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EVALUATION
OF A
DATA DICTIONARY SYSTEM

Job Order 85-617

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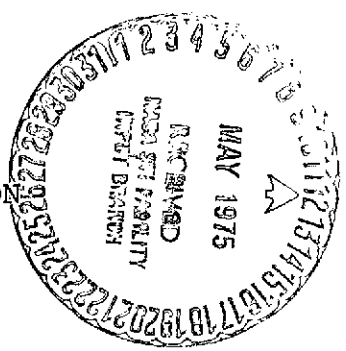
Contract NAS 9-12200

For

INSTITUTIONAL DATA SYSTEMS DIVISION



National Aeronautics and Space Administration

LYNDON B. JOHNSON SPACE CENTER

Houston, Texas

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CONTENTS

Section		Page
1.0	INTRODUCTION	1-1
	1.1 Identification	1-1
	1.2 Background	1-1
	1.3 Evaluation Approach	1-2
2.0	POTENTIAL USES OF A DATA DICTIONARY SYSTEM	2-1
	2.1 Data Control Assistance	2-1
	2.2 Program Development Assistance	2-3
3.0	EVALUATION OF THE DATA CATALOGUE SYSTEM	3-1
	3.1 Data Description	3-1
	3.2 Data Structure - Logical	3-4
	3.3 Data Structure - Physical	3-5
	3.4 Security Level	3-6
	3.5 Programming Aids	3-7
	3.6 Test Data	3-8
4.0	RECOMMENDATIONS	4-1
	4.1 Data Dictionary	4-1
	4.2 Short-Range Implementation	4-2
	4.3 Long-Range Implementation	4-3
	4.4 Program Network Description	4-4
5.0	MISCELLANEOUS REMARKS	5-1
	5.1 Data Description Languages	5-1
	5.2 Directory Capabilities	5-2

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5.3 Data Explosion 5-4
5.4 Maintenance 5-5
5.5 Fault Correction 5-5
5.6 Data Dictionary Names 5-7
6.0 REFERENCES 6-1

Appendix REPORT EXAMPLES A-1

FIGURES

Figure		Page
A-1	Example of Catalogue Report, Fund Source Elementary Item	A-3
A-2	Example of Catalogue Report, Primary Work Code Elementary Item	A-4
A-3	Example of Catalogue Report, Group Items . . .	A-6
A-4	Example of Catalogue Report, Record	A-8
A-5	Example of Index by Catalogue Name	A-11
A-6	Example of Index by Program	A-12
A-7	Example of Index by Data Name	A-13
A-8	Example of Index by Source Department	A-14
A-9	Example of Cross-Reference Report, Elementary Items	A-16
A-10	Example of Program Revision Report	A-18

TABLE

Table		Page
I	SUMMARY OF DATA CATALOGUE CAPABILITIES	3-2

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ABBREVIATIONS AND ACRONYMS

DBMS	Data base management systems
DBTG	Data Base Task Group
DD/D	Data dictionary/directory
DDL	Data description language
FACS	Financial and Contractual Status
FD	File Definition
IDSD	Institutional Data Systems Division
IFMS	Interactive Financial Management System
IMAS-B	Institutional Management Accounting System Phase B
JSC	Lyndon B. Johnson Space Center
RTOP	Research Technology Objectives and Planning

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1.0 INTRODUCTION

1.1 Identification

Evaluation of the Data Catalogue system was performed in response to job order 85-617, covering work activities on the Data Integration Planning project. This work was performed in support of the Data Systems Development Branch (FD6) of the Institutional Data Systems Division (IDSD) at the National Aeronautics and Space Administration/Lyndon B. Johnson Space Center (NASA/JSC).

1.2 Background

Tools are needed to assist in evaluating the desirability and feasibility of integrating data files and data bases for several financial and administrative applications, such as the integration of the Basic Accounting System through the development of the Interactive Financial Management System (IFMS). Data dictionary/directory (DD/D) systems were recognized as capable of providing assistance. DD/D systems might also help minimize maintenance costs for existing applications, thus improving the effectiveness of data files maintained by the Branch in support of user organizations. The Data Catalogue system was selected by the Data Systems Development Branch for the evaluation of general data dictionary capabilities.

The Data Catalogue system is a proprietary software package marketed by the Synergetics Corporation, Burlington, Massachusetts. Originally developed for the IBM 360/370, the system has been modified to run under EXEC 8 on the

UNIVAC 1100 series. By arrangement with Synergetics, the Data Systems Development Branch was authorized to test the Data Catalogue system at JSC for a 30-day trial period. Initially scheduled to begin in August 1974, the trial period actually began January 9, 1975. However, all report generation capabilities of the system were available prior to the start of the 30-day period; these and other capabilities were made available for testing a few at a time, beginning October 31, 1974.

In summary, this project has the purpose of determining to what extent a DD/D system can assist the Data Systems Development Branch and IDSD in achieving optimum benefits from its substantial existing and planned investments in computer data files.

1.3 Evaluation Approach

Of the commercially available data dictionary systems, only the Data Catalogue system is currently operational on the UNIVAC 1100, EXEC 8 system (ref. 1). Therefore, the Data Catalogue system must be evaluated in terms of whether it can satisfy specific needs, rather than in comparison to the performance of competitive products. This document establishes several potential DD/D system applications in support of the Data Systems Development Branch and discusses the performance of the Data Catalogue system in satisfying the specific needs of the Branch.

Input data for the evaluation is based on COBOL source code for the Financial and Contractual Status (FACS) system. FACS was selected for this purpose because its data is

representative of the data used in financial and administrative applications, it is well-documented, and the capability to describe the data to a DD/D system was still available to the Data Systems Development Branch.

Data for IFMS was also converted to Data Catalogue format and is included in the reports which have been produced. This data, however, represents only the contents of various IFMS transactions and reports, neither of which can be identified as such to the Data Catalogue system. To avoid confusion, this evaluation does not reference the IFMS data because it is less useful than the FACS data.

2.0 POTENTIAL USES OF A DATA DICTIONARY SYSTEM

The potential uses of a DD/D system have been documented in several technical papers and reports (see refs 2, 3, and 4). The distinction between dictionary functions and directory functions is described by Uhrowczik (ref 2) in terms of "management use mode" and "computer use mode," and in the November 1974 EDP Analyzer (ref 4) in terms of "source definitions" and "object definitions." Briefly, dictionary functions involve the storage, processing, and reporting of information about data to users of that information; directory functions involve the availability of information about data at the time of loading and executing programs which use the data.

Throughout the remainder of this document, the Data Catalogue system will be referred to as having only data dictionary capabilities. The system does not perform any of the functions required of a data directory, which are discussed in greater detail in section 5.2. Data dictionary uses are categorized in this evaluation according to (1) the assistance they provide to the data control function of installation management and to the program development function and (2) the capabilities needed to provide that assistance.

2.1 Data Control Assistance

To provide useful results to users, installation management must exercise some degree of control, either centralized or decentralized, over its data resources. Increased emphasis on integrated data bases, which are

available to several applications, increases the degree of control needed for data resources. Accurate, current information about data base contents and structure should be readily available to management. Additional information would be needed to analyze the effect of restructuring or modifying a data base. Information required to support these functions includes the following:

- Data description for analysis and standards control.
  - Descriptive text for each element or collection of elements
  - Source responsibility, defining the organization responsible for data and how the data originates
  - Format
  - Statistical data, such as volume and frequency, which would be useful for redundancy analysis or for performance analysis
  - Cross reference data, such as
    (a) Data items used by a specific program
    (b) Programs in which a data item is used
    (c) Data names assigned in a specific program
    (d) Programs in which a data name is used

- Security level reports by file, record, and element.

- Data structure.
  - Logical - relationships among data elements (dependency or derivability) and among records (parent-child or owner-member)
  - Physical - storage structure for data elements, groups, records, and files

2.2 Program Development Assistance

Use of a DD/D in support of the programming function may be of many different types. Only those of an informational nature or requiring only limited computational support are discussed in this document. Uses requiring directory capabilities are not discussed (see section 5.2). Information required to support applications programming functions include the following:

- Data description.
  - Descriptive text for data elements, group items, records, and files
  - Data formats
  - Definition of the contents of records, files, reports, and transactions
  - Edits required for specific elements
  - Conversion and compaction techniques
  - Data names

- Source code generation.

- Test data assistance.
  - Value ranges and dependencies
  - Data generation

3.0 EVALUATION OF THE DATA CATALOGUE SYSTEM

Data Catalogue system capabilities will only partially support the needs discussed in the preceding sections. A summary of the degree of support provided is shown in table I. Areas of potential use are discussed in the succeeding paragraphs.

3.1 Data Description

Overall, data description capabilities of the Data Catalogue system are very good and reasonably easy to use, assuming that the source data is available. Some exceptions to this statement are noted later in this section.

Descriptive data maintained by the system provides support best for functions related to documentation and to standards control. The examples shown in the appendix illustrate the descriptive data in the Catalogue report, the Index reports, and the Cross-Reference reports. Data in the Catalogue report, for example, will provide a significant portion of the basic data included in the definition of application system requirements. Much of the data in the FACS System Requirements document (ref 5) is now in Data Catalogue files.

Central control is not now exercised over the assignment of data names in applications programs implemented for the Data Systems Development Branch. As a result, a multiplicity of names are generally assigned to each element within each system. (Fourteen data names in FACS are used to refer to the element Fund Source.)

TABLE I.- SUMMARY OF DATA CATALOGUE CAPABILITIES

Item	Degree of support
Data description	
Text	Good
Cycle, frequency	Fair
Volume data (records)	None
Format	Good
Source	Good
Data structure-logical	
Owner-member relationships	None
Element-dependency, derivability	None
Data structure - physical	
Elementary, group items	Good
Records	Good
Files, data bases	Good
Reports	Fair
Transactions	Fair
System	None
Security level	
Elementary items	Fair
Records, files	None
Reports	None
Programming (assistance) aids	
Source code generation - COBOL	Good
Edit description	None
Test data assistance	
Value ranges	Good
Dependencies	Fair
Generation	None

Standards in this area could provide better management of the naming function; fewer names, carefully chosen, could simplify program maintenance tasks and possibly reduce computer resources required for compilation. Up to 90 data names may be assigned to each item in the Data Catalogue.

Data description needed for performance analysis or redundancy analysis, such as volume of records of a given definition in a data base, is not specifically provided by the Data Catalogue system. Cycle and frequency data are included only for elementary and group items and are confusing to use.

The appendix includes several examples of the various reports. Sections A.1, A.2, and A.3 describe the Catalogue report for elementary items, group items, and records, respectively. Section A.4 shows some of the indexes produced by the system, and section A.5 provides an example of a Cross-Reference report; these reports are used to index and cross-reference data in the Catalogue report. The capability of being more selective in generating these reports would be a valuable feature.

Most of the descriptive data may be omitted at the option of the installation, through appropriate designation of "Installation Standards." The intended use of the Installation Standards capability, namely, to detect and report omission of data designated as mandatory or semi-mandatory, could help assure that data entries for the dictionary are complete.

Data description capabilities are probably the strongest feature of the system. Nevertheless, the quality of the descriptive reports should be improved. In the Catalogue report, for example, abbreviations should be avoided wherever practical, codes should be interpreted, and spacing should be handled more carefully. Consideration should be given to listing, at most, one data item (elementary, group, or record) on a page, with the added capability of listing only a single or a few catalogue entries following an update.

Problems with other reports indicate that the system may not yet be fully debugged. For example, entries in some of the index reports (Index by Program, Index by Source Department) are not sorted alphabetically. In the Structure report listing for an elementary item, the first two lines are truncated erroneously.

3.2 Data Structure - Logical

Logical data structures considered here are the parent-child or owner-member relationships among the records in a data base, and data element dependencies and derivability. No real support is provided in either of these categories by the Data Catalogue system. Logical data structure relationships are not identified in the system; logical record structures are supported only to the extent that they are the same as physical record structures.

The 1971 CODASYL Data Base Task Group (DBTG) report (ref 6) defines data base tree structures and networks using the parent-child relationship among sets of data or records.

The capability to describe these relationships would be a valuable data dictionary feature. The description of these relationships would require designating all parent-child relationships involving each type of record by providing additional information to the data dictionary, either as part of the definition of that record or as still another type of input data. Reporting capabilities of the data dictionary should include the capability of tracing these relationships for a specified system, program, or transaction.

The capability to identify, define, and retrieve data dependencies or derivability could also be a valuable data dictionary feature.

3.3 Data Structure - Physical

Physical data structures involving data elements, groups of elements, records, and files are well supported by the Data Catalogue system. Definitions of these relationships are easy to prepare as input and are well described in the various reports available from the system.

Figure A-3 shows the structure of a group item. Figure A-4 illustrates how the structure of a record is indicated through use of indentation; each successivly lower level of the physical structure, to a maximum of five levels below the record, can be shown through indentation. The Cross-Reference reports (see fig. A-9 for an elementary item example) also document the physical structure; each successively higher level of the physical structure is listed for each entry.

Explicit definitions of transactions (both input and output) and reports are not supported in any of the intended uses. Usage data for an elementary item can specify implicitly that a data name is used in processing a transaction or producing a report, but this information is not reported in an index. These relationships should be defined explicitly in any data dictionary system. Another important relationship, that of an application system to its component programs, processes, and data collections; is omitted completely. No references to such a system are included in the data.

A list of data elements used in a specific program is given in the Index by Program (see fig. A-6) report. However, this data is defined implicitly for each data element rather than explicitly by program.

3.4 Security Level

Security levels may be specified only for data elements (elementary and group items). Security information for records, files, reports, or transactions is not provided. The only use made of the security code is its inclusion in the Catalogue and Structure reports as an encoded item. No report has been produced focusing on or highlighting a security level or access to data.

No provision is made by the Data Catalogue system for the security of its own files. The only capabilities available to the user in restricting access to system files are provided by the operating system.

3.5 Programming Aids

Some direct programming assistance, in the form of generation of COBOL source language statements, is available from the Data Catalogue system. Testing of this feature was omitted, as instructed by the Branch, because of the late delivery of that system capability.

Another capability is the generation of transactions for the Data Catalogue system from COBOL source code. It is expected that this feature would be a useful tool in collecting data elements from existing applications, correlating those elements with existing catalogue entries, and entering the corresponding names into the catalogue. Thus, the system could assist in the maintenance of existing programs through improved documentation.

Another capability which could potentially assist in the maintenance function is the Program Revision report. This report identifies programs which must be modified as the result of a change in the data format or physical structure, assuming that the usage data in the catalogue is complete and accurate. However, Program Revision report data is excessively repetitious; an example is shown in the appendix, section A.6.

Edit data is not included in the system in the form of either descriptive material or generation of edit modules.

3.6 Test Data

Optional free-form input may be provided to the system describing the value of a data item (see the appendix, section A.1). This input could be used to specify the range of values for the particular data item. Another possible use of this input might be to specify data dependency or derivability, but no structured means of specifying such data is provided. For example, in a payroll application, gross salary might be a function of hours worked and rate of pay. To a limited extent, such dependencies could be described to the system and could be useful information for redundancy analysis. Since any such information would be unstructured and not recognized by the Data Catalogue system, its usefulness would be limited.

This system has no test data generation capabilities.

4.0 RECOMMENDATIONS

Based upon experience with the Data Catalogue system, the following recommendations are submitted for consideration.

4.1 Data Dictionary

Data dictionary capabilities could be used profitably by the Data Systems Development Branch and should be implemented to fulfill Branch requirements for improved visibility and control over data resources. Reasons for this recommendation include the improved visibility and control over data resources which would be provided and the assistance which could be provided to the function of requirements definition, program development, and maintenance.

It is recommended that the initial use of the data dictionary be in support of (1) data gathering for documentation, (2) assistance for program development and maintenance, and (3) standards implementation. Future capabilities should be provided to support functions such as performance and redundancy analysis, representation of additional data relationships, and more advanced programming aids. The provision for directory-type capabilities (see section 5.2) should be considered a function of the systems organization.

It is further recommended that only one data dictionary be implemented and used within the Data Systems Development Branch. There are several reasons for this recommendation

in view of the different efforts in progress at present. First, many of the data elements for most financial and administrative application software systems are the same; describing the same data elements to more than one data dictionary would be redundant. Next, maintenance of each such data dictionary system would require effort. Finally, maintenance of the same data for different data dictionary systems would invite inconsistency, one of the problems the data dictionary is intended to resolve.

Both short-range (see section 4.2) and long-range (see section 4.3) capabilities are suggested, consistent with recommendations in MITRE WP-5183 (ref 7).

4.2 Short-Range Implementation

The Data Catalogue system implementation of a data dictionary is recommended for short-range use. Modification of the system could remedy some of its shortcomings and could probably be performed at a lower cost than the development of a new system. The Data Catalogue system is written in ANSI COBOL. Reasons for this recommendation include the following:

- The Data Catalogue system is installed and working under UNIVAC 1108, EXEC 8. It is capable of providing significant assistance in requirements definition and system maintenance, particularly with current COBOL systems.

- FACS data, which is representative of much of the financial and administrative data maintained by the

Branch, is already established in Data Catalogue files. The FACS data probably represents some 20 to 25 percent of the basic descriptive data of this type (70 percent of Basic Accounting data, 15 percent of PMATS and Logistics data).

- The Data Catalogue system organization is appropriately based on data elements, group items, records, and files, consistent with the approach discussed by Uhrowczik (ref 2, pp. 340-341). Although the system makes no provision for explicit definitions of reports, transactions, and systems (a serious fault), these could probably be added for less cost than an entirely new system.

However, it should be noted that, while the system currently provides facilities for assistance in defining requirements and in other functions, no real assistance is provided for the analysis of performance or redundancy for evaluating proposed data base designs.

4.3 Long-Range Implementation

Comprehensive requirements should be defined for long-range implementation of a data dictionary system. Directory capabilities can be reconsidered at the time the requirements are defined.

As with most computer software applications, the cost of the initial development will be only a fraction of the eventual cost which must include maintenance of the data dictionary system and establishment and maintenance of its

data base. Therefore, care must be exercised in the definition of requirements. A basic consideration must be whether the data dictionary system will be used primarily to assist in the design of integrated data bases or whether equal importance will be placed on other considerations, such as data control, standards, maintenance functions, and programming assistance. It is suggested that all the capabilities discussed in this evaluation would be legitimate requirements and should be defined in more detail.

4.4 Program Network Description

Another capability which would be useful, both in redundancy analysis and in determining the possible effects of program, file, or data base modifications, would be that of recording and tracing data flow in a network of related computer programs. Relationships of interest are those data collections which constitute interfaces among the programs. Inclusion of data dictionary information describing data interfaces among programs would be a logical development.

The Data Catalogue system produces an Index by Program report listing all data items (elementary items only) used or produced by a program. Because data for this report is taken from usage data (lines 1002-1099) for the elementary items, it is liable to be incomplete or inaccurate. Better organized input facilities defining specific input and output files for each program are needed in order for this data to be a useful part of a data dictionary.

5.0 MISCELLANEOUS REMARKS

Several comments about data dictionaries generally and the Data Catalogue system specifically are in order. Some of these are merely reiterations of previous comments, whereas others did not seem to "belong" to any other section of the evaluation.

5.1 Data Description Languages

Data Description Languages (DDL's) are growing in importance and are directly related to the subject of data dictionaries. In order to focus on the evaluation of the Data Catalogue system, however, virtually no mention was made of data description languages as such. Several examples of DDL's are contained in the following paragraphs.

Probably the most common DDL is that used in the data division of a COBOL program to describe elementary items, group items, records, and files. The same DDL terminology used in any COBOL manual is used in defining data for the Data Catalogue system.

The CODASYL Data Base Task Group report of April 1971 (see ref 6) proposed a data description language for the description of a data base. The proposed DDL is largely an extension of the COBOL language and has been implemented in DMS1100 for the UNIVAC 1100 series and in other data base management systems (DBMS) for other computers. The DBTG data description language includes facilities for defining data relationships such as those mentioned in section 3.1.

A technical paper (ref 8) written by Senko, Altman, Astrahan, and Fehder proposes another approach to a DDL. This data description language was chosen by personnel of the Martin-Marietta Corporation for use in their Research Technology Objectives and Planning (RTOP) project in support of IDSD. Still other approaches to data description have been proposed by Codd (ref 9) and Sibley and Taylor (ref 10).

The connection between a data dictionary and a DDL lies in the description of data relationships for users of the dictionary and in the possible generation of source code by the data dictionary for inclusion in application systems. For example, the Data Catalogue system was designed primarily for description of data used by COBOL programs. Relationships which are easily defined in COBOL (the physical data structures) are meaningful to the Data Catalogue system; COBOL source code defining the physical structure can be generated by the system. Relationships not defined in the standard COBOL (i.e., logical data structures) were excluded in the design of the Data Catalogue system; therefore, DBTG-type statements defining the logical data structure sets cannot be generated by the system. Generation of DBTG-type statements would be an important capability if DMS-1100 (or any other system based on DBTG-recommended language) were used extensively in the installation.

5.2 Directory Capabilities

The directory capabilities of a DD/D system were mentioned briefly in section 2.0. Uhrowczik's paper, "Data

Dictionary/Directories," (ref 2) gives an excellent summary of directory functions, which he refers to as the "computer use mode." These include important capabilities such as use of the DD/D system at program execution time (1) to perform the actual mapping between logical and physical data structures, (2) to centralize the actual data editing function, or (3) to centralize actual data conversion and compaction functions. Capabilities such as these require that a common DD/D system be used by the installation operating system and by each DBMS used in the installation. It is expected that the next generation of computer hardware and software may well provide such a common DD/D system. However, the prospect of introducing such a concept into a production environment such as the IDSD facility was beyond the scope of this job order.

Another approach has apparently been implemented at the Shell Information Center in Houston, as described in a paper given at the recent UH/HIS Data Base Conference (ref 11). The technique described involves use of a DD/D system in an "envelope preprocessor" cycle to generate an object module. This object module then serves as interface between the applications program and the data base management system. While this approach seems awkward and apparently provides only a few of the dictionary functions defined by Uhrowczik (ref 2), it does have some advantages. For example, it facilitates interfacing more than one DBMS with the DD/D without modifying the DBMS, and it permits use of standard data element names independent of the program data names.

5.3 Data Explosion

As stated previously, data from FACS was used to evaluate the Data Catalogue system. Of the FACS data, approximately 91 elementary items, 21 group items, 4 record formats, and 2 files were selected as input. These data items generated over 2,000 input data cards for the Data Catalogue system. Because this "data explosion" has been a source of some concern, several comments are appropriate.

Most of the data explosion is inherent in any data dictionary. In some respects, the value of a data dictionary is directly proportional to the amount of accurate, meaningful, useful data recorded about each data item; the same is true of a word dictionary for a specific natural language. In this sense, the data explosion is desirable. However, both maintenance cost and data dictionary usefulness dictate that careful consideration be given to what types of data should be kept in the data dictionary. Certain items of data are more useful to standards control, others to improved documentation or maintenance of existing programs, and still others to redundancy analyses or system design. If all these needs are to be served, the amount of data required by the dictionary will certainly be greater than for any single need. The Data Catalogue system does facilitate control over what data will be maintained.

Moreover, several techniques can be used to control the data explosion to some degree. For the Data Catalogue system, proper organization of the data can eliminate some redundancy; many entries could be eliminated by restricting

the recording of data names to those required for file definition (FD) in COBOL entries, thus, not permitting entries for working storage data, or modifications to the system could permit more data per input data card. Some of these items should be dicussed in the user manual for the system.

5.4 Maintenance

As stated in section 4.3, establishment of the initial data base is probably the greatest single item of cost. Once the initial data base is established, however, it must be maintained carefully in order for the data dictionary to be useful. Procedures are needed for updating the data dictionary automatically as part of the validation and review cycle each time an application system is modified. Maintenance of the data base should not be expensive, but it would require care.

5.5 Fault Correction

If the Data Systems Development Branch decides to purchase the Data Catalogue system, contractual provision should be included for correcting known errors and faults. Fault corrections should include the following:

- Elimination or replacement of all symbols in the input and output data which are meaningful only in an IBM 360/370 environment.

- Elimination of the repetition of data items in the Cross-Reference reports, and of groups of lines in the Program Revision report.

- Elimination of erroneously truncated header lines in the Structure report for elementary items.

- Sorting of input transactions by the system prior to an initial run or update (as provided for the IBM 360/370 version).

Attempts should also be made to negotiate other improvements, such as

- Provision for the capability of beginning the listing for each data item (elementary item, group item, record, or file) on a new page.

- Provision for printing only those data items affected by a change, rather than the entire Catalogue report.

- Capability for producing a single report of a given type, rather than the requirement that all reports in that type be produced (i.e., it should be possible to print a new index by catalogue name without also printing new indexes of each of the other types).

- Provision for the Cataloque report format which would be more useful at this installation if the elementary item usage data were organized

differently. Also, system and program identification provisions are inadequate. The following general approach is suggested for organizing and formatting Catalogue report usage data output:

System	Program	Data_name	Format	Use	Using organization
FACS	P3860	FS-1	X(1)	CREATE	FMD
		WS-1	X(1)	CREATE	FMD
	P3870	FS-3	X(1)	READ	FMD
P497	--	--	--	--	--

This data would replace lines XX00, XX01, and XX02 in the Catalog report (see appendix, section A.1) for each elementary item.

- Encoded data (specifically for the Data Catalogue) should be interpreted in the output reports rather than appear as encoded data.

5.6 Data Dictionary Names

Care should be exercised in the assignment of names in a data dictionary. In order for naming conventions to be as meaningful as possible to users of the dictionary, responsibility for this function should be centralized as a data base administrator function. Otherwise, data dictionary names will be assigned one application system at a time. As a result, those systems described to the dictionary first would probably establish name standards by default.

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APPENDIX

REPORT EXAMPLES

APPENDIX
REPORT EXAMPLES

Several examples of reports produced by the Data Catalogue system are included for illustrative purposes in this appendix. Data in these reports is primarily from FACS; however, some references are made to elementary items and transactions (shown as "records") from IFMS.

A.1 Elementary Items

Two examples of elementary items are presented - FUND SOURCE (fig. A-1) and PRIMARY WORK CODE (fig. A-2). Both are included in the Catalogue report, with some variations in their contents. Line numbers are listed in the far right column.

Item descriptions may be recorded on lines 0001-0099 (actually shown on lines 0001-0004 for fund source, 0001-0005 for primary work code). Keywords (up to 10 per item) begin on line 0001. Remaining lines are in free-form with contents at installation discretion.

Source data (lines 0100-0199) needs careful preparation. It should involve study of the origin and responsibility for each particular data item. Lines 0101-0199 are recorded in free form.

Value description is unstructured, free-form data recorded in lines 0200-0299. Installation standards could be imposed to structure the value data for optimum usefulness. These standards could consist of fixed codes

and descriptive text. The fund source entry (fig. A-1) provides one example of possible use.

Lines 0300-0999 are currently not used by the Data Catalogue system, and could be used at the discretion of the installation, particularly if modification of the system were undertaken. Some possible uses of these lines would be for the designation of those systems (such as FACS, Institutional Management Accounting System Phase B (IMAS-B), or PR-497) in which the element is used, designation of dependency on other elements, or designation of specific derivability algorithms.

Usage data is recorded on several successive groups of lines, ranging from 1000 to 9999. Up to 90 groups of usage data may be recorded (lines 1000-1099, 1100-1199,---9900-9999). Generally, 1 to 3 lines will be needed within a group, which is associated with a specific data name. The first specifies the data names (the "BAL Symbol" and "DBD Name" fields are IBM 360/370 terms without meaning for this evaluation); the second specifies element format; and the third (and succeeding lines, if necessary) specify programs, reports, and other "element usages." Since only 1 to 3 lines are generally needed for a particular data name, the 100 lines available are wasteful; standards for data names could change this condition; otherwise, the system should be modified to increase the number of permissable names by a factor of at least 10.

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DATA CATALOGUE
CATALOGUE REPORT

REPORT DATE- 02/27/75
REVISION NUMBER- 11
DATE OF LAST REVISION- 02/15/75
TYPE OF UPDATE- PERMANENT

SECTION 1. ELEMENTARY ITEMS

CATALOGUE NAME	REV.		LINE NUMBER
*** FUND-SOURCE ***		---DESCRIPTION---	
	1	KW=FS	0001
	1	CODE THAT IDENTIFIES FINANCING APPROPRIATION IN TERMS	0002
	1	OF CURRENT ADMINISTRATIVE CLASSIFICATION USED BY NASA	0003
	1	HEADQUARTERS TO MANAGE FUNDS.	0004
		---SOURCE RESPONSIBILITY---	
	9	DEPT=JSC-FIN-MGMT-DIV PROG/APPLICATION/SYSTEM=BASIC ACCOUNTING	0100
		FORM NO.= CREATION CYCLE=MTHLY STATUS=E LIFE EXPECTANCY=01	0100
	9	VALID FUND SOURCES ARE PROVIDED VIA A TABLE WITHIN	0101
	9	THE JSC BASIC ACCOUNTING SYSTEM (PROJECT 2520).	0102
		---VALUE DESCRIPTION---	
	9	CODE DESCRIPTION	0200
	9	1-3 RESEARCH AND PROGRAM MANAGEMENT	0201
	9	1 PERSONNEL SERVICES	0202
	9	2 TRAVEL	0203
	9	3 OPERATION OF INSTALLATION	0204
	9	4 RESEARCH AND DEVELOPMENT PROGRAM	0205
	9	5-8 CONSTRUCTION OF FACILITIES	0206
	9	5 CONSTRUCTION OF FACILITIES EXCEPT FOR	0207
	9	FACILITY PLANNING AND VARIOUS LOCATIONS	0208
	9	6 FINAL DESIGN	0209
	9	7 VARIOUS LOCATIONS	0210
	9	8 PRELIMINARY DESIGN	0211
	9	T TRUST FUND	0212
	9	0 UNFUNDED TRANSACTIONS	0213
		---IMPLEMENTATION STANDARDS---	
	1	DATA NAME=M-FS BAL SYM= DBD=	1000
	1	LENGTH= 1 LANG=COBOL FORMAT=DISPLAY JUST/SYNC=J DYNAMIC=C	1001
		COBOL PICTURE=X VALUE=	1001
		CODE NAME OPTIONS CYCLE FREQ. SECURITY DEPARTMENT NAME	
	9	P P3860 U M 0001	1002
	1	DATA NAME=T-FS BAL SYM= DBD=	1100
	1	DATA NAME=WS-FS BAL SYM= DBD=	1200
	1	DATA NAME=P-M-FS BAL SYM= DBD=	1300
	1	DATA NAME=P-T-FS BAL SYM= DBD=	1400
	1	DATA NAME=F-FS BAL SYM= DBD=	1500
	1	LENGTH= 1 LANG=COBOL FORMAT=DISPLAY JUST/SYNC=J DYNAMIC=C	1501
		COBOL PICTURE=X VALUE=	1501
	9	P P3850 R M 0001	1502
	1	DATA NAME=S-FS BAL SYM= DBD=	1600
	1	DATA NAME=ST-FS BAL SYM= DBD=	1700
	1	DATA NAME=F-C-FS BAL SYM= DBD=	1800
	1	DATA NAME=M-FS BAL SYM= DBD=	3000
	1	LENGTH= 1 LANG=COBOL FORMAT=DISPLAY JUST/SYNC=J DYNAMIC=C	3001
		COBOL PICTURE=X VALUE=	3001

Figure A-1. – Example of Catalogue Report, Fund Source Elementary Item.

DATA CATALOGUE
CATALOGUE REPORT

REPORT DATE- 02/27/75
REVISION NUMBER- 11
DATE OF LAST REVISION- 02/15/75
TYPE OF UPDATE- PERMANENT

SECTION 1. ELEMENTARY ITEMS

CATALOGUE NAME	REV.		LINE NUMBER
*** PRIMARY-WORK-CODE ***		---DESCRIPTION---	
	9	KW=PWC	0001
	9	THIS FIELD IS THE JSC WORK BREAKDOWN STRUCTURE CODE,	0002
	9	WHICH IS A UNIFORM CLASSIFICATION AND IDENTIFICATION	0003
	9	OF ALL JSC ACTIVITIES FOR THE PURPOSES OF PLANNING,	0004
	9	PROGRAMMING, BUDGETING, AND ACCOUNTING.	0005
		---SOURCE RESPONSIBILITY---	
	9	DEPT=JSC-FIN-MGMT-DIV PROG/APPLICATION/SYSTEM=BASIC ACCOUNTING	0100
		FORM NO.= CREATION CYCLE=MTHLY STATUS=E LIFE EXPECTANCY=01	0100
	9	VALID PRIMARY WORK CODES ARE PROVIDED VIA A TABLE	0101
	9	WITHIN THE JSC BASIC ACCOUNTING MGMT DATA SYSTEM	0102
		---VALUE DESCRIPTION---	
	9	MUST BE VALID FOR SPECIFIED FUND SOURCES (2)	0200
	9	AND PROGRAM YEAR (5)	0201
		---IMPLEMENTATION STANDARDS---	
	1	DATA NAME=T-PWC BAL SYM= DBD=	1000
	1	LENGTH= 9 LANG=COBOL FORMAT=DISPLAY JUST/SYNC=J DYNAMIC=C	1001
		COBOL PICTURE=X(9) VALUE=SPACES	1001
		CODE NAME OPTIONS CYCLE FREQ. SECURITY DEPARTMENT NAME	
	9	P P3860 U M 0001	1002
	1	DATA NAME=WS-PWC BAL SYM= DBD=	1100
	1	DATA NAME=P-M-PWC BAL SYM= DBD=	1200
	1	DATA NAME=P-T-PWC BAL SYM= DBD=	1300
	1	DATA NAME=S-PWC BAL SYM= DBD=	1400
	1	LENGTH= 9 LANG=COBOL FORMAT=DISPLAY JUST/SYNC=J DYNAMIC=C	1401
		COBOL PICTURE=X(9) VALUE=	1401
	9	P P3850 R M 0001	1402
	1	DATA NAME=L-PWC BAL SYM= DBD=	1500
	1	DATA NAME=IE-PWC BAL SYM= DBD=	1600
	1	DATA NAME=M-PWC BAL SYM= DBD=	2000
	1	LENGTH= 9 LANG=COBOL FORMAT=DISPLAY JUST/SYNC=J DYNAMIC=C	2001
		COBOL PICTURE=X(9) VALUE=	2001
	1	DATA NAME=F2-PWC BAL SYM= DBD=	2100
	1	LENGTH= 9 LANG=COBOL FORMAT=DISPLAY JUST/SYNC=J DYNAMIC=C	2101
		COBOL PICTURE=X(9) VALUE=	2101
	1	DATA NAME=F1-PWC BAL SYM= DBD=	2200
	1	LENGTH= 9 LANG=COBOL FORMAT=DISPLAY JUST/SYNC=J DYNAMIC=C	2201
		COBOL PICTURE=X(9) VALUE=	2201
	9	R P3870 R M 0001	3002

Figure A-2. – Example of Catalogue Report, Primary Work Code Elementary Item.

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A.2 Group Items

The entry for MASTER SEQUENCE is presented to illustrate the Catalogue report for group items (fig. A-3). The format is the same as for elementary items for descriptive text (lines 0001-0099). Lines 0100-0999 are not used by the system, with the same options available for installation use as lines 0300-0999 of the elementary item entries (see section A.1).

Lines X000 are used to specify data names for the group items (up to 9 names). Corresponding to the data name specified in line N000, lines N001-N999 may be used to specify the structure for that group item together with indexing data. Each element of a group item may also be referenced to a specific data name entry in the corresponding elementary item through designation of the line number for that data name.

Subgroups may be specified by treating each subgroup as an elementary item. Fillers, as defined for COBOL programs, may also be specified. The Catalogue report will show each level of subgroup as indented from the previous level, the indentation being repeated until the lowest, or elementary item, level is reached.

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DATA CATALOGUE
CATALOGUE REPORT

REPORT DATE- 02/27/75
REVISION NUMBER- 11
DATE OF LAST REVISION- 02/15/75
TYPE OF UPDATE- PERMANENT

SECTION 2- GROUP ITEMS

CATALOGUE NAME	REV.		LINE NUMBER	DEFINED ON PAGE
*** MASTER-SEQUENCE ***		---DESCRIPTION---		
	1	KW=SORT-SEQ	0001	
	1	SORT SEQUENCE OF FACS MASTER,FILE	0002	
	1	CONT-MOD,RECORD TYPE, PWC,MA,PY,FS,OBJECT CLASS,	0003	
	1	WORK-STATUS CODE AND FILE SOURCE CODE	0004	
		---IMPLEMENTATION STANDARDS---		
	1	DATA NAME=M-SORT-SEQ SYMBOL=	1000	
		SECURITY= FREQUENCY OF ACCESS=	1000	
		---GROUP ITEM STRUCTURE---		
		FROM TO ITEM CATALOGUE NAME LINE LENGTH RD INDEX DEPEND		
	1 001	CONTRACTOR-MOD 1000	1001	68
	1 001	JSC-CONTRACT-NO 1000		33
	1 001	JSC-CONTRACT-NO-MOD 1000		34
	1 001	MASTER-RECORD-TYPE 1000	1002	36
	1 001	PRIMARY-WORK-CODE 1000	1003	48
	1 001	WORK-STATUS-CODE 1000	1006	66
	1 001	FILE-SOURCE-CODE 1000	1007	29
		---IMPLEMENTATION STANDARDS---		
	1	DATA NAME=T-SORT-SEQ SYMBOL=	2000	
		SECURITY= FREQUENCY OF ACCESS=	2000	
		---GROUP ITEM STRUCTURE---		
		FROM TO ITEM CATALOGUE NAME LINE LENGTH RD INDEX DEPEND		
	1 001	CONTRACTOR-MOD 2000	2001	68
	1 001	JSC-CONTRACT-NO 1100		33
	1 001	JSC-CONTRACT-NO-MOD 1100		34
	1 001	MASTER-RECORD-TYPE 1100	2002	36
	1 001	PRIMARY-WORK-CODE 1000	2003	48
	1 001	WORK-STATUS-CODE 1100	2006	66
	1 001	FILE-SOURCE-CODE 1100	2007	29
		---IMPLEMENTATION STANDARDS---		
	1	DATA NAME=PUR-SORT-SEQ SYMBOL=	3000	
		SECURITY= FREQUENCY OF ACCESS=	3000	
		---GROUP ITEM STRUCTURE---		
		FROM TO ITEM CATALOGUE NAME LINE LENGTH RD INDEX DEPEND		
	1 001	CONTRACTOR-MOD 3000	3001	68
	1 001	JSC-CONTRACT-NO 1200		33
	1 001	JSC-CONTRACT-NO-MOD 1600		34
	1 001	MASTER-RECORD-TYPE 1200	3002	36
	1 001	FILLER 0020	3003	

Figure A-3. — Example of Catalogue Report, Group Items.

A.3 Records

The FACS TRANSACTION RECORD (fig. A-4) is presented as an example of a Data Catalogue entry for a record. Again, lines 0001-0099 are used to specify descriptive data. Lines 0100-0999 are not used by the data and would be available if the Data Catalogue system were modified to accommodate the definition of relationships among records.

For each data name assigned to a record, the user may specify the usage (using program, language, and use function) associated with that data name and the corresponding record structure; the example used here shows varied structure representations corresponding to the data names TRANS, TRANS-10-30-35, TRANS-TR, and WORK-RECORD.

A.4 Index Reports

Several index reports are produced by the Data Catalogue system. Those selected for examples (figures A-5 through A-8) include a single page from the Index by Catalogue Name, the Index by Program, the Index by Data Name, and the Index by Departmental Use.

Given the Catalogue Name, any elementary or group item, record, or file entry in the Catalogue report can be located in the Index by Catalogue Name (figure A-5). Entries are sorted alphabetically. Three columns of data are listed: the Catalogue Name, type of entry, and page location in the Catalogue report.

For any program recorded as part of the usage data for an elementary item or record, a listing of those entries and

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DATA CATALOGUE
CATALOGUE REPORT

REPORT DATE- 02/27/75
REVISION NUMBER- 11
DATE OF LAST REVISION- 02/15/75
TYPE OF UPDATE- PERMANENT

SECTION 3. SEGMENT ITEMS

CATALOGUE NAME	REV.									LINE NUMBER	DEFINED ON PAGE
*** TRANSACTION-RECORD ***											
			---DESCRIPTION---								
	1	KW=TRANS								0001	
	1	UPDATES THE FACS MASTER-FILE								0002	
			---IMPLEMENTATION STANDARDS---								
	9	DATA NAME=TRANS					SYMBOL=********			1000	
		IMS SEGMENT NAME=********								1000	
			---USAGE LIST---								
		CODE	NAME	LANG	OPTIONS	CODE	NAME	LANG	OPTIONS		
	9	P	P3860	COBOL	G	P	P3880	COBOL	G	1001	
			---SEGMENT STRUCTURE---								
		FROM	TO	ITEM CATALOGUE NAME	LINE	LEN	RD	INDEX	DEPEND	KEY	
	1		001	MASTER-SEQUENCE	2000					1100	82
	1		001	CONTRACTOR-MOD	2000						68
	1		001	JSC-CONTRACT-NO	1100						33
	1		001	JSC-CONTRACT-NO-MOD	1100						34
	1		001	MASTER-RECORD-TYPE	1100						36
	1		001	PRIMARY-WORK-CODE	1000						58
	1		001	WORK-STATUS-CODE	1100						66
	1		001	FILE-SOURCE-CODE	1100						29
	1		001	MASTER-COLUMN-37-138	2000					1101	79
	1		001	MODIFICATION-TYPE	1800						39
	1		001	REPORT-CODE	1100						60
	1		001	PROC-PLACEMENT-CODE	2000						51
	1		001	CONTRACT-DATE	1300						10
	1		001	FILLER		0020					
	1		001	OBLIGATION-REQUIRED	1100						43
	1		001	INITIAL-OBLIGATION	1100						32
	1		001	ESTIMATED-COST	1100						26
	1		001	ESTIMATED-FEE	1100						27
	1		001	AWARD-INDICATOR	1100						5
	1		001	COST-ACCOUNTING	1300						19
	1		001	MINORITY-CONTRACT	1400						38
	1		001	FILLER		0011					
	1		001	INITIAL-CONTR-DATE	2000						76
	1		001	INITIAL-CONTR-MONTH	1100						31
	1		001	INITIAL-CONTR-DAY	1100						31
	1		001	INITIAL-CONTR-YEAR	1100						32
	1		001	FILLER		0012					
			---IMPLEMENTATION STANDARDS---								
	1	DATA NAME=TRANS-10-30-35					SYMBOL=********			2000	
		IMS SEGMENT NAME=********								2000	

Figure A-4. – Example of Catalogue Report, Record.

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DATA CATALOGUE
CATALOGUE REPORT

REPORT DATE- 02/27/75
REVISION NUMBER- 11
DATE OF LAST REVISION- 02/15/75
TYPE OF UPDATE- PERMANENT

SECTION 3. SEGMENT ITEMS

CATALOGUE NAME	REV.									LINE NUMBER	DEFINED ON PAGE
		---USAGE LIST---									
		CODE	NAME	LANG	OPTIONS	CODE	NAME	LANG	OPTIONS		
	1	P	P3860	COBOL	A					2001	
		---SEGMENT STRUCTURE---									
		FROM	TO	ITEM CATALOGUE NAME		LINE	LEN	RD	INDEX	DEPEND	KEY		
	1		001	FILLER			0014				2100		
	1		001	MASTER-COLUMN-15-116		2000					2101	78	
	1		001	FILLER			0023						
	1		001	AS-OF-MONTH		1100						4	
	1		001	FILLER			0004						
	1		001	COMMITMENTS		1500						6	
	1		001	OBLIGATIONS		1600						42	
	1		001	COST		1700						18	
	1		001	DISBURSEMENTS		1600						23	
	1		001	REGULAR-HOURS-LD		1100						58	
	1		001	OVERTIME-HOURS-LD		1100						44	
	1		001	ENGINEERING-HOURS-LD		1600						25	
	1		001	FILLER			0008						
	1		001	FILLER			0010				2102		
	1		001	DATE-OF-LAST-CHANGE		1100					2103	75	
	1		001	CUT-OFF-DATE		2000					2104	74	
	1		001	CUT-OFF-MONTH		1400						21	
	1		001	CUT-OFF-DAY		1400						21	
	1		001	CUT-OFF-YEAR		1400						22	
		---IMPLEMENTATION STANDARDS---											
	1	DATA NAME=TRANS-TR					SYMBOL=********				3000		
		IMS SEGMENT NAME=********									3000		
		---USAGE LIST---											
		CODE	NAME	LANG	OPTIONS	CODE	NAME	LANG	OPTIONS				
	1	P	P3860	COBOL	A						3001		
		---SEGMENT STRUCTURE---											
		FROM	TO	ITEM CATALOGUE NAME		LINE	LEN	RD	INDEX	DEPEND	KEY		
	1		001	FILLER			0038				3100		
	1		001	FILLER			0016				3101		
	1		001	COMMITMENTS		1600					3102	6	
	1		001	OBLIGATIONS		2400					3103	42	
	1		001	COST		1800					3104	18	
	1		001	DISBURSEMENTS		1800					3105	23	
	1		001	REGULAR-HOURS-LD		1200					3106	58	
	1		001	OVERTIME-HOURS-LD		1200					3107	44	
	1		001	ENGINEERING-HOURS-LD		1700					3108	25	
	1		001	RECORD-COUNT		1100					3109	56	
	1		001	TRAILER-TITLE		1100					3110	64	

Figure A-4. – Example of Catalogue Report, Record (Continued).

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DATA CATALOGUE
CATALOGUE REPORT

REPORT DATE- 02/27/75
REVISION NUMBER- 11
DATE OF LAST REVISION- 02/15/75
TYPE OF UPDATE- PERMANENT

SECTION 3. SEGMENT ITEMS

CATALOGUE NAME	REV.								LINE NUMBER	DEFINED ON PAGE
		---IMPLEMENTATION STANDARDS---								
	1	DATA NAME=WORK-RECORD				SYMBOL=********			4000	
		IMS SEGMENT NAME=********							4000	
		---USAGE LIST---								
		CODE	NAME	LANG	OPTIONS	CODE	NAME	LANG	OPTIONS	
	1	P	P3860	COBOL	A					4001
		---SEGMENT STRUCTURE---								
		FROM	TO	ITEM CATALOGUE NAME			LINE	LEN	RD	INDEX	DEPEND	KEY	
	1		001	CONTRACTOR-MOD			7000					4101	68
	1		001	JSC-CONTRACT-NO			1000						33
	1		001	JSC-CONTRACT-NO-MOD			1500						34
	1		001	MASTER-RECORD-TYPE			1600					4102	36
	1		001	PRIMARY-WORK-CODE			3000					4103	87
	1		001	PRI-WORK-CODE-PROJ			1200						50
	1		001	PRIMARY-WORK-CODE			1000						48
	1		001	PRIMARY-WORK-CODE			1000						48
	1		001	PRIMARY-WORK-CODE			1000						48
		---IMPLEMENTATION STANDARDS---								
	1	DATA NAME=FIL-NAME				SYMBOL=********			5000	
		IMS SEGMENT NAME=********							5000	
		---SEGMENT STRUCTURE---								
		FROM	TO	ITEM CATALOGUE NAME			LINE	LEN	RD	INDEX	DEPEND	KEY	
	1		001	MODIFICATION-TYPE			1600					5101	39
	1		001	REPORT-CODE			1400					5102	60
	1		001	PROC-PLACEMENT-CODE			1000					5103	88
	1		001	PROC-PLACE-CODE-1			1000						52
	1		001	PROC-PLACE-CODE-2			1000						53
	1		001	CONTRACT-DATE			1200					5104	10
	1		001	CONTRACT-COMPL-DATE			5000					5105	70
	1		001	CONTR-COMPL-MONTH			1400						15
	1		001	FILLER				0004					
	1		001	LABOR-SUR-PREFER-COD			1000					5106	35
	1		001	KIND-OF-ACTION			1000					5107	35
	1		001	REASON-NOT-SMALL-BUS			1000					5108	56
	1		001	CONTRACT-TYPE			1100					5109	14
	1		001	EXTENT-OF-COMPETITIO			1000					5110	28
	1		001	SMALL-BUSINESS-SUBCT			1000					5111	61
	1		001	PROCUR-SYNOPSIZED			1000					5112	51
	1		001	NEW-TECHNOLOGY-REPT			1000					5113	41
	1		001	GEOGRAPHIC-DISTRIB			1000					5114	30
	1		001	SUPPORT-SVC-CONTRACT			1000					5115	63
	1		001	COST-PERFORMANCE			1000					5116	20

TRANSACTION-RECORD

Figure A-4. – Example of Catalogue Report, Record (Concluded).

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DATA CATALOGUE

INDEX BY CATALOGUE NAME

REPORT DATE- 02/27/75
REVISION NUMBER- 11
DATE LAST REVISION- 02/15/75
TYPE OF UPDATE- PERMANENT

CATALOGUE NAME	SECTION	PAGE
AA-EXAMPLE-FIVE	DATA BASE	1
AA-EXAMPLE-FOUR	FILE	1
AA-EXAMPLE-ONE	ELEMENTARY	1
AA-EXAMPLE-THREE	SEGMENT	
AA-EXAMPLE-TWO	GROUP	
ACCEPTANCE-AMOUNT	ELEMENTARY	1
ALLOTMENT-BALANCE	ELEMENTARY	1
ALLOTMENT-ISSUES	ELEMENTARY	1
ALLOTMENT-RECEIPTS	ELEMENTARY	1
ALLOT-AVAILABLE-REC	ELEMENTARY	2
ALLOT-ISSUES-FS	ELEMENTARY	2
ALLOT-ISSUES-MA	ELEMENTARY	2
ALLOT-ISSUES-PRIOR-D	ELEMENTARY	2
ALLOT-ISSUES-PY	ELEMENTARY	2
ALLOT-SUB-ISSUED-SUS	ELEMENTARY	2
AMENDMENT-NUMBER	ELEMENTARY	3
APPROPRIATION	ELEMENTARY	3
ASSIGNMENT-AMOUNT	ELEMENTARY	3
AS-OF-DATE	ELEMENTARY	3
AS-OF-DAY	ELEMENTARY	3
AS-OF-MONTH	ELEMENTARY	4
AS-OF-YEAR	ELEMENTARY	4
AWARD-INDICATOR	ELEMENTARY	5
BASE	ELEMENTARY	5
CARRIER-ID	ELEMENTARY	6
CARRIER-RD	ELEMENTARY	6
CARRIER-TA	ELEMENTARY	6
CHANGE-INDICATOR	ELEMENTARY	6
COMMITMENTS	ELEMENTARY	6
CONTRACTOR-CITY	ELEMENTARY	7
CONTRACTOR-DIVISION	ELEMENTARY	8
CONTRACTOR-MOD	GROUP	
CONTRACTOR-NAME	ELEMENTARY	8
CONTRACTOR-STATE	ELEMENTARY	9
CONTRACT-ADM-DELEGAT	ELEMENTARY	9
CONTRACT-COMPL-DATE	GROUP	
CONTRACT-DATE	ELEMENTARY	10
CONTRACT-ID-CODE	ELEMENTARY	11
CONTRACT-MOD-DATE	GROUP	
CONTRACT-MOD-DAY	ELEMENTARY	12
CONTRACT-MOD-MONTH	ELEMENTARY	12
CONTRACT-MOD-YEAR	ELEMENTARY	12
CONTRACT-NO-BASE	ELEMENTARY	13
CONTRACT-NO-1FP	ELEMENTARY	13
CONTRACT-NO-2FP	ELEMENTARY	14
CONTRACT-NUMBER	GROUP	
CONTRACT-TYPE	ELEMENTARY	14
CONTROL-NUMBER	ELEMENTARY	15
CONTR-AND-MOD	GROUP	
CONTR-COMPL-DAY	ELEMENTARY	15
CONTR-COMPL-MONTH	ELEMENTARY	15
CONTR-COMPL-YEAR	ELEMENTARY	16
CONT-COMPL-DATE	ELEMENTARY	17
CONT-NO-PFX	ELEMENTARY	17
CONV.-PWA-BALANCE	ELEMENTARY	18
CONV.-PWA-ISSUES	ELEMENTARY	18
CONV.-PWA-RECEIPTS	ELEMENTARY	18
CORRECTION-INDICATOR	ELEMENTARY	18
COST	ELEMENTARY	18
COST-ACCOUNTING	ELEMENTARY	19
COST-PERFORMANCE	ELEMENTARY	20
CUT-OFF-DATE	GROUP	
CUT-OFF-DATE	ELEMENTARY	21
CUT-OFF-DAY	ELEMENTARY	21
CUT-OFF-MONTH	ELEMENTARY	21
CUT-OFF-YEAR	ELEMENTARY	22
DATE-OF-LAST-CHANGE	GROUP	
DATE-OF-LAST-CHANGE	ELEMENTARY	22
DAY-OF-LAST-CHANGE	ELEMENTARY	23
DISBURSEMENTS	ELEMENTARY	23
DOLLAR-AMOUNT	ELEMENTARY	24
ENGINEERING-HOURS-LD	ELEMENTARY	25
ESTIMATED-COST	ELEMENTARY	26
ESTIMATED-FEE	ELEMENTARY	27
EXTENT-OF-COMPETITIO	ELEMENTARY	28
FILE-SOURCE-CODE	ELEMENTARY	29
FUND-SOURCE	ELEMENTARY	29
F-PFX	GROUP	
FII-IFMS	SEGMENT	
GEOGRAPHIC-DISTRIB	ELEMENTARY	30
G11-IFMS	SEGMENT	
G13-IFMS	SEGMENT	
G21-IFMS	SEGMENT	
G22-IFMS	SEGMENT	
G23-IFMS	SEGMENT	
H11-IFMS	SEGMENT	
H12-IFMS	SEGMENT	
H13-IFMS	SEGMENT	
INITIAL-CONTR-DATE	GROUP	
INITIAL-CONTR-DAY	ELEMENTARY	31

Figure A-5. – Example of Index by Catalogue Name.

ORIGINAL PAGE IS
OF POOR QUALITY

DATA CATALOGUE

INDEX BY PROGRAM

REPORT DATE- 02/27/75
REVISION NUMBER- 11
DATE LAST REVISION- 02/15/75
TYPE OF UPDATE- PERMANENT

PROG. NAME=P3860

CATALOGUE NAME	PAGE	CATALOGUE NAME	PAGE	CATALOGUE NAME	PAGE
CONTRACT-TYPE	14	PROGRAM-YEAR	53		
CONTRACT-NO-2FP	14	REC-CREATION-DAY	57		
CONTRACT-NO-1FP	13	WORKING-STORAGE-RCD	107		
CONTR-COMPL-DAY	15	PURGE-RECORD	101		
CONTR-COMPL-YEAR	16	PROC-PLACEMENT-CODE	51		
CONTR-COMPL-MONTH	15	WORKING-STORAGE-RCD	107		
COST-ACCOUNTING	19	TRANSACTION-RECORD	102		
OBLIGATIONS	42	WORKING-STORAGE-RCD	107		
COST	18	PRI-WORK-CODE-PROJ	50		
OBLIGATIONS	42	WORKING-STORAGE-RCD	107		
CUT-OFF-MONTH	21	PROC-PLACE-CODE-1	52		
CUT-OFF-DAY	21	WORKING-STORAGE-RCD	107		
DISBURSEMENTS	23	MASTER-RECORD	97		
DATE-OF-LAST-CHANGE	22	PROC-PLACE-CODE-2	53		
CUT-OFF-YEAR	22	PHYSICAL-COMPLETE-DT	48		
DISBURSEMENTS	23	TRANSACTION-RECORD	102		
ENGINEERING-HOURS-LD	25	TRAILER-TITLE	64		
ESTIMATED-COST	26	REGULAR-HOURS-LD	58		
ESTIMATED-FEE	27	REPORT-CODE	60		
FILE-SOURCE-CODE	29	REC-CREATION-YEAR	58		
FUND-SOURCE	29	TRAILER-RCD-COUNT	63		
INITIAL-CONTR-MONTH	31	PHYSICAL-COMPLETE-DT	48		
INITIAL-CONTR-DAY	31	TRANSACTION-RECORD	102		
JSC-CONTRACT-NO-MOD	34	WORK-STATUS-CODE	66		
JSC-CONTRACT-NO	33	REC-CREATION-MONTH	57		
INITIAL-OBLIGATION	32	TRANSACTION-RECORD	102		
OBLIGATION-REQUIRED	43	RECORD-COUNT	56		
INITIAL-OBLIGATION	32				
INITIAL-CONTR-YEAR	32				
OBJECT-CLASS-1-3	41				
MASTER-RECORD-TYPE	36				
OBLIGATION-REQUIRED	43				
COMMITMENTS	6				
CONTRACTOR-NAME	8				
CONTRACT-DATE	10				
CONTRACT-NO-BASE	13				
AWARD-INDICATOR	5				
METHOD-OF-AUTHORIZAT	37				
MINORITY-CONTRACT	38				
MODIFICATION-TYPE	39				
OVERTIME-HOURS-LD	44				
MASTER-RECORD	97				
PRIMARY-WORK-CODE	48				

Figure A-6. - Example of Index by Program.

ORIGINAL PAGE IS
OF POOR QUALITY

DATA CATALOGUE
INDEX BY DATA NAME

REPORT DATE- 02/27/75
REVISION NUMBER- 11
DATE LAST REVISION- 02/15/75
TYPE OF UPDATE- PERMANENT

DATA NAME	SECTION	PAGE	DATA NAME	SECTION	PAGE
AA-EXAMPLE-14	ELEMENTARY	1	C1-MOD	ELEMENTARY	34
A-PREV-MD-ADJ	ELEMENTARY	18	C1-NEW-TECH	ELEMENTARY	41
B-PREV-MD-ADJ	ELEMENTARY	42	C1-OBLI-REQ	ELEMENTARY	43
B97-BASE	ELEMENTARY	5	C1-PIC	GROUP	88
B97-CONTR-DATE	ELEMENTARY	10	C1-POP-CITY	ELEMENTARY	7
B97-CONTR-MOD	GROUP	72	C1-POP-STATE	ELEMENTARY	9
B97-COST-ACCTG	ELEMENTARY	19	C1-PPC	ELEMENTARY	51
B97-ECOST	ELEMENTARY	26	C1-PREF	ELEMENTARY	20
B97-EFEE	ELEMENTARY	27	C1-PROP-HOWE	ELEMENTARY	54
B97-MIN-BUS-CON	ELEMENTARY	38	C1-REC-TYPE	ELEMENTARY	36
B97-MOD	ELEMENTARY	34	C1-RNSB	ELEMENTARY	56
B97-OBL-NEEDED	ELEMENTARY	43	C1-RPT-SB-SUB-CONT	ELEMENTARY	61
B97-PFX	ELEMENTARY	45	C1-SCHED-ONLY	ELEMENTARY	40
B97-PHY-COMPL-DT	ELEMENTARY	48	C1-SUP-SVC	ELEMENTARY	63
B97-TYPE-MOD	ELEMENTARY	39	C1-SYNOP	ELEMENTARY	51
CD-MM	ELEMENTARY	15	C1-TYPE-CONT	ELEMENTARY	14
CT-DA	ELEMENTARY	21	C1-TYPE-EFFORT	ELEMENTARY	64
CT-MO	ELEMENTARY	21	C1-XCOST	ELEMENTARY	26
CT-YR	ELEMENTARY	22	C1-XFEE	ELEMENTARY	27
C-COMM	ELEMENTARY	6	C2-CIC	ELEMENTARY	11
C-COST	ELEMENTARY	18	C2-COMP-DATE	ELEMENTARY	17
C-DISB	ELEMENTARY	23	C2-CONT	GROUP	72
C-ENG-HRS	ELEMENTARY	25	C2-CONT-BASE	ELEMENTARY	13
C-OBLI	ELEMENTARY	42	C2-CONT-DATE	ELEMENTARY	10
C-OVT-HRS	ELEMENTARY	44	C2-CONT-PFX	ELEMENTARY	17
C-PREV-MD-ADJ	ELEMENTARY	6	C2-CON-ADM-DEL	ELEMENTARY	9
C-REG-HRS	ELEMENTARY	58	C2-COST-ACCT	ELEMENTARY	19
C1-CIC	ELEMENTARY	11	C2-COST-PREF	ELEMENTARY	20
C1-COMP-DATE	ELEMENTARY	17	C2-EST-FEE	ELEMENTARY	27
C1-CONT	GROUP	72	C2-EST-FEE	ELEMENTARY	26
C1-CONT-BASE	ELEMENTARY	13	C2-EXT-COMP	ELEMENTARY	28
C1-CONT-DATE	ELEMENTARY	10	C2-GEO-DIST	ELEMENTARY	30
C1-CONT-DIV	ELEMENTARY	8	C2-KIND-ACT	ELEMENTARY	35
C1-CONT-NAME	ELEMENTARY	8	C2-LS-PREF	ELEMENTARY	35
C1-CONT-PFX	ELEMENTARY	17	C2-MD-TP	ELEMENTARY	39
C1-CON-ADM-DEL	ELEMENTARY	9	C2-MIN-BUS	ELEMENTARY	38
C1-COST-ACCT	ELEMENTARY	19	C2-MOD	ELEMENTARY	34
C1-EST-COST	ELEMENTARY	26	C2-NEW-TECH	ELEMENTARY	41
C1-EST-FEE	ELEMENTARY	27	C2-OBLI-NEEDED	ELEMENTARY	43
C1-EXT-COMP	ELEMENTARY	28	C2-PIC	GROUP	88
C1-GEO-DIST	ELEMENTARY	30	C2-PPC	ELEMENTARY	51
C1-KIND-ACT	ELEMENTARY	35	C2-PROP-HOWE	ELEMENTARY	54
C1-LSAP	ELEMENTARY	35	C2-REC-TYPE	ELEMENTARY	36
C1-MD-TP	ELEMENTARY	39	C2-RPT-SB-SUBCONT	ELEMENTARY	61
C1-MIN-BUS	ELEMENTARY	38	C2-SB-REASON	ELEMENTARY	56

Figure A-7. – Example of Index by Data Name.

ORIGINAL PAGE IS
OF POOR QUALITY

DATA CATALOGUE

INDEX BY SOURCE DEPARTMENT

REPORT DATE- 02/27/75
REVISION NUMBER- 11
DATE LAST REVISION- 02/15/75
TYPE OF UPDATE- PERMANENT

DEPT. NAME=IFMS INFORMATION

CATALOGUE NAME	PAGE	CATALOGUE NAME	PAGE	CATALOGUE NAME	PAGE
PRIOR-TRANSACTION-ID	50	ALLOTMENT-BALANCE	1		
PRIOR-PWA-TRANS-CONT	50	OLD-ACCEPTANCE-AMT	44		
CONTROL-NUMBER	15	OLD-RA-RECEIPTS	44		
RESERV.-PWA-BALANCE	60	SUB-RA-PWA-RECEIPTS	62		
SUB-ALLOT-RECEIPTS	61	RA-ISSUES-PY	55		
CORRECTION-INDICATOR	18	AS-OF-DATE	3		
CONV.-PWA-RECEIPTS	18	ASSIGNMENT-AMOUNT	3		
CONV.-PWA-ISSUES	18	APPROPRIATION	3		
CONV.-PWA-BALANCE	18	AMENDMENT-NUMBER	3		
RESPONSIBLE-ORGN	61	ALLOT-SUB-ISSUED-SJS	2		
RA-ALLOT-AVAIL.-DIFF	54	ALLOT-ISSUES-PY	2		
RA-ISSUES-PWC	55	ALLOT-ISSUES-PRIOR-D	2		
USER-ID	66	ALLOT-ISSUES-MA	2		
TRANSACTION-CODE	64	ALLOT-ISSUES-FS	2		
DOLLAR-AMOUNT	24	ALLOT-AVAILABLE-REC	2		
RESERV.-PWA-ISSUES	60	SUB-ISSUED-BALANCE	62		
REIMB.ORDER-NUMBER	59	PRIOR-PWA-TRANS-ID	50		
SUB-ISSUED-RECEIPTS	62	SUBAUTHORIZATION-ID	61		
RESERV.-PWA-RECEIPTS	60	UPDATE-RA-RECEIPTS	66		
PRIOR-CONTROL-NO.	49	CHANGE-INDICATOR	6		
TYPE-OF-TRANSACTION	65	CARRIER-LA	6		
REIMBURSABLE-ORDER	59	CARRIER-RO	6		
RA-ISSUES-MA	55	CARRIER-ID	6		
METHOD-OF-AUTHORITY	37	SUB-ISSUED-ISSUES	62		
RA-SUB-ISSUED-RECEIP	56	RA-ISSUES-PRIOR-DATE	55		
UNASSIGNED-BALANCE	65	PRIOR-AMENDMENT-NO.	49		
RA-ISSUES	55				
SUB-AUTH.-IDENTIFIER	61				
UPDATE-AMOUNT	65				
TRANSACTION-DATE	64				
PRIOR-PWA-TRANS-DATE	50				
TYPE-OF-FUNDING	65				
RA-RECEIPTS	55				
RA-AVAILABLE-RECEIPT	54				
TRANS-ID	64				
SUB-RA-PWA-ISSUES	62				
SUB-RA-PWA-BALANCE	62				
RA-BALANCE	55				
NEW-ACCEPTANCE-AMT	41				
NEW-RA-RECEIPTS	41				
ACCEPTANCE-AMOUNT	1				
ALLOTMENT-RECEIPTS	1				
ALLOTMENT-ISSUES	1				

PAGE 1

Figure A-8. – Example of Index by Source Department.

their locations are provided by the Index by Program (fig. A-6). At least two problems exist for this index. First, the index names are not sorted alphabetically. Finally, the entries are provided implicitly in data recorded for elementary items and records; the listing would probably be more accurate if the records were specified explicitly for the particular programs.

The Index by Data Name (fig. A-7) lists all data names in the catalog alphabetically. The type of entry and Catalogue report page number for that data name are given.

Elementary items used by a specific department as defined implicitly in the usage data, (see section A.1) are listed with page locations in the Index by Departmental Use (fig. A-8).

A.5 Cross Reference Report

One page of the Cross Reference report for elementary items is presented in figure A-9 as an example. Similar reports are produced for group items, records, files, data bases, and programs with entries listed alphabetically within those categories.

The element ESTIMATED-FEE can be used to illustrate the report, which shows that the element is defined on page 26 of the Catalogue report. All group items, records, files, and programs which are recorded as using this element are listed, along with their page locations. Note that the data is repetitious. For example, for the element ESTIMATED-FEE, Program P3860 is listed four times. Whether this repetition is a program bug or intentional, it is useless and

DATA CATALOGUE — REPORT DATE- 02/27/75
REVISION NUMBER- 11
SECTION 1. ELEMENTARY ITEMS — ITEM NAME CROSS REFERENCE — DATE LAST REVISION- 02/15/75

CATALOGUE REFERENCES AND PAGE NUMBERS

ELEMENTARY ITEMS CATALOGUE NAME	DEFINED ON PAGE	SECTION	CATALOGUE NAME	PAGE	CATALOGUE NAME	PAGE	CATALOGUE NAME	PAGE
ESTIMATED-COST	26	GROUP	MASTER-COLUMN-37-138	79	MASTER-COLUMN-39-138	81	MASTER-COLUMN-37-138	79
			MASTER-COLUMN-39-138	81				
		SEGMENT	MASTER-RECORD	97	TRANSACTION-RECORD	102	WORKING-STORAGE-RCD	107
		FILE	MASTER-FILE	118	TRANSACTION-FILE	118		
		PROGRAMS	P3860 P3880		P3860 P3880		P3860 P3870	
			P3850 P3860					
ESTIMATED-FEE	27	GROUP	MASTER-COLUMN-39-138	81	MASTER-COLUMN-37-138	79	MASTER-COLUMN-39-138	81
			MASTER-COLUMN-37-138	79				
		SEGMENT	MASTER-RECORD	97	TRANSACTION-RECORD	102	WORKING-STORAGE-RCD	107
		FILE	MASTER-FILE	118	TRANSACTION-FILE	118	MASTER-FILE	118
			TRANSACTION-FILE	118				
		PROGRAMS	P3860 P3880		P3860 P3880		P3860 P3850	
			P3860 P3850		P3870			
EXTENT-OF-COMPETITIO	28	SEGMENT	MASTER-RECORD	97	TRANSACTION-RECORD	102		
		FILE	MASTER-FILE	118	TRANSACTION-FILE	118		
		PROGRAMS	P3850					
FILE-SOURCE-CODE	29	GROUP	MASTER-SEQUENCE	82				
		SEGMENT	MASTER-RECORD	97	PURGE-RECORD	101	MASTER-RECORD	97
			PURGE-RECORD	101	MASTER-RECORD	97	PURGE-RECORD	101
			TRANSACTION-RECORD	102	WORKING-STORAGE-RCD	107		
		FILE	MASTER-FILE	118	TRANSACTION-FILE	118		
		PROGRAMS	P3860 P3880		P3860 P3880		P3860 P3880	
			P3860 P3880		P3860 P3850		P3860	
FUND-SOURCE	29	GROUP	MA-PY-FS	84	MASTER-SEQUENCE	82	MA-PY-FS	84
		SEGMENT	G11-IFMS	92	F21-IFMS	91	H12-IFMS	95
			F11-IFMS	91	G22-IFMS	94	H13-IFMS	96
			G13-IFMS	93	H11-IFMS	95	G23-IFMS	94
			MASTER-RECORD	97	PURGE-RECORD	101	TRANSACTION-RECORD	102
			WORKING-STORAGE-RCD	107	050016-IFMS	112	050010-IFMS	111
			050030-IFMS	114	050005-IFMS	110	WORKING-STORAGE-RCD	107

ELEMENTARY ITEMS CROSS REFERENCE — PAGE 9

Figure A-9. — Example of Cross-Reference Report, Elementary Items.

unnecessary. The FUND-SOURCE entry shows several references to IFMS transaction and report entries.

A.6 Other Reports

A Structure report and a Program Revision report are also produced by the Data Catalogue system. The Structure report presents the same information as the Catalogue report, except that it is sequenced top-down so that all data related to a specified program or file can be considered as a single collection of data. Source portions of the catalogue entries may be omitted if the user so designates.

The Program Revision report is intended to specify those programs which would require change (and the type of change required), if changes were in the data it uses. The excessively repetitious items in the reports produced to date are illustrated in figure A-10.

	D A T A C A T A L O G U E		REPORT DATE-	03/01/75
			REVISION NUMBER-	12
	P R O G R A M R E V I S I O N R E P O R T		DATE LAST REVISION-	03/01/75
			TYPE OF UPDATE-	PERMANENT

TRANSACTION IDENTIFICATION		AFFECTED SEGMENT - REVISION REASON				
SECTION	CATALOGUE NAME	LINE	CATALOGUE NAME	REASON	P R O G R A M S T O B E R E V I S E D	
1	AS-OF-MONTH	1001	MASTER-RECORD	MAX LENGTH FORMAT DYN OR STA PICTURE JUST/SYNC	P3860	P3870
1	AS-OF-MONTH	1002	MASTER-RECORD	USAGE CODE USAGE NAME OPTION CYCLE FREQUENCY	P3860	P3870
1	AS-OF-MONTH	1001	MASTER-RECORD	MAX LENGTH FORMAT DYN OR STA PICTURE JUST/SYNC	P3860	P3870
1	AS-OF-MONTH	1002	MASTER-RECORD	USAGE CODE USAGE NAME OPTION CYCLE FREQUENCY	P3860	P3870
1	AS-OF-MONTH	1001	MASTER-RECORD	MAX LENGTH FORMAT DYN OR STA PICTURE JUST/SYNC	P3860	P3870
1	AS-OF-MONTH	1002	MASTER-RECORD	USAGE CODE USAGE NAME OPTION CYCLE FREQUENCY	P3860	P3870
1	AS-OF-MONTH	1001	MASTER-RECORD	MAX LENGTH FORMAT DYN OR STA PICTURE JUST/SYNC	P3860	P3870
1	AS-OF-MONTH	1002	MASTER-RECORD	USAGE CODE USAGE NAME	P3860	P3870

PAGE 1

Figure A-10. - Example of Program Revision Report.