responsible for day-to-day operations including approving access and troubleshooting technical issues, but the owner and manager are typically within the same, larger organization. The host of the information system often appears to be an office outside of the owner or manager and is typically a contractor for the federal systems.

Statute/Policies Requiring Each Information System

Most of these systems originated in statute requirements, with the Federal Acquisition Regulation also being a common reason for creating a data system. Some systems originated in policies or memoranda from senior DoD leadership.

Characterization of the Data in the Information System

There is no consensus on whether the data in these systems is authoritative. Some systems contain data that are authoritative, but others pull data from elsewhere. There is also significant variation in the dates of the data in these information systems. A version of one information system goes back as far as 1951 for the DoD. For several other systems, there may be some historical data back to the 1960s. Likewise, there is some variation in whether a formal data dictionary exists and, if one does, whether it is available to users. In some cases, information managers use the data dictionary for planning, but do not provide it to users. In some systems, data elements have been added over time or their definitions have changed.

Characterization of the Users

The number of users for these information systems varied from less than 100 to nearly 400,000 users. Information managers may count their users as “registered,” “active,” “average users per month,” or “number of users in a particular time period.” Composition of users also varies widely. Some of the information managers provided high-level statistics (e.g., public, government, DoD), while others provide specific organization names for users.

Conclusions and Options

Acquisition data and information take on a wide variety of forms within the Department of Defense and include such information as the cost of weapon systems (both procurement and operations), technical performance, contracts and contractor performance,



and program decision memoranda. This data is collected for a variety of reasons including statutory requirements, regulation, policy, and other reasons.

The information resides throughout all levels of the DoD and can be found in informal, decentralized locations as well as formal, centralized locations (e.g., information systems). The DoD also uses other federal data residing elsewhere.

Data elements within this plethora of sources may vary. Some data elements are unique, while others may overlap depending on different definitions. The timeframe and source of these data vary as well.

There are multiple, changing conditions that affect the management of acquisition data. Information owners and managers may need to consider whether a current architecture can support additional statutory requirements, administrative changes, or security policy changes. Technological advancements may also be implemented to improve collection efficiency, quality, aggregation, and ease of access or use.

These same conditions can also affect the development of various acquisition systems. Acquisition information systems were created, evolved, or repurposed based upon data needs and legitimate reasons (e.g., statutory needs). Yet they are often difficult for users to navigate effectively and can require years of consistent access and use to fully understand and master. Most systems are built for reporting, not analysis, and compliance and tracking has been a priority. Acquisition information systems and the data they contain might answer current questions but may be inflexible for future ones.

This analysis found that there are also barriers to use of each information system and cross use between the information systems. Access procedures are complicated and generally have many steps that need to be met in order to be permitted access to the information system and its contents. There are also varying access procedures/permissions between and sometimes within systems. The federal systems have an abundance of data available to the public, but DoD systems are mostly restricted. New users can have great difficulty establishing and maintaining access. Although full access to acquisition information systems enables analysts to maximize use of data, it is not practical given the need to balance security and access.

Deep Dive Conclusions

We compiled information on 21 federal and DoD information systems that contain structured and unstructured acquisition data and information. The level of detail we were able to pull together on each information system and its contents varied considerably based on

- RAND team user experience with individual systems
- Availability and access to official policy documentation and other materials on the information systems
- Interviewee interpretation of discussion questions

There was a wide variety of interpretation of each of the questions in the interview protocol and how these questions pertain to the individual information systems that an information manager is overseeing. The output of these discussions showed that even common terms like “owner,” “user,” or “data element” and “data dictionary” are subject to interpretation, which suggests that a common taxonomy would be difficult to implement, but may be necessary. Basic details were fairly easy to identify and verify. We also pulled together a large variety of potential questions that can be answered by the data in each information system, but the list is not comprehensive nor an assessment of how well the



questions could be answered. Nevertheless, both are critical information for decision-makers.

Some factual information can be difficult to assess, given subtle distinctions such as those between owner and manager in some cases. In other cases, it was easy to verify information on owners, managers, and hosts, because all three functions are performed by the same office. Yet some owners, managers, and hosts changed over time, so it was not always clear who held which role.

The list of policies that led to the origins of these systems was not always apparent as some of the systems are older, some systems have “morphed” from one objective to others, and there has been a turnover in personnel who manage the systems. Some information systems provided a list within the information system documenting the policies that led to the system creation/the data in the system. In other cases, we were given the information during our discussions with information managers.

When we asked about security and access and the user base with information managers, the feedback we got was very difficult to compare across systems. Security and access were intertwined in discussions even though there are supposed to be clear origins in statute and policy that require both security and access restrictions. Similarly, the information we received on users varied by number, type, and characteristic.

For each data system we reviewed we also sought to identify strengths and challenges for the information manager and users. We summarized the major cross-cutting strengths and challenges themes associated with the systems reviewed. The following are some of the major strengths:

- The collection and standardization of selected acquisition related information into one place where it can be input, accessed, and analyzed by those needing to use it.
- Data that is input electronically with controls (e.g., through validation checks and business rules) to assure that key data elements are entered, edited, and cross checked against historical and other data, which improves data quality.
- Systems that have been established or improved to answer acquisition questions. These systems are attempting to pull together variables in one place for analysis, so as to improve DoD decision-making, and also to save funding that is typically spent by analysts trying to cobble together information.

Information managers also face several challenges in managing acquisition data, including the following:

- Data quality vary depending on what is input or provided, and often with no means to verify accuracy.
- The need to have the originators input new data when the data have changed.
- Assuring access to those who need-to-know while protecting sensitive data. Access procedures vary greatly by system, burdening those needing to access multiple systems.
- Inconsistency in terms. The same term can have different meanings in different acquisition systems which makes analyses across systems particularly challenging.
- Inconsistency in data formats.



- High variance in hardware and software.
- Need for more data elements, leveraging of authoritative systems, real time editing and verification, and updating to new platforms.
- Desired, backlogged improvements and sometimes critical updates that lack resources for implementation.

Options for Improving the Acquisition Data Environment

Our analysis yields several recommendations for improving the DoD acquisition-data environment.

Formalize a Data Governance and Data Management Function

To answer the DoD's acquisition questions, the USD(AT&L) should consider formalizing a data management and governance function (e.g., data steward) to oversee data opportunities. Any decision on a data steward would need to consider who could be the authority to institutionalize/implement these changes given the diversity of data ownership in the DoD.

Our discussions with information managers and our literature review on Master Data Management found that data governance plays a key role in the success of acquisition data management. In particular, data governance can monitor and enforce the use of acquisition tools. Data governance also determines the process and structure for authority control, planning, monitoring, and enforcement over data assets (American Institute of CPAs, 2013, p. 4). While data quality/validation focuses on managing individual pieces of data, data governance focuses on data definitions, policies, and processes, including those for data quality/validation. Data governance has two primary data-management objectives: planning and supervision/control.

A data steward function would need to further identify where and what data opportunities exist by maintaining a master list of data/information and authoritative sources. As can be seen from this study, authoritative sources are not always integrated into information systems, and it is not apparent that developers have a good understanding of all of the authoritative sources. There appears to be a movement in that direction, but the DoD should continue to re-syndicate data from authoritative sources.

The data steward and information managers should proactively solicit ways to improve value of the data from all categories of users (inputters, overseers, and analysts) in order to improve data quality, capability, access, usability, and functionality. This function could also improve understanding of related systems and identify potential opportunities for consolidation.

Improve Data Quality and Its Analytic Value

The DoD should require that all new systems have user and data entry guides and data dictionaries that describe data elements and their sources (e.g., another system or enterprise/personnel entering). This informs data opportunities and may eliminate duplication. Information managers should try to minimize manual entry whenever possible or provide validation checks. An explicit list of authoritative sources for data elements should be available and new systems should be required to use them, while older systems migrate towards them.

Information managers frequently mentioned that data verification and validation is a top priority and that they have both manual and automated checks built into the systems. Information managers should continue and expand this best practice.



Information managers mentioned one of their challenges is to be able to continue to update their systems to add capability and comply with the latest security requirements. The DoD should require system owners to develop and update plans and budgets for continuous improvement of data quality and analytic value, and document unfunded requirements linked to these improvements.

Make Structured Data the Top Priority

Current practice is to collect DoD Acquisition data in structured and unstructured formats. Both types of formats have an important role in the execution, oversight, and analysis of acquisition programs. However, structured data, which is easier to use for analysis, should be the top priority. The DoD should minimize the use of unstructured data, which takes more resources and different capabilities to make useful for analysis. More specifically, structured data

- allows for topic metatags
- can use strategic algorithms to check quality
- maximizes drop-down menus; minimizes free text

Similarly, a large amount of acquisition information is produced in unstructured formats. Since not all data can be converted to a structured format, the DoD needs to identify ways to make unstructured data more useful. Structured data is easy to use once meaning and access has been determined.

By moving toward structured data, the standardization of formats for acquisition data would promote sharing between systems. The standardization needs to take into account context and meaning when appropriate.

Develop and Train Organic Capability Among the DoD Workforce to Use/Improve Data

RAND has spent decades using acquisition data to solve difficult questions on a variety of defense acquisition topics. Answering sophisticated acquisition questions requires analysts with detailed knowledge, access, and experience with numerous data sets. They also need knowledge of how the information systems and their data have changed over time to do trend and other analyses. When utilizing very large data sets, robust processing and storage capacity and the skills of research programmers are critical.

The DoD needs to ensure that its workforce is educated and trained to fully understand, analyze, and use existing acquisition data opportunities. The acquisition community must have the skills and aptitude to understand, analyze, and use this data to make decisions. Lastly, but importantly, the DoD needs to continue to focus on developing internal, organic capability to use and improve acquisition data to better understand what data is being collected, what data should be collected, and how that information can inform DoD decision-making.

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