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Implementation Guide for Data Management

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Implementation Guide for Data Management

GEIA-HB-859

January 2006

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(Formulated under the cognizance of the GEIA Data and Configuration Management Committee (G-33).)

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Implementation Guide for Data Management

GEIA-HB-859

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Foreword

The federal government and industry have moved to concurrent acquisition and development processes using integrated process teams (IPTs). These processes are supported by timely, accurate, cross-functional access to data within an integrated data environment (IDE) enabled by advances in information technology (IT). Since the advent of acquisition reform in 1994, Data Management (DM) practices have evolved from being directed by a prescriptive set of standards and procedures to use of the guidance in a principles-based standard -- ANSI/EIA 859.

GEIA Handbook 859 provides implementation guidance for ANSI/EIA 859, with discussions of applications of the standard's principles, tools, examples, and case studies. Handbook 859 is organized according to the lifecycle of data management and covers activities from the pre-RFP stage through records disposition. It also provides annexes on topics which apply at multiple stages in the lifecycle, such as protection of data, continuous improvement and knowledge management.

Scope and Purpose of Data Management

As an integral part of the evolution to ANSI/GEIA-859 and the new environment, data management ensures that appropriate information support is available. Data requirements are established that ensure that data are properly timed and accessible, and provide the necessary visibility. The integrity of the data must be ensured regardless of their physical location. The DM process, implemented with rapidly maturing technologies, makes information available sooner and facilitates information sharing. It controls the digital format and the procedures necessary to exchange, index, store, and distribute or provide access to data.

The DM process offers a wide range of benefits that contribute to improvements in the cost, schedule, performance, and support of products and services by enabling acquisition managers to do the following:

- Make better tradeoff decisions
- Identify problem areas earlier
- Decrease cycle times for decisions and information processing
- Eliminate overhead costs of receiving, storing, and processing hard-copy documents.

Data management, originally instituted to address the information needs for the Department of Defense (DoD), has been adopted widely, not only in the defense industrial base, but in insurance, medicine, and other businesses with complex data environments. DM's purpose has always been to ensure that data are available for any legitimate use whenever needed, for the least cost.

Scope and Purpose of Handbook

ANSI/GEIA-859 presents core DM principles, with emphasis on managing data in a digital environment over the life cycle of the data. Handbook 859 contains detailed advice on applying the standard. Like the standard, the handbook addresses each phase of the data life cycle. The essential core DM principles presented in ANSI/GEIA-859 are applied through decision criteria, recommended inputs and outputs, and defined recommended outcomes. Case studies illustrate the application of the principles in different phases.

This handbook is organized according to the activities in the traditional data management life cycle. This life cycle should be familiar to data managers and should provide a context for applying the principles articulated in the standard. Annexes provide specific areas of guidance and education for the practitioner, which apply throughout the life cycle. Annex B addresses intellectual property (IP), Annex C discusses continuous improvement of the DM process, and Annex D presents two perspectives on the integration of data management and knowledge management (KM). Cross-references have been inserted into the handbook to direct the reader to additional information contained in the annexes.

The purpose of this handbook is to provide implementation guidance to data managers who are applying ANSI/GEIA-859, either to new projects or to improve existing data management environments. The guidance in this handbook will help data managers define suitable approaches, methods, processes, and techniques for applying the principles presented in ANSI/GEIA-859. Several areas in ANSI/GEIA-859 (enterprise planning, continuous improvement, and the like) are new areas of emphasis for data managers. The new areas are emphasized in this handbook, but the handbook covers all data management activities

Intended Audience

The primary audience for this handbook is the data manager seeking to update or build new DM systems according to the principles in ANSI/GEIA-859. However, this handbook can be useful to others in the enterprise, such as the data managers' peers in coordinating organizations and members of the executive staff who wish to understand the value of data management and its appropriate roles in the organization.

How the Handbook Was Developed

Traditional DM methods were satisfactory in the era when U. S. government acquisition and management policy required conformance to military specifications and standards, data were primarily hard copy, and all data were delivered for evaluation and use. Following acquisition reform, the shift from "oversight" to "insight" management methods, streamlining of contracting practices, and technology advances enabled data to be increasingly digital and more dynamic. Data began to reside with the contractor for sustained periods of the life of the contract and were subsequently managed, maintained, updated, and archived during the contract life cycle.

These phenomena were the catalyst for the reinvention of data management and were largely responsible for the body of industry and government practitioners who came together to form

the Government Electronics and Information Technology Association (GEIA) Data Management Panel. (Annex A lists the panel members and other contributors to the handbook.)

This handbook incorporates lessons learned by industry and government practitioners and managers from the aerospace, transportation, defense, and other communities. The effort was sponsored by the Office of the Secretary of Defense, Acquisition, Technology and Logistics, Systems Engineering, Enterprise Development in partnership with Logistics Systems Modernization.

Note:

This handbook is one of a family of GEIA documents that provide standardization and guidance for configuration and data management. This family of documents consists of:

- ANSI/EIA-649, “National Consensus Standard for Configuration Management”
- GEIA-HB-649, “Implementation Guide for Configuration Management”
- ANSI/EIA-859, “Data Management”
- GEIA-HB-859, “Implementation Guide for Data Management”
- EIA-836, “Configuration Management Data Exchange and Interoperability”

CM and DM are disciplines with naturally occurring overlapping areas of interest that may be implemented differently in each organization, according to its unique corporate culture. Whether in separate organizations, or under the same leadership, CM and DM must work in concert in order for them to work effectively. Though CM and DM were established, historically, to be uniquely focused—and some aspects of that natural separation of intention occur—they must work together for the benefit of the organization. The CM and DM disciplines are more than what CM/DM people do; they are what is done throughout the enterprise to manage the configuration of its products and maintain its data assets. CM and DM activities involve personnel from many corporate and functional groups and teams. The focus of the GEIA standards and handbooks is more on the functions that must be performed and not on who is tasked to perform them.

GEIA does not endorse any specific organizational relationships. It is GEIA policy that standards and handbooks reflect methods available to each enterprise, which then determines how to allocate their resources and distribute these tasks. Any reference to how organizations are, or should be, comprised is the province of each individual enterprise. In the above CM and DM documents, any reference to specific organizational relationships are strictly for example purposes. They may illustrate typical situations, but such references should not be construed as necessarily appropriate or correct for any given enterprise.

How to Use This Handbook

ANSI/GEIA-859 is a principles-based standard, organized according to the focus of the principles. This handbook is organized according to the activities in the traditional data management life cycle. This life cycle should be familiar to data managers and should provide a context for applying the principles articulated in the standard.

ANSI/GEIA-859 principle	Application of principle in handbook
1—Define the enterprise-relevant scope of data management	Section 3
2—Plan for, acquire, and provide data responsive to customer requirements	Sections 3 and 4
3—Develop DM processes to fit the context and business environment in which they will be performed	Section 3.
4—Identify data products and views so that their requirements and attributes can be controlled	Section 4
5—Control data, data products, data views, and metadata using approved change control processes	Section 5
6—Establish and maintain an identification process for intellectual property, proprietary, and competition-sensitive data	Annex B
7—Retain data commensurate with value	Section 6
8—Continuously improve data management	Annex C
9—Effectively integrate data management with knowledge management	Annex D

How the Handbook Was Developed

This handbook was developed under the auspices of GEIA’s Data Management Panel, a joint industry-government group. It incorporates lessons learned by industry and government practitioners and managers from the aerospace, transportation, defense, and other communities. Leadership of this effort was sponsored by the Office of the Secretary of Defense, Acquisition, Technology and Logistics, Systems Engineering, Enterprise Development in partnership with Logistics Systems Modernization.

Companion Documents

ANSI/GEIA-859 and this handbook are part of a family of standards and handbooks that, taken together, cover most of the aspects of complex systems design, engineering, and production:

- ANSI/EIA-632-1999, Processes for Engineering a System
- ANSI/EIA-649-A-2004, National Consensus Standard for Configuration Management
- GEIA-HB-649, Handbook for EIA-649, National Consensus Standard for Configuration Management"
- EIA-836, Configuration Management Data Exchange and Interoperability.

1.0 Introduction

Data management is an area of discipline oriented to ensuring that data and information are available and usable when and where they are needed. Data management is most visibly practiced in challenging information environments—those in which the volume of data is large, the useful life of the data far exceeds the useful life of storage media, and there is a complex mix of types of data, a broad user base, and many levels and categories of access rights.

Data management comprises the activities needed to plan, develop, implement, and administer systems for the acquisition, storage, and retrieval of data.

Mandatory in many federal activities since the 1960s, data management is widely used in the aerospace industry. It is also used commercially in industries with challenging data environments, such as the automotive industry, the pharmacological industry, the nuclear power industry, and medicine and clinical settings. Many of the examples in this handbook originate in the aerospace community, but the principles in ANSI/GEIA-859 and the practices in this handbook can be applied in other contexts.

Traditional DM approaches were based on the divide between the customer (often a government agency) and the supplier. Standards and guidance focused on how a customer specified the data to be supplied, data formats, frequency of delivery, etc., to ensure that data products (often in physical forms such as paper) were delivered and on-hand to support engineering and program management decisions. The traditional role of the data manager in the customer organization has been to specify data to be delivered, contracting for that delivery, and monitoring the data delivered.

For sometime we have been in transition; as a result of changes in acquisition (performance-based contracts, capabilities-based acquisition, and contracted logistics support), only minimal data may be physically delivered to the customer. Suppliers may build, operate, and maintain the system for its useful life. When data are delivered to the customer, delivery is frequently via electronic access to supplier-maintained information systems. The DM standards must recognize this new business environment and allow for the transition from the traditional to newer acquisition approaches and new information delivery methods.

To accommodate the range of acquisition approaches, ANSI/GEIA-859 provides the underlying principles of effective data management to be applied in traditional, transitional, or new DM environments. The principles are as follows:

1. Define the enterprise relevant scope of data management
2. Plan for, acquire, and provide data responsive to customer requirements
3. Develop DM processes to fit the context and business environment in which they will be performed

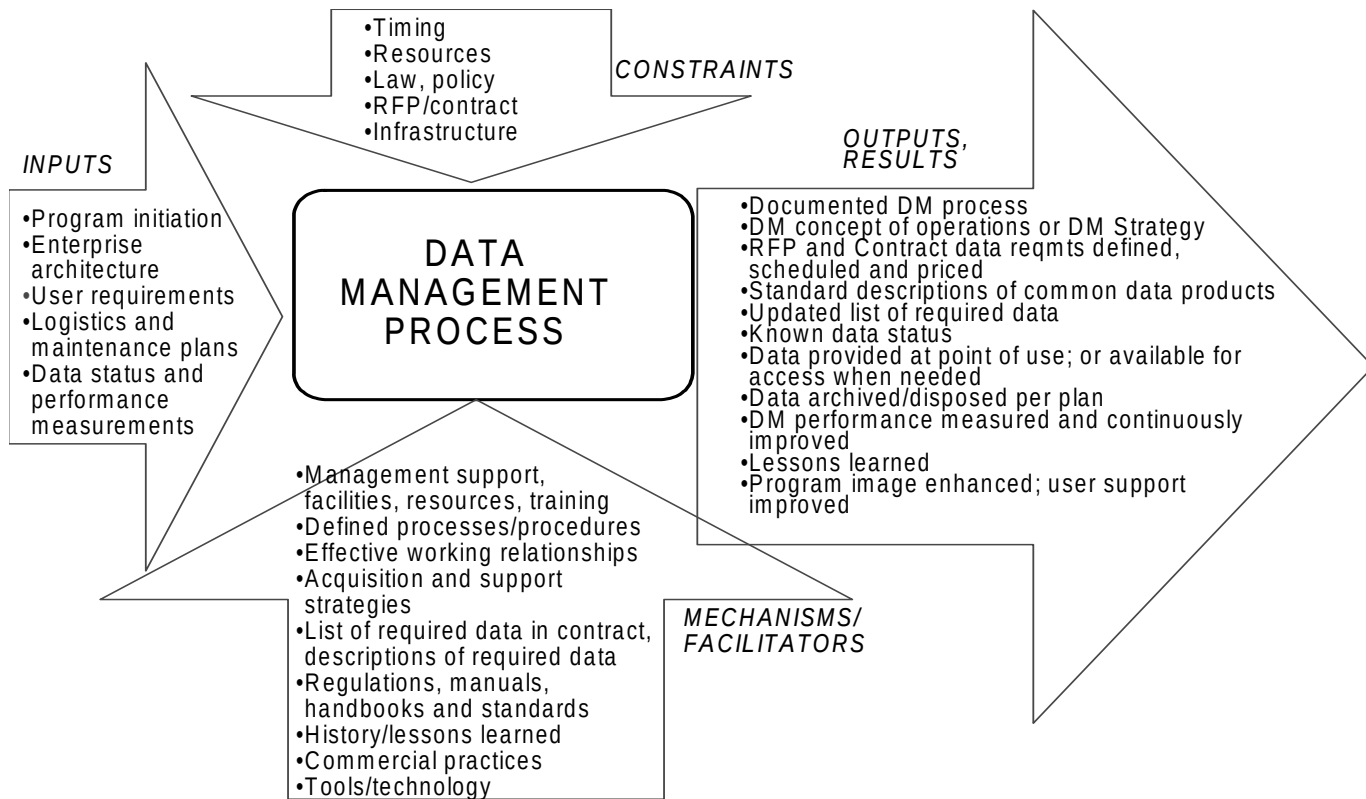
4. Identify data products and views so that their requirements and attributes can be controlled
5. Control data, data products, data views, and metadata using approved change control processes
6. Establish and maintain an identification process for intellectual property, proprietary, and competition-sensitive data
7. Retain data commensurate with value
8. Continuously improve data management
9. Effectively integrate data management with knowledge management

The principles can be applied to managing data regardless of the environment; they apply to traditional paper-based delivery of data, to electronically maintained and delivered data, and to performance-based acquisition, including contractor logistics.

1.1 Data Management Overview

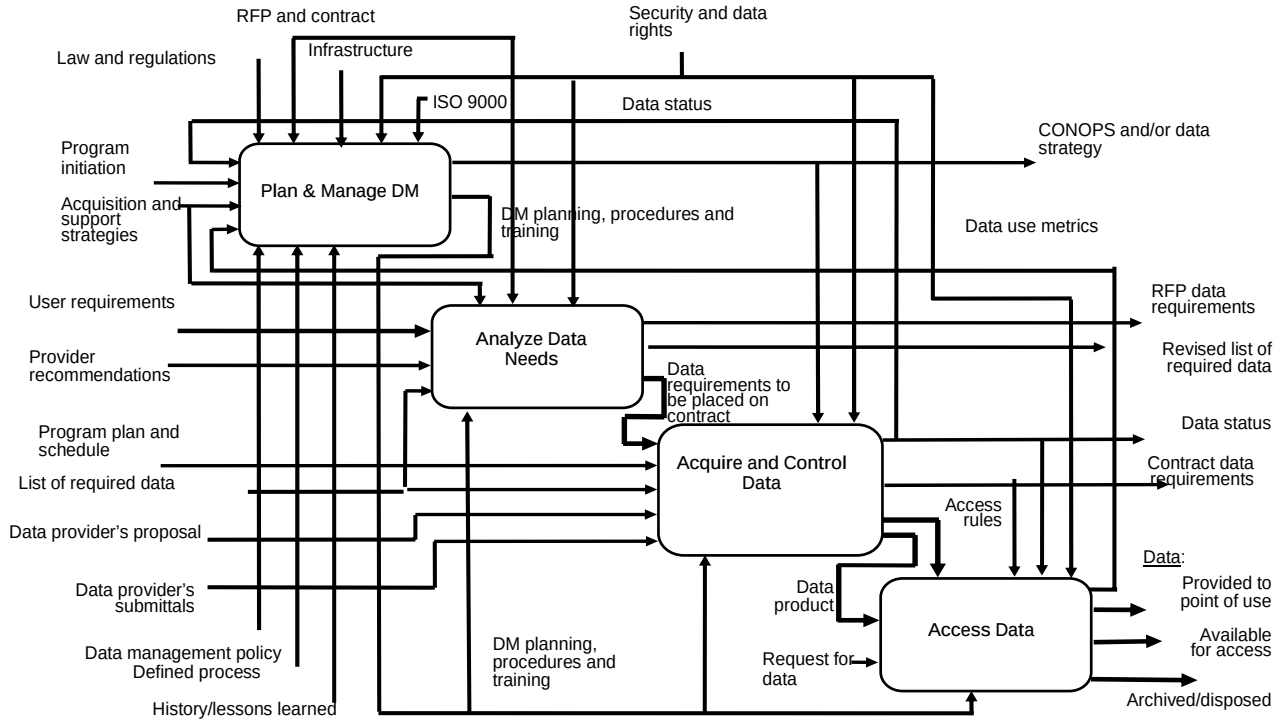
[Figure 1-1](#) shows, at the highest level of abstraction, the DM process in a complex engineering program environment. The process begins when a complex engineering program is contemplated—specifically, when the requirements for the engineered product are being developed. At this time, the customer for the product plans for the product and its maintenance, the evolution of its systems to read and use the data provided by the supplier, and the measures needed to ensure that both product development and data proceed according to plan. The DM process uses the inputs, facilitators, and good data management practices to deliver all needed outputs within constraints.

Figure 1-1. Top-Level Process Model of Data Management



[Figure 1-2](#) is a high-level depiction of DM activities. To be successful, the data manager must plan and manage the DM program, determine what data are needed by whom and when, acquire and provide stewardship over the data, and deliver, provide access to, and properly dispose of the data.

Figure 1-2. Top-Level Activity Model of Data Management



In earlier approaches to data management, prior to ANSI/GEIA-859, when the prevailing data media was paper, many of the day-to-day DM activities were prescribed and nearly clerical in nature. The customer specified in detail the data products to be delivered; often, customers bought more data than needed due to an inability to predict specifically and in detail what types of data would be needed. Due to acquisition reform and the explosion in information systems and networks that facilitate data sharing between customer and supplier, this approach is no longer effective.

1.2 Benefits of Enterprise Data Management

By conducting DM activities according to the principles of ANSI/GEIA-859, enterprises reduce the risk of not having needed data available when and where they are needed. Having the right data available supports better design and development decisions, supports faster decision processes, provides early-warning information, and reduces costs associated with hard-copy data delivery. Providing electronic access to the authoritative source for a given data product, for example, ensures data integrity in a way not possible in the old environment where multiple hard-copy documents were delivered over the life cycle. The enterprise DM process, aided by new computing and networking support, makes information available more quickly and facilitates collaboration among customers and suppliers. It controls the digital format and the procedures necessary to exchange, index, store, and distribute or provide access to data. It offers a wide range of benefits that contribute to improvements in the cost, schedule, performance, and support of complex engineered systems.

A small case study can help managers understand the impacts of approaching data management from the enterprise perspective illustrated in ANSI/GEIA-859:

In a defense supplier manufacturing facility, electronic circuit board manufacture is supported by schematics supplied electronically to the shop floor. Elsewhere in the DM infrastructure, photographs of completed assemblies are stored for use in technical manuals and other high-level descriptions of avionics components. In the process of maintaining the DM infrastructure, the data manager at this installation has been gradually integrating all of the DM systems to provide a single interface to all DM systems, with appropriate access control.

The shop floor employees became aware of the availability of the photographs of the completed components used for documentation and now routinely retrieve both the photograph of the completed component and the schematic for use during the assembly process. The schematic still governs the assembly process, but the photograph provides a different context that the assembly employees find useful; the context the photos provide has helped reduce errors in assembly.

By having a DM strategic plan that includes a gradual transition to an integrated DM infrastructure, and a vision of how DM can be used across the enterprise, this data manager enabled a no-cost improvement to the circuit board assembly function. This data manager's DM strategic plan includes transition to an integrated DM and configuration management (CM) architecture as his next phase.

2.0 Planning for Data Management

This section will answer the following questions:

- ◆ What is the scope of the DM process?
- ◆ What activities constitute the DM process?
- ◆ How is data management related to other functional activities?
- ◆ What are the DM objectives for each phase of the program life cycle?
- ◆ What DM activities are performed in each phase? What decisions are made and what are the criteria for making them?
- ◆ What are the benefits derived from DM activities, and what are the risks if the activities are not performed?
- ◆ How can the process be measured, and how do the measurement metrics relate to objectives?

2.1 Introduction

The federal government and industry are moving to a more concurrent acquisition process using integrated process teams (IPTs) and requiring timely, accurate, cross-functional access to data within an integrated data environment (IDE). Advancing information technology (IT) is enabling the changing acquisition environment.

As an integral part of the evolution to ANSI/GEIA-859 and the new DM process, data management ensures that appropriate information support is available. Data requirements are established that ensure that data are properly timed and accessible, and provide the necessary visibility. The integrity of the data must be ensured regardless of their physical location. The DM process, implemented with rapidly maturing technologies, makes information available sooner and facilitates information sharing. It controls the digital format and the procedures necessary to exchange, index, store, and distribute or provide access to data.

In sum, the DM process offers a wide range of benefits that contribute to improvements in the cost, schedule, performance, and support of products and services by enabling acquisition managers to do the following:

- ◆ Make better tradeoff decisions
- ◆ Identify problem areas earlier
- ◆ Decrease cycle times for decisions and information processing
- ◆ Eliminate overhead costs of receiving, storing, and processing hard-copy documents.

2.2 Scope

The activities described in this section are conducted very early in the DM life cycle and may precede the beginning of the program life cycle. For example, when the requirements for a new capability are being defined, the DM function should capture and manage the documentation of initial requirements, any significant changes in direction, and tradeoffs made. By applying a DM perspective to these early decisions, the data will be available for later requirements traceability, for example. The usual DM activities in this phase include planning for data management; strategic DM planning may also take place at this time.

2.3 Data Management Process Description

[Figure 1-1](#), provides an overview of the DM process (showing the entire process as a single activity) with the following components:

- ◆ Inputs—information needed to initiate and perform the process
- ◆ Constraints—information or factors that inhibit or put limitations on the process
- ◆ Mechanisms/facilitators—information, tools, methods, and technologies that enable or enhance the process
- ◆ Outputs—results that derive from the process and information provided by the process.

The Defense Acquisition Guidebook, a compilation of best practices for use in DoD acquisition programs, states the requirement for data management, as follows:

Data Management plays an important role in the systems engineering process. In the program office, data management consists of the disciplined processes and systems used to plan for, acquire, access, manage, protect, and use data of a technical nature to support the total life cycle of the system. Under the Total Life Cycle Systems Management concept, the program manager is responsible for Data Management. The program manager should develop a plan for managing defense system data during each phase of the system life cycle and include it in the Systems Engineering Plan.

Data Management applies policies, systems, and procedures to identify and control data requirements; to responsively and economically acquire, access, and distribute data; and to analyze data use. Adherence to data management principles enables the sharing, integration, and management of data by government and industry, and ensures that data products (information) meet or exceed customer requirements. Recent government and industry initiatives in Data Management have changed the approach and scope of data management, and made it a stronger element in the systems engineering process.

- Data Management has a leading role in capturing, organizing, and providing information for the following uses in the systems engineering process:
- Enabling collaboration and life cycle use of acquisition system product data;

- Capturing and organizing all systems engineering inputs, as well as current, intermediate, and final outputs;
- Providing data correlation and traceability among requirements, designs, solutions, decision, and rationale;
- Documenting engineering decisions, including procedures, methods, results, and analyses;
- Functioning as a reference and support tool for the systems engineering effort and process;
- Facilitating technology insertion for affordability improvements during re-procurement and post-production support; and
- Supporting configuration procedures, as needed.¹

Here and elsewhere, DoD policy provides a broad scope to data management:

- ◆ It relates to the complete program life cycle (i.e., supporting the systems engineering effort; interacting with program management, configuration management, and business management; and providing information for operational support of deployed systems).
- ◆ It embraces the use of contractor data formats, whenever feasible.
- ◆ It reflects the integration of data management with all program functional activities.
- ◆ It does not limit the data to be managed solely to contractually specified data but encompasses government programmatic information, as well.

Current policy recognizes the reality that in today's environment, most data exist in digital format; the challenge is to find the most efficient and cost-effective mode of delivery (submittal or access) from the data source that supports the product throughout its life cycle.

The DM process detailed in this handbook encompasses all data generated as part of the acquisition, development, production, and support of products and services. It involves customer and supplier activities, and it embraces acquisition reforms and integrated product and process development teams. Data management, as a discipline that cuts across all functional activities of a program, can and must provide the unifying focus on the goal of an integrated data environment.

2.3.1 Description of Top-Level Data Management Activities

As shown in [Figure 1-2](#), the DM process has four top-level activities: plan and manage data, analyze data needs, acquire and control data, and access data. They are described below in terms of their inputs, outputs, constraints, and facilitators. The need to perform the DM activities is independent of any specific organizational structure or specific method.

¹ Defense Acquisition Guidebook, Chapter 4

2.3.1.1 Plan and Manage Data

This activity covers much of the work that must be completed before a request for proposals (RFP), statement of work (SOW), or statement of objectives (SOO) can be developed. In this handbook, this activity is addressed in both this section and in [Section 3.0](#), Identification and Definition.

◆ Inputs

- *Authorization to initiate the program.* This input is the initiator for the entire systems engineering activity.
- *Acquisition and support strategies for the program.* These inputs are major factors in determining what data will be needed.
- *Data status.* This input, from the Acquire and Control Data activity, provides performance measurement feedback to the management activity on schedule vs. actual accomplishment of DM actions.
- *Data use metrics.* This input, from the Access Data activity, provides information about the data accessed by users for decision making and for lessons learned.

◆ Outputs

- *Concept of operations (CONOPS) with regard to data, or equivalent information contained in operating plans, program plans, data management plans, etc.* This output provides the information needed to establish an effective information interface.
- *DM planning, procedures, and training.* This output defines the extent of DM application and facilitates all DM functional activities.

◆ Constraints

- *Public laws and regulations.* - These govern much of the DM process.
- *RFP and subsequent negotiated contract provisions.* These constrain the process by setting boundaries on customer and supplier obligations.
- *Existing and planned customer and supplier infrastructure.* These place limits on the capabilities of the supplier to provide data and on the customer to receive data.
- *Security and data rights.* These limit who can see specific data.
- *ISO 9000 quality system standards.* These provide globally understood design and document control requirements that are a de facto standard.

◆ Facilitators

- *DM policy.* This facilitator covers customer policy and guidance (for example, the DoD policy cited in [Section 2.3](#)), and industry enterprise policies.
- *Defined process.* This facilitator is the enterprise's defined generic DM process to be tailored for program application. This generic DM process will be tailored much like the DM strategy is tailored for a particular program.

NOTE: The enterprise-defined process should be continuously improved to incorporate new technology. Technology such as the appropriate use of distributed systems, service-oriented architectures, etc., can enable more efficient and timely data preparation, distribution, and access at lower cost. The infusion of technology is reflected in the plans, procedures, and training that facilitate all DM activity.

- *History and lessons learned.* This facilitator represents both documented history and the experience of the enterprise and its personnel (an irreplaceable commodity).

2.3.1.2 Analyze Data Needs

This activity is necessary to determine and document user data needs. In this handbook, these activities are described in [Section 3](#), Identification and Definition.

◆ Inputs

- *User requirements.* This input is provided by data end users.
- *Provider recommendations.* This input is from data providers after review of draft data requirements.

◆ Outputs

- *RFP data requirements.* This output is the preliminary list of data and information requirements to be included in an RFP and in the associated SOW tasks to generate the data.
- *Revised list of required data to be placed on contract.* This output is the primary output of the Analyze Data Needs activity. It represents the final iteration of candidate data requirements to be placed on contract (in the Acquire and Control Data activity).
- *Data descriptions.* This output is a description of data requirements defined by the end user.

- ◆ Constraints
 - *Acquisition and support strategies.* These constraints limit the data requirements as compared to complete organic support.
 - *Security and data rights.* These constraints limit who can see specific data.
- ◆ Facilitators
 - *DM planning, procedures, and training.* These facilitate all DM activities.

2.3.1.3 Acquire and Control Data

This activity includes completing contract inputs, negotiating contract requirements, and performing the acquisition, data preparation, and control functions that result in data products. In this handbook, these activities are found in [Section 4](#), Acquisition and Preparation, and [Section 5](#), Data Asset Control.

- ◆ Inputs
 - *Program plan and schedule.* This input aligns data submittal and access requirements with the final version of the program planning and scheduling.
 - *Data provider's proposal.* This input represents the provider's formal proposal submittal. It is a basis for proposal evaluation and the modification of data requirements to accommodate accepted value-adding alternate approaches.
 - *Data submitted by the data provider.* This input represents the data generated and supplied under the terms of the contract.
- ◆ Outputs
 - *Contract data requirements.* This output represents the list of required data after negotiation.
 - *Data products.* This output represents the data produced in response to the list of data required and the SOW or SOO.
 - *Access rules.* This output represents the rules for access associated with each data product.
 - *Data status.* This output provides performance information and, in conjunction with the access rules, is a factor in determining authorized access.
- ◆ Constraints
 - *CONOPS or equivalent information concerning the enterprise infrastructure.* This constraint limits the data interchange method.

- *RFP and subsequent negotiated contract provisions.* These constrain the process by setting boundaries on customer and supplier obligations.
- *Security and data rights.* These limit who can see specific data.
- ◆ Facilitators
 - *DM planning, procedures, and training.* These facilitate all DM activities.

2.3.1.4 Access Data

This activity provides data to end users throughout the product life.

- ◆ Inputs
 - *Data product.* This input represents the data provider's data products ready for delivery or access, as applicable.
 - *Requests for data.* This input represents the request for data by a data user, which may be an online transaction.
- ◆ Outputs
 - *Data provided to point of use.* This output represents physical delivery of data to users.
 - *Data available for access.* This output represents notification that required data are available for access by authorized users.
 - *Archiving or disposal.* This output represents the removal of data from active access and the disposal of data no longer needed.
- ◆ Constraints
 - *Access rules.* These constrain or limit the access privileges provided each user.
 - *Contract data requirements.* These include distribution requirements and distribution statements, which limit access.
 - *Data status.* An output of the Acquire and Control Data activity, data status limits access (e.g., it identifies who is allowed access to working data).
 - *Security and data rights.* These limit who can see specific data.
- ◆ Facilitators
 - *DM planning, procedures, and training.* These facilitate all DM activities.

2.3.2 Relationship of Data Management to Other Functional Activities

Data management by its very nature is a cross-functional activity. It involves every program activity that generates and uses program information. The traditional role of the data manager has been one of conducting a data call, structuring the resulting requirements into contractual form, and monitoring timely delivery. Much of this traditional role will change as the result of some combination of adopting ANSI/GEIA-859 principles, new approaches such as online CoPs to gather data requirements, or enterprise architecture (EA) approaches to developing processes and systems. New aspects of the data manager's role include integration of information sources and management of online resources for information retrieval.

The changing program work environment focuses the data manager's attention on the following details:

- ◆ Defining IPT structures, which includes specifying the individual functions represented on each IPT, their relationships to one another, and the uses that each IPT has for data
- ◆ Working closely with IT professionals to provide the infrastructure necessary to support IPT data sharing needs
- ◆ Establishing a method for documenting and capturing IPT output
- ◆ Acquiring and distributing data in an integrated, digital environment.

Effective performance in this role will require the data manager to have a working knowledge of ANSI/EIA-859 principles, acquisition management, relevant information technologies, and techniques for process development and infrastructure design.

Regardless of program size and the existence of a full-time data manager, each IPT must have DM representation, if only part time or on call. A dedicated DM professional is always a wise choice. As a minimum, in an environment with more IPTs than DM specialists, one of the IPT members should be assigned the responsibility to be the data management interface. The data manager must ensure that IPT members who assume this role are provided the necessary training and know whom to consult when questions arise. Short foundation courses in data management should be provided to give them an appreciation for the job and the basic tools they will need to accomplish it.

Data are the most timely and accurate when they are generated, stored, and maintained at their source. Because data are in many places, the data manager needs distributed database tools to maintain the visibility and relationships of data. In an IDE, the data manager manages the exchange of data between data providers and users by interfacing with a virtual data warehouse encompassing the entire distributed database.

The primary goal is always to provide the right data to the right people at the right time to support cross-functional life-cycle decision making. This, in turn, will reduce the total life-cycle costs of products and services. A significant departure from the traditional paper-based DM approach is necessary to accomplish this goal in the evolving data environment. In many

cases, data management will be practiced at the data-element level and at the document level, in order to access and extract information from object-oriented or relational databases.

2.4 Data Management Implementation Over the Program Life Cycle

DM objectives are related to the program activity and program objectives for each phase of the life cycle. The various sections of the handbook provide DM templates for implementing the principles of ANSI/EIA-859.

3.0 Identification and Definition

This section will answer the following questions:

- ◆ How can a data manager employ strategic thinking about data management and the enterprise?
- ◆ How might a data manager approach strategic planning?
- ◆ How would a data manager go about designing a DM architecture, process, and infrastructure?
- ◆ How can a data manager employ ANSI/GEIA-859 Principle 1 in an environment in which an enterprise approach to DM does not exist?
- ◆ How should a data strategy and CONOPS for a program or contract be developed?

3.1 Introduction

This section of the handbook covers planning for the acquisition, control, distribution, and disposition of data. The application of the principles of ANSI/GEIA-859 requires a holistic approach to data management, thus planning includes strategic planning and developing an understanding of data needs of traditional direct users of program data, other functional areas, and customers. The benefits of this approach include greater efficiency in supplier processes (for example, manufacturing processes can benefit) and in customer processes (operations, sustainment, and logistics).

3.2 Scope

This section covers a sample methodology for the activities necessary to define what data are needed and what processes are needed to acquire and provide data to users when needed. It describes strategic planning for the DM function, as well as the development of the data strategy for a particular program. It also describes steps to take when designing the processes and architecture needed to execute the plans.

3.3 Development of Data Management Strategy and Architecture

3.3.1 Strategic Planning

Development of a strategy begins by considering the role of data management in the enterprise and developing the DM strategic plan. The following subsection describes a sample strategic planning process, but to fit the specific needs of a particular enterprise, that process must be customized, based on a number of factors:

- ◆ The size and scope of the DM effort contemplated: is this a strategic plan for a single program, or for the enterprise's future approach to DM?

- ◆ The type of plan: is this an update to a strategic plan (perhaps the enterprise strategic plan) or a completely new DM strategic plan?
- ◆ The resources available for strategic planning
- ◆ The deadline for strategic planning: is this plan needed quickly (for a program due to start soon or for a proposal) or is it part of the enterprise strategic planning process, with a deliberate cycle for development of the plan?

3.3.2 Sample Strategic Planning Process

The following is a description of a generic strategic planning process; it is intended as a short introduction to DM strategic planning. If the enterprise has a process for strategic planning, it should be used. Other enterprise planning models can be adapted for strategic planning as well. In addition, numerous reference materials, courses, and the like are available on this topic.

3.3.2.1 Summary

The process begins by identifying the vision and mission of the DM effort (either for the enterprise's DM organization or for a specific program or contract). Once the vision and mission are clearly defined, the DM organization conducts a series of analyses (for example, external environment analysis, internal environment analysis, current versus proposed gap, and benchmarking), which provide a context for identifying the DM strategic issues. Strategic programming follows; the DM organization develops specific strategies, including goals, action plans, and tactics. Periodically, the organization evaluates its strategies and reviews its strategic plan, considering progress made and evolving changes. It may take several planning iterations before strategic planning becomes institutionalized and organizations learn to think strategically.

3.3.2.2 Develop Vision and Mission

Identification of the DM vision and mission is the first step of any strategic planning process. The vision sets out the reasons for the DM effort and the state that the organization aims to achieve; it enables development of goals and performance objectives. Both the vision and mission are defined within the framework of the enterprise culture and contract constraints and are used as a context for development and evaluation of strategies. One cannot overemphasize the importance of a clear vision and mission; none of the subsequent steps will matter if the organization is not certain where it is headed.

The data manager must do some creative thinking to develop the DM organization's vision and mission. Thinking beyond what the DM organization must do to satisfy contractual requirements, the data manager should consider what else data management can do for the enterprise. A strategic vision can be developed via brainstorming, facilitated working groups, or some other means to spur thinking beyond what is already known. The results of out-of-the-box thinking will be tempered later by real-world constraints, such as resources, contractual restrictions, and the like; but the first step is to think creatively about how data management can best benefit the enterprise and its customers.

3.3.2.3 Analyze the Environment

Once the vision and mission are clearly identified, the enterprise must analyze its internal and external environment. Many techniques can be applied; a proven technique is a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. In short, a SWOT analysis addresses internal factors such as enterprise policies affecting DM: functions such as the configuration management, quality assurance, and records management operations; and available resources such as staff, IT, and communications. In the SWOT technique, one also analyzes information about the external environment; including economic, legal, technological, political, and international factors, the customer base, and the state of the industry.

SWOT analysis identifies factors that may affect desired future outcomes of the organization. The SWOT model is based on identifying the organization's internal strengths and weaknesses, opportunities for improvement, and threats of the external environment; and consequently identifying the company's distinctive competencies and key success factors. The objective of a SWOT analysis is to recommend strategies that ensure the best alignment between the external environment, internal resources, and environmental factors.

The following are examples of questions that may help in brainstorming about DM strengths and opportunities:

- ◆ For customers, can the DM capabilities and electronic products be leveraged beyond the acquisition phase? In other words, can DM be a service offering during the maintenance phase of the product life cycle?
- ◆ Can DM processes be applied elsewhere in the enterprise? For example, DM processes could serve as templates for other necessary enterprise processes such as those needed to satisfy provisions of recent legislation.
- ◆ Are there effective DM processes in place that (although they may have been designed for paper data products) can translate to the electronic environment? Can DM systems be modified to provide electronic delivery to customers? Can they be integrated with other enterprise systems?
- ◆ Can DM processes be applied to additional functional areas or to support subcontract management, project management, operations, logistics, etc.?
- ◆ How can DM contribute significantly to reducing enterprise costs or to generating revenue?

A similar process can be followed to identify weaknesses and threats.

Usually, the result of the SWOT analysis is presented in a “quad chart.” [Figure 3-1](#) is an example.

Figure 3-1. Quad Chart Resulting from SWOT Analysis

Strengths	Weaknesses
Integrated leadership; leadership team establishes policy Organizational metrics manual and metrics champion Project workbooks; integrates all disciplines Earned-value management system Customer involvement and communication Detailed plans and strategy	Estimation process not completely documented Responsibilities for some risk management activities inconsistent between the plans, handbook, and workbook
Opportunities	Threats
Some tools approaching obsolescence Staffing for subcontract management could be supplemented by DM staff for tracking subcontractor deliverables	50% of experienced DM staff within 5 years of retirement Access and downtime issues with customer required/owned IDE sites

Synthesizing strengths, weaknesses, opportunities, and threats should produce several scenarios of the future DM organization, its functions, and role in the enterprise:

- ◆ Strength + Opportunity = Capitalize.
- ◆ Strength + Threat = Optimize.
- ◆ Weakness + Opportunity = Invest.
- ◆ Weakness + Threat = Retrench.

Selecting a single scenario as the target may require a recursive process of identifying gaps and developing high-level strategies and resource estimates. Once a target state has been decided upon, detailed analysis of what is required to achieve that state can begin.

3.3.2.4 Perform Gap Analysis

Organizations evaluate the difference between their current position and desired future state through gap analysis. As a result, the DM organization can develop specific strategies and allocate resources to close the gap and achieve its desired state. Resources that may be applied include existing DM assets: processes; systems; and personnel capable of defining data requirements, preparing internal data, acquiring external data, controlling data, managing records, and archiving and disposing of data.

To aid in analysis of where to invest (identifying which gaps to address), the data manager might use benchmarking to assess the DM organization's operations, practices, and performance against other, similar DM organizations. Benchmarking data are also useful in defining metrics to assess the DM organization's performance and progress toward goals. Finding benchmarking data that are specifically applicable to similar DM organizations is

often difficult; professional associations and peers may provide benchmarking opportunities. Benchmarking can also help with identifying best practices useful in setting goals and metrics.

3.3.2.5 Identify Strategic Issues

The DM organization determines its strategic issues based on (and consistent with) its vision and mission, within the framework of the environmental analysis and other analyses. Strategic issues are fundamental issues the organization must address to achieve its mission and move toward its desired future. For example, in a systems engineering effort with over 80 contactors and suppliers, one strategic issue is the state of the practice in managing data rights and access.

3.3.2.6 Develop the Strategic Plan

The DM organization develops strategic and tactical goals and associated action plans during the strategic programming process, to address strategic issues and develop deliberate strategies for achieving its mission. Strategic goals are the milestones the enterprise wishes to achieve to address strategic issues. Strategic goals should be specific, have milestones and costs, be measurable, be committed to by all parties, and be achievable. The DM organization should develop action plans to achieve its strategic goals.

3.3.2.7 Monitor and Continuously Improve

The DM organization and enterprise components responsible for the activities in the action plans should be periodically evaluated, and the progress toward strategic goals monitored. It is important to measure performance at least annually (but preferably more often), to evaluate the effect of specific actions on long-term results and on the organization's vision and mission. The DM organization should measure current performance against previously set expectations and should consider any changes or events that may have impacted the desired course of actions.

The enterprise should review strategic plans to ensure that they are still relevant and, if not, make adjustments based on these evaluations, including revising strategic goals when warranted. The revised plans should incorporate changes in the environment (internal and external), progress to date, and any revised strategic goals.

3.3.3 Case Study—Development of a Strategic Plan

The data manager at Best Corporation, an aerospace firm, anticipates a win on the largest contract bid the firm has ever made. He had begun a strategic planning effort earlier, but resource constraints have slowed that effort in recent months. He revives that planning initiative and determines to finish the strategic plan for his DM organization and draft a DM strategy—then flesh out the conceptual DM architecture used in preparing the contract bid. To establish the baseline information for this planning effort, he revisits the latest corporate strategic plan and rechecks the vision and mission developed for the DM organization in the earlier efforts. He determines that a review of the DM business environment is needed.

[Figure 3-2](#) shows the SWOT analysis for the DM organization at Best.

Figure 3-2. Case Study DM Organization—SWOT Analysis Quad Chart

Strengths	Weaknesses
Enterprise has robust IT capabilities Strong intellectual property protection capabilities	Related capabilities (records management, quality assurance) are in “foreign” parts of the enterprise; little interaction with DM
Opportunities	Threats
Customers increasingly desire, and are capable of using information maintained in enterprise databases Enterprise is in a fluid position regarding mergers and acquisitions	50% of experienced DM staff within 5 years of retirement

The DM organization’s strategic planning effort results in several goals, which align well with Best’s strategic goals:

- ◆ Position the DM organization to be more flexible, to serve both internal and external customers (and to respond to fluid merger and acquisition environment)
- ◆ Address the impending loss of experienced DM staff over the next 5 years
- ◆ Look for opportunities to ally the DM organization with other parts of the enterprise and become more central to engineering and other operations.

Another factor in the DM strategic plan is that the DM plan in the contract bid proposed that Best would

- ◆ Submit some data products electronically via file transfer,
- ◆ Allow the customer to access other data products in Best’s repository via the internet, and
- ◆ Periodically, deliver, on appropriate media, “snapshot” documents for the customer’s use.

When the proposal was submitted, neither the specific capabilities for data access in subcontractor and supplier DM systems nor the specific data products from each supplier were final.

The strategic programming effort of Best’s data manager produces a prioritized list of initiatives, to be accomplished at lowest cost:

- ◆ Human resources initiatives, including cross-training and mentoring
 - Develop junior DM staff to understand multiple DM functions
 - Help all staff understand the potential of various enterprise IT systems

- ◆ IT initiatives, including investigating existing systems in the enterprise
 - Assess their potential to support DM systems and functions
 - Look for opportunities to re-engineer processes and interfaces
 - Potentially realign DM with respect to those systems
 - Look for flexibility in systems, to influence interactions with suppliers and customers.

Considering the multiple factors to assess and possibly reengineer, the data manager decides that an integrated architecture-based approach is needed to determine where the DM processes, performing organizations, and infrastructure are currently and where it is feasible to be in 4 or 5 years. The IT staff also recommends an internal consultant who can provide some assistance and help her estimate the resources needed for the DM architecture design effort. The amount of staff time required is significant—the equivalent of a couple of people, plus some assistance from an architecture consultant.

The data manager charts three IPTs, each focusing on a particular model of the architecture framework.

- The process analysis team starts with representatives from records management and quality assurance. After the team completes the initial conceptual and contextual analyses, a representative from the project design and engineering team, and a software applications developer from the IT staff, are also needed.
- The data analysis team starts with subject matter experts (SMEs) from the DM staff and the same IT staff as on the process analysis team. Early on, during the development of the semantic model, the documentation of the needed business objects, a member of the library staff joins the IPT to assist with metadata development.
- A third IPT addresses the organization and staffing issues; it enlarges occasionally to include selected subcontractors and suppliers.

As the three models of the architecture framework evolve, each IPT is active when an aspect of the architecture becomes the main focus. For example, the process team led off, and quickly involved the team focused on performing organizations. When that analysis got to the point of examining data and information interchange and customer retrieval, the data team and metadata consultant were more active.

Once the analysis of the current DM architecture (with its multiple views: process, data, and people) was sufficiently defined (so that the processes targeted for improvement were documented to the level of detail where the applications to be reengineered were isolated), the data manager chartered a to-be IPT. This team was composed of the core DM staff on the as-is team and an application developer from the IT staff, with support as needed from other

members of the IPTs. As definition of the to-be DM architecture got beyond the conceptual level, the to-be IPT began including SMEs from other parts of the enterprise to design the specific processes, business rules, data, and performers for the target state.

The to-be DM architecture effort answers all of the strategic DM IT initiatives:

- ◆ It identifies the interactions between DM and other systems in the enterprise, either in their interfaces to DM processes, or completely disconnected from DM, but performing similar functions (identified in contextual level process analysis).
- ◆ It identifies opportunities for reengineering various systems in the enterprises, not just DM systems. (Those opportunities were passed on to management; the DM IPTs were not empowered to redesign non-DM systems.)
- ◆ It realigns DM processes, systems, and data with systems external to the DM function.
- ◆ With flexibility in systems and roles as a goal, it allows transfer of information products with suppliers and with customers in an open, standards-based architecture.

The to-be DM architecture effort also indirectly supports the human resources initiatives. Junior and senior staff members on IPTs exchanged information on why as-is processes work the way they do, and the judgment of the senior staff was incorporated in good business rules underlying the to-be processes. Being on cross-functional IPTs exposed the DM staff to the context and high-level functions of other enterprise applications.

3.3.4 Identification of Customer Requirements

This section will answer the following questions:

- ◆ How are data needs determined?
- ◆ How can a streamlined set of candidate data requirements be developed?
- ◆ What are the steps to defining, consolidating, and coordinating candidate data requirements?
- ◆ How are the most appropriate delivery media/methods determined? What are the advantages and pitfalls of different methods?
- ◆ How and when should the data provider be involved in the process for determining data requirements?
- ◆ What are the criteria for review and acceptance of candidate data requirements?

Data management has changed over the years from a largely clerical activity to a value-added enterprise business process. This new process expands the boundaries of data management

from planning and acquisition of contractual data to include all types of data used within the enterprise throughout the entire life cycle of the data.

In ANSI/GEIA-859, Principle 2 provides a general approach to assessing data needs or requirements and planning the acquisition, management, delivery, and maintenance of data, as well as ownership and usage rights. This section of the handbook provides specific actions and techniques to accomplish these activities and to develop a data strategy and CONOPS.

The following steps are taken to establish general requirements for data:

- ◆ Review project strategy and planning documents and access requirements
- ◆ Develop a general description of requirements
- ◆ Consider information that may be needed to support oversight functions
- ◆ Recognize the spectrum of data views that may be required through the life cycle
- ◆ Determine project-specific requirements
- ◆ Identify related data that may be needed to meet broader external or organizational requirements
- ◆ Map data requirements to identify paper, electronic, other format, or database access.

Identifying potential data requirements requires reviewing existing enterprise or project strategy documents as well as other basic data such as the following:

- ◆ Organization policies and processes
- ◆ Planning documents
- ◆ Budgets
- ◆ Statements of objectives
- ◆ Statements of work
- ◆ Performance specifications
- ◆ Supplier data
- ◆ Financial data
- ◆ Technical data.

Data that may be needed for design and information for business oversight also should be considered. Such data include legal, tax, historical, internal audit, manufacturing, testing, operations, and maintenance data.

The acquisition strategy and acquisition plan should provide the basis to evaluate the elements of risk, maturity of systems and equipment, and life-cycle phases. It should also provide information on data rights, including those procured or granted and methods to be used for protecting proprietary data. (See [Annex B](#) for more information on the protection of data.)

The acquisition plan documents the procurement and logistics, reliability, and maintenance support requirements, and it drives the initial data requirements identification and delivery schedule. Identification of required data is an integral part of the planning process, and in the preliminary documentation step, all the desired data should be identified and documented. These requirements can then be reviewed and assessed for cost and schedule constraints. Data requirements can be consolidated, and informed decisions can be made regarding the actual procurement of data. Subject matter experts should be involved in the identification of data requirements, and all data requirements should be captured and documented, along with the rationale for the final procurement decisions.

Multiple views of the data could be valuable to users. It might be helpful at this point, to develop a matrix capturing the potential requirements for views and forms of data and to consider possible methods of storage and maintenance. Any data views may be affected by the supplier intellectual property policies and procedures. (Refer to the [Annex B](#) for information about IP implications.)

The next step is to define potential data delivery methods. Physical data can be delivered in multiple ways, such as postal service mail, FedEx, UPS, and courier. Likewise, softcopy data can be delivered in multiple ways, such as e-mail, web access, or access to an electronic repository. As data delivery requirements are developed, the potential methods of review and approval of data should be considered:

- ◆ Online IPTs
- ◆ Data review boards
- ◆ Configuration control boards
- ◆ People with a vested interest and expertise who might be responsible for data review.

This review and approval process may take several forms, such as physical meetings, e-mail, and workflow-enabled reviews. The results of the review and approval process should be identified, documented, and controlled. These results will ultimately be provided to the supplier as part of a legal agreement identifying the requirements for data they must provide.

3.3.5 Development of a Data Strategy and CONOPS

3.3.5.1 Determine Data Strategy

Whether a strategic plan is developed for the DM organization or for the enterprise, the data manager will develop a DM strategy for each acquisition program or contract. The existence of a strategic plan will simplify the development of the data strategy in several ways:

- ◆ The data manager will be familiar with the process for developing a strategy.
- ◆ Strategic goals will assist in determining the target DM environment.
- ◆ The SWOT and gap analyses and any benchmarking performed for strategic planning can help bound the program data strategy.
- ◆ The DM manager can leverage any strategic initiatives begun as part of the strategic plan.

Many people believe that data management is not practiced outside of the defense industrial base. However, although the practice originated in DoD, DM principles have been widely applied in many industries and in many countries. The ISO 9000 quality standards address the importance of document control, a documented process, performance in accordance with the documented process, and measuring the effectiveness of the process in order to make continuous improvements. When the concepts underlying document control are examined, they reflect the need to have a data management process.

The data strategy is one way to ensure that DM contributes to the success of short- and long-term goals and enables decisions on data issues by multiple customers or functional areas:

- ◆ *Decisions on how much data to purchase.* A decision to purchase all desired data and associated data rights likely would prove to be immensely costly. On the other hand, the decision not to purchase any data would have significant cost and performance impacts.
- ◆ *Decisions regarding internal development or external acquisition of data and products.* These decisions bring their own opportunities and challenges. On-time delivery, quality of data, cost, and ability to manage information all affect the enterprise and project decisions.
- ◆ *Decisions about strategy.* System or equipment maturity and life cycle of the system impact the strategy decisions and influence the amount of data needed. A lesser amount of data may be needed for a proven system because some data may be public domain or commercial products. Use for the data is also a factor of the data strategy, such as logistics support and maintenance by the supplier vs. purchasing data and material for internal maintenance, and can help determine affordability. Affordability may be affected by embedded intellectual property. This issue may make the cost of data prohibitive, even if the data can even be purchased, which in turn affects the logistic support and maintenance strategies.

DM strategy is a vital part of the preparation for each phase. This strategy at the enterprise level may be documented as minimum requirements or operational policy for DM implementation and consists of setting objectives for the program phases that are consistent with the data acquisition strategy articulated in the CONOPS.

Although there is no specific requirement for a data manager to prepare a formal DM plan, a prudent exercise is to generate and maintain a working document, which contains pertinent information relating to the implementation of the DM strategy for a particular program. Such a file or document is extremely useful in maintaining a steady course, making necessary mid-course corrections, and capturing and recording lessons learned along the way. It provides the basis for all activities related to the acquisition, identification, status, receipt, control and access, reviews, responses, notifications, repository storage, and final disposition of data, including related IP responsibilities.

Effective DM strategy and planning provide a rational basis for developing and coordinating data management requirements to appear in RFPs and for formulating the criteria to be used to evaluate proposals submitted by suppliers. The RFP requirements should have sufficient flexibility to enable suppliers to meet the DM strategic goals using a variety of approaches.

The RFP also must send the message to the suppliers that the buyer is serious about data management and its contribution to cost avoidance. It is one of the best opportunities for the data manager to establish an environment in which the supplier's DM process will have the support of its management. The proposal evaluation criteria (Section L of the RFP) should have data management as a management and past performance discriminator. Its weighting should reflect the significance that an effective, documented supplier DM process can have in mitigating risk, especially in Phases 0 and 1, in which data are the primary (or only) contract deliverables.

Preparation for the next phase is not complete until the data manager determines and gains commitment for the resources and facilities that will be needed to implement the DM process. The infrastructure requirements must be adequate to support the program in accordance with the CONOPS and DM plan. Goal-risk analysis performed in developing these documents provides the convincing argument that the investment in the DM process will be returned many times.

Some elements of the data strategy and acquisition plan may be designated by public laws, government regulations, and policies that impact cost, desired performance, and support capability. These include data ownership and stewardship rights and responsibilities, distribution of information, data access and data quality and must also be evaluated.

Finally, there is the element of available resources and the cost impacts associated with a workforce that is increasing in size and the cost of tools, space, and training vs. the cost of acquisition through multiple sources and associated management, tracking, and protection of supplier data.

[Table 3-1](#) is a checklist that may provide some assistance with determining a program data strategy.

Table 3-1. Checklist of Information for Determining Data Strategy

Question	Information
What is the appropriate placement model for the enterprise DM functions?	Centralized—all DM responsibilities are within one organization Decentralized—DM responsibilities are distributed throughout the organization Hybrid—one organization has most of the DM responsibilities, but leverages other enterprise assets (for example other organizations provide CM or records management resources)
What data are needed and by whom?	Evaluate program life cycle Identify the documentation that defines program requirements Review documentation and develop list of required data products Determine who (organizations, functions, or systems) will use the data, what decisions or functions are supported by the data, and how and when they will use various types of data
Which views of data will be required?	Identify the content and format for each data product Identify duplicate data products or opportunities to combine data products Consolidate requirements for similar data products Develop complete list of data products to be created for the program
When will the data be required?	Identify the users for each data product required Establish whether multiple deliveries are required Determine delivery dates and identify updates or reversions Prepare a list of data products with users and delivery dates
What are the delivery mechanisms?	Evaluate data product requirements Identify data product sources or providers Identify external and internal data providers Verify that requirements for data identification are defined and communicated Develop a list of data products with all sources identified
What organization design and staffing changes are needed?	Determine if a change in the way DM is staffed requires specific training and certification for data management personnel. ^a

^a Training and certifying organizations can be located by searching the Internet. They can be industry-centric (for example, the Insurance Data Management Association or the Society for Clinical Data Management), affiliated with a professional association (for example, the Data Management Association or the Association for Configuration and Data Management), or organization-specific (for example, DoD's Defense Acquisition University).

3.3.5.2 Determine Concept of Operations

A documented CONOPS is an integral part of a program's acquisition planning. It outlines the requirements for information and the ability to receive and process the various forms and formats of digital data that could potentially be provided by suppliers or exchanged among various activities involved in a program or project. The CONOPS provides the strategy for

acquisition and use of data throughout the program life cycle. It is thus the guidance that suppliers need to establish an appropriate data environment. The CONOPS is the framework for process development, documentation, and implementation.

The information requirements for each program are unique, and the opportunities for cost-effective application vary. For that reason, it is essential to have a coherent enterprise strategy that facilitates the management of program information and to be able to communicate that strategy. Information is a valuable asset; if managed properly, information can save time, increase efficiency, improve system quality and performance, and reduce cost. The acquisition manager must base decisions concerning information resources and data requirements on the overall program acquisition strategy, the support strategy, available technology, and an analysis of cost and benefits of alternative methods.

Defining a CONOPS for a program is a DM activity performed in conjunction with IT experts and other program participants, preferably in an IPT atmosphere. [Table 3-2](#) identifies participants in the CONOPS process and their roles. This task should be revisited in each program phase in preparation for the next phase.

Table 3-2. Participants in the CONOPS Process

Organization/IPT members	Customer	Supplier	Role
Data management	X	X	Facilitator, data requirements, data standards
Information technology	X	X	Computing resources, infrastructure, networks, operating systems, servers, communications and data standards/protocols
Data providers/end users			
Program management	X	X	Plans, schedules, financial information, resources
Engineering	X	X	System engineering, software engineering, specifications, simulation and test, design data/models, software
Configuration management	X	X	CM data (baselines, status accounting)
Logistics	X	X	Support equipment, trainers, training, supply, maintenance, publications, support software
	X		Operations, deployment, end user
Manufacturing		X	Manufacturing, production, tooling, models
Quality		X	Inspection points, critical processes, software quality assurance

The CONOPS initiates the planning for an IDE and is the framework for implementing shared digital data partnerships. The DM infrastructure needs to accommodate both legacy and standard digital data processes. The CONOPS should address the following:

- ◆ Data users, types of data, frequency of use and timeliness of data access or delivery to all user
- ◆ Data use and the review and approval processes to support life cycle functions

- ◆ User's locations and their primary functions in support of the defense system
- ◆ Current and in process hardware and software systems to manage and use data
- ◆ Data interchange requirements including format, media, applicable standards and existing telecommunications/network capabilities
- ◆ Concurrent access by multiple functional users
- ◆ Access authorizations and restrictions
- ◆ Data management responsibilities
- ◆ Data flow among sites/facilities
- ◆ Identification of data integration between disciplines, and
- ◆ Methods to be used to exchange data
- ◆ Rules defining when data are considered "delivered"
- ◆ Rules regarding approval of electronically delivered data (e.g., is e-mail acceptable or is an electronic signature required?)
- ◆ Rules for notification that data are available for access.

The types of information used during a system or product life cycle generally fall into the following three broad generic categories:

- ◆ Program management data
- ◆ Product information (engineering data)
- ◆ Operations and logistic support data.

Each of these generic categories has a number of subordinate categories, each of which may require different acquisition, access, format, and use attributes to be assigned in the CONOPS.

Each category of data may have different processing requirements based on who the users are, where they are located (what their infrastructure capabilities are), how they will use the information, and what information timeliness they require. Because the objective of the IDE is to share as much common data as possible—creating each data element once and using it many times—the sources for information in more than one category may be common.

Therefore, it is necessary to balance the processing needs based on the data sources as well as the data uses. Defining the CONOPS is a truly cross-functional enterprise suited to the IPT environment.

The CONOPS preparation process has the following steps:

- ◆ Identify data types (examples: engineering documents, supply documents, training data, technical manuals)
- ◆ Identify who will use the data type (examples: acquisition, engineering, operations, maintenance)
- ◆ Identify what the users will do with the data type (examples: view, annotate/excerpt, update/maintain, process/transform, archive)
- ◆ Identify the users' DM infrastructure (examples: hardware, software, databases, networks)
- ◆ Identify the users' preferred data delivery or access method (examples: documents, data files with metadata, interactive access)
- ◆ Determine required data format or access method (examples: hard copy, electronic document file in processable format, documents in archive format, graphics file)
- ◆ Determine standards for delivery or access method (examples: HTML, XML, SGML, STEP, PDF, IDE)
- ◆ Determine media type for data delivery (examples: magnetic tape, optical disk, ftp, IDE, encrypted e-mail).

3.3.5.3 Determine Specific Data Requirements

Before acquisition reform, the government was totally responsible for supporting and maintaining its defense assets. The government data manager was typically required to acquire a complete technical data package, which included design disclosure information on all repairable and replaceable parts. The data package enabled the government to procure spare parts and to perform maintenance, repair, and design modification. This design-based acquisition practice, which continues for the vast majority of legacy programs, distinguished the defense acquisition community from most of the commercial and industrial sectors. In assembling data requirements for a new acquisition, the data manager and data users could comfortably refer to a similar past procurement as a baseline for the needed data.

A major perceived difference between the defense establishment and the private sector is that they have different types of customers. The defense contractor perceives that he has only one customer in the DoD acquisition community. This is similar to the perception of a commercial contractor who contracts for a specific item designed for a single customer. Consumer-oriented companies perceive that they have many customers. When one looks at data needs, however, the ultimate end users of the product are of primary concern in both the military and the commercial environments. In both environments, the customers for data are the people or organizations in the roles of the acquirer, the designer, the manufacturer, the distributor, the operator, and the maintainer.