Audit Report

OFFICE OF THE INSPECTOR GENERAL

DEFENSE DATA REPOSITORY SYSTEM

Report No. 96-188 June 28, 1996

Department of Defense

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DEPARTMENT OF DEFENSE
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June 28, 1996

MEMORANDUM FOR ASSISTANT SECRETARY OF DEFENSE (COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE)
DIRECTOR, DEFENSE INFORMATION SYSTEMS AGENCY

SUBJECT: Audit Report on the Defense Data Repository System (Report No. 96-188)

We are providing this audit report for review and comment. We considered comments on a draft of this report in preparing the final report.

DoD Directive 7650.3 requires that all recommendations be resolved promptly. As a result of management comments, we revised Finding B to state that DoD data element naming standards are contrary to National Bureau of Standards guidance and added Recommendation B.3. to clarify our intention. Therefore, we request that the Director, Defense Information Systems Agency, provide additional comments on Recommendations B.1., B.2., and B.3. by August 28, 1996.

We appreciate the courtesies extended to the audit staff. Questions on the audit should be directed to Ms. Mary Lu Ugone, Audit Program Director, at (703) 604-9529 (DSN 664-9529) or Ms. Cecelia A. Miggins, Audit Project Manager, at (703) 604-9542 (DSN 664-9542). See Appendix D for the report distribution. The audit team members are listed inside the back cover.

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Office of the Inspector General, DoD

Report No. 96-188 **June 28, 1996**
(Project No. 5RE-0073)

Defense Data Repository System

Executive Summary

Introduction. DoD Directive 8000.1, "Defense Information Management Program," October 27, 1992, tasks the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) to develop policy and procedures to support automated information system interoperability and integration throughout the DoD. Further, the Directive tasks the Director, Defense Information Systems Agency, to develop and manage the DoD Data Administration Program. One of the primary tools the Data Administration Program uses to support automated information system interoperability and integration requirements is a data dictionary system. The data dictionary is a highly structured data base used to design, monitor, locate, protect, and control data. Within DoD, the data dictionary system is part of the Defense Data Repository System.

Objective. The audit objective was to determine whether the Defense Data Repository System will support the DoD goal of integrating DoD automated information systems through the use of common, shared data. We also reviewed the management control program as it applied to the primary audit objective.

Audit Results. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) has not yet formalized the implementation strategy for a multiple data repository system (Finding A). In addition, about 11 percent of the 9,229 approved standard data elements in the Defense Data Dictionary System do not conform to data element naming standards (Finding B). As a result, the DoD may acquire a data repository system that would not adequately support the development or modification of automated information systems with requirements for shared data and interoperability.

The management control program could be improved by establishing an implementation strategy for the Defense Data Repository System to include functional and Component-level data repository systems (Appendix A). Recommendations in the report, if implemented, will help ensure that DoD policy and procedures are consistent with a multiple repository approach and that standardized data meet naming and interoperability requirements.

Summary of Recommendations. We recommend that DoD policy and procedures be updated relating to the purpose, scope, and development strategy for the Defense Data Repository System and that the DoD Data Administrator follow standards and procedures for approving and managing standard data elements in the Defense Data Dictionary System. Further, we recommend that the DoD Data Administrator measure the utility and quality of standard data elements.

Management Comments. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) partially concurred, stating that planned revisions to DoD Manual 8320.1-M and DoD Manual 8320.1-M-1 will establish an implementation strategy for multiple repositories and will revise data element naming standards. The Defense Information Systems Agency concurred with establishing a time limit in which data elements may remain in a developmental status, but did not concur that procedures

for approving and managing standard data elements in the Defense Data Dictionary System are inadequate or that additional data quality measures are required. See Part I for a summary of management comments and Part III for the complete text of the comments.

Audit Response. As a result of Defense Information Systems Agency comments, we revised Finding B and added a recommendation regarding control of the data element naming process. We do not consider Defense Information Systems Agency comments on the data element naming process responsive, because we believe that proposed changes to current procedures will not provide effective control. Further, we believe that additional qualitative and quantitative measures are required to ensure the usefulness and quality of the DoD data standardization program. We request that the Director, Defense Information Systems Agency, provide additional comments on the final report by August 28, 1996.

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Part I - Audit Results

Audit Background

The DoD has recognized the importance of information technology in providing interoperability for combat support functions and between combat support and command and control functions. Full interoperability requires data element standardization. Data element standardization is part of the Defense Information Management Program.

Information Management Program Policy. DoD Directive 8000.1, "Defense Information Management Program," October 27, 1992, establishes policy and assigns responsibilities for the implementation, execution, and oversight of the Defense Information Management Program. The Directive states it is DoD policy that:

o the supported function or organization shall determine the need for the creation and availability of information,

o data and information shall be corporate assets structured to enable full interoperability and integration among organizations DoD-wide, and

o changes to DoD functional processes and information shall be based on sound business principles and supported by DoD-approved analyses.

DoD Directive 8000.1 tasks the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) to develop and oversee information policies, procedures, strategic planning, methods, models, and tools as well as appropriate information management performance measures and assessments. The Directive also specifically tasks the Director, Defense Information Systems Agency, to develop and manage the DoD Data Administration Program.

Data Administration Program. DoD Directive 8320.1, "DoD Data Administration," September 26, 1991, establishes data administration policy and procedures and assigns responsibilities for planning, managing, and regulating data within DoD. The Directive tasks the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) to designate a DoD Data Administrator.

The two objectives of the DoD Data Administration Program are:

o to structure information systems in ways that encourage horizontal and vertical[1] data sharing; and

o to support DoD operations and decisionmaking with data that meet those needs in terms of availability, accuracy, timeliness, and quality.

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[1]Horizontal data sharing is sharing data with organizations that are at the same level, vertical data sharing is sharing data with organizations either above or below the reference organization.

The primary tools of data administration are a data dictionary system, a data structure, and rules.

Defense Data Repository System. DoD Directive 8320.1 also authorizes the establishment of a DoD Information Resource Dictionary System, now called the Defense Data Repository System (the Repository). The Repository is a specialized automated application that provides for shared storage of and common access to data needed to support the development and reengineering of the DoD automated information systems and data bases.

The Repository consists of:

- o the Defense Data Dictionary System,
- o the DoD Enterprise Data Model,
- o user access tools, and
- o developer's tools.

Defense Data Dictionary System. The Defense Data Dictionary System contains a highly specialized data base used to design, monitor, locate, protect, and control data. The data base consists of data element names and metadata, that is, descriptive information about named data elements. The process for naming data elements that are to be in the dictionary is defined in DoD Manual, 8320.1-M-1, "Data Element Standardization Procedures," January 1993.

DoD Enterprise Data Model. The DoD Enterprise Data Model is a graphic[2] representation of data that can be shared and reused across application systems, organizational boundaries, and different functional areas. Guidance on the DoD Enterprise Data Model is in DoD Manual 8320.1-M-x, "DoD Enterprise Data Model Development, Approval, and Maintenance Procedures," November 1994. DoD Manual 8320.1-M-x also contains standard data element naming procedures.

User Access Tools. The primary user access tools are the Enterprise Data Model viewer and the Personal Computer Access Tool. The Personal Computer Access Tool is a CD-ROM[3] based system that provides users a copy of the Defense Data Dictionary System data base and the ability to query the data base.

Developer's Tools. Using computer aided software engineering tools, developers can access the DoD Data Dictionary System and the Enterprise

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[2]A description of the organization of data in a manner that reflects the information structure of an organization.

[3]Compact Disk-Read Only Memory, a data storage device.

Data Model as the hub of information for any software project. The developer's tools are needed for synthesizing project management, configuration management, and quality assurance into the entire software process.

Quality Data. The quality of the data element is the key to a sound foundation for all data structures. Proper emphasis on the creation, naming, and definition of data elements will improve the quality of the entire data structure. A data element name must be clear, accurate, self-explanatory, and have a singular purpose. A data element name must also be designed according to functional and logical characteristics, not physical characteristics such as location, organization, or system. The data element definition should describe its purpose and usefulness, not how, where, or when data are used or who uses them. Consistency in following data structure and rules will result in high quality data standardization.

Audit Objectives

The primary audit objective was to determine whether the Defense Data Repository System will support the information management goal of integrating DoD automated information systems through the use of common, shared data. We also reviewed the management control program as it applied to the primary audit objective. See Appendix A for a discussion of the audit scope and methodology and the results of the review of the management control program. Summaries of prior audit coverage are in Appendix B.

Finding A. Implementation Strategy for the Defense Data Repository System

The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) has not yet formalized the implementation strategy for a multiple DoD data repository system.

No formal implementation strategy exists because DoD has not yet defined the relationship between the Defense Data Repository System and the multiple functional and DoD Component-level[4] data repositories. Also, DoD policy and procedures, which specify a requirement for a central data repository, have not been modified to accommodate the multiple data repository system approach.

As a result, the DoD may acquire data repository systems that will not efficiently achieve the DoD goal of horizontal and vertical data sharing.

Implementation of the DoD Repository System

The implementation strategy for a DoD-wide data repository system is described in a series of DoD directives and manuals. The requirement for a data repository system is in DoD Directive 8320.1. Further, DoD Manual 8320.1-M, "Data Administration Procedures," March 29, 1994, and DoD Manual 8320.1-M-1 define the DoD-wide data repository system as a single data repository system with centralized management control. In contrast, the "DoD Data Administration Strategic Plan for Fiscal Years 1995-2002," October 1995, recognizes multiple functional and Component-level data repositories in addition to the DoD central repository.

Defense Data Repository System. DoD Directive 8320.1 states that one of the responsibilities of the DoD Data Administrator is to develop, operate, and maintain a DoD data repository that is easily accessible by all users and supports DoD data administration procedures. DoD Manual 8320.1-M-1 states that the intent of DoD Data Administration is to document standard data, their definitions, and other attributes in a single, centrally maintained DoD reference data dictionary, the Defense Data Repository System (the Repository). The Repository resides on a Hewlett-Packard 9000/877 computer at the Defense Systems Support Organization, the Pentagon, Washington, D.C. The Repository provides information about data needed by the data administration community, technical development organizations, and functional organizations to support integrated operations between and among DoD Components and

[4]Functional areas include areas such as logistics, personnel, and health affairs. DoD Components are the Military Departments and the Defense agencies.

outside organizations, such as other Federal agencies and foreign governments. The Defense Information Systems Agency manages the development, operation, and support of the Repository.

Functional and Component Data Repository Systems. The "DoD Data Administration Strategic Plan for Fiscal Years 1995-2002" summarizes functional and DoD Component plans for multiple data repository systems. Among others, the following data repository systems are included in functional and DoD Component data administrator action plans.

o The Offices of Test and Evaluation, Atomic Energy, and Logistics, within the Office of the Under Secretary of Defense for Acquisition and Technology, plan to establish and maintain their own data repositories.

o The Director, Operational Test and Evaluation, plans to select and implement a data dictionary and repository system to assist the operational test and evaluation community's data administration effort.

o The Air Force plans to interface its Air Force Information Resource Dictionary with the Defense Data Dictionary System.

o Headquarters, U. S. Pacific Command, plans to develop a visionary, next-generation repository system.

o Headquarters, U. S. Transportation Command, is developing a plan to combine the efforts of its component commands and the transportation community to collectively define and acquire a common, standard repository that meets data requirements at all levels.

Even though the above data repositories are planned, there are no procedures for managing a multiple data repository network, such as how to submit and approve standard data elements or update data bases in the individual data repository systems. Currently, developers submit candidates for data element standardization through the functional and Component-level data administrators to the Defense Information Systems Agency. The Defense Information Systems Agency coordinates candidate data elements among all data administrators in the DoD and, if approved, enters them into the Defense Data Dictionary System as standard data elements.

The DoD has established a data repository network that could be very useful; however, existing policy and procedures must be changed for submitting and approving data elements and for managing a multiple data repository system network. Because data element names maintained in the functional and Component data repositories are also maintained in the Defense Data Repository System, the relationship between the repositories should be clearly defined to avoid duplication and to increase the usefulness of the Defense Data Repository System.

Relationship of DoD Component and Functional Repositories

Since the issuance of DoD Directive 8320.1 in September 1991, functional and DoD Component data repositories have remained part of the data element standardization process. The DoD-wide and the functional area repositories are linked by the data modeling process. DoD Manual 8320.1-M-x describes two types of data models, strategic and functional.

Strategic Data Models. Strategic data models are high-level models of data that support the information needs across a corporate organization. A strategic data model is typically used for strategic data planning and policy purposes. The DoD Enterprise Data Model, a part of the Defense Data Repository System, is an example of a strategic data model.

Functional Area Data Models. Functional area data models are business area models that support specific information needs within or between the major functional areas of a business. A functional area data model is typically used for business area analysis to support functional area integration efforts. Among other uses, functional area data models are used to reengineer unique business processes to create systems that provide cross-functional data flow across the DoD.

Functional area data models may contain every data element used within the functional area. The data elements may be standard or nonstandard. The data elements may also be common to other functional areas or unique to a particular functional area. However, DoD Manual 8320.1-M-1 states that any data element that has been identified in a validated Component or functional data model and is used by more than one application or information system will be standardized. The standardized data elements are stored in a special data base, the Defense Data Dictionary System.

Data Dictionaries. Although the DoD recognizes the difference between a strategic and a functional repository, the DoD does not make the same distinction between data dictionary systems. Conversely, DoD Manual 8320.1-M-1 states that the DoD will use a single reference data dictionary system. Because the functional area data models are linked to the DoD Enterprise Data Model, every data element name at the functional and Component level can be submitted into the data standardization process and can reside in the Defense Data Dictionary System. See Finding B for a discussion of the data element standardization process.

Summary

DoD policy and procedures on the development and management of a Defense Data Repository System are not up to date. One of the main elements of the repository system, the Defense Data Dictionary System, is defined as a single DoD reference data dictionary; however, the DoD Data Administration

Strategic Plan for Fiscal Years 1995-2002 also recognizes functional and Component repository systems that are either already linked or will be linked to the Defense Data Repository System. Therefore, DoD policy and procedures should also reflect a multiple repository system approach.

Recommendations, Management Comments, and Audit Response

A. We recommend that the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence):

1. Formalize the implementation strategy of a multiple repository system approach by doing the following.

a. Define the purpose, scope, and relationship between the Defense Data Repository System and the functional and DoD Component data repository systems in the data element standardization process.

b. Develop procedures for submitting and approving data elements within the framework of a multiple repository system approach.

2. Revise DoD Directive 8320.1, "DoD Data Administration," September 26, 1991; DoD Manual 8320.1-M, "Data Administration Procedures," March 1994; and DoD Manual 8320.1-M-1, "Data Element Standardization Procedures," January 15, 1993, to reflect the actions described in Recommendation 1.

Management Comments. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) concurred with Recommendation A.1. and partially concurred with Recommendation A.2., stating that the implementation strategy for multiple repositories will be included in the planned revisions to DoD Manual 8320.1-M and DoD Manual 8320.1-M-1. A decision on the necessity of revising DoD Manual 8320.1-M will be made within 6 months, and the revision to DoD Manual 8320.1-M-1 is expected to be completed by the fourth quarter of FY 1996.

Although not required to respond, the Defense Information Systems Agency concurred, stating that existing DoD procedures recognize the existence of multiple DoD data repositories, but do not clearly articulate the purpose, scope, or relationships among the repositories. DoD Manual 8320.1-M and DoD Manual 8320.1-M-1, the procedural documents that support the DoD Data Administration Program, need to be changed.

Finding B. Defense Data Dictionary System

About 11 percent of the 9,229 approved standard data elements in the Defense Data Dictionary System do not conform to DoD data element naming standards. Also, the DoD Data Administration office has not established procedures for removing unapproved data elements from the Defense Data Dictionary System. Further, the DoD data element naming standards are contrary to guidance provided by the National Bureau of Standards.

The approved standard data elements do not conform to data element naming standards because the DoD Data Administration office did not follow procedures and methodologies in DoD Manual 8320.1-M-1 for name standardization. In addition, the DoD Data Administration office has not determined how long a proposed data element may remain in the data base without being approved. Also, the DoD Data Administrator has not maintained effective control over data element naming standards.

As a result, the DoD does not have a coherent set of data element naming standards and the Defense Data Dictionary System will have limited utility in automated information systems that have shared data or interoperability requirements.

Defense Data Dictionary System

A data dictionary is a data base that contains an organization's standard data elements. A data dictionary may range from containing every data element used within an organization to a strategic dictionary with limited entries. An organization may have one or multiple data dictionaries. The DoD data dictionary is the Defense Data Dictionary System.

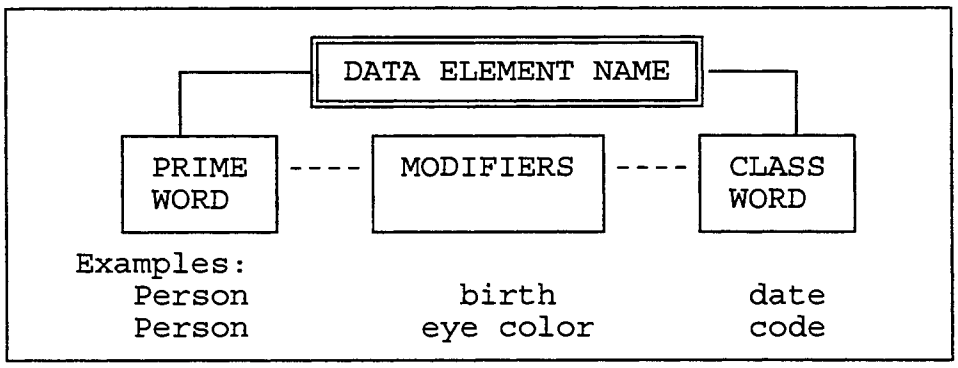
Approved Standard Data Elements. As of June 1995, the Defense Data Dictionary System contained 3,529 approved standard data elements. In April 1995, the Enterprise Integration Corporate Information Management Council directed that a concentrated effort be undertaken to increase the number of standardized data elements that were approved and active within the Defense Data Dictionary System. By the end of October 1995, the DoD Data Administration office reported that the Defense Data Dictionary System contained more than 9,000 approved standard data elements.

Standardization Methodology. Both DoD Manual 8320.1-M-1 and DoD Manual 8320.1-M-x specify methodologies for submitting entries for data element standardization. The primary difference between the two manuals is that DoD Manual 8320.1-M-x incorporates the use of data modeling into the process of naming data elements. Although the procedures in DoD Manual 8320.1-M-x are appropriate for data modeling, the resulting data

element names are subject to less control and therefore are not necessarily appropriate for inclusion in the Data Dictionary System. The DoD Data Administrator needs to follow naming standards in DoD Manual 8320.1-M-1 to control the data element approval process.

Data Standardization Procedures and Standards

Data Element Naming Procedures. DoD Manual 8320.1-M-1 prescribes data element naming procedures. A data element name consists of at least two distinct parts; a prime word and a class word. A data element name may also contain modifiers that further describe the information being named. This relationship is illustrated in the figure below.



Components of a Data Element Name

o Data Element Name. The name given to a data element must convey a single, informational concept that may be shared throughout an organization. The name assigned to a data element should contain a prime word and a single class word. Modifiers may be used to further describe the data element(s) being named.

o Prime word. A prime word is a noun that describes groups of related data elements. A prime word identifies the object to which a data element refers and, therefore, is the most significant piece of information in the data element name.

o Modifiers. Modifiers are adjectives that further describe and classify the class word, prime word, or data element.

o Class word. A class word is a noun used to identify and describe the general purpose (or use) of a data element. It is the second most important piece of information in the data element name. Including a class word in the data element name allows a user of a data dictionary to categorize and search for a standard data element name based on its use in data processing systems. Only one class word should appear in each data element name.

Data Element Naming Standards. The methodology for naming data elements begins with the general class word and ends with the specific data element name. This methodology makes it easier for a user to access the information. For example, if a user wishes to search the dictionary for a standard data element name, that user can first search using the class word (code) and prime word (person) to narrow the field of potential data element names. The next step is to search for the specific word or words (eye color) that further describe the data or to search for the values (brown, blue, etc.) of the data the user is attempting to name.

Data element naming standards are important because they provide a recognizable structure to the data dictionary. Our analysis showed that the Defense Data Dictionary System has 9,229 approved standard data elements, of which 997 did not conform to standards established in DoD Manual 8320.1-M-1.

Analysis of Data Elements in the Defense Data Dictionary System

We used the Defense Information Systems Agency Personal Computer Access Tool (December 1995 version) to analyze the contents of the Defense Data Dictionary System. The Personal Computer Access Tool uses table files to store the various parts that comprise a standard data element name.

Data Base Table Files. The principal table files are the Generic-Element table, which contains the class words; the Prime-Word table, which contains the prime words; and the Standard-Data-Element table, which contains the data element name. We tested the individual files against the data element naming standards in DoD Manual 8320.1-M-1.

Status Codes. All data element name records, class word records, and prime word records in the Defense Data Dictionary System contain a status code. The status code is used to track the entries through the standardization process. In order of their occurrence in the standardization process, the status codes are (D), developmental;[5] (C), candidate; (R), rejected; and (A), approved. Entries that are removed from the Defense Data Dictionary System because they are no longer useful are code (X), archive. An entry may also be code (Z), unknown.

Developmental Data Elements. When a DoD contract requires a developer to use standard data elements, the developer may satisfy the requirement by using either approved standard data elements or developmental data elements. As of December 1995, the Defense Data Dictionary System data base contained 3,623 prime words and 10,913 data element names coded developmental. We determined how long the developmental data elements had been in the data base.

[5]Data elements that have been submitted for approval but have not been released for review.

Of the 3,623 prime words with a developmental status code, 2,398 prime words, about 66 percent, had been in the data base a year or more without being approved. We do not know how long the 10,913 developmental data element names have been in the data base, because the dates the data element names were entered into the data base were not included in the Personal Computer Access Tool files. The age of developmental data elements is a potential problem because developers may use developmental data element names, even though those names have not gone through the review and approval process.

Approved Standard Data Element Analysis. The Defense Data Dictionary System data base contained 9,229 approved data element names, prime words, and class words. We compared the approved data element names, prime words, and class words to the naming standards in DoD Manual 8320.1-M-1. We considered each data element to be either valid or invalid, depending on whether it complied with the naming standards. Specifically, we tested for the following conditions:

o a prime word should not contain class words, articles, prepositions, or conjunctions;

o a data element name may contain only one class word and one prime word; and

o a data element name should not contain articles, prepositions, or conjunctions.

The results of the comparisons are shown in the following table.

Results of the Comparison of Naming Conventions to Approved Data Elements

	Class Words	Prime Words	Data Element Names	Total
Valid	17	2,136	6,079	8,232
Invalid	0	216	781	997
Total	**17**	**2,352**	**6,860**	**9,229**

Approved, But Invalid Data Elements. The analysis showed about 11 percent of the prime words and data element names as invalid.

Prime Words. Of the 2,352 approved prime words, 216 are invalid for the following reasons:

o 161 contain at least one class word, and

o 55 contain articles, prepositions, or conjunctions.

For example, the prime word name "Award-Instrument-Modification-Contract-Cost-Accounting-Standard-Date-Time-Reference" is invalid because it contains two class words--date and time. When combined with a class word to form a data element name, the resulting name will then contain three class words.

Data Element Names. Of the 6,860 approved data element names, 781 are invalid for the following reasons:

- o 557 data element names contain more than one class word, and
- o 224 data element names contain articles, prepositions, or conjunctions.

For example, the standard data element name "Request-For-Quotation-Date-Time-Reference Logical Identifier" contains three class words; date, time, and identifier. The standard data element name "Military-Organization-Ammunition-Component Transferred Out of Service Type Quantity" contains the preposition "of." The standard data element name "Catalog-Characteristic-Reply and or Code" contains the conjunctions "and" and "or."

One potential problem of having data element names in the Defense Data Dictionary System that do not conform to naming standards is that when developers cannot find particular data element names, they may create similar data element names. The creation of similar names would unnecessarily increase the size and complexity of the Defense Data Dictionary System.

Control of the Data Element Naming Process

National Bureau of Standards Special Publication 500-149, "Guide on Data Entity Naming Conventions," October 1987, provides guidance on the establishment of data naming standards. While DoD Manual 8320.1-M-1 complies with this guidance, DoD Manual 8320.1-M-x and the draft revision to DoD Manual 8320.1-M-1 indicate a trend away from controls recommended by the National Bureau of Standards.

National Bureau of Standards Guidance. Special Publication 500-149 states that a coherent set of naming standards is crucial to the central management of data. There are two primary areas of concern in data element naming: content and format.

Content relates to the essential meaning or significance of the words chosen for a data element name. The information conveyed by the name may be either discrete or relational. For example, "Contractor Name," the discrete content, indicates that what follows is the name of a contractor associated with the organization. Since the contractor name is recorded, the user may assume that other information about the contractor is also recorded in the data base. That information is the relational content.

Format relates to the size, shape, and general arrangement of the words in a data element name. Among the factors that must be considered when deciding upon the name format are length, character set, word form, word order, abbreviations, acronyms, and modifiers. Because data element naming rules play an important part in maintaining consistency of the data and the reduction of redundant data through consolidation of synonymous and overlapping data elements, the data administrator needs to control the content and format of data element names.

DoD Data Element Naming Standards. The DoD, data element naming standards are in DoD Manual 8320.1-M-1. DoD Manual 8320.1-M-x, November 1994, modified the data element naming standards for prime word names. In addition, the Defense Information Systems Agency has proposed a draft revision to DoD Manual 8320.1-M-1 that will combine the previous two documents. Both DoD Manual 8320.1-M-x and the draft revision to DoD Manual 8320.1-M-1 will provide less control over the data element standardization process than the current DoD Manual 8320.1-M-1 because those documents reduce content and formatting requirements for data element names.

Proposed Changes to DoD Data Element Naming Standards. There are two significant differences between DoD Manual 8320.1-M-1 and DoD Manual 8320.1-M-x relating to the format and content of prime words. Further, the draft revision to DoD Manual 8320.1-M-1 proposes a third change.

DoD Manual 8320.1-M-x allows a prime word to be a noun phrase and permits a prime word to contain a class word. A noun phrase may contain articles and prepositions. The third significant change is that the draft revision to DoD Manual 8320.1-M-1 no longer prohibits the use of conjunctions in prime words.

Effects of Changes. Allowing the use of noun phrases effectively negates previous restrictions against articles and prepositions in prime words. Permitting prime words to contain class words means that the class words are no longer unique and will make searching for data element names more difficult. Allowing the use of conjunctions eliminates the last definitive restriction on what a prime word may contain.

The above changes exhibit a systematic reduction of control over the data element naming process. Control, especially in data element name content and format, is important because it directly affects the efficiency of data sharing between functional areas by reducing redundancy and the need to match unlike data elements that have the same meaning.

We believe DoD Manual 8320.1-M-1 provides for control over the data element naming process as recommended by the National Bureau of Standards and that DoD Manual 8320.1-M-x and the draft revision to DoD Manual 8320.1-M-1 allow for little or no control. The revision to DoD Manual 8320.1-M-1 should retain the content and format controls for individual generic data element and prime word names in the current DoD Manual 8320.1-M-1.

Qualitative Measures for the Defense Data Dictionary System

Data Quality. DoD Manual 8320.1-M-1 specifies data element standardization procedures but does not mention data element quality. Data element quality is critical to sound data structures. The number of data elements in a data dictionary is not synonymous with data quality.

Out of a total of 26,331 entries submitted to and tracked by the Defense Data Dictionary System, the data administration review process rejected only 394 entries, or less than 1.5 percent. This low rejection rate may be an indicator that too much emphasis is placed on standardizing a large number of data elements rather than the quality of the data elements.

Performance Measures. The National Defense Authorization Act for Fiscal Year 1995, section 381, requires the DoD to establish performance measures and management controls for the development of data standards. In an interim report to Congress dated March 22, 1995, the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) listed the following measures for data standards:

o number of approved DoD standard data elements,

o number and percentage of DoD standard data elements used in DoD migration[6] systems (by using DoD standard data elements or mapping nonstandard data to DoD standard data), and

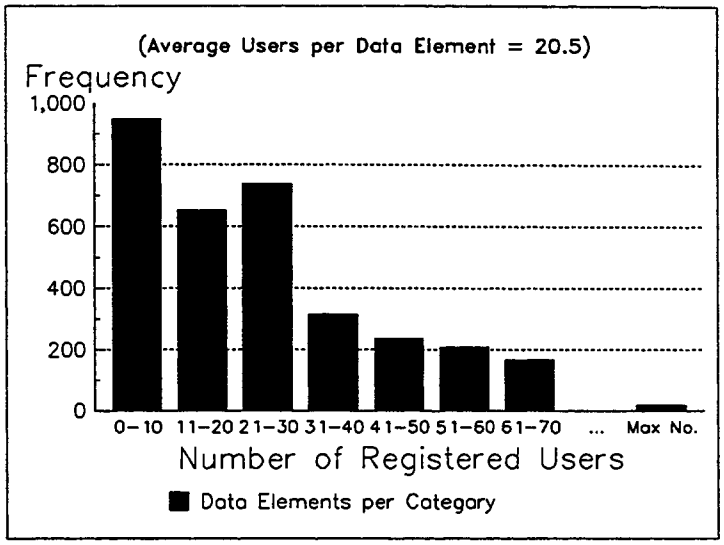
o number and percentage of DoD migration systems using shared data bases.

Measures such as the number of approved DoD standard data elements in the Defense Data Dictionary System do not reflect either quality or usefulness. Combining quantitative measures with measures based on the data element standardization procedures in DoD Manual 8320.1-M-1 could provide meaningful indicators that automated information systems are meeting data sharing and interoperability goals.

A meaningful quantitative measure would be one which depicts the number and overall average of registered automated information system users per standard data element. The graph below illustrates a possible format for that data. The horizontal axis depicts the number of registered automated information system users per standard data element. The vertical axis reflects the count of standard data elements. For example, the first bar indicates that 950 standard data elements have 0-10 registered users. The average users per standard data element is calculated by dividing the sum of the number of automated

[6]An existing or planned and approved automated information system that has been officially designated as the single automated information system to support standard functional processes.

information systems registered as users of the standard data elements by the total number of standard data elements. A rise in the average would indicate an increase in data sharing potential across the DoD.



Usage of Standard Data Elements in Automated Information Systems

Summary

The DoD does not have effective control over the data element naming process. Without explicit rules for data element naming such as those found in DoD Manual 8320.1-M-1, the usefulness of the Defense Data Dictionary System is reduced. Although we recognize that data standardization and the population of a data dictionary are evolutionary, it is counterproductive to populate the Defense Data Dictionary System with data that have not passed rigorous and consistent standardization criteria. Data element name records that are incomplete or too complex will not be useful for data sharing and interoperability. Therefore, to ensure that data standardization is truly being achieved, we believe that qualitative performance measures must be established to measure the progress towards data sharing between automated information systems.

Recommendations, Management Comments, and Audit Response

Revised Finding and Added and Renumbered Recommendations. After the draft report was issued on April 11, 1996, we met with representatives of the DoD Data Administrator to discuss management comments. As a result of the meeting, we revised Finding B to reflect a decrease in the number of approved standard data elements in the Defense Data Dictionary System that do not conform to data element naming standards from about 36 percent to about 11 percent. We also added a section to Finding B entitled "Control of the Data Element Naming Process" to clarify our position that controls are needed to strengthen the data element standardization process. Further, we added Recommendation B.3. as a method to retain content and format controls in the data element naming process. We renumbered Recommendations B.3., B.4., and B.5. as Recommendations B.4., B.5., and B.6., respectively. In addition, we revised Recommendation B.5. (now B.6.) to state that both quantitative and qualitative measures are required to measure data sharing and the utility and quality of standard data elements.

B. We recommend that the DoD Data Administrator:

1. Use the naming standards and procedures described in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, with regard to the Defense Data Dictionary System, and approve only those entries having content and format that conform to the naming standards.

2. Review and correct, as necessary, the approved entries in the Defense Data Dictionary System to conform with the naming standards in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993.

Management Comments. Although not required to respond, the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) partially concurred with the recommendations and stated that approved data standards will be reviewed to ensure that they conform to the naming standards of the revised DoD Manual 8320.1-M-1.

The Defense Information Systems Agency nonconcurred with the recommendations, stating that DoD Manual 8320.1-M-x was issued as interim guidance in November 1994 to address the data modeling aspects of data administration and is used by the data administration community for data element naming standards. Although agreeing that inconsistencies exist between DoD Manual 8320.1-M-1 and DoD Manual 8320.1-M-x, the Defense Information Systems Agency stated that a draft revision to DoD Manual 8320.1-M-1, expected to be published by the fourth quarter of FY 1996, will clarify data element naming procedures.

Audit Response. The Defense Information Systems Agency's comments are not responsive. DoD Manual 8320.1-M-x and the proposed revision to DoD Manual 8320.1-M-1 do not provide adequate control over the data element naming process because those documents eliminate existing controls over the content and format for data element names. We request that the Defense Information Systems Agency reconsider its position and provide additional comments in response to the final report.

3. Retain data element content and format controls in DoD Manual 8320.1-M-1 as part of the revision to data element standardization procedures.

4. Revise DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, to establish a time limit in which entries may remain in a developmental status.

5. Review and either approve or reject, in accordance with the naming standards in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, the developmental data elements in the Defense Data Dictionary System that are more than 1 year old.

Management Comments. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) concurred with Recommendation B.3. (now B.4.) and partially concurred with Recommendation B.4. (now B.5.), stating that the revision to DoD Manual 8320.1-M-1 will contain procedures to review developmental data elements more than 1 year old.

The Defense Information Systems Agency concurred with the recommendations, stating that a time limit in which entries may remain in a developmental status will be included in the revision to DoD Manual 8320.1-M-1.

6. Use quantitative measures such as a usage count and qualitative measures based on the naming standards in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, in measuring data sharing and the utility and quality of standard data elements.

Management Comments. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) partially concurred, stating that data administration metrics are being improved and will include qualitative measures.

The Defense Information Systems Agency nonconcurred with the recommendation. While agreeing that performance measures are critical to the success of the Data Administration Program, management believes that current data standardization procedures and practices are adequate to ensure standard data element quality.

Audit Response. The Defense Information Systems Agency comments are not responsive. Without quantitative measures based on the usage of standard data

elements and qualitative measures based on data element naming standards, the usefulness and quality of the DoD data standardization program cannot be determined. We request that the Defense Information Systems Agency reconsider its position and provide additional comments in response to the final report.

Part II - Additional Information

Appendix A. Audit Process

Scope

Defense Data Repository System. We reviewed the development and management of the Defense Data Repository System. Specifically, we examined the processes used to standardize data within the DoD and analyzed the standard data in the Defense Data Dictionary System. We reviewed 6,608 prime word records, and 19,682 data element name records from the Personal Computer Access Tool, release 1.2, dated December 1995.

Methodology

DoD Guidance on Data Standardization. We reviewed and analyzed policy and guidance on data standardization within the DoD. Specifically, we analyzed policy in DoD Directive 8320.1, "DoD Data Administration," and procedures described in DoD Manual 8320.1-M, "Data Administration Procedures," March 1994; DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993; and DoD Manual 8320.1-M-x, "DoD Enterprise Data Model Development, Approval, and Maintenance Procedures," November 1994. We evaluated the policy and guidance for consistency regarding the data standardization process.

Use of Computer-Processed Data and Statistical Sampling. We used computer-processed data in analyzing the data elements in the Defense Data Dictionary System. We assessed the reliability of the data and concluded that the computer-processed data were sufficiently adequate to be used in meeting the audit objective. We did not use statistical sampling procedures, because we analyzed 100 percent of the relevant data.

Use of Technical Assistance. Software engineers from the Technical Assessment Division, Office of the Inspector General, DoD, assisted in analyzing the Defense Data Dictionary System data base and in evaluating technical documentation.

Audit Period, Standards, and Locations. We performed this program audit from September 1995 through March 1996 in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD. We included tests of management controls considered necessary. Appendix C lists the organizations we visited or contacted.

Management Control Program

DoD Directive 5010.38, "Internal Management Control Program," April 14, 1987, requires DoD organizations to implement a comprehensive system of management controls that provides reasonable assurance that programs are operating as intended and to evaluate the adequacy of controls.

Scope of Review of the Management Control Program. We reviewed the elements of the management control program established by the Joint Interoperability and Engineering Organization, Defense Information Systems Agency, that apply to the process of standardizing data within DoD because the DoD Data Administrator is part of that organization. Specifically, we reviewed management controls over policy and procedures relating to the management of the Defense Data Repository System. We also reviewed management's self-evaluation applicable to those controls.

Adequacy of Management Controls. We identified a material management control weakness, as defined by DoD Directive 5010.38, relating to development and management of the Defense Data Repository System. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) has not yet formalized an implementation strategy for a multiple repository system to include the Defense Data Repository System. Recommendations A.1. and A.2., when implemented, will correct the weakness by establishing an implementation strategy that includes the Defense Data Repository System and other functional and Component-level data repository systems. A copy of the report will be provided to the senior official responsible for management controls in the Office of the Assistant Secretary of Defense (Command, Control, Communication, and Intelligence) and at the Defense Information Systems Agency.

Adequacy of Management's Self-Evaluation. Defense Information Systems Agency officials implemented a management control program, but they did not specifically identify the Defense Data Repository System as an assessable unit and, therefore, did not identify or report the material management control weakness identified by the audit.

Appendix B. Prior Audits and Other Reviews

During the last 5 years, the General Accounting Office and the Air Force Audit Agency have each issued a report on the Defense Data Administration Program.

General Accounting Office

The General Accounting Office issued Report No. GAO/AIMD-94-14 (OSD Case No. 9506), "Management Commitment Needed to Achieve Defense Data Administration Goals," January 21, 1994. The report states that DoD senior management has not supported the data administration program, has not documented business needs, has not determined what data are needed to manage on a Department-wide basis, and has implemented a data dictionary system that cannot meet DoD needs. The report recommends that the DoD determine the data administration method, performance measures, processes, and data needed to manage DoD corporate data resources and that the DoD acquire a new data dictionary system based on data administration processes and requirements.

The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) nonconcurred with the recommendations, stating that DoD senior management supports the data administration program and that the data dictionary system is adequate.

Air Force Audit Agency

Air Force Audit Agency Report of Audit, "Air Force Management of Data Administration and Standardization," Project No. 95054004, was issued on January 24, 1996. The report stated that Air Force Management had not established adequate internal controls to efficiently or effectively manage the data administration and standardization program.

The report recommends that the Air Force revise the Air Force Data Administration Program, develop training courses for database managers and system developers, clarify procedures on when data elements should be submitted for standardization consideration, develop procedures mandating standard data elements in program development, and require commands to discontinue maintenance of local data repositories.

The Air Force Deputy Chief of Staff for Command, Control, Communications, and Computers concurred with the recommendations and estimated that corrective action would be completed by November 1996.

Appendix C. Organizations Visited or Contacted

Office of the Secretary of Defense

Assistant Secretary of Defense (Command, Control, Communications and Intelligence), Washington, DC

Defense Agency

Defense Information Systems Agency, Arlington, VA

Appendix D. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense (Comptroller)
  Deputy Chief Financial Officer
  Deputy Comptroller (Program/Budget)
Assistant Secretary of Defense (Command, Control, Communications, and Intelligence)
Assistant to the Secretary of Defense (Public Affairs)
Director, Defense Logistics Studies Information Exchange

Department of the Army

Auditor General, Department of the Army

Department of the Navy

Assistant Secretary of the Navy (Financial Management and Comptroller)
Auditor General, Department of the Navy

Department of the Air Force

Assistant Secretary of the Air Force (Financial Management and Comptroller)
Auditor General, Department of the Air Force

Other Defense Organizations

Director, Defense Contract Audit Agency
Director, Defense Information Systems Agency
Director, Defense Logistics Agency
Director, National Security Agency
  Inspector General, National Security Agency
Inspector General, Defense Intelligence Agency

Non-Defense Federal Organizations and Individuals

Office of Management and Budget
Technical Information Center, National Security and International Affairs Division, General Accounting Office

Non-Defense Federal Organizations and Individuals (Cont'd)

Chairman and ranking minority member of each of the following congressional committees and subcommittees:

Senate Committee on Appropriations
Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
House Committee on Appropriations
House Subcommittee on National Security, Committee on Appropriations
House Committee on Government Reform and Oversight
House Subcommittee on National Security, International Affairs, and Criminal Justice, Committee on Government Reform and Oversight
House Committee on National Security

Part III - Management Comments

Office of the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) Comments

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE

18 JUN 1996

MEMORANDUM FOR DIRECTOR, READINESS AND OPERATIONAL SUPPORT DIRECTORATE, INSPECTOR GENERAL

SUBJECT: Audit Report on the Defense Data Repository System (Project No. 5RE-0073)

We appreciate the efforts of your staff in trying to improve the support provided by the Defense Data Repository System (DDRS). We generally concur with your findings and recommendations. However, where this office does not concur, the attachment provides detailed comments on the draft report findings, recommendations and material management control weakness.

The DDRS and the data standardization process that it supports are evolving rapidly. The DoD is practically "plowing new ground" that many others are following. That situation continues to challenge us to maintain alignment of procedures and actual practices.

Thomas E. Bozek
Director
Information Technology

Attachment

IG DRAFT REPORT -- DATED APRIL 11, 1996
(PROJECT NO. 5RE-0073)

AUDIT REPORT ON THE DEFENSE DATA REPOSITORY SYSTEM

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE (COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE) COMMENTS

*****

FINDINGS

- FINDING A: IMPLEMENTATION STRATEGY FOR THE DEFENSE DATA REPOSITORY SYSTEM. The Assistant Secretary of Defense (Command, Control, Communications, and intelligence) has not yet formalized the implementation strategy for a multiple DoD data repository system.

  No formal implementation strategy exists because DoD has not yet defined the relationship between the Defense Data Repository System and the multiple functional and DoD Component-level data repositories. Also DoD policy and procedures, which specify a requirement for a central data repository, have not been modified to accommodate the multiple data repository system approach.

  As a result, the DoD may acquire data repository systems that will not efficiently achieve the DoD goal of horizontal and vertical data sharing.

  OASD(C3I) RESPONSE: Partially concur. The DDRS capabilities, and the functionality of repositories, have been evolving quickly and growing. The implementation strategy will be incorporated into the revision to DoD 8320.1-M-1, currently underway.

- FINDING B: DEFENSE DATA DICTIONARY SYSTEM. About 36 percent of the 9,229 approved standard data elements in the Defense Data Dictionary System do not conform to data element naming standards.

  The approved standard data elements do not conform to data element naming standards because the DoD Data Administration office did not follow procedures and methodologies in DoD Manual 8320.1-M-1 for name standardization. Also, the DoD Data Administration office has not determined how long a

proposed data element may remain in the data base without being approved.

As a result, the Defense Data Dictionary System will have limited utility in automated information systems that have shared data or interoperability requirements.

OASD(C3I) RESPONSE: Partially concur. The Findings are based on an incomplete set of guidance. The Office of the Inspector General (OIG) analysis used is found in DoD 8320.1-M-1. That manual provides naming conventions for data elements. The ASD(C3I) issued DoD 8320.1-M-x, "DoD Enterprise Data Model Development, Approval, and Maintenance Procedures," as interim guidance on November 30, 1994. DoD 8320.1-M-x provides guidance for naming data entities and modified naming conventions for data elements. Additionally, the criteria used by the OIG counted the use of hyphenated words as violations of the naming conventions. Hyphenated words are specifically allowed as written in subparagraph 3.D.1.g. of DoD 8320.1-M-1. With that naming rule properly considered, the percentage of invalid names drops dramatically.

*****

RECOMMENDATIONS

- RECOMMENDATION A.1: Formalize the implementation strategy of a multiple repository system approach by doing the following.

  a. Define the purpose, scope, and relationship between the Defense Data Repository System and the functional and DoD Component data repository systems in the data element standardization process.

  b. Develop procedures for submitting and approving data elements within the framework of a multiple repository system approach.

  OASD(C3I) RESPONSE: Concur.

- RECOMMENDATION A.2: Revise DoD Directive 8320.1, "DoD Data Administration," September 26, 1991; DoD Manual 8320.1-M, "Data Administration Procedures," March 1994; and DoD Manual 8320.1-M-1, "Data Element Standardization Procedures,"

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January 15, 1993, to reflect the actions taken as a result of Recommendation 1.

OASD(C3I) RESPONSE: Partially concur. No data administration policy changes are required at this time, therefore, there is no need to revise DoDD 8320.1. Additional changes to DoD 8320.1-M are expected within the next six months at which time this office will assess the urgency of reissuing the manual. DoD 8320.1-M-1 is currently under revision. DoD 8320.1-M-x is being merged into the revised DoD 8320.1-M-1. DoD 8320.1-M-1 is expected to be issued for formal coordination in the 4th Quarter of FY96. The manual will document the strategy for multiple repository systems to include the purpose, scope, and relationships among the functional and DoD Component repositories.

- RECOMMENDATION B.1: Use the naming standards and procedures described in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, with regard to the Defense Data Dictionary System, and approve only those entries that conform to the naming standards.

  OASD(C3I) RESPONSE: Partially concur. The naming standards and procedures in 8320.1-M-1 will be updated to include many of the rules and procedures issued in 8320.1-M-x as interim guidance and on experience gained from current practice. These rules and procedures will then be used to develop and approve DoD standard data.

  Added Recommendation B.3.

- RECOMMENDATION B.2: Review and correct, as necessary, the approved entries in the Defense Data Dictionary System to conform with the naming standards in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993.

  OASD(C3I) RESPONSE: Partially concur. Upon reissuance of DoD 8320.1-M-1, approved data standards in the Defense Data Dictionary System will be reviewed to ensure they conform to the revised naming standards.

- RECOMMENDATION B.3: Revise DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, to establish a time limit in which entries may remain in a developmental status.

  Renumbered as Recommendation B.4.

  OASD(C3I) RESPONSE: Concur.

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Renumbered as Recommendation B.5.

- **RECOMMENDATION B.4**: Review and either approve or reject, in accordance with the naming standards in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, developmental data elements in the Defense Data Dictionary System that are more than 1 year old.

  OASD(C3I) RESPONSE: Partially concur. The revision to the manual will ensure that developmental data elements that have been in that status for a year are reviewed and deleted unless they are being actively developed as candidate standard data.

Renumbered as Recommendation B.6.

- **RECOMMENDATION B.5**: Use qualitative measures and the naming standards in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, in measuring the utility and quality of data element names.

  OASD(C3I) RESPONSE: Partially concur. Data administration metrics are being improved and will include qualitative measures. Particular attention will be given to the use of standard data in systems and databases, and making it easier for developers to do so.

*****

MANAGEMENT CONTROL WEAKNESS

Adequacy of Management Controls. We identified a material management control weakness, as defined by DoD Directive 5010.38, relating to development and management of the Defense Data Repository System. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) has not yet formalized an implementation strategy for a multiple repository system to include the Defense Data Repository System. Recommendations A.1. and A.2., when implemented, will correct the weakness by establishing an implementation strategy that includes the Defense Data Repository System and other functional and Component-level data repository systems. A copy of the final report will be provided to the senior official responsible for management controls in the Office of the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) and at the Defense Information Systems Agency.

OASD(C3I) RESPONSE: Concur.

Defense Information Systems Agency Comments

DEFENSE INFORMATION SYSTEMS AGENCY
701 S. COURTHOUSE ROAD
ARLINGTON, VIRGINIA 22204-2199

IN REPLY REFER TO

Inspector General 10 June 1996

MEMORANDUM FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE
ATTN: Readiness and Operational Support

SUBJECT: Draft Audit Report on the Defense Data Repository System (Project No. 5RE-0073)

Reference: DODIG Report, subject as above, 11 Apr 96

1. We have reviewed the subject draft report as per your request. We concur with Finding A concerning the implementation strategy for the Defense Data Repository System (DDRS). However, we nonconcur with Finding B concerning the number of invalid standard data elements in the DDRS. Our nonconcurrence is based on (1) the DODIG's interpretation of DoD policy concerning data standardization and (2) recent changes in guidance which have not been incorporated into current DoD policy. Where we nonconcur, we have provided the rationale and proposed rewording of the finding and associated recommendations.

2. We thank you for the opportunity to comment on the draft report. If you have questions concerning our response, please contact Ms. Sandra J. Sinkavitch, Audit Liaison, on commercial (703) 607-6316.

FOR THE DIRECTOR:

1 Enclosure a/s

RICHARD T. RACE
Inspector General

Quality Information for a Strong Defense

MANAGEMENT COMMENTS TO DODIG DRAFT AUDIT ON THE DEFENSE DATA DICTIONARY SYSTEM (PROJECT NO. 5RE-0073)

FINDING A - General Comments

Multiple data repositories currently exist within DOD. The Defense Data Dictionary System (DDRS) is the centrally managed authoritative source for DoD data standards, and it supports the DoD data element standardization process. Various functional and component repositories also exist. These repositories act as both feeders to, and implementation extensions of, the DDRS. Many of these repositories provide a developmental environment, and in some cases, an implementation environment for data standards. These repositories are tailored to their specific functional/component-level repository requirements. A clear understanding within DoD of the roles and relationship among the various DoD repositories will help ensure that DoD reaches it's interoperability goals.

Recommendation A.1: Formalize the implementation strategy of a multiple repository system approach by doing the following:

a. Define the purpose, scope, and relationship between the Defense Data Repository System and the functional and DoD Components data repositories in the data element standardization process.

b. Develop procedures for submitting and approving data elements within the framework of a multiple repository system approach.

Recommendation A.2: Revise DoD Directive 8320.1, "DoD Data Administration," September 26, 1991; DoD Manual 8320.1-M, "Data Administration Procedures," March 1994; and DoD Manual 8320.1-M-1, "Data Element Standardization Procedures," January 15, 1993, to reflect the actions taken as a result of Recommendation 1.

Comments to A.1 and A.2: Concur. DoD Directive 8320.1, "DoD Data Administration," is the governing policy for the DDRS. DoDD 8320.1-M requires a single authoritative source for data standards. DoD systems developers at any level need a single source for authoritative information on data element

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standards. This single source is the DDRS. Some DoD organizations need additional tools to support their programs internally which DoD policy permits. The policy does not prescribe or restrict the implementation strategies for DoD data repositories and, therefore, does not need to change.

DoD 8320.1 Manual, "Data Administration Procedures," and DoD Manual 8320.1-M-1, "Data Element Standardization Procedures," are the procedural documents that support the DoD data administration program. DoD 8320.1-M-1 is currently under revision. The existing DoD procedures recognize the existence of multiple DoD data repositories. However, these procedures do not clearly articulate the purpose, scope, or relationships among these repositories. The relationship among dictionaries and repositories should be clarified. In particular, the procedures should clearly articulate that: (1) the DDRS is the authoritative source of DoD data standards and is the mechanism to be used in the DoD level approval process, and (2) that while functional/component level repositories should not duplicate DoD level of functionality, they may provide for "internal" functional/component level requirements not supported by the DDRS, and they may support the implementation of approved data standards.

FINDING B - General Comments

The DODIG reported that "About 36 percent of the 9,229 approved standard data elements in the Defense Data Dictionary system do not conform to the data element naming standards." The DODIG also states that 2,255 prime words are invalid because they are not single words as required by the naming standards. DoD 8320.1-M-1 does not indicate anywhere that a prime word must be a single word. Revised

Key word/phrase search of the electronic version of 8320.1-M-1 revealed five (5) uses of the word "single":

(1)	Paragraph 1 F.9	Page 1-3	Line 1
(2)	Paragraph 2 B.1	Page 2-1	Line 3
(3)	Paragraph 2 C.4	Page 2-4	Line 1
(4)	Paragraph 2 C.4	Page 2-4	Line 3
(5)	Paragraph 3 B.1.d	Page 3-1	Line 2

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Revised

None of these paragraphs state or infer that a prime word must be a single word. The phrase "single word" was not found.

In addition, the DODIG states that the 2,255 invalid prime words are compound words that contain modifiers and nouns connected by hyphens, inferring that hyphens are not allowed in prime word names. Hyphenation is allowed in all procedures followed, as noted below:

DoD8320.1-M-1	Paragraph 3 D.1.g
DoD8320.1-M-x	Paragraph 6 C.1.b
FIPS 184	Paragraph 3.1

In a meeting with the DODIG audit team on 21 May 1996, the DODIG recognized that hyphenation is permitted in prime word names and agreed not to report these as invalid records. The DODIG provided the following invalid record count:

Invalid Data Standards Reported by DODIG

Prime Words	Data Elements	Total
216	780	996

DISA analyzed the DODIG invalid records and obtained the following results (using the format and rationale provided in the draft audit report, except that a percentage column has been added to assist the reader in the interpretation of Finding B):

Results of the Comparison of Naming Conventions to Approved Data Elements

	Class Words	Prime Words	Data Element Names	Total	Percentage
Valid	17	2,193	6,138	8,348	90.5
Invalid	0	159	722	881	9.5
Total	17	2,352	6,860	9,229	100.0

During our analysis we discovered that some invalid records had been counted twice. These records were considered invalid because they contained both a class word and also contained an article, preposition, or conjunction.

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It should also be noted here that DoD 8320.1-M-x, "DoD Enterprise Data Model Development, Approval, and Maintenance Procedures," which was issued as interim guidance to supplement DoD 8320.1-M-1, states that entity names (prime words) may contain a class word, as appropriate (paragraph 6 C.1.f). This change was made and agreed to by our community to accommodate our customers' business requirements. However, the procedures were not updated to incorporate this change.

Utilizing the naming conventions in DoD 8320.1-M-x, only 213 invalid records (data element names containing articles, prepositions, or conjunctions), or 2.3 percent of the entire DDDS database, would have been discovered. These 213 data elements were approved to accommodate terminology familiar to the functional community, such as REQUEST-FOR-QUOTATION which appears in 168 data element names.

We recommend that all references in the draft audit report that contain the following phrase, "about 36 percent of the 9,229 approved standard data elements" be changed to "about 10 percent of the 9,229 approved data standards". Also, we recommend that the table provided above replace the table on page 13 of the draft audit report. Furthermore, we recommend that Finding B (page 9) be rewritten as follows: Revised Page 12

"About 10 percent (881 total) of the 9,229 approved data standards in the Defense Data Dictionary System do not conform to the naming conventions of DoD 8320.1-M-1. These 881 data standards do not conform to the naming conventions of 8320.1-M-1 primarily because required changes in data standardization business practices were not incorporated in procedural updates. Also, the DoD Data Administration office has not determined how long a developmental data element may remain in the database without being placed into candidate status. As a result the Defense Data Dictionary System may contain unsuitable developmental data standards that system developers may implement in automated information systems." Revised

Recommendation B.1: Use the naming standards and procedures described in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, with regard to the Defense Data Dictionary System, and approve only those entries that conform to the naming standards.

Recommendation B.2: Review and correct, as necessary, the approved entries in the Defense Data Dictionary System to conform

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with the naming standards in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993.

Comments to B.1 and B.2: Nonconcur. DoD 8320.1-M-x was issued as interim guidance in November 1994 to address the data modeling aspects of data standardization. 8320.1-M-x changed the naming conventions for DoD data standards and is used by the data administration community today. We agree that there are inconsistences in the naming conventions between 8320.1-M-x and 8320.1-M-1.

At the 5 April 1996 Data Administration Council (DAC) Meeting, the DoD DAd released for comment updated data standardization procedures, DoD 8320.1-M-1 (draft), also referred to as the "merge document," combining the requirements of DoD 8320.1-M-1 and DoD 8320.1-M-x. These updated procedures are expected to be published by 4th Quarter, FY96. The draft document, provided to the DODIG, clarifies these naming conventions. We recommend that Recommendations B.1 and B.2 be combined as rewritten below:

Added Recommendation B.3.

"B.1: Revise DoD Manual 8320.1-M-1 to incorporate consistent naming conventions therein."

Renumbered as Recommendation B.4.

Recommendation B.3: Revise DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, to establish a time limit in which entries may remain in a developmental status.

Renumbered as Recommendation B.4.

Recommendation B.4: Review and either approve or reject, in accordance with the naming standards in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, developmental data elements in the Defense Data Dictionary System that are more than one year old.

Comments to B.3 and B.4: Concur. Currently there is no time limit on how long a data element may remain in developmental status. Developmental data elements are those data elements that have not yet been released by the originator for standardization review. A time limit in which entries may remain in developmental status will be placed in the merge document. One of the examples given by the DODIG for an invalid data element name, "Data-Attribute Department of the Army Identifier," is not an approved data element but a developmental data element. We recommend that the reference to "Data-Attribute Department of the Army Identifier" be removed from the report.

Deleted

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Recommendation B.5: Use qualitative measures and the naming standards in DoD Manual 8320.1-M-1, "Data Element Standardization Procedures Manual," January 1993, in measuring the utility and quality of data element names.

Revised and Renumbered as Recommendation B.6.

Comments: Nonconcur. The DODIG states on page 14 that "... the data administration review process rejected only 394 entries, or less than 1.5 percent. This low rejection rate may be an indicator that too much emphasis is placed on standardizing a large number of data elements." The low rejection rate is due directly to the detailed DoD data standardization procedures, practices, and informal coordination.

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DoD 8320.1-M-1 and DoD 8320.1-M-x both recognize that for data standardization to be successful the data administration and system development communities must work together in the development and coordination of data standards. Coordination and collaboration early on in the data standardization life-cycle is strongly encouraged. In DoD 8320.1-M-1 early coordination occurs during the preliminary review. In DoD 8320.1-M-x early coordination occurs during the preliminary review, informal review, and through the utilization of collaborative techniques. These reviews are used to facilitate cross-functional coordination, insure conformance to functional and technical requirements, and eliminate redundancy before nominating candidate data standards.

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In addition, a large percentage of the DoD approved data standards were worked by teams comprised of functional, technical, and information system subject matter experts. We recommend the second paragraph on page 14 be removed from report.

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On page 14, the DODIG takes exception to the ASD(C3I) established performance measures and recommends a more appropriate measure. The recommended measure would permit an automated information system using one standard data element to qualify in the numerator of the equation proposed by the DODIG, thereby falsely indicating greater data sharing across the DoD.

We agree with the DODIG that performance measures are critical to the success of the Data Administration Program. We are working with others in DoD to incorporate the recommendations of the General Accounting Office and the National Academy of Public Administration to develop suitable Information Management Performance Measures, including data standardization metrics.

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