

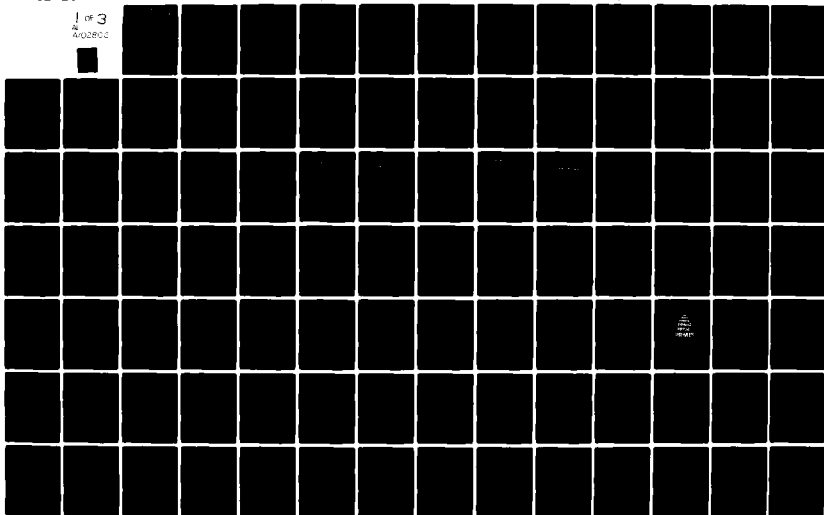
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**DAVID W. TAYLOR NAVAL SHIP
RESEARCH AND DEVELOPMENT CENTER**

Bethesda, Maryland 20084



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PROCEEDINGS OF THE FIRST PRINTING
RESOURCES MANAGEMENT INFORMATION
SYSTEMS WORKSHOP

by

Michael Gray

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ELECTED
AUG 13 1981**
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COMPUTATION, MATHEMATICS AND LOGISTICS DEPARTMENT
DEPARTMENTAL REPORT

June 1981

DTNSRDC/CMLD-81/20

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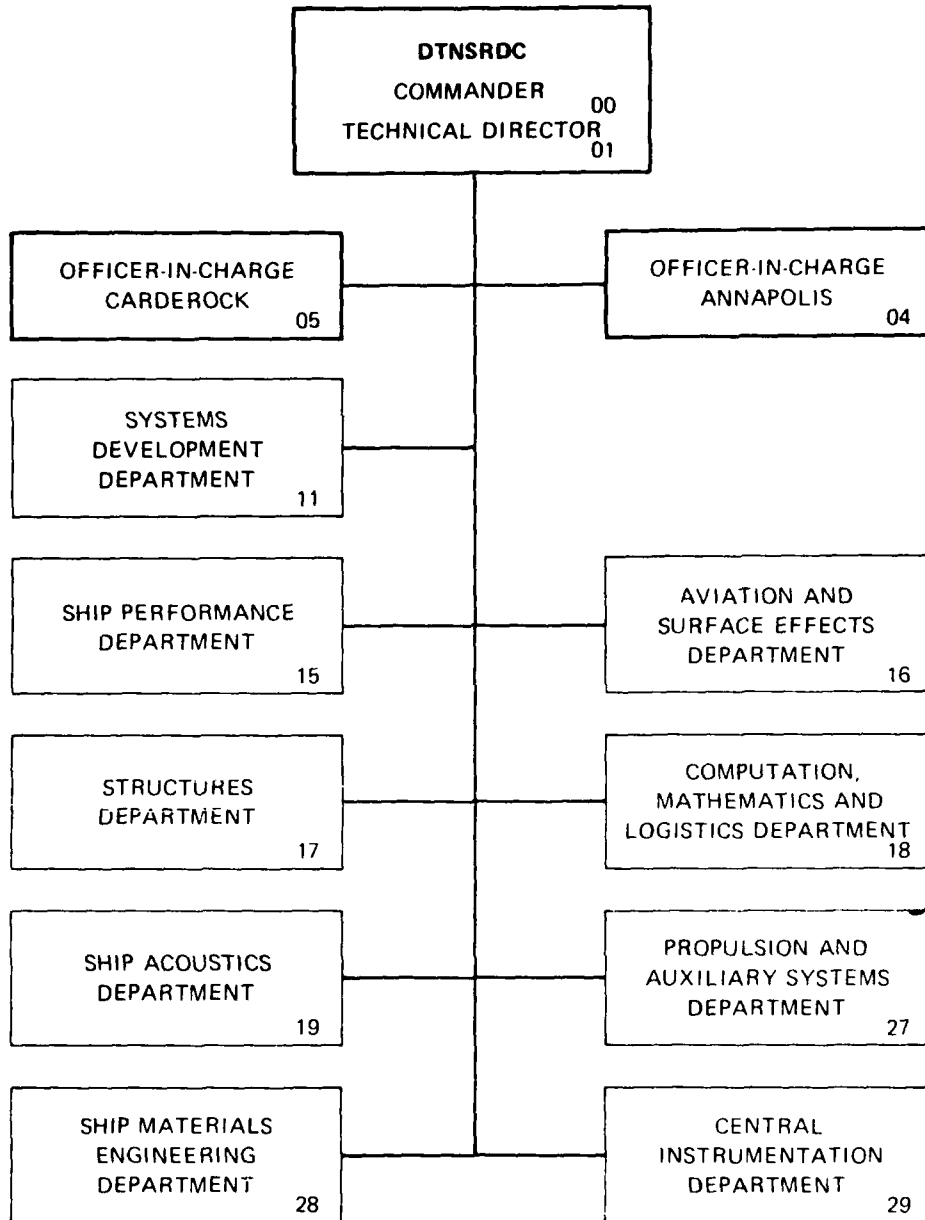
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PROCEEDINGS OF THE FIRST PRINTING RESOURCES MANAGEMENT INFORMATION SYSTEMS WORKSHOP

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
	AD-A203 802		
4. TITLE (and Subtitle)		5. TYPE OF REPORT & PERIOD COVERED	
PROCEEDINGS OF THE FIRST PRINTING RESOURCES MANAGEMENT INFORMATION SYSTEMS (PRMIS) WORKSHOP		9 Final Rpt.	
6. AUTHOR		7. PERFORMING ORG. REPORT NUMBER	
(155) M. S. 7, 1984, Washington, DC.			
8. AUTHOR		9. CONTRACT OR GRANT NUMBER(s)	
10. Michael/Gray			
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
David Taylor Naval Ship R&D Center Bethesda, MD 20084		NIF Funded 1826-001 (12) 247	
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE	
Navy Publications and Printing Service Bldg. 157-3, Washington Navy Yard Washington, D.C. 20734		June 1981	
13. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		13. NUMBER OF PAGES	
(14) DTN 5 R DC / CM LD-87/20			
14. SECURITY CLASS. (of this report)		15. SECURITY CLASS. (of this report)	
UNCLASSIFIED		UNCLASSIFIED	
15. DECLASSIFICATION DOWNGRADING SCHEDULE			
16. DISTRIBUTION STATEMENT (of this Report)			
APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED			
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)			
18. SUPPLEMENTARY NOTES			
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)			
PRMIS Production Printing Planning Cost and Finance Requirements Inventory Source Data Automation			
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)			
Copies of the briefings given at the Printing Resources Management Information Systems (PRMIS) Workshop held on May 5 through 7 are presented. Also discussed are findings and conclusions and future actions.			

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ABSTRACT

Copies of the briefings given at the Printing Resources Management Information Systems (PRMIS) Workshop held on May 5 through 7 are presented. Also discussed are findings and conclusions and future actions.

INTRODUCTION

On May 5-7, 1981 David Taylor Naval Ship R&D Center (DTNSRDC) hosted a workshop/seminar for the Naval Publications and Printing Service (NPPS) in Washington, D.C on the Printing Resources Management Information System (PRMIS). The agenda appears in Appendix A. Representatives of the four NPPS field divisions, and representatives of the Naval Publications and Printing Management Office (NPPSMO), and the DTNSRDC project team attended. Appendix B contains a list of the attendees.

The objectives of the workshop were

- . to acquaint DTNSRDC with the NPPS community and vice versa
- . to present new PRMIS design and concepts
- . to discuss and define requirements
- . to develop PRMIS requirements collection plans

Appendix C contains copies of the graphics used in presentations during the workshop. Appendix D contains the preliminary requirements statements of the initial PRMIS subsystems. These preliminary statements a) indicate a direction for the development of each subsystem, b) provide NPPS with a basis for comment and criticism, and c) indicate the type of information needed in developing requirements. Appendix E contains the Planning Overview and Milestones (POAM) developed at DTNSRDC, and Appendix F contains the NPPS Mission Element Need Statements (MENS) for PRMIS.

BACKGROUND

The original PRMIS project was undertaken to support NPPS operations by providing a number of functional capabilities. However, only the Cost and Financial (C&F) and Reprographics subsystems were developed. C&F provides cost accounting support under the Navy Industrial Fund (NIF) system for NPPS operations, generating monthly accounting reports. Reprographics provides an inventory and selection procedure for all Navy reprographics equipment.

In order to fulfill the original goals of PRMIS and supply NPPS with an automated management information system, DTNSRDC was tasked to provide technical support in developing the new PRMIS and in adapting and/or redesigning the existing subsystems into an efficient, interactive, responsive management tool. The results would be a "second generation" of PRMIS.

Successful design and development of PRMIS, calls for collection of accurate data and formulation of requirements from information supplied by future PRMIS users. A combination of interviews and information collection forms will be used in this process. A workshop/seminar was considered an excellent vehicle for formulating and discussing concepts to be used in the information gathering stage of PRMIS.

FINDINGS AND CONCLUSIONS

Each NPPS field division will nominate functional area specialists. DTNSRDC will interview each of these people to determine user needs and capabilities, and to devise a general information collection form for distribution to all NPPS organizations. All information from the interviews and forms will be compiled and analyzed in order to formulate PRMIS requirements. Once formulated, the requirements will be distributed to all NPPS organizations for review and comment.

Table 1 gives the results obtained at the workshop of the initial interests for each of the proposed functional areas of PRMIS. The output of the budget functional area will consist mainly of information retrieved from data associated with other PRMIS subsystems. The forecast functional area may not be considered as a separate subsystem but may be integrated in subsystems requiring forecast capabilities. The production planning and production monitoring subsystems will be implemented at various levels of detail depending on individual plant requirements. More detailed findings of the workshop appear in the PRMIS memo in Appendix G.

TABLE 1 - LEVELS OF INTEREST IN PRMIS SUBSYSTEMS

- . Budget - NPPSMO, DIV
- . Cost and Finance - All
- . Customer Accounts - All
- . Forecast - NPPSMO
- . Equipment Inventory - NPPSMO, DIV, Joint Committee on Printing (JCP) Level plants
- . Materials Inventory - All
- . Production Planning - Naval Publications and Printing Service Office (NPPSO), Naval Publications and Printing Service Branch Office (NPPSBO)
- . Commercial Procurement - NPPSMO, NPPSO, NPPSBO
- . Production Monitoring - NPPSMO (Production Br.), NPPSO, NPPSBO
- . Purchasing - NPPSO, NPPSBO

The commercial procurement functional area may be integrated with the purchase functional area which may, in turn, be integrated with the materials inventory functional area.

NPPS users have varied requirements in each functional area. It will be essential to accommodate these differences and also to provide a standard capability in PRMIS. Those plants with unique requirements will be provided with additional capabilities to supplement the basic PRMIS capabilities. Operational capabilities will be designed for the most extreme cases, but only the level of capability required for each plant need be used.

A prototype of PRMIS providing the following functional capabilities will be implemented at Defense Printing Service (DPS):

- . Production Monitoring
- . Production Planning
- . Material Inventory
- . Segments of Cost and Financial

The objective of this prototype are to

- . Test PRMIS operations and functions
- . Provide examples of PRMIS operations
- . Provide DPS with a capability to replace those provided by the obsolete NOVA 800 computer
- . Test source data automation techniques

FUTURE ACTION

- . DTNSRDC will contact functional area coordinators at each NPPS field division and schedule visits by the NPPS project team for interviews and plant tours.
- . Procure ADP equipment and services for implementing the PRMIS prototype at DPS
- . Initiate information collection and requirements formulation procedures

ACKNOWLEDGMENTS

The author would like to acknowledge the assistance of Martin Culpepper, Dr. David Jefferson, Joseph Garner, Tom Martin, and Jim O'Donnell in the planning and conducting the PRMIS workshop.

Appendix A

PRMIS Workshop Schedule

May 5

0900-0915	Introduction -- Director, Planning Division
0915-1015	Orientation -- Plans, Policy and Systems Dev Branch
1015-1030	Coffee Break
1030-1100	DTNSRDC's Role in PRMIS -- Culpepper
1100-1130	Technology Trends and Potential Applications In PRMIS -- Culpepper
1130-1300	Lunch
1300-1400	Conceptual View of PRMIS -- Gray
1400-1415	Coffee Break
1415-1515	Source Data Automation at the Printing Plant -- Garner

May 6

0900-1000	The Requirements Collection Approach In the ICP Resolicitation -- Jefferson
1000-1015	Coffee Break
1015-1045	Definition and Identification of Requirements -- Gray
1045-1130	Discussion of Requirements -- Gray
1130-1300	Lunch
1300-1400	Presentation and Discussion of PRMIS Information Collection Form -- O'Donnell
1400-1415	Coffee Break
1415-1530	Roundtable Discussion of User Needs -- Gray

May 7

0900-0930	User Needs Discussion (Con't) -- Gray
0930-1100	Discussion of Information Collection Form and Collection Procedures

APPENDIX B

List of Attendees

<u>Name</u>	<u>Organization</u>	<u>Phone</u>
Louis Cambardella	NPPSMO	433-3891
Glenn Dixon	NPPSMO	433-3665
Tom Martin	DTNSRDC	227-1618
Joe Garner	DTNSRDC	227-1900
Michael Gray	DTNSRDC	227-1291
David K. Jefferson	DTNSRDC	227-1622
George Shaver	NPPSO, Norfolk	AV690-7068
Dwight French, Jr.	NPPSO, San Diego	AV958-2291
Jim Alford	NPPSMO	433-3975
Bill Sterling	NPPS, Western Div.	958-2296
Lloyd Mehr	NPPS, Southeast Div.	794-6957
Martin Culpepper	DTNSRDC	227-1887
J. Stewart	NPPSMO	433-3891
Jim O'Donnell	DTNSRDC	227-1393
H.A. Freatman	NPPSMO-Prod. Br.	433-3003
R. F. Walsh	NPPS, Northern	442-4733
Hert Newton	NPPSBO, Portsmouth, N.H.	207-436-1000 X1602
Normand Fontaine	NPPSMO	433-2214
R. W. DeNeane	DPS	697-5000
Bruce Wilson	NPPSMO	433-3891
Boyd Pool	NPPSMO	433-3891
John Karpovich	NPPSMO	433-3520
Frank Zmuda	NPPSMO	433-3520

APPENDIX C

PRMIS WORKSHOP BRIEFINGS

INTRODUCTION

Good morning ladies and gentlemen. Welcome to this seminar hosted by the David W. Taylor Naval Ship Research and Development Center, Carderock, Maryland.

The purpose of this seminar is to have NPPS-wide participation in the requirements definition phase for the development of an Automated Information System.

Before proceeding with the seminar, the Planning Division has prepared an orientation which will be presented to you. The purpose of this orientation is to provide you with background information which will explain why we are here today.

SLIDE 2

Despite some of the problems we've encountered in the past, the Director, Navy Publications and Printing Service (NPPS) has re-affirmed that a continuing need exists for NPPS Headquarters, Field Division and plant managers to have access to timely production management and plant operational data.

These requirements must be met if resources and equipment are to be utilized in their most productive manner.

SLIDE 6

NPPS is ever-increasing its geographically dispersed facilities to accommodate the world-wide demand for its services. Inherently, there is a need to have access to data for the daily management and operational decisions which must be made at various management levels. The present decentralized data bases, the majority of which are maintained manually, contribute to a lack of standardization and delays in obtaining data. It is a system which does not provide the proper types of information necessary to manage NPPS operations and provides little or no potential for growth in the future.

SLIDE 7

Contributing to this "managing" problem are deficiencies which exist in our unprogrammed functional areas; such as, material and equipment inventories, cost and financial, funds resources and status reporting, planning, estimating, scheduling, production control, and commercial procurement. These potential subsystem applications, along with other user identified requirements, form the basis for future Automated Information Systems (AIS) development and direction.

Although the majority of our efforts to date have emphasized the Cost and Financial (C & F) aspects of our operations, other existing deficiencies along with a lack of programmed operations research modules, makes it virtually impossible to project the impact of new technology in the printing industry. Additionally, the impact of the technologies to facilitate NPPS' plan to update its output capability or to obtain data to facilitate resource utilization is equally unpredictable.

Given the escalating costs of doing business, NPPS management and operational personnel can no longer continue to operate effectively in a "status quo" position.

SLIDE 8

An analysis by David W. Taylor Naval Ship Research Development Center (NSRDC) of our existing and programmed capabilities concluded that our present system is inadequate to meet present or future needs. NSRDC after reviewing existing procedures and software recommended that management consider a complete redesign of the existing C & F software prior to the implementation and integration of any new subsystems.

The cost and financial system is improperly designed to accept or maintain data elements required for effective production management and, as in the case of reprographics, has not been integrated into other functional areas.

The Automated Planning and Production Control System (APPCS), currently available only at DPS, has never been fully developed and is incapable of being enhanced within the boundaries of existing hardware.

These systems must be examined in conjunction with other functional areas to provide for a single, uniform interactive automated information system responsive to the needs of all levels of NPPS management.

SLIDE 9

NPPS recognizes that certain operational constraints must be addressed.

For example, the new system must provide required information to the Assistant Secretary of Navy for Financial Management (ASN/FM) as well as provide information to satisfy statutory requirements and local accounting procedures.

It must be flexible to compensate for increased functional responsibilities and be totally integrated across all functional areas.

The teleprocessing services environment must be determined as well as the manpower and materials necessary for the development effort and

Above all, the system must be designed for users who are non-ADP oriented and with little or no ADP experience.

SLIDE 10

In recognizing our requirements, deficiencies and constraints, several alternatives will be considered in the initial phase of the project, i.e., should we expand our data processing support in a commercial, Navy, other government or in-house NPPS environment? One of our initial tasks will be to provide an economic analysis of each alternative and select the most viable and economic path based on that analysis. Considering existing commercial teleprocessing costs, initial indications support the development of some degree of in-house capability.

SLIDE 11

Preliminary investigations conclude that in order to alleviate our deficiencies a study must be conducted to determine the characteristics of the system needed to meet the information needs of our various levels of management and based on this study that an automated information system be developed and implemented to satisfy our information requirements.

The Systems Engineering Assessment you see identified on this vu-graph will involve determining user needs and capabilities and the development of functional descriptions and requirements specifications.

SLIDE 12

SECNAVINST 5231.1A implements life-cycle management for the development and implementation of automated information systems. Each phase requires chain-of-command approval and basically provides for a "fail safe" method in developing systems. With this as our guide the Planning Division developed the following approach:

SLIDE 13

The preparation of the Mission Element Need Statement (MENS) (Phase 0) is a Planning Division responsibility and has been completed and forwarded through the Chain of Command for approval. After the SUP 04 and MAT 09 approval the MENS was forwarded to Naval Data Automation Command (NAVDAC) and approved last week.

The concept development (Phase I) and systems design (Phase II) would be tasked to the David W. Taylor Naval Ship Research and Development Center (NSRDC). These phases include the identification of user requirements, development of a functional description and a system specification for the entire AIS. For each functional area to be automated separate documentation will be developed (i.e. functional description, data requirements, subsystem specifications, data base specifications and programming specifications). The intent of these two phases is to insure that all the up-front systems work is done and approved before the first line of coding begins.

The systems development software (Phase III) and implementation (Phase IV) as well as system maintenance have not yet been tasked pending the determination of the availability of in-house resources. (FMSO Mechanicsburg is currently considering the acceptance of these tasks.)

A plan of action and milestones chart (POA & M) detailing the subtasks and completion dates for each phase was prepared and a copy is provided in your briefing package for information purposes.

SLIDE 14

Mr. Cherny, as the functional manager and sponsor has designated the Director, Planning Division administrator of the AIS. Work will be performed under the direction and supervision of the Head, Plans, Policy and Systems Development Branch, which is staffed by a Program, ADP and Telecommunications Manager.

NSRDC is designated as the Central Design Agency. Appropriate tasking was forwarded and accepted by NSRDC.

All designations were made in fulfillment of the requirements set forth by SECNAV. Additionally, on an as required basis, technical and technical project assistance will be provided by the ADP Telecommunications Branch of the General Services Administration (GSA).

SLIDE 15

Our current status portrays significant accomplishments which provide the foundation for continued development of an automated information system.

The MENS statement is approved.

The central design agency responsibilities has been accepted by NSRDC.

The POA&M is approved.

Analysis of current operations is complete.

The requirement for a redesign of the financial system has been determined.

An assessment of our telecommunications is complete.

Our continuing teleprocessing support service needs are currently being evaluated and we are now prepared to develop, with your assistance, input user requirements.

From this point forward, your participation and our combined level of effort will result in the preparation of a functional description, the umbrella under which the total system will be built. Preliminary efforts, for purposes of this presentation, conceptualized one of many intermediate and long range communications networks to satisfy the information and processing requirements of NPPS. Here are Mr. Boyd Poole and Mr. Lou Cambardella to present this concept.

SLIDE 16

The system hardware currently utilized is a centralized mainframe fed by semi-intelligent Linolex terminals with concentrator sites acting as communications interfaces.

The main problem with this configuration is the need for optimum hardware and software support at each level to effectively transmit data.

SLIDE 17

The local hardware configuration at the transmission sites is a word processing machine with data capture and communications capabilities.

Since NSRDC has recommended a redesign of our current C & F system, (the lead time will be at least three years) we are faced with some serious procedural problems at the data entry level right now for this existing system.

Simplex Digital conducted a study to evaluate our front-end procedures and hardware; we concur with their findings and have forwarded our evaluations to upper management. Their findings consists of rewriting the Linolex software at the cost of \$243K over a five month time frame to fully utilize Linolex capabilities. This will facilitate data entry by eliminating any repetitive keystrokes, provide batch totalling routines for on-site use, simplify and foolproof data transmission procedures and software, and simplify error correction.

This new software will be directly transferrable to the next phase of AIS development and the transition will be transparent.

Along with this effort we are working with the Comptroller's Office in determining which reports will be useful to the plants immediately after processing by utilizing existing remotes and job retrieval procedures.

SLIDE 18

The first phase slated for implementation during FY 84 at a cost of \$2.5 million will almost totally eliminate our need for teleprocessing support from a host computer.

Our teleprocessing will consist of inexpensive "dumb" terminals interfacing interactively with their "host" which will be a mini-processor.

In turn, these Division level mini-processors will interface exclusively with NPPSMO's processor which will link directly to a host for processing.

This will facilitate any software releases as well as provide added operational control. It will also decentralize "host" hardware malfunctions so only a small group of plants would be affected rather than everyone when our mainframe goes down now.

Mr. Boyd Poole will now discuss plans beyond this phase of development.

SLIDE 19

The future NPPS automated data processing configuration will incorporate three major levels of capability:

1. Automatic data processing at the NPPSO level
2. Automatic data processing at the Division level
3. Automatic data processing at the Management Office level.

NPPSO CAPABILITY.

All NPPSO's requiring internal ADP support for Planning, Scheduling, Production Control, Job Tracking and etc., will be provided a capability somewhat like the APPC system presently supporting the Defense Printing Service facility. The system will be enhanced to eliminate deficiencies now being experienced at DPS such as dual data entry. It will be enhanced to be compatible with the host system.

DIVISION LEVEL CAPABILITY.

Each Division will have its own data collection and processing network. A mini computer at the Division will host data terminals from all facilities in its area of responsibility. The Divisions will collect, process, provide access to its data base and make distribution of any hard copy requirement to its plants. The Division system will interface with the Management Office system. Software which runs one Division system will be common to all Divisions. Personnel with some automatic data processing background will be required at the Division level.

MANAGEMENT OFFICE SYSTEM.

The Management Office system will be supported by a mini computer. It will store all subsystems in an interactive mode to furnish managers with current information upon request. All NPPSMO Divisions and NPPS Field Divisions will have access to the system.

SUMMARY.

Bottom line - we are looking toward a "distributed" inhouse automatic data processing capability with emphasis on consolidation rather than centralization. Each NPPS facility will have interface capability and all management levels will be on-line.

SLIDE 20

Ultimately, NPPS hopes to organize both its ADP requirements and its digital "camera ready copy" into a star configuration, providing interactive communications between Divisions. This future satellite-oriented configuration will result in maximum flexibility and allow for the reprogramming of production volumes between electronically-configured facilities.

But again, this is much farther down the "pike" than we would like to address today.

Statement of Deficiency

- **Geographically Dispersed**
- **Decentralized Depositories of Data**
- **Lack of Standardization**
- **Delays**

Requirements

- Production Management Data
- Plant Operational Data

Deficiencies in Functional Areas

Existing and Programmed Capabilities

- **Cost and Financial**
- **Reprographics**
- **Automated Planning and Production
Control System (DPS Only)**

Available Alternatives

NPPS Operational Constraints

- **Navy Reporting Requirements**
- **Statutory Requirements**
- **Increased Functional Responsibilities**
- **Existing Automated Capabilities**
- **Hardware Configuration**
- **Resources**
- **User Oriented**

Recommendations

- **Conduct Systems Engineering Assessment**
- **Develop an Automated Information System**

Automated Information Systems Requirements

<u>Phase</u>	<u>Description</u>
0	Mission Element Need Statement (MENS)
I	Concept Development
II	System Design
III	Software Development
IV	Implementation

Planning Approach

<u>Phase</u>	<u>Responsible Code</u>	<u>Completion Date</u>
0	NPPS, Planning Division	Completed
I	NSRDC, Carderock	1981-1982
II	NSRDC, Carderock	1982-1983
III	Undetermined	1983-1984
IV	Undetermined	1984

System Maintenance Support - Undetermined

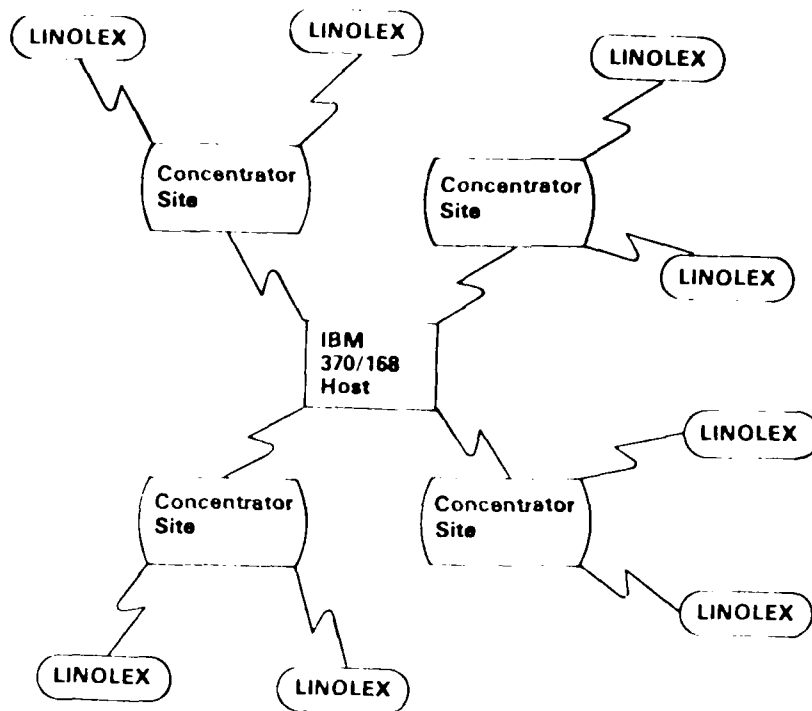
Designations

- Director, NPPS
- Director, Planning Division
- Head, Plans, Policy and Systems
Development Branch
- Program Manager
- ADP Manager
- Telecommunications Manager
- Central Design Agency
- Management and Technical Assistance

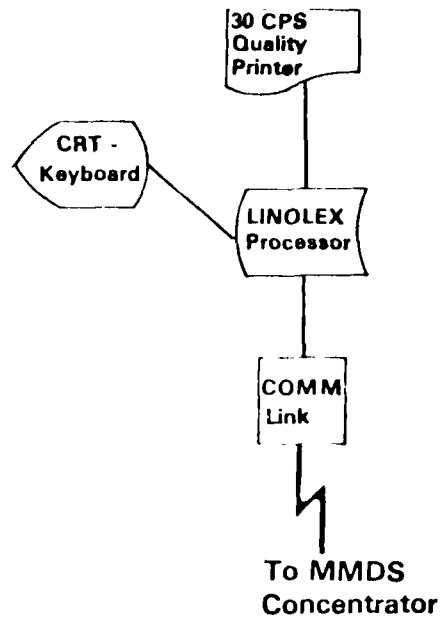
Current Status

- **MENS Statement**
- **Designation of Central Design Agency**
- **Plan of Action and Milestone Chart**
- **Analysis of Capabilities**
- **Redesign of the Cost & Financial Subsystem**
- **Technical Accessment of Linolex**
- **User Requirements**

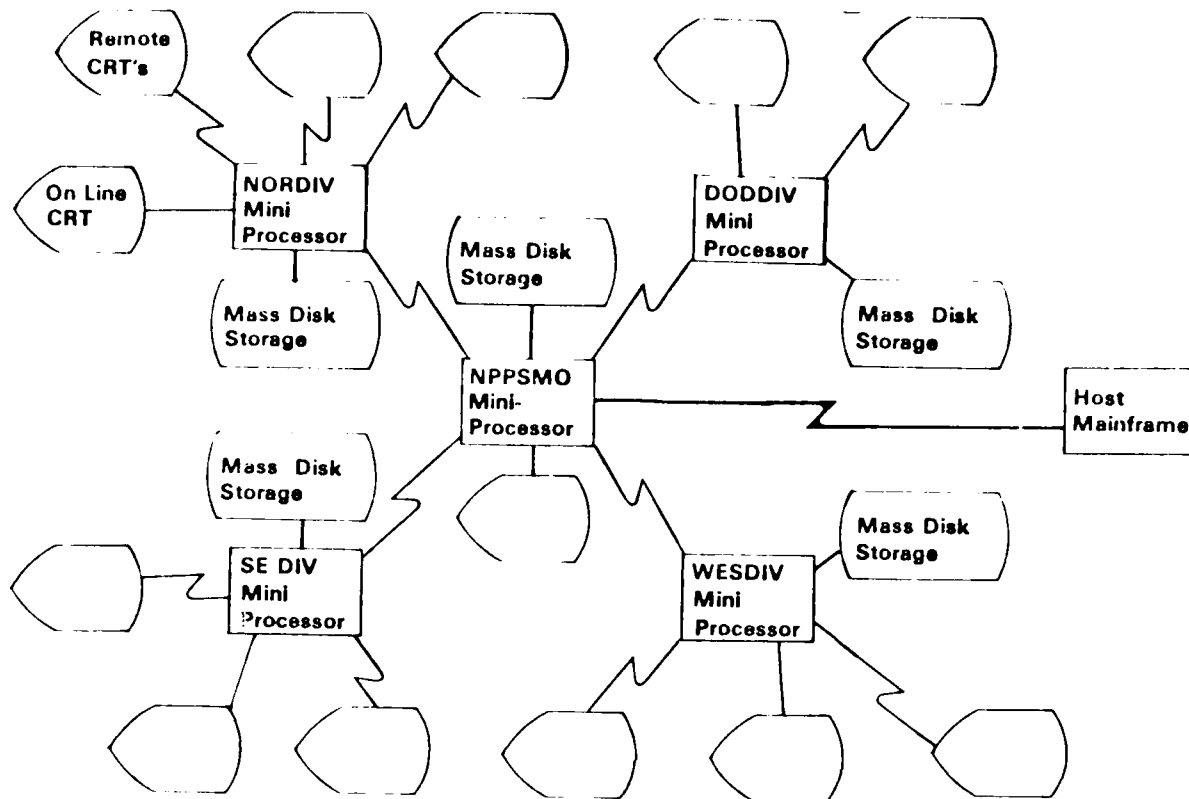
Current PRMIS Hardware System Configuration



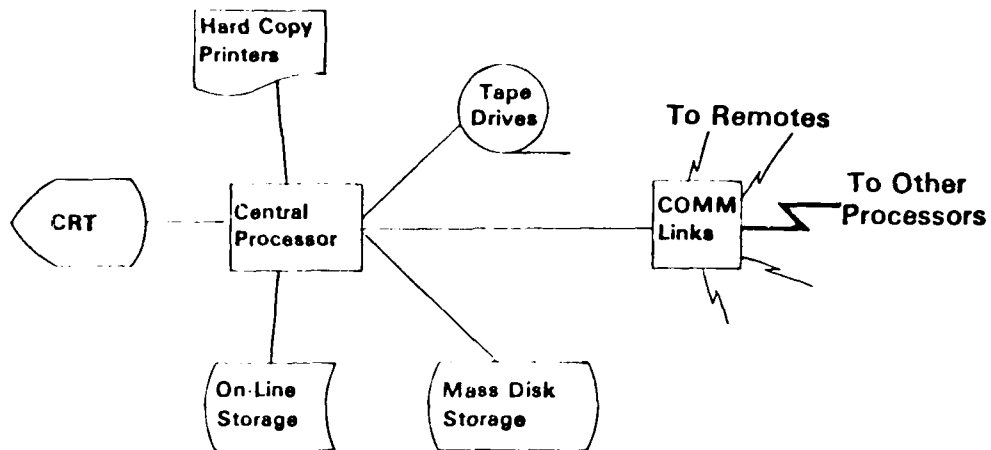
Current PRMIS Hardware Remote Terminal Configuration



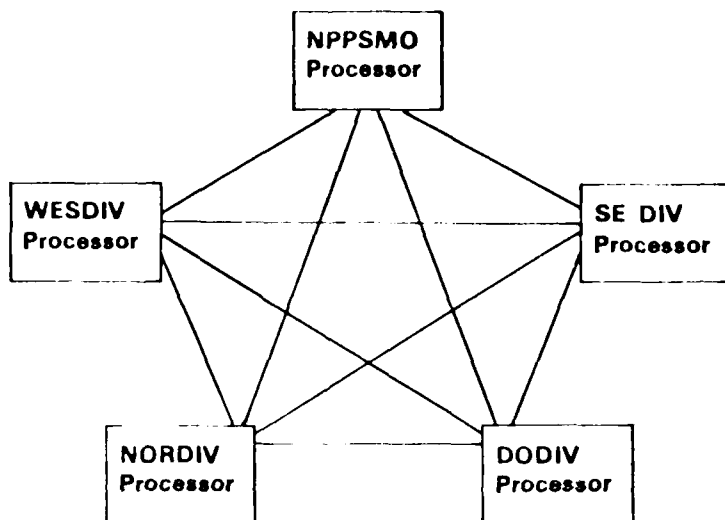
Future PRMIS Hardware Configuration



Distant Future PRMIS Division -Level Hardware Configuration



Distant Future PRMIS Hardware Configuration



DTNSRDC's ROLE IN PRMIS

MARTIN CULPEPPER

WHO ARE WE

DAVID TAYLOR NAVAL SHIP R&D CENTER

- o ONE OF 8 CNM LABORATORY CENTERS
- o NIF FUNDED
- o 100 MATHEMATICIANS/OPERATIONS RESEARCH ANALYSTS/COMPUTER SCIENTISTS/ELECTRICAL ENGINEERS
- o PROJECTS IN: MANAGEMENT INFORMATION SYSTEMS
INVENTORY MANAGEMENT
OFFICE AUTOMATION
DATA MANAGEMENT
AUTOMATION OF RECEIVING AT NSCS
- o RESEARCH IN: INFORMATION SYSTEM DESIGN
DATA BASE DESIGN
DISTRIBUTED PROCESSING AN ICPs
SOURCE DATA AUTOMATION

TASK ASSIGNMENT

- o PROVIDE TECHNICAL SUPPORT TO COMPLETE THE CONCEPT DEVELOPMENT AND DEFINITION/DESIGN PHASES OF THE AIS.
- o MONITOR THE EFFORTS OF AN OUTSIDE AGENCY IN THE SYSTEM DEVELOPMENT AND DEPLOYMENT PHASES OF THE AIS.

PROJECT TEAM

MARTIN CULPEPPER

MIKE GRAY

JOE GARNER

TOM MARTIN

JIM O'DONNELL

RON WILSON

DAVE JEFFERSON - CONSULTANT

GOVERNING INSTRUCTION
IS
SECNAVINST 5231.1A OF 20 NOV 1979

LIFE CYCLE MANAGEMENT OF AUTOMATED INFORMATION SYSTEMS

PHASE	DESCRIPTION
A	DETERMINE NEW REQUIREMENT. PRODUCE MENS.
B	LOOK AT ALTERNATE APPROACHES AND SELECT ONE. PRODUCE
C	DETERMINE DETAILED REQUIREMENTS DESIGN SYSTEM.
D	SYSTEM DEVELOPMENT
E	DEPLOYMENT AND OPERATION

AIS DEVELOPMENT PLAN

PHASE	TASK	COMPLETION
A	MISSION ANALYSIS	3/81
B	CONCEPT DEVELOPMENT	8/82
C	DEFINITION/DESIGN	8/83
D	SYSTEM DEVELOPMENT	9/85
E	DEPLOYMENT/OPERATION	9/85

PROGRAM

- o TWO PRESENTATIONS ON TECHNOLOGY.
- o ONE PRESENTATION ON CONCEPTUAL VIEW OF PRMIS.
- o ONE PRESENTATION ON EXPERIENCE WITH REQUIREMENTS DEFINITION.
- o PRESENTATIONS ON OUR APPROACH TO REQUIREMENTS DEFINITION.

TECHNOLOGY TRENDS
AND
IMPLICATIONS FOR NPPS AIS

MARTIN CULPEPPER

THE LAST TWENTY YEARS

- o TECHNICAL FACTORS FAVORING CENTRALIZATION OF DP OPERATIONS.
- o MANAGEMENT FACTORS FAVORING CENTRALIZATION OF DP OPERATIONS.
- o GENERAL DISSATISFACTION WITH MIS DUE IN PART TO DIFFICULTY IN DATA COLLECTION.

TECHNICAL FACTORS

- o ECONOMIES OF SCALE
- o EXPENSIVE COMMUNICATIONS -- LACK OF FLEXIBILITY

MANAGEMENT FACTORS

- o UTILIZATION
- o CONTROL
- o TOLERANCE FOR "INFORMATION FLOAT"

DATA COLLECTION

- o DATA WRITTEN DOWN, TRANSCRIBED
KEYPUNCHED,
VERIFIED,
VALIDATED,
PROCESSED
- o FREQUENT DUPLICATION

THE NEXT TWENTY YEARS

- o TECHNICAL FACTORS FAVORING DISTRIBUTION OF
DP OPERATIONS
- o MANAGEMENT FACTORS FAVORING DISTRIBUTION OF
DP OPERATIONS
- o GREATLY IMPROVED DATA COLLECTION METHODS

TECHNICAL FACTORS

- o NO-COST HARDWARE
- o SLIGHTLY LOWER COST COMMUNICATIONS WITH MUCH GREATER FUNCTIONALITY.

MANAGEMENT FACTORS

- o FULL UTILIZATION OF ADP EQUIPMENT NO LONGER NEEDED
- o DECREASED ORGANIZATION OVERHEAD COSTS ARE NEEDED
- o IMPROVED UTILIZATION OF PRINTING RESOURCES IS NECESSARY
- o LOWER TOLERANCE FOR "INFORMATION FLOAT"
- o COMMUNICATION COSTS MUST BE LOWERED
- o INCREASED MODULARITY

HOW CAN TECHNOLOGY BE USED TO INCREASE NPPS
PRODUCTIVITY AND CAPABILITY

FOUR MAJOR AREAS

- o BASIC FINANCIAL PROCESSING
 - BILLING, ACCOUNTS
- o SUPPORT OF OPERATIONS
 - INVENTORY CONTROL, JOB COST
- o CONTROL OF OPERATIONS
 - ROUTING, SCHEDULING, JOB CONTROL
- o FUTURE PLANNING
 - SIMULATION, FORECASTING, LOADING

THE TECHNOLOGY EXISTS TO:

- o PUT MAINFRAME COMPUTING CAPABILITY AT A PRINTING PLANT FOR A FEW \$K
- o COLLECT DATA FOR DECISION MAKING AT CONSIDERABLY LOWER COST
- o SEND DATA BETWEEN ANY TWO PLANTS AT FAIRLY LOW COST AND FAIRLY HIGH SPEED. ONE MILLION CHARACTERS FOR TWO DOLLARS IN A FEW MINUTES. OR -- AN 800 PAGE BOOK ANYWHERE IN THE COUNTRY FOR \$10.00 IN 1 HOUR.

THEREFORE:

- o DATA COLLECTED AT PLANT CAN BE PROCESSED THERE
- o DATA FORWARDED TO NPPSMO FOR FURTHER ANALYSIS
- o DATA SHARED WITH OTHER PLANTS
- o PROCESSING DONE AT OTHER PLANTS (BACKUP)
- o WORKLOAD BALANCING AMONG PLANTS

WHAT WE HOPE TO ACHIEVE IN THIS WORKSHOP

- o DISCUSS TECHNOLOGICAL POSSIBILITIES
- o BEGIN THE REQUIREMENTS COLLECTION PROCESS

PRMIS
PRMIS
PRMIS
PRMIS
PRMIS
PRMIS
PRMIS
PRMIS

CONCEPTUAL VIEW OF PRMIS

MICHAEL GRAY

PRMIS PARTICIPANTS

SPONSOR: NPPSMO

USERS: NPPSMO
DIV's
SG/BO/RF

DEVELOPERS: EINSRDC - TOTAL SYSTEM
MARTIN MARIETTA - COST AND FINANCIAL

WHAT IS PRMIS?

MANAGEMENT INFORMATION SYSTEM

- STORE, RETRIEVE, AND ALTER DATA EASILY
- REPORT GENERATION AS REQUIRED
- FAST RESPONSE
- STANDARD INPUT FORMS AND OUTPUT REPORTS

COMPUTATIONAL CAPABILITY

- FORECASTING
- INVENTORY, ETC.

OFFICE MANAGEMENT (OPTIONAL)

- ELECTRONIC MAIL
- DOCUMENT PROCESSING

PRMIS FUNCTIONAL AREAS

SUPPLY

- PURCHASING
- MATERIAL INVENTORY
- PROCUREMENT

FINANCIAL

- COST AND FINANCIAL
- BUDGET

JOB PRODUCTION

- PRODUCTION CONTROL
- PLANNING AND SCHEDULING
- CUSTOMER ACCOUNTS
- FORECASTING

EQUIPMENT

- EQUIPMENT INVENTORY
- REPROGRAPHICS

INPUT TO PRMIS

- STANDARD INPUT DATA FOR ALL NPPS
- MINIMIZED DATA INPUT BY EXAMINING AND CAPTURING DATA AT THE SOURCE
- CENTRALIZED DATA INPUT
- DATA ENTERED AS IT BECOMES AVAILABLE, ELIMINATE LARGE AMOUNTS OF DATA AT ANY ONE TIME

PRMIS CHARACTERISTICS

- INTERACTIVE CAPABILITY
- DATA SHARED BETWEEN FUNCTIONAL AREAS
- JOB, SUPPLIES, ETC., TRACKED CONTINUOUSLY
THROUGH SYSTEM
- REPORTS AS REQUIRED, WHEN REQUIRED

INTERACTIVE CAPABILITY

- INFORMATION CAN BE RETRIEVED AND UPDATED AT THE TERMINAL, ON-LINE
- OUTPUT OBTAINED AT THE TERMINAL WHEN REQUIRED
- STATUS OF ACTIONS CAN BE DETERMINED WHEN REQUIRED

DATA SHARED BETWEEN FUNCTIONAL AREAS

- DATA ENTERED ON A DBMS
- DATA ENTERED ONLY ONCE, NO DUPLICATION
- ALL INFORMATION ON JOB OR ACTION AVAILABLE AT ONE TIME

DATA BASE MANAGEMENT SYSTEM (DBMS)

- DATA COMPILED AND STORED IN CONFIGURATIONS TO
 - MINIMIZE HANDLING
 - MAXIMIZE DATA AVAILABILITY
- DATA RETRIEVAL WITH COLUMN HEADINGS
- DATA CAN BE SORTED
- OUTPUT REPORTS CAN BE ALTERED TO REFLECT CHANGING USER REQUIREMENTS
- ELIMINATE DATA REDUNDANCY

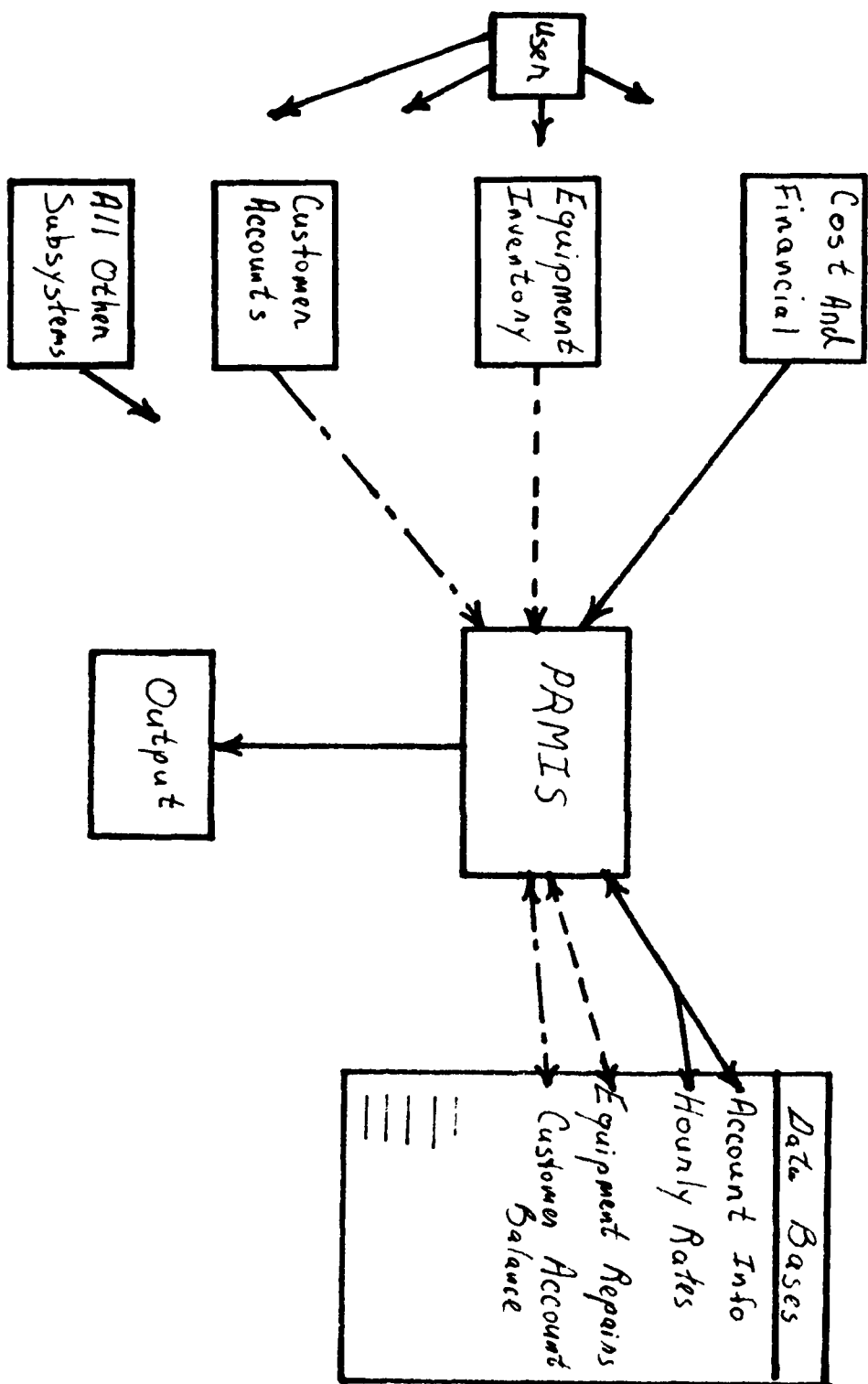
CONTINUOUS TRACKING

- ITEM, E.G., PRODUCTION JOB, PURCHASE, IS TRACKED THROUGHOUT CYCLE
- STATUS OBTAINED AS REQUIRED, REPORTS GENERATED
- ITEM'S LOCATION MONITORED

OUTPUT REPORTS AS REQUIRED

- ONLY REPORTS REQUIRED ARE GENERATED
- FREQUENCY OF REPORTS
 - ON DEMAND
 - CYCLIC
- TYPE OF OUTPUT
 - HARD COPY
 - TERMINAL DISPLAY
- PROCESSING AND OUTPUT MEETS USER REQUIREMENTS
 - ON-LINE, INTERACTIVE
 - BATCH
 - PROCESSING CAPABILITY WHERE PEOPLE ARE

System	Description
--------	-------------



DETERMINATION OF PRMIS CONFIGURATION

- FUNCTIONAL CONCEPTS
- FUNCTIONAL DESCRIPTIONS
- SYSTEM CONFIGURATION
- ECONOMIC ANALYSIS

COMPUTER CONFIGURATION

- o FACTOR IN LEVEL OF CONTROL
- o OTHERWISE, NOT USER CONCERN
- o DEVELOPER RESPONSIBILITY

ELEMENTS OF A MANAGEMENT INFORMATION SYSTEM

- PROCESSING - LOCATION OF SOFTWARE, HARDWARE AND DATA STORAGE
- DATA FLOW - INPUT AND OUTPUT STATIONS
- NETWORK - COMMUNICATIONS CONFIGURATION SUPPORTING INPUT/OUTPUT AND PROCESSING

ALTERNATE TYPES OF COMPUTER SYSTEMS PROCESSING

1. CENTRAL PROCESSING

- PROCESSING AND DATA STORAGE AT CENTRAL SITES.
NON-PROGRAMMABLE TERMINALS AT EACH WORK SITE.

2. DISTRIBUTED PROCESSING

- PROCESSING AND DATA STORAGE PERFORMED BY
MICROCOMPUTERS AT EACH WORK SITE.

3. LIMITED CENTRAL

- PERMANENT STORAGE, REPORT PROCESSING AND
OVERALL SYSTEM STATISTICS PERFORMED ON
LARGE CENTRAL COMPUTER CONNECTED TO
MICROCOMPUTERS AT EACH WORK SITE.

4. LIMITED DISTRIBUTION

- PROGRAMMABLE TERMINALS AT EACH WORK SITE
SUPPORTED BY LARGE CENTRAL COMPUTER

DATA FLOW - INPUT

1. CENTRALIZED - DATA INPUT AT TERMINALS AT WORK
SITES AND STORED IN CENTRAL MEMORY
2. DISTRIBUTED - DATA INPUT AT WORK SITES AND STORED
3. HYBRID - INPUT STORED AT WORK SITES THEN
RELAYED TO CENTRAL MEMORY

DATA FLOW - OUTPUT

1. CENTRALIZED - HARD COPY AT CENTRAL SITES AND TERMINAL DISPLAYS
2. DISTRIBUTED - HARD COPY AT ALL WORK SITES AND TERMINAL DISPLAYS
3. HYBRID - HARD COPY AT CENTRAL SITES, REMOTE PRINTERS PROVIDING HARD COPY AT WORK SITES AND TERMINAL DISPLAYS

MIS NETWORK

1. CENTRALIZED - LARGE NETWORK FROM CENTRAL SITES
TO ALL PERIPHERAL TERMINAL SITES
2. DISTRIBUTED - LIMITED NETWORK BETWEEN MINICOMPUTERS
3. HYBRID - MID-SIZE NETWORK BETWEEN CENTRAL SITES
AND REMOTE MINICOMPUTERS

PRMIS DESIGN OBJECTIVES

BEST CONFIGURATION —————→ MANAGEMENT CAPABILITY WHERE NEEDED

DICTATED BY —————→ MANAGEMENT STRUCTURE

OUTCOMES FROM PRMIS

- INCREASED PRINTING PRODUCTIVITY
- DECREASED ADMINISTRATIVE REQUIREMENTS
- INCREASED ACCURACY OF RESULTS
- ACTIONS AND OUTPUT REPORTS PERFORMED MORE RAPIDLY

REPROGRAPHICS SUBSYSTEM

- o NAVY REPROGRAPHICS PROGRAM DEVELOPED
 - EQUIPMENT INVENTORY CONTAINING TYPES, NUMBERS, AND COST
 - _ SELECT NEW OR MODIFY EQUIPMENT
- o DATA GATHERED
- o LOADED ON SYSTEM 2000 DBMS

APPLICATIONS TO PRMIS

- o INTERACTIVE CAPABILITY
- o UTILIZE DBMS
- o APPLY LOGIC TO PRMIS
- o RELEVANCE TO EQUIPMENT INVENTORY SUBSYSTEM

SOURCE DATA AUTOMATION

AT THE PRINTING PLANT

JOSEPH GARNER

SOURCE DATA AUTOMATION

- o DEFINITION
- o APPLICATIONS
- o IMPLICATIONS
- o MOTIVATION

SOURCE DATA AUTOMATION

(SDA)

THE ABILITY TO CAPTURE DATA AT ITS SOURCE

IN A MACHINE READABLE FORM.

DATA SUITABLE FOR SDA

- o HANDWRITTEN OR TYPED CARDS, FORMS, ...
- o INVENTORY STOCK RECEIPTS/ISSUES
- o CUSTOMER BILLS/RECEIPTS
- o LEDGER RECORD
- o TELEPHONE/MAIL INFO.

SDA TECHNOLOGY

- o KEY-TO-STORAGE DEVICES
- o OPTICAL READERS
 - MARKS
 - BAR CODES
 - OCR
- o ALPHANUMERIC DISPLAY TERMINALS (CRT's)
- o VOICE DATA ENTRY
- o COMMUNICATION LINKS
- o MIXED MEDIA

SDA BENEFITS

- o USER/OPERATOR NEED NOT BE PROFESSIONAL
DATA ENTRY CLERK
- o REDUCED VOLUME OF HARD COPY DATA DOCUMENTS
- o IMMEDIATE DATA EDITING, VALIDATION & CORRECTION
- o FAST/EASY

KEY-TO-STORAGE

DISK

TAPE

- o REPLACES CARDS
- o EXPEDITES DATA FLOW AFTER ENTRY
- o EDITS AND FORMATS
- o LABOR INTENSIVE

POTENTIAL APPLICATION:

MONTHLY COLLECTION OF
REPROGRAPHIC METER READINGS.

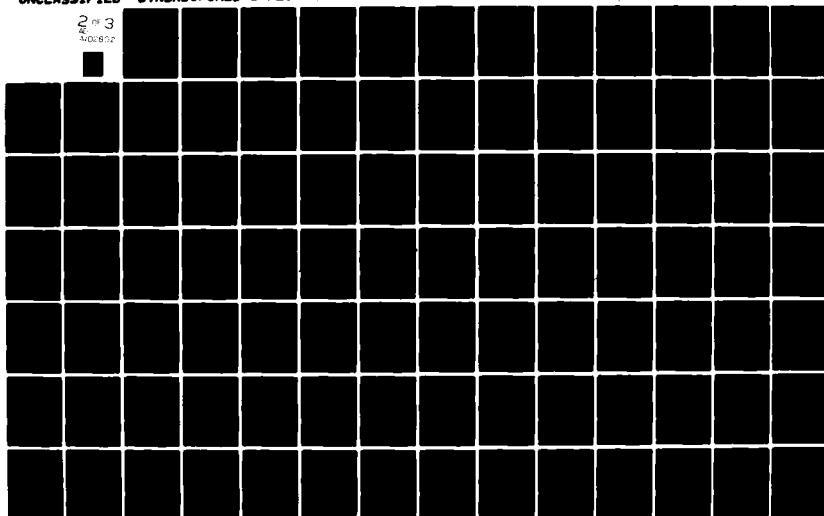
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DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CE--ETC F/G 5/1
PROCEEDINGS OF THE PRINTING RESOURCES MANAGEMENT INFORMATION SY--ETC(U)
JUN 81 M GRAY
DTNSRDC/CMLD-81/20

NL

UNCLASSIFIED

2 of 3
AUG 81



OPTICAL MARK READERS

- o READ HANDWRITTEN MARKS ON PRE-PRINTED FORMS
- o INFLEXIBLE
- o GOOD FOR LIMITED DATA COLLECTION IN UNCONTROLLED ENVIRONMENT

APPLICATION: SURVEYS, CENSUS

BAR CODE READERS

- o MATERIAL HANDLING DATA ENTRY
- o FAST ITEM IDENTIFICATION (UPC)
 - INVENTORY MANAGEMENT
- o CHEAPER THAN OCR
- o COST OF MARKING

APPLICATIONS: GROCERY CHECKOUT
NPPSO JOB TRACKING
NPPSO INVENTORY

OPTICAL CHARACTER RECOGNITION (OCR)

- o HIGH SPEED
- o LARGE VOLUME
- o FLEXIBLE
 - . MULTI-FORM
 - . MULTIFONT
 - . HANDWRITTEN NUMERICS
- o DIRECT INPUT OF SOURCE DOCUMENTS
- o VARIETY OF VENDORS, CAPABILITIES, PRICES

APPLICATIONS

DEPARTMENT STORE BILLS

UTILITY COMPANY BILLS

ALPHANUMERIC DISPLAY TERMINALS

- o TYPES: "DUMB"
"SMART"
"INTELLIGENT"
- o EDIT/CORRECT
- o REAL-TIME INTERACTIVE DATA ENTRY AND RETRIEVAL
- o FLEXIBILITY AND SUPPORTING SOFTWARE
- o PORTABILITY

APPLICATIONS:

- . CUSTOMER ACCOUNT STATUS & ADJUSTMENTS
- . CONTRACTOR DATA BASE
- . PROCUREMENT MONITORING

VOICE DATA ENTRY

- o MULTIPLE TALKERS/TERMINALS
- o LOCAL TUNING TO TALKER AND VOCABULARY
- o VIDEO/AUDIO VERIFICATION
- o IDEAL FOR "HANDS-TIED" DATA ENTRY

APPLICATIONS:

- . UPS PACKAGE SORTING
- . AIRLINES BAGGAGE HANDLING
- . NPPS: INVENTORY

LIGHT PENS

- o HAND-HELD OCR WANDS
- o HAND-HELD BAR CODE SCANNERS
- o MENU SELECTION DISPLAYS
- o KEYBOARD OPTION

PORTABLE,
BATTERY POWERED

APPLICATIONS:

- . RETAIL CHECKOUT (SEARS)
- . NPPS: JOB TRACKING/ID.
INVENTORY

OTHER SDA TECHNOLOGY

- o FUNCTION-KEY TERMINALS
- o TOUCH SCREEN DISPLAYS
- o VOICE RESPONSE
- o INFRARED COMMUNICATIONS
- o MIXED MEDIA

APPLICATIONS:

- . RESTAURANT CASHIER (McDONALD's)
- . NPPS: PROCESS PLAN

SDA FORECAST

o STEADY PROGRESS IMPROVING EXISTING CONCEPTS

- FLEXIBILITY
- ACCURACY
- SPEED
- CONVENIENCE

o TECHNOLOGY BREAKTHROUGH?

SDA

IMPLEMENTATION FACTORS

- o KIND OF DATA
- o SOURCE OF DATA
- o VOLUME
- o ACCURACY REQUIREMENTS
- o PROCESSING ENVIRONMENT
- o COST

SDA

COST FACTORS

- o EQUIPMENT
 - SDA HARDWARE
 - COMMUNICATIONS
- o SOFTWARE SUPPORT
- o OPERATIONS
 - INCORRECT DATA
 - LATE DATA
 - NO DATA
- o LABOR
 - WAGES
 - BENEFITS
 - RETENTION

SDA AT NPPS

- o PROCESS PLANSFUNCTION-KEY TERMINAL
- o JOB TRACKING.....BAR CODE, OCR
- o INVENTORY MANAGEMENT.....BAR CODE, OCR, VOICE
- o COST & FINANCIAL.....ALPHANUM. DISPLAY, OCR
- o REPROGRAPHICS METERS.....KEY-TO-STORAGE
- o CUSTOMER ACCOUNTS.....ALPHANUM. DISPLAY
- o INTERNAL MANAGEMENT.....ELECTRONIC MAIL/ALPHANUM.
DISPLAY

SYSTEM IMPACT

- o INCREASED DATA REQUIREMENTS
- o SDA FACILITATES DATA INPUT
- o SDA: ONE-TIME DATA CAPTURE
- o AUTOMATIC DATA COMMUNICATION
- o REDUCED MANUAL DATA ENTRY
- o DATA ENTRY BY FUNCTIONAL SPECIALIST

REQUIREMENTS COLLECTION APPROACH

IN THE ICP RESOLICITATION

DAVID K. JEFFERSON
CODE 1821
DTNSRDC
202-227-1622

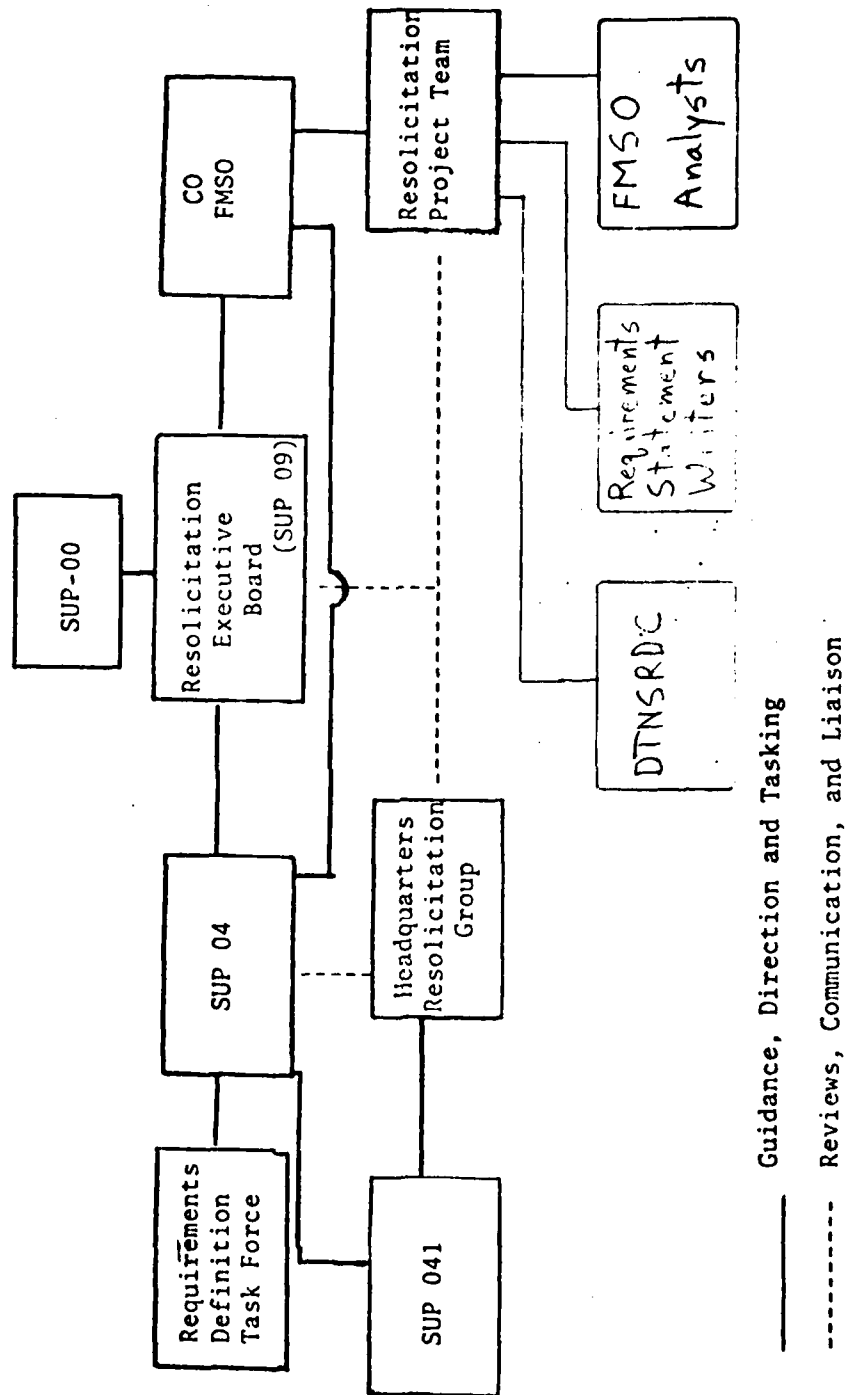
OUTLINE

- . DESCRIPTION OF THE UNIFORM INVENTORY CONTROL PROGRAM
- . ORGANIZATION OF ICP RESOLICITATION
- . PREFERRED PHASES IN SYSTEM DESIGN
- . ACTUAL PHASES IN ICP DESIGN
- . MISTAKES IN DESIGN OF NEW ICP SYSTEM
- . SUCCESSES IN DESIGN OF NEW ICP SYSTEM

DESCRIPTION OF THE UNIFORM INVENTORY CONTROL PROGRAM (UICP)

- . WORKLOAD
 - UICP MANAGES 800,000 ITEMS
 - UICP MANAGES PURCHASES OF \$1.5B/YEAR
 - UICP RECEIVES 50,000 TRANSACTIONS/DAY
- . HARDWARE
 - TWO SITES WITH NEARLY IDENTICAL HARDWARE
 - EACH HAS DUAL UNIVAC 494's
 - TOTAL 10B CHARACTERS ON-LINE
- . SOFTWARE
 - 132 MAJOR APPLICATION AREAS
 - 5M LINES OF EXISTING CODE
- . DATA BASE
 - FILE MANAGEMENT SYSTEM DEVELOPED IN-HOUSE
 - 5,000 STANDARDIZED DATA ELEMENTS
 - 8,000 PROPOSED NEW DATA ELEMENTS

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Enclosure (5)

ORGANIZATION OF ICP RESOLICITATION

PREFERRED PHASES IN SYSTEM DESIGN

- . SYSTEM CONCEPTS AND GUIDELINES
- . CONCEPTUAL DATA STRUCTURE FOR SYSTEM
- . FUNCTIONAL SPECIFICATIONS FOR SYSTEM
- . LOGICAL DATA STRUCTURE FOR SYSTEM
- . FUNCTIONAL SPECIFICATIONS FOR SUBSYSTEMS
- . LOGICAL DATA STRUCTURES FOR SUBSYSTEMS
- . REVISED LOGICAL DATA STRUCTURE FOR SYSTEM
- . PHYSICAL DATA STRUCTURE
- . OPERATIONAL SPECIFICATION OF SUBSYSTEMS

SYSTEM CONCEPTS AND GUIDELINES

- . WHAT PROBLEMS MUST BE SOLVED?
- . WHAT RESOURCES ARE AVAILABLE?
- . WHAT CONSTRAINTS ARE NECESSARY?
- . TOPICS
 - SECURITY
 - RELIABILITY
 - TIMING OF SYSTEM DEVELOPMENT
 - TRAINING
 - ORGANIZATION
 - CHANGE
 - TIMING OF APPLICATION CYCLES

CONCEPTUAL DATA STRUCTURE FOR SYSTEM

- . REAL-WORLD OBJECTS
 - SUPPLY ITEM
 - ACTIVITY
- . REAL-WORLD CONCEPTS
 - APPROPRIATION
 - SUPPLY ACTION
- . RELATIONSHIPS AMONG OBJECTS AND CONCEPTS
 - SUPPLY ITEM STOCKED AT ACTIVITY
 - SUPPLY ITEM AND ACTIVITIES INVOLVED IN SUPPLY ACTION

FUNCTIONAL SPECIFICATIONS FOR SYSTEM

- WHAT OUTPUTS ARE PRODUCED BY WHAT INPUTS?
- INITIAL DEFINITION OF SUBSYSTEMS
- INITIAL DEFINITION OF INTERFACES

LOGICAL DATA STRUCTURE FOR SYSTEM

INDEPENDENT OF HARDWARE

INDEPENDENT OF SOFTWARE

SUPPORTS ALL SUBSYSTEMS

CONSISTS OF SYSTEM DATA BASES AND APPLICATION FILES

FUNCTIONAL SPECIFICATIONS FOR SUBSYSTEMS

- WHAT OUTPUTS ARE PRODUCED FROM WHAT INPUTS?
- REVISED DEFINITION OF SUBSYSTEMS
- REVISED DEFINITION OF INTERFACES

LOGICAL DATA STRUCTURES FOR SUBSYSTEMS

- . INDEPENDENT OF HARDWARE
- . INDEPENDENT OF SOFTWARE
- . EACH DESCRIBES ONLY DATA NEEDED BY SUBSYSTEM
- . CAN BE CONSIDERED TO CONSIST OF APPLICATION-ORIENTED FILES

REVISED LOGICAL DATA STRUCTURE FOR SYSTEM

- . INDEPENDENT OF HARDWARE
- . INDEPENDENT OF SOFTWARE
- . SUBSYSTEMS AND INTERFACES MAY BE REVISED

PHYSICAL DATA STRUCTURE

- . HARDWARE DEPENDENT
- . SOFTWARE DEPENDENT
 - DATA BASE MANAGEMENT SYSTEM(s)
 - FILE MANAGEMENT SYSTEM(s)
 - APPLICATION PROGRAMS
- . SUPPORTS ALL SUBSYSTEMS
 - APPLICATION PROGRAMS ARE ISOLATED FROM CHANGE
 - SUBSYSTEMS CAN BE ADDED INCREMENTALLY

OPERATIONAL SPECIFICATION OF SUBSYSTEMS

- HOW OUTPUTS ARE PRODUCED FROM WHAT INPUTS?
- HOW SUBSYSTEMS CONTRIBUTE TO SECURITY, RELIABILITY, ETC.

ACTUAL PHASES IN ICP DESIGN

- . SYSTEM CONCEPTS AND GUIDELINES (RED)
- . REQUIREMENTS STATEMENTS (RS WRITERS)
- . FUNCTIONAL DIAGRAMS (FMSO ANALYSTS)
- . MECHANIZED RS's (DTNSRDC)
- . LOGICAL DATA STRUCTURE FOR SYSTEM (FMSO + DTNSRDC)
- . PHYSICAL DATA STRUCTURE

REQUIREMENTS STATEMENTS (RS's)

- . IDEALLY, FUNCTIONAL
- . IN PRACTICE, OFTEN OPERATIONAL
 - SPECIFIC FILES, RATHER THAN DATA
- . INCOMPLETE
 - UNCLEAR CONNECTION BETWEEN DATA AND PROCESSES
- . INCONSISTENT
 - INTERFACES BETWEEN RS's INCONSISTENT
- . VERY DIFFICULT TO USE
 - QUALITY UNEVEN
 - COMPLEXITY HIGH
- . CONCLUSION: MORE TRAINING AND GUIDANCE, FEWER PEOPLE

FUNCTIONAL DIAGRAMS

- RESTRICTED TO WHAT, NOT HOW
- VISUAL VERIFICATION OF COMPLETENESS AND CONSISTENCY

MECHANIZED RS's

- . COMBINE FUNCTIONAL DIAGRAMS WITH DATA STRUCTURE
- . EXPRESSED IN PROBLEM STATEMENT LANGUAGE (PSL)
 - PROCESSES
 - DATA (FILES, RECORDS, GROUPS, ELEMENTS)
 - RELATIONSHIPS (PROCESSES USE DATA, ETC.)
- . DOCUMENTATION BY PROBLEM STATEMENT ANALYZER (PSA)
 - STORAGE IN PSA DATA BASE
 - ANALYSIS OF CONSISTENCY
 - ANALYSIS OF COMPLETENESS
 - DOCUMENTATION ON DEMAND

LOGICAL DATA STRUCTURE FOR SYSTEM

- INDEPENDENT OF HARDWARE
- INDEPENDENT OF SOFTWARE
- APPARENTLY SUPPORTS ALL SUBSYSTEMS
- VERY COMPLEX (MORE THAN 10,000 DATA ELEMENTS)
- CONCLUSION: MORE TRAINING AND GUIDANCE, FEWER PEOPLE
- CONCLUSION: HIGH-LEVEL DESIGN AND PROTOTYPE

PHYSICAL DATA STRUCTURE

- WILL REQUIRE DETAILED ANALYSIS OF WORKLOAD
- A PROTOTYPE IS BEING DEVELOPED BY A FEW PEOPLE

MISTAKES IN DESIGN OF NEW ICP SYSTEM

- . PERSONNEL PROBLEMS
 - NOT ENOUGH TRAINING BEFORE DESIGN
 - NOT ENOUGH GUIDANCE DURING DESIGN
 - TOO MANY PEOPLE, TOO SOON

- . TECHNICAL PROBLEMS
 - NOT ENOUGH USE OF PROTOTYPES
 - NOT ENOUGH ATTENTION TO HIGH-LEVEL DESIGN
 - TOO MUCH DETAIL, TOO SOON

SUCSESSES IN DESIGN OF NEW ICP SYSTEM

- PERSONNEL SUCSESSES

- MANY LEVELS OF EXPERTISE AVAILABLE IN-HOUSE
- DOCUMENTATION AND EXAMPLES ARE AVAILABLE

- TECHNICAL SUCSESSES

- MECHANIZED BASE-LINE DESIGN OF APPLICATIONS
- MECHANIZED BASE-LINE DESIGN OF DATA BASE
- MANY LEVELS OF DETAIL ARE AVAILABLE
- HIGH DEGREE OF CONSISTENCY AND COMPLETENESS

DEFINITION AND IDENTIFICATION

OF REQUIREMENTS

MICHAEL GRAY

CENTRAL PROBLEMS IN LARGE DATA PROCESSING SYSTEMS ARE:

- CONTINUITY
- CHANGE

PREDOMINANT COST OVER LIFE CYCLE IS:

- MAINTENANCE COST

POSSIBLY DUE TO POOR REQUIREMENT SPECIFICATIONS

REQUIREMENTS

- SOMETHING MANDATORY
- ESSENTIAL PROPERTY OR CONDITION THAT SYSTEM MUST SATISFY
- CONTRACT BETWEEN CUSTOMER AND DEVELOPER
- BASIS FOR
 - DESIGN
 - DEVELOPING USERS MANUAL
 - CONTROLLING EVOLUTION OF SYSTEM

WHY DO WE NEED REQUIREMENT STATEMENTS?

- BASIS FOR ADS PLAN DEVELOPMENT (OPNAV 5231.1)
 - PRESENT OPERATIONS
 - FUTURE NEEDS
 - . IMPROVEMENTS
 - . BENEFITS
- BASIS FOR HARDWARE SPECIFICATIONS DEVELOPMENT
 - COMPUTE SYSTEM CONFIGURATION
 - FACILITIES/CAPABILITIES NEEDED

BOTH → ADS PLAN AND HARDWARE SPECIFICATION;
NEEDED

TO GET → APPROVAL TO OBTAIN HARDWARE TO
DO THE JOB

REQUIREMENTS DEFINITION STAGE

- SYSTEM CONCEPT AND GUIDELINES - WHY SYSTEM IS TO BE
CREATED AND STIPULATION
OF ITS CONSTRAINTS
- FUNCTIONAL SPECIFICATIONS - DESCRIPTION OF PROPOSED SYSTEM
IN TERMS OF ITS FUNCTIONS
- DETAILED DESIGN - HOW THE SYSTEM IS TO BE CONSTRUCTED AND
IMPLEMENTED

SYSTEM CONCEPT AND GUIDELINES

- NEEDED CAPABILITY DOES NOT EXIST
- EXISTING CAPABILITIES INSUFFICIENT
- MODERN TECHNOLOGY AVAILABLE
 - CONSTRAINTS SPECIFIED - NECESSARY TO DEFINE SYSTEM CHARACTERISTICS

FUNCTIONAL SPECIFICATIONS

- DETERMINE STANDARD OPERATING PROCEDURES
- USER INFORMATION OF DESIRED CAPABILITIES
 - INPUT
 - OUTPUT
 - FUNCTIONS
- FUNCTIONAL FLOW

DETAILED DESIGN

- NETWORK CONFIGURATION
- SYSTEM ARCHITECTURE
- SYSTEM CONSTRAINTS

<u>INCORPORATE</u>	-	PRESENT PROCEDURES
<u>WITH</u>	-	USER REQUIREMENTS
<u>AND</u>	-	SYSTEM PROCEDURES
<u>TO GET</u>	-	NEW SYSTEM DESIGN

SYSTEM —————> DRIVEN BY REQUIREMENTS

YOU —————> USE THE SYSTEM

THE SYSTEM IS ONLY AS GOOD AS THE REQUIREMENTS SPECIFIED

GOOD REQUIREMENTS

- UNDERSTANDABLE
- COMPLETE
- CONSISTENT
- TESTABLE
- FEASIBLE
- MODIFIABLE
- BRIEF

INFORMATION COLLECTION PLAN

PHASE 1 - INITIAL LETTER WITH BRIEF FORM

PHASE 2 - WORKSHOP

- FILL OUT NEW FORM
- OBTAIN COMMENTS AND DATA

PHASE 3 - DISTRIBUTE NEW FORM TO SELECTED WORK SITES

- OBTAIN COMMENTS AND DATA
- REVISE FORM

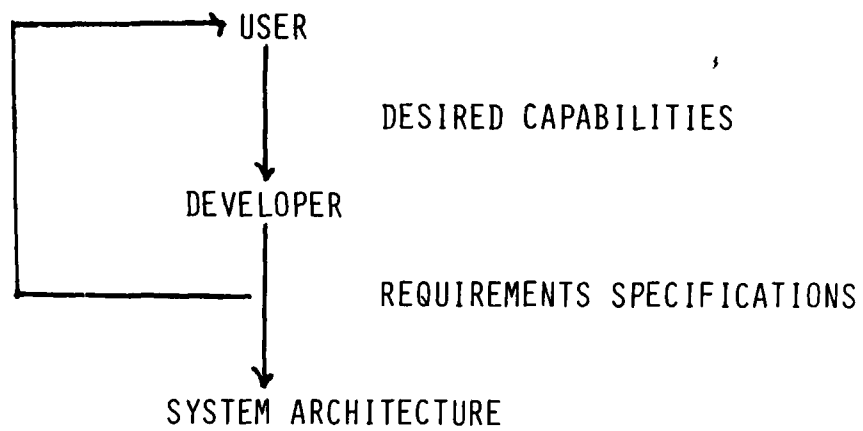
PHASE 4 - DISTRIBUTE NEW REVISED FORM TO ALL WORK SITES

- COLLECT INFORMATION
- DEVELOP REQUIREMENTS

PHASE 5 - VISIT REPRESENTATIVE NPPS WORK SITES

- OBSERVE OPERATIONS
- COLLECT DATA

REQUIREMENTS COLLECTION PROCESS



REQUIREMENTS DEVELOPMENT CHAIN

↓
USER

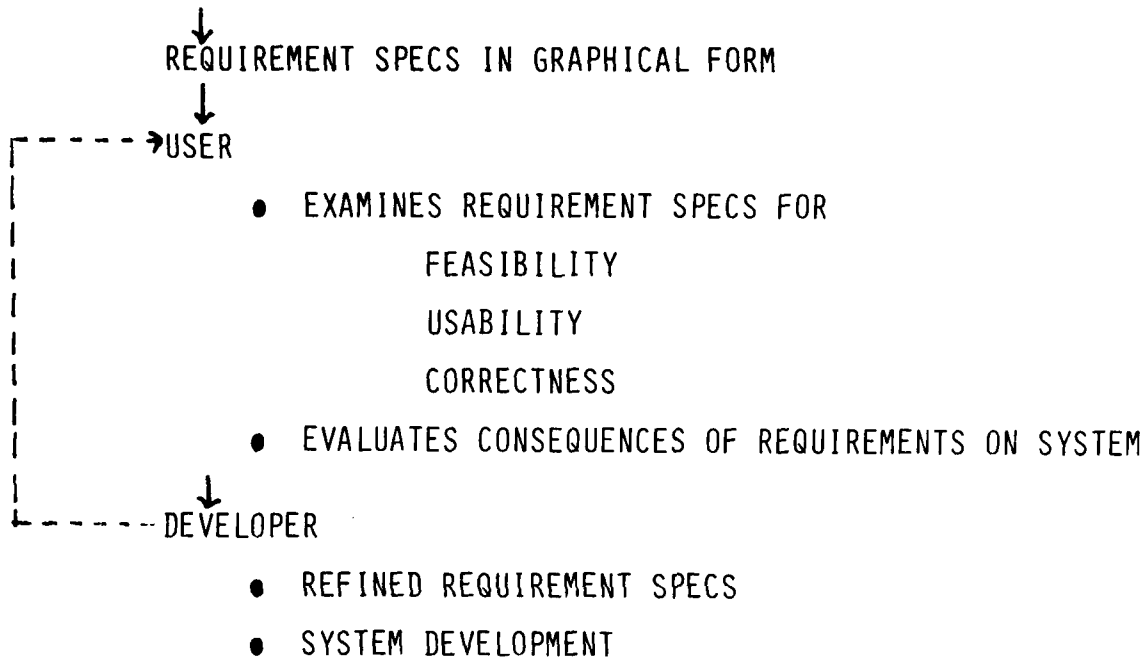
- o SPECIFIES DESIRED CAPABILITIES
- o NARRATIVE FORM

↓
DEVELOPER

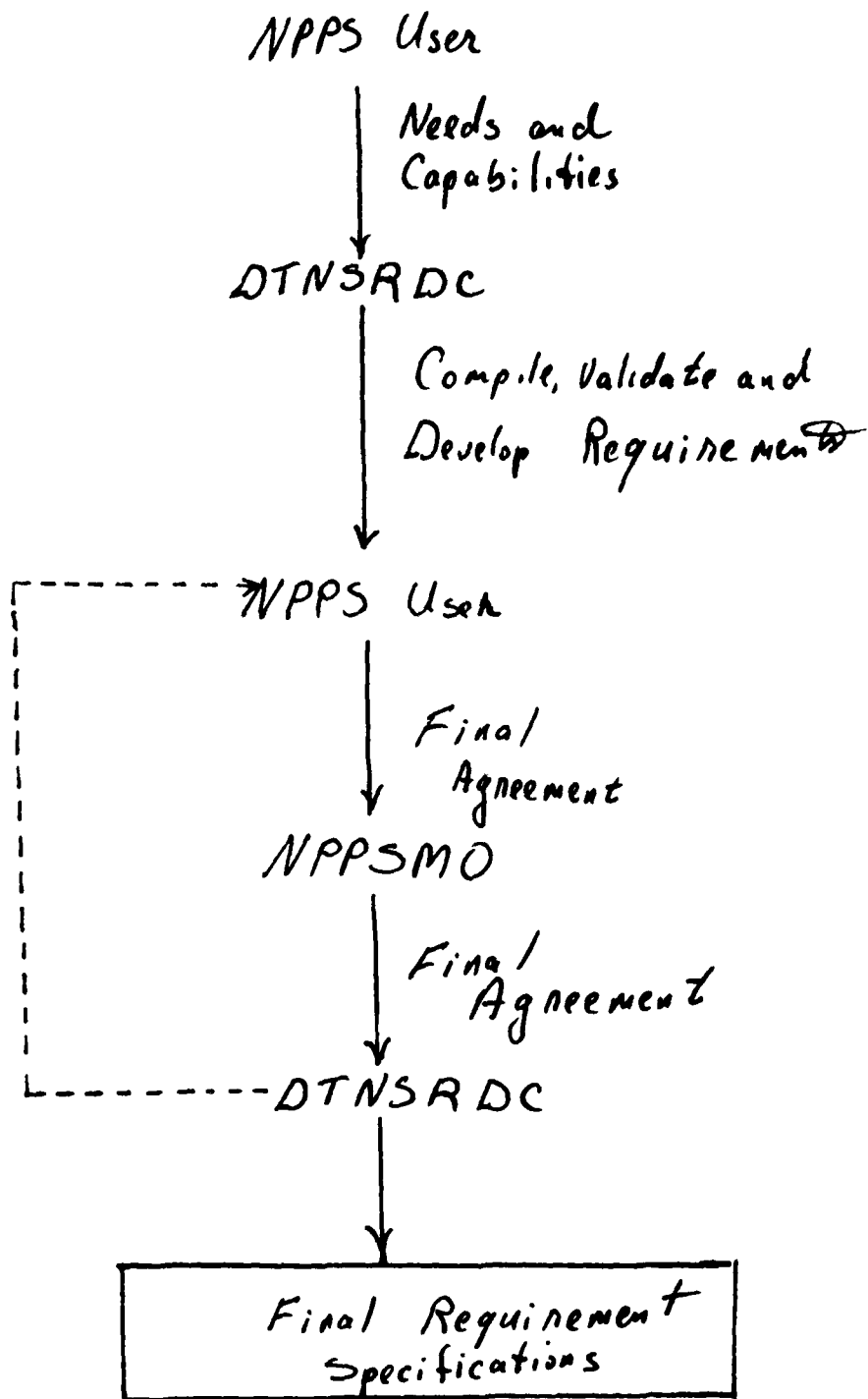
- o GENERATES REQUIREMENT SPECIFICATION WHICH ARE
 - FEASIBLE
 - USABLE
 - CORRECT

↓
DETERMINES CONSEQUENCES OF REQUIREMENTS ON SYSTEM DEVELOPMENT
↓

REQUIREMENTS DEVELOPMENT CHAIN (CONT'D)



Development of PRMIS Requirements



REQUIREMENTS DEVELOPMENT

- ITERATIVE APPROACH
- CHANGES TO REQUIREMENTS DURING DEVELOPMENT
- SYSTEM DESIGNED TO ACCOMMODATE
POST-DEVELOPMENT CHANGES

ATTENDEES FUNCTIONS

- REQUIREMENTS EDUCATION
- FILL OUT FORMS
- RELAY FORMS TO SO/BO/RF
- PROVIDE GUIDANCE

PRMIS INFORMATION COLLECTION FORMS

JIM O'DONNELL
CODE 1828
DTNSRDC

INFORMATION COLLECTION FORMS

OUTLINE:

- DISCUSS USE OF FORMS
- PRESENT A SAMPLE CASE
- OBTAIN FEEDBACK
- DISTRIBUTE FORMS

PURPOSE OF FORMS

- OBTAIN DESIRED CAPABILITIES FROM USERS OF THE NEW PRMIS.
- BACKGROUND INFORMATION IS NEEDED TO EFFICIENTLY ORGANIZE INTERVIEWS IN PHASE 5.

ADVANTAGES OF USING FORMS

- FORMS ARE A FAST AND ECONOMICAL MEANS OF GATHERING INFORMATION WHEN:
 - MANY PEOPLE MUST BE CONTACTED
 - THE PEOPLE TO BE CONTACTED ARE GEOGRAPHICALLY DISPERSED.
 - INFORMATION IS AMENABLE TO FORMS COLLECTION

WHAT MAKES A GOOD FORM?

EACH FORM MUST BE

- READABLE
- UNAMBIGUOUS
- EASY TO COMPLETE
- MUST PROVIDE REQUIRED INFORMATION

PROCEDURES TO TEST FORMS

THE FORMS WILL BE TESTED THROUGH

- FEEDBACK FROM WORKSHOP PARTICIPANTS
- PILOT TEST: DISTRIBUTION TO SELECTED
NPPS ACTIVITIES.

ORGANIZATION OF FORMS

- ONE SECTION IN FORMS FOR EACH FUNCTIONAL AREA

- EACH SECTION HAS 2 PARTS:

 - PART 1: NEW CAPABILITIES AND IMPROVEMENTS

 - PART 2: DESCRIPTION OF PRESENT OPERATIONS

PRESENTATION OF COLLECTION FORMS

- EACH QUESTION DISCUSSED
- SAMPLE ANSWERS PROVIDED
- FEEDBACK DESIRED
 - IMPROVEMENTS
 - CRITICISM
 - CLARIFICATIONS

SAMPLE CASE DESCRIPTION

PAYROLL SYSTEM

- NON-PRINTING APPLICATION
- EVERYONE IS FAMILIAR WITH PAYROLL
- MANUAL SYSTEM

PURPOSE

- DEVELOP AN AUTOMATED PAYROLL SYSTEM

SUMMARY

- WHY FORMS ARE NEEDED.
- REASON FOR FEEDBACK.

Information Collection Forms

To enhance the management of printing operations and resources at NPPS headquarters and field activities, a computerized information system integrating the NPPS community is to be developed. This development effort will involve making modifications to the existing cost and financial and reprographic equipment management systems as well as developing additional capabilities in other functional areas including payroll.

The purpose of this questionnaire is to determine what capabilities are needed in payroll as it will exist within the new information system.

Point of contact for follow-up questions concerning information provided in the questionnaire:

Name: _____

Phone: _____

Organization: _____

1.1 Background of Payroll

Please provide a brief list or description of your organization's payroll functions and operations.

1.2 Documentation, Regulations and Procedures

Please reference documents, regulations, guidelines and written procedures that describe payroll functions and operations.

Title of document: _____

Identification number if applicable: _____

Issued by: _____

General purpose or description of document: _____

A copy is located at: _____

1.3 Proposed Improvements to Payroll

With respect to payroll, please specify a.) any additional capabilities and b.) any changes or improvements to current capabilities that you would like to see incorporated in the new information system. Next to each change or improvement, circle the letter which best indicates its importance. (H=high importance, M=moderate importance, L=low importance)

	Importance		
	H	M	L
1 _____			
2 _____			
3 _____			
4 _____			
5 _____			
6 _____			
7 _____			

Please list the benefits that you hope to realize as a result of these changes and improvements.

1.4 New Reports

With respect to payroll, describe any new reports that you would like to see provided by the new information system.

Provide a brief description of the report: _____

What information would be contained in the new report: _____

Please describe how this report would be used. _____

Estimate how frequently you would expect to receive this report.

Provide a brief description of the report: _____

What information would be contained in the new report: _____

Please describe how this report would be used. _____

Estimate how frequently you would expect to receive this report.

2.1 Currently Used Forms

For each form currently used in payroll, please supply the following information. If available, enclose a blank or sample copy of the form.

Form name: _____

Identification number: _____

When or how often is this form used? _____

Describe briefly the use of this form within payroll.

Form name: _____

Identification number: _____

When or how often is this form used? _____

Describe briefly the use of this form within payroll.

2.2 Other Currently Used Information

Describe information needed in the operation of payroll that is not supplied by the forms described in section 2.1. Examples of this type of information would include that provided by memos, messages and records of information.

Brief description or name of the information: _____

How often is this information used?: _____

Please describe briefly the use of this information within payroll.

Brief description or name of the information: _____

How often is this information used?: _____

Please describe briefly the use of this information within payroll.

2.3 Currently Used Reports

Please indicate any reports which are prepared or used within payroll.
If feasible, please enclose a copy of each report.

Report name: _____

How frequently is this report produced?: _____

Describe briefly the use of the report within payroll. _____

Report name: _____

How frequently is this report produced?: _____

Describe briefly the use of the report within payroll. _____

DISCUSSION

- COMMENTS ON FORMS
- CHANGES/ADDITIONS TO FORMS
- WHO SHOULD GET PART 2
- WHO SHOULD PARTICIPATE IN PILOT TEST
- TOMORROW, FILL OUT FORMS

APPENDIX D

PRMIS INITIAL REQUIREMENT STATEMENTS

Title: Budget Subsystem

Objective: Provide budgetary inputs for the planning and control of NPPS operations.

Background: Operating budgets, which include revenues and costs for future fiscal years based on inputs from field divisions, are currently prepared manually. Large volumes of cost and revenue data must be examined, analyzed and stored in order to forecast budget elements. Presently neither a centralized data base nor a budget analysis capability are available.

Potential Improvements: An efficient, responsive capability will be developed able to collect input in a timely manner from the entire NPPS community, relay the information to central sites for analysis, and generate budget reports.

Impact on Equipment: Estimates of new equipment requirements in the budget will aid in obtaining the best equipment to meet work requirements and providing efficient service to NPPS customers.

Impact on Organization: More precise budget information will allow management to configure organizations to meet future NPPS needs.

Impact on Operations: Forecasting customer loads and plant needs, e.g., future cost of equipment services and personnel, will enable NPPS to make its operation more efficient.

Assumptions and Constraints: none

System Functions and Operations: Data will be collected directly from each service and branch office as required and stored at the division offices for compilation and analysis. Accumulated data can be sent to NPPSMO for analysis and/or analyzed at the divisions. Much of the data required, e.g., yearly costs, personnel costs, and revenue, will be generated by other subsystems. New construction costs, growth trends, and plant capacities will be projected. Once goals and objectives are identified, alternative budgets will be developed and tradedoff with regard to cost and goals in order to develop budgets meeting NPPS requirements.

Input:

- Procurement costs
- Personnel costs
- Equipment costs
- Operational costs
- Maintenance costs
- Revenue
- New developments
- New construction

Output:

- Projected plant capacities
- Growth trends
- Projected equipment performance
- Budgetary costs
- Price/marketing strategy

Interfacing Subsystems:

- Cost and Finance
- Inventory
- Purchasing
- Forecasting

Inventory
Purchasing
Forecasting

Title: Cost and Financial Subsystem

Objective: Collect, analyze, store, and report NIF cost and financial information such as investments, disposition of labor and materials and financial resources.

Background: The present Cost and Financial (CF) subsystem is a large computer program operated and maintained by Martin-Marietta. This batch-mode program consists of 219,000 Cobol statements, runs for 15 hours, and prints out 76 reports which are reduced and sent to each plant. Comments have indicated that that these reports do not always meet user requirements, are not received in a timely manner, and may contain inaccuracies. The input to CF is entered on remote terminals and stored on floppy discs. The data on these discs is batched periodically to the central site at Orlando where errors may occur due to faulty input and transmission. Data errors are flagged and returned to the sending unit for corrections and changes. There the data are reentered on the disc and retransmitted.

Potential Improvements: The CF subsystem will be part of an extensive management information system with all data entered into a centralized data base where it will be stored and retrieved as required. This data will be accessible by other subsystems for use. When C&F data is first entered by other subsystems functions, it will be accessible for CF operations, eliminating multiple entry of the data. Reports will be developed to meet users needs and only those specific reports needed by each user will be printed, or displayed. Any specific element in the data base, e.g., last year's labor costs, can be retrieved and printed. If on-line data entry is used, any input or format errors can be identified during entry. Extensive data testing and an edit capability will be incorporated to insure accuracy of results.

System Functions and Operations: CF will be the heart of PRMIS since it will interact with most PRMIS subsystems. CF will provide costing, revenue, accounting, and cost related personnel information. Data will be input from all plants for compilation and analysis. Output reports will be sent to the plants as required. CF data will probably be stored at the divisions with management reports sent to NPPSMO and detailed reports sent to the plants. Various types of output will be generated depending on response time requirements and type and location of the requiring organization. For example, output can be printed at the terminal, at a remote printer, or at the main computer location.

Impact on Equipment: none directly

Impact on Organization: none

Impact on Operations: NPPS operations will be aided by timely and accurate financial reports.

Assumptions and Constraints: Data will have to be input in a timely manner at each participating organization. Extensive analysis will be made to determine data sources and the best means of supporting effective data transfer to central sites.

Input:

Hours
Personnel
Overtime

Leave

- Indirect
- Cost
 - Overhead
 - Labor
 - Inventory
 - Direct Material
 - Contractual
- Cash at hand
- Accounts Receivable
- Account Payable
- Revenue

Output:

- Summary of Accounts
- Statement of Operations
- Manpower Cost Data
- Distributions of Funds
- Annual Overhead Reports

Interfacing Subsystems:

- Purchasing
- Budget
- Forecasting
- Customer Accounts
- (Inventory through Purchasing)

Title: Customer Accounts Subsystem

Objective: Maintain current customer accounts, records of credits and charges.

Background: No capability exists to determine timely customer account balance and the availability of sufficient funds to cover outstanding jobs. Possibly, jobs could be processed only to find that adequate funds are not available to cover the job.

Potential Improvements: On-line, accurate, and rapid status of customer accounts will be available. Customers will receive regular account statements including estimates of all their jobs in process; notices of low balance will be generated as needed. Customer records will be maintained for each branch and service office, and summary reports will be available to the divisions and NPPSMO.

Impact On Equipment: none

Impact On Organization: unknown

Impact On Operations: Tighter customer cost accounting will exist at all levels of NPPS operations as charges to customer accounts will be maintained on-line.

Assumptions And Constraints: none

System Functions And Operations: Accurate and timely records of customer accounts, including estimated charges for jobs in process, will be maintained. Separate customer accounts for each branch and service office will provide local managers on-line access to customer account status. Estimated charges for new jobs will be posted immediately to eliminate processing unfunded jobs. Interfaces will be provided with the Cost and Financial Subsystem in order to record earned income and funds received on customer accounts. Alternative designs involve the manner in which customer accounts will be grouped -- either at the division level or at the service/branch office level. In the latter design, each NPPSO will maintain records only of the customers doing business with it and associated branch offices. In the former, the records of all customers doing business with service and branch offices within each division will be maintained at the division but will be available to all offices.

Interfacing Subsystems:

- Cost and Financial
- Production monitoring and Control
- Production Planning and Scheduling

Input:

- Customer identifications
- Credits to customer accounts
- Job identifications, estimated charges, and cost adjustments to customer accounts

Output:

- Regular statement of accounts for customers with itemized charges
- Low balance notices to customers
- Summary of customer accounts for NPPS

Title: Forecast Subsystem

Objective: Forecast and project NPPS requirements and determine the technology for best meeting them.

Background: NPPS lacks the capability to project the impact of new technology on the printing industry. Centralized information on existing equipment and plant operations and new equipment is not available. The unavailability of such data prevents NPPS from systematically planning and projecting long term operations.

Potential Improvements: Plant equipment information, e.g., usage statistics, operating and maintenance costs, and inventory data, will be provided. Customer demands will be identified and management assisted in obtaining greater resource utilization. Equipment replacement actions and materials inventory levels will be forecast. Forecasts such as those estimating effects on productivity achieved by selective equipment replacement will be performed. Plant configuration and throughput will be modeled, providing a mechanism for predicting the impact of new technology and configurations on overall NPPS production capability.

Impact on Equipment: Forecast equipment requirements will insure that the most suitable equipment is used.

Impact on Operations: Printing operations will be performed more efficiently through the use of cost/effective equipment selection. Inventory operations will meet demands more closely, reducing stockouts and cost of holding low demand items.

Assumption and Constraints: Forecasting procedures can not produce absolute accuracy. The longer the forecasting time period the less accurate the prediction. However, for reasonable time periods, forecasts can provide an excellent basis for decision making.

System function and Operations: Printing operations will be modelled considering numbers and types of equipment. An equipment replacement file describing the latest commercially available equipment including acquisition costs, operating costs, and production capacity will be developed. Another file will consist of descriptions of equipment types available in the future. New equipment characteristics will be input to the model, and the variations in cost and productivity from the present base configuration compared. Tradeoffs between equipment types, numbers, cost, and productivity can then be made. Inventory data in the form of parts and frequency required will be recorded for the purposes of predicting inventory levels.

Input:

- Equipment
 - uptime
 - downtime
 - repairs
 - productivity rates

- Cost
 - operating
 - maintenance
 - replacement
 - inventory

New equipment characteristics
Future equipment characteristics

Output:

Equipment replacement configurations
Cost of replacement
Inventory levels

Interfacing Subsystems:

Equipment inventory
Production control

Title: Equipment Inventory Subsystem

Objective: Project and recommend equipment replacement, transfer, and/or disposal based on timely operational and maintenance information.

Background: Accurate projections of NPPS equipment disposition and applications are not possible since life expectancy data, maintenance related information such as repair histories, and related production and depreciation data are not currently maintained.

Potential Improvements: Equipment depreciation, life expectancy, and repair history will be collected and maintained on a centralized file. This data will assist in repair/replace decisions, equipment acquisitions, and redistribution of equipment on a regional level. Routine maintenance for equipment will be scheduled automatically on the basis of established maintenance policies.

Operational Impact: Since equipment replacement needs will be projected in advance, new equipment will be acquired as needed. Maintenance personnel will be able to diagnose equipment problems more quickly, thereby increasing equipment up-time. Since routine maintenance will be performed regularly, machine failures should occur less frequently.

Organizational Impact: unknown

Assumptions and Constraints: none

System Functions and Operations: Maintenance and repair information, equipment utilization data, and data on replacement and disposal of equipment will be collected at each plant. Reports which will assist maintenance and operations personnel in making repair and replacement decisions will be produced. Summary reports of the same information will be available to the division and NPPSMO.

Inputs:

- Spare part order
- Machine repair request
- Repair performance record
- Equipment procurement request
- Machine usage record
- Equipment transfer record
- Equipment procurement record
- Equipment disposal record
- Record of depreciation
- Equipment lease cost
- Equipment purchase cost

Outputs:

- Equipment inventory report
- Repairs and maintenance report
- Purchase/lease analysis report
- Repair/replace analysis report
- Maintenance history for item

Interfaces:

- Production Scheduling
- Purchasing

Title: Materials Inventory Subsystem

Objective: Maintain material inventories at the most cost-effective levels.

Background: Inventory stocks are not currently maintained at cost-effective levels, for high inventory costs have been experienced due to excessive buildup of stock levels. Inventories contain many items that are obsolete and indiscriminate adjustments to inventories are frequently made.

Potential Improvements: Item usage data will be captured and stored to determine economical stock levels and reorder quantities. Usage data will also help to identify items no longer in use and to determine the causes of inventory shrinkages.

Operational Impact: Minimizing stockouts will cause fewer jobs to be delayed because of insufficient supplies. Maintaining cost-effective stock levels will reduce inventory carrying costs. Identifying obsolete stocks and items that are in excess supply will also result in cost savings. Improving the ability to determine the causes of stock adjustments will reduce inventory shrinkages.

Organizational Impact: unknown

Assumptions and Constraints: none

System Functions and Operations: Inventory data will be entered at the plants when supplies are withdrawn or received. Inventory reports coupled with procedures available in the Forecasting Subsystem will be used to determine inventory levels and reorder amounts. Automatic reorders will be triggered and routed to the Purchasing and the Planning and Scheduling Subsystems. Summary level reports on stock levels and adjustments will be available to the divisions and NPPSMO.

Inputs:

- User request for item
- Inventory adjustments
- Item in stock query
- Receipt of goods notice

Outputs:

- Usage report
- Inventory report
- Need to reorder notice

Interfacing Subsystems:

- Purchasing
- Planning and Scheduling

Title: Production Planning And Scheduling Subsystem

Objective: Automate job process plan entry, cost estimation, and process scheduling in order to optimize plant production.

Background: Observations at DPS indicated that job process plans and costs are now performed manually on paper forms that accompany the job through the plant. When the job is complete, the same information is keyed into the batch mode Cost and Financial subsystem for charging to customer accounts.

Potential Improvements: Job process plan will be created using automated input formats and automatic cost computations. During this process the following will be determined: availability of optimum production routes, cost estimates, current and projected work loads, availability of material and equipment, and manpower requirements. Time and labor costs will be reduced by one-time entry of cost data, and production will be increased by on-line automatic scheduling of jobs. Automatic rescheduling and re-routing of jobs in a plant will improve resource utilization and balance workload distribution.

Impact On Equipment: Equipment utilization will be improved and workloads balanced.

Impact On Organization: unknown

Impact On Operations: Process plan entry will be expedited and jobs will not be allowed to proceed if customer funds do not cover costs. Remedial scheduling required by equipment failure will be automated.

Assumptions And Constraints: None

System Functions And Operations: Two levels of planning will be provided at each plant. Lower level planning will prepare process plans for each individual job, specifying the manner it is to be performed, the resources required, and the estimated cost. Higher level planning will schedule plant operations and route jobs through the plant to maximize productivity and meet job priorities. Job information will be entered into the computer using standard NPPS pricing schedules, job costs will be estimated and charged to customer accounts, and jobs will proceed only if adequately funded. At job completion, actual costs will be determined and the proper billing and accounting information will be sent to the Customer Accounts and Cost and Financial subsystems. The scheduling function will design an optimum route and schedule for completing the job plan based on priority, current equipment status, and plant workload distribution. The Production Monitoring and Control Subsystem will then track the job through the plant. In addition to scheduling new jobs, the scheduler will occasionally re-route existing jobs to reduce backlogs. Records will be maintained on job requirements, workloads, equipment performance, and workstation capacities for scheduling jobs and forecasting workloads.

Interfacing Subsystems:

- Production Monitoring and Control
- Equipment Inventory
- Materials Inventory
- Cost and Financial

Customer Accounts
Forecasting

Input:

Initial job description
Job process plan
Plant equipment status
Plant configuration and capacities
Recurring job load description
Manpower resources
NPPS process cost schedule
Customer account status

OUTPUT:

Job process plan, schedule and route
Estimated cost
Equipment use trend report
Job trends report
Workload distribution trend report

Title: Commercial Procurement Subsystem

Objective: Provide the NPPS capability to manage the printing procurement program by developing a comprehensive information system containing procurement and contractor data.

Background: NPPS is unable to monitor and manage the printing procurement program which provides 60% of NPPS gross revenue. Consequently, a centralized data base containing procurement information would provide NPPS with the capability to properly manage commercial procurement.

Potential Improvements: A centralized management system will contain printing procurements by contractor, enabling NPPS to determine contractual cost estimates for work to be performed. Information on type of printing being procured, quality and quantity of contractors work, number of procurement actions, and procurement lead times would be readily available.

Impact On Equipment: Specific equipment may be acquired or eliminated, depending on the performance of contracted jobs utilizing these types of equipment and overall inhouse job requirements.

Impact on Operations: Specific operations will be performed both in- and out-house to determine the most economic means of performance.

Assumption and Constraints:
none

System function and Operations: In order to judge past performance of contractors, information will be obtained describing accuracy of contract cost estimates, job quality, and size and length of jobs. Also, with interaction from the Planning and Scheduling subsystem, estimates of job costs can be made and used in the development of contracts.

Input:

- Contractors Name and ID
- Award Date
- Amount of Contract
- Type of Work
- Time Estimates
- Start and End date of job
- Size of job
- Job Quality

Output:

- Procurement Lead Time
- Job Volume
- Job performance
- Actual and estimated costs of contracts

Interfacing Subsystem:

- Forecasting
- Planning and Scheduling

Title: Production Monitoring and Control Subsystem.

Objective: Track jobs in the printing plant, monitor their compliance with schedules, and generate itemized and summary reports of production efficiency.

Background: Capabilities do not exist to monitor and track jobs through the printing process and to handle customer inquiries on job status.

Potential Improvements: Jobs will be tracked from planning through various production processes (planning, composition, press, bindery, shipping, etc.). The status and location of individual jobs in the plant will be readily available, providing accurate evaluation of plant productivity, equipment utilization and performance, and assessment of plant capacity and loads. Furthermore, customer satisfaction will be increased by the ability to provide timely job status reports. Also, better estimates of commercial procurement will be possible from accurate assessment of plant loads.

Impact On Equipment: Accurate data on equipment utilization and performance will aid in the selection and replacement of equipment.

Impact On Organization: unknown

Impact On Operations: The greatest impact will be on the plant job allocation and routing operations. Station operators will enter job identification numbers (either by keying in numbers to a terminal or by using an automated reading device such as a bar code reader) to move jobs in and out of workstation queues. Job routing will be automated with manual over-rides available. Customer accounts billing and cost and financial data will be generated and made available to these subsystems. The system will monitor and compile all production data, reducing manual record keeping requirements.

System Functions And Operations: Fast location and chronological tracking of all jobs in the plant will be provided. Jobs will be logged in and out of all workstations, and the size and contents of all workstation job queues will be dynamically maintained. Bottlenecks will be identified so that new jobs can be routed around the bottleneck; possibly jobs already at the workstation affected by the bottleneck can be reallocated. Equipment readiness will be monitored and all equipment failures will be reported. Equipment status and readiness reports will be compiled and furnished to management personnel as well as to the Scheduling and Planning Subsystem. Itemized and summary production reports will be compiled, maintained, and generated, differing in scope according to the management level utilizing the reports.

Assumptions And Constraints: Data entry requirements for tracking jobs will depend on the type of equipment used, e.g., keyboard terminals, bar code readers.

Interfacing Subsystems:

- Cost and Financial
- Customer Accounts
- Supply Inventory Control
- Equipment Inventory
- Production Planning and Scheduling

Input:

Job identification, priority, time received
Job process plan and costs
Job schedule and route
Times in and out of queues at each workstation for each job in plant
Workstation equipment status and notice of malfunction

Output:

Location of and chronological tracking of jobs in plant
Itemized production report for plant, division or NPPS
Summary production report for specified periods
Cost adjustments if needed

Title: Purchasing Subsystem

Objective: Automate purchasing operations so that status of orders and other purchasing information can be determined as needed and entries can be tracked through the entire purchase cycle.

Background: Current procedures do not provide sufficient information to adequately process purchase orders, determine the status of purchase orders, monitor supplier performance, trace orders, and identify delays.

Potential Improvements: The status of any purchase order will be determined by entering a query from a terminal. Automatic reorder information will be provided from the inventory subsystem when inventory quantities fall below reorder points. Information on damaged, incorrect and incomplete shipments will be captured upon delivery for follow-up action by appropriate personnel. Data on supplier performance will be maintained for use in future purchasing decisions.

Operational Impact: Automatic reorder capability will reduce ordering delays and the safety stock levels required to prevent stockouts. Supplier performance data will be used to evaluate NPPS suppliers.

Organizational Impact: unknown

Assumptions and Constraints: none

System Functions and Operations: Reorders will be received through the Materials Inventory Subsystem, and equipment orders will be supplied by various plant personnel. Ordering information and other data will be used to generate formatted purchase orders. The description and status of all purchase orders will be kept on file and will be available. Information on supplier performance will be collected and stored and can later be retrieved in summary form to make future purchasing decisions. Cost data on all purchases will be routed to the Cost and Financial Subsystem.

Inputs:

- New supplier
- Purchase order
- Purchase order status query

Outputs:

- Supplier performance report
- Purchase report
- Unfilled or late orders report
- Receipt exceptions report

Interfacing Subsystems:

- Cost and Financial
- Materials Inventory
- Equipment Inventory
- Commercial Procurement

APPENDIX E

PLANNING OVERVIEW AND MILESTONES (POAM)

PLAN OF ACTION AND MILESTONES FOR THE DEVELOPMENT OF
THE PRINTING RESOURCES MANAGEMENT INFORMATION SYSTEM

FEBRUARY 10, 1981

PREPARED BY:

THE COMPUTER SCIENCE AND INFORMATION SYSTEMS DIVISION,
DAVID TAYLOR NAVAL SHIP R AND D CENTER,
BETHESDA, MARYLAND

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PHASE B: CONCEPT DEVELOPMENT - MILESTONE 1

ITEM	1981 MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1982 JAN	FEB	MAR	APR	MAY
1 APPOINT PROJECT MANAGER; APPROVE CHARTER															
2 REQUIREMENTS IDENTIFICATION AND ANALYSIS (SUBCHART 1)															
3 STATE FUNCTIONAL OBJECTIVES															
4 IDENTIFY DATA REQUIREMENTS AND COLLECTION TECHNIQUES															
5 PREPARE FUNCTIONAL CONCEPT															
6 SELECT AND SOLICIT ALTERNATIVE DESIGN CONCEPTS															
7 PRELIMINARY CONTRACTOR VS IN-HOUSE DETERMINATION															
8 PRELIMINARY EVALUATION OF RECOMMENDED CONCEPTS															
9 PRELIMINARY ECONOMIC ANALYSIS															
10 RECOMMEND CONCEPTS FOR FURTHER EVALUATION															
11 DEVELOP FUNCTIONAL DESCRIPTION (SUBCHART 2)															
12 ECONOMIC ANALYSIS (SUB- CHART 3)															
13 INITIAL DETERMINATION OF SYSTEM/SUBSYSTEM SPECS															
14 PREPARE TELCOM SPECS															

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PHASE C: DEFINITION/DESIGN - MILESTONE 11

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ITEM	1982 SEP	1982 OCT	1982 NOV	1983 DEC	1983 JAN	1983 FEB	1983 MAR	1983 APR	1983 MAY	1983 JUN	1983 JUL	1983 AUG	1983 SEP	1983 OCT	1983 NOV	1983 DEC	1984 JAN	1984 FEB
1. REFINE DEFINITION OF SYSTEM/SUBSYSTEM FUNCTIONS																		
2. DEFINE ALL INTERFACES BETWEEN SYSTEMS/SUBSYSTEMS																		
3. HARDWARE ACQUISITION (SUBCHART 6)																		
4. DEVELOP DETAILED SYSTEM DESIGN																		
5. COMPLETE AND DOCUMENT SYSTEM/SUBSYSTEM SPECS																		
6. REVIEW SYSTEM/SUBSYSTEM SPECS WITH USER																		
7. COMPLETE DATA REQUIREMENTS DOCUMENT																		
8. REVIEW/FINALIZE CONTRACTOR VS IN-HOUSE DETERMINATION																		
9. COMPLETE PROGRAM SPECS																		
10. COMPLETE DATABASE SPECS																		
11. DEVELOP USER'S MANUAL																		
12. DEVELOP OPERATOR'S MANUAL																		
13. UPDATE TRAINING PLAN																		
14. UPDATE/REVIEW T AND E PLANS																		

AD-A102 802

DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CE--ETC F/6 5/1
PROCEEDINGS OF THE PRINTING RESOURCES MANAGEMENT INFORMATION SY--ETC(U)
JUN 81 M GRAY
DTNSRDC/CHLD-81/20

UNCLASSIFIED

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3 of 3
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PHASE D: SYSTEM DEVELOPMENT - MILESTONE III

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ITEM	1983 AUG	SEP	OCT	NOV	DEC	1984 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1985 JAN	FEB	MAR
1 COMPLETE TRAINING PLAN																				
2 PREPARE TESTBED SITE																				
3 CONDUCT DEVELOPER TRAIN- ING																				
4 COMPLETE CONFIGURATION MANAGEMENT PLAN																				
5 COMPLETE STAFFING PLAN																				
6 COMPLETE T AND E PLAN																				
7 INSTALL DEVELOPER TESTBED																				
8 ESTABLISH CONFIGURATION MANAGEMENT ORGANIZATION																				
9 MONITOR CONTRACTOR PER- FORMANCE																				
10 DEVELOP AND CODE PROGRAMS																				
11 REVIEW/COMPLETE USER'S AND OPERATOR'S MANUALS																				
12 BEGIN SITE PREP																				
13 DEVELOP DATABASE																				
14 CONDUCT USER TRAINING																				

ITEM	1985							
	APR	MAY	JUN	JUL	AUG	SEP	OCT	
1 COMPLETE TRAINING PLAN								
2 PREPARE TESTBED SITE								
3 CONDUCT DEVELOPER TRAIN- ING								
4 COMPLETE CONFIGURATION MANAGEMENT PLAN								
5 COMPLETE STAFFING PLAN								
6 COMPLETE T AND E PLAN								
7 INSTALL DEVELOPER TESTBED								
8 ESTABLISH CONFIGURATION MANAGEMENT ORGANIZATION								
9 MONITOR CONTRACTOR PER- FORMANCE								
10 DEVELOP AND CODE PROGRAMS								
11 REVIEW/COMPLETE USER'S AND OPERATOR'S MANUALS								
12 BEGIN SITE PREP								
13 DEVELOP DATABASE								
14 CONDUCT USER TRAINING								

PAGE 9

[illegible]

PAGE 11

[illegible]

APPENDIX A: SUBCHARTS

1. REQUIREMENTS IDENTIFICATION AND ANALYSIS (SEE PHASE B, ITEM 2)
2. DEVELOPMENT OF FUNCTIONAL DESCRIPTION (FD) (SEE PHASE B, ITEM 10)
3. ECONOMIC ANALYSIS (SEE PHASE B, ITEM 11)
4. DEFINITION OF SECURITY REQUIREMENTS (SEE PHASE B, ITEM 15)
5. DEVELOPMENT OF PRELIMINARY PLAN (SEE PHASE B, ITEM 17)
6. HARDWARE PROCUREMENT CYCLE (SEE PHASE C, ITEM 3)

SUBCHART 2: DEVELOPMENT OF FUNCTIONAL DESCRIPTION (FD)

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ITEM	1981		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		1982		JAN		FEB		MAR		APR	
	MAR																													
1 ESTABLISH SYSTEMATIC PROCEDURE TO DOCUMENT REQUIREMENTS																														
2 GATHER DETAILED REQUIREMENTS																														
3 DETERMINE FUNCTIONAL DESCRIPTIONS:																														
INPUTS, PROCESSES, OUTPUTS AND INTERFACES																														
4 COMPILE DATA ELEMENT DICTIONARY																														
5 DETERMINE PERFORMANCE MEASURES																														
6 VALIDATE FUNCTIONAL DESCRIPTIONS																														
7 RESOLVE INCONSISTENCIES																														
8 USER REVIEWS FUNCTIONAL DESCRIPTIONS																														
9 REVIEW FINAL FD																														
10 USER APPROVES FINAL FD																														

[illegible]

[illegible]

SUBCHART 6: HARDWARE PROCUREMENT CYCLE

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ITEM	1982 SEP	OCT	NOV	DEC	1983 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1984 JAN	FEB
1 PREPARE ACQUISITION PLAN; DETERMINE OVERSIGHT RESPONSIBILITY																		
2 OBTAIN GSA BIDDERS LIST																		
3 DRAFT FINAL SOLICITATION DOCUMENT(SD)																		
4 OBTAIN DPA FROM GSA																		
5 RELEASE PRE-SOLICITATION NOTICE & EVALUATE REPLIES																		
6 MODIFY SD AS REQUIRED																		
7 GSA REVIEW OF SD																		
8 RELEASE SD AND RECEIVE RESPONSES																		
9 EVALUATE RESPONSES																		
10 CONDUCT NEGOTIATIONS																		
11 RECEIVE REVISED PROPOSAL																		
12 EVALUATE PROPOSAL																		
13 PERFORM BENCHMARKS																		
14 AWARD CONTRACTS																		

APPENDIX F

PRMIS MISSION ELEMENT NEED STATEMENT (MENS)



DEPARTMENT OF THE NAVY
NAVY PUBLICATIONS AND PRINTING SERVICE
MANAGEMENT OFFICE
WASHINGTON, D.C. 20374

PD:SD:FZ:pcj
5230

JAN 28 1981

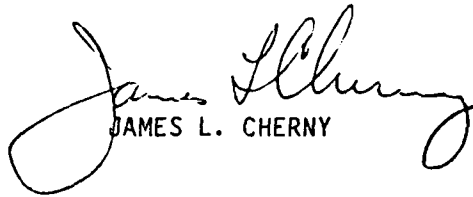
From: Director, Navy Publications and Printing Service
To: Chief of Naval Material (MAT 09Y)
Via: Commander, Naval Supply Systems Command (SUP 04112A)

Subj: Printing Resources Management Information System

Ref: (a) SECNAVINST 5231.1A of 20 November 1979

Encl: (1) Mission Element Need Statement

1. In accordance with reference (a), enclosure (1) is hereby forwarded.


JAMES L. CHERNY

MISSION ELEMENT NEED STATEMENT (MENS)

A. Requirement

There is a requirement that the Navy Publications and Printing Service (NPPS) Headquarters, division and plant personnel have access to production management and plant operational data in a timely manner to optimize resource and equipment utilization.

B. Content

1. Mission Area Identification

The primary mission of NPPS is to provide printing and publication services to the Navy, the Department of Defense and Federal Agencies which include the Executive Office of the President. Financial management reporting responsibility is to the Assistant Secretary of the Navy for Financial Management (ASN/FM). Operational (production) responsibility for printing services is under the authority of the Joint Committee on Printing, Congress of the United States (JCP).

The Director of NPPS is responsible for the operations of NPPS Headquarters activities and services provided by NPPS field divisions and production facilities. The ability of the Navy and NPPS customers to meet their information requirements is dependent upon the level of service that NPPS can offer on a plant-to-plant, world-wide basis. This includes the capability to be responsive to customer requests, and meet these requests in the most efficient and economical manner possible.

As a Navy Industrial Fund Activity, NPPS provides publication and printing services on a cost reimbursable basis. Customers are billed for the cost of reproducing and printing documents, and payment results in NPPS revenues. These revenues are used to cover operational and management expenses incurred in support of the production facilities.

2. Deficiency Statement

NPPS consists of 56 major field activities throughout the world plus NPPS headquarters in Washington, DC. Management and operational decisions are made daily at the field locations and at NPPS headquarters; however the data for these decisions is not available at a central depository. Information for decision making is developed through document submission, via mail, from 56 printing plants and other detached printing facilities to four regionally located NPPS Divisions and to NPPS Headquarters. The delays and lack of standardization in this essentially manual system result in untimely and inaccurate management reporting thus providing a poor tool for achieving the management objectives of controlling costs and maximizing

efficiency. No system exists in NPPS to provide advanced management information or techniques which are required to effectively control and manage NPPS operations.

Given the escalating costs of equipment, materials, manpower and facility maintenance, NPPS operational and management personnel cannot continue to operate effectively without rapid access to, and analysis of, production management information.

Deficiencies exist within the following functional areas:

- a. Material Inventory Management - the current manual system does not support the management of approximately 2000 line items of supply on a system-wide basis.
- b. Equipment Inventory Management - presently, items of equipment and related production and depreciation data are not maintained in a centralized data base. Life expectancy data or maintenance related information is not maintained nor is a history of repair or budget-related acquisition data. The unavailability of data to calculate remaining life expectancy of equipment items results in inefficient and inaccurate projections/recommendations for equipment replacement, transfer and/or disposal.
- c. Purchasing - the current system does not provide automatic recommended purchase order information based on the monitoring of on-hand, on-order methods. No system exists for tracing purchases or for flagging delays.
- d. Funds Resources and Status - a need exists to automatically track customer requisitions or orders for NPPS services to calculate the amount of unbilled orders for the customer fund. No management tool exists to preclude acceptance of orders from customers whose funds have become exhausted.
- e. Budget - operating budgets are currently prepared manually to forecast revenue and cost for future fiscal years. No centralized data base exists to extract statistical information relative to growth trends, equipment performance, relative plant capacity, etc. or to provide for the collection of data for the planning and control of NPPS operations and pricing/marketing strategy.
- f. Production Planning and Estimating - the planning and estimating of production is currently done manually. The planner does not have adequate information to assess the availability of the optimum production route, to determine exact cost estimates, current and projected workloads or availability of materials, equipment and manpower.
- g. Scheduling and Production Control - no management tool exists to monitor the progress of each job in the printing plant from planning through the various production processes (composition,

camera, press, bindery, shipping, etc.) thus disallowing customer inquiries to be made regarding the status of any job. Plant managers cannot "track" any particular job through the printing processes, assess the impact of problems, reschedule the job before production or access any information on plant load in a timely manner.

- h. Forecasting - the lack of operations research modules makes it virtually impossible to project, in the decision making process, the impact of new technology in the printing industry, impact of the technologies to facilitate NPPS' plan to update its output capability or to obtain data to facilitate resource utilization.
- i. Commercial Procurement - NPPS is unable to monitor and manage the printing procurement program which consists of 60% of NPPS' gross revenue. Timely information is not available regarding types of printing being procured, quality and quantity of work contractors are providing, number of procurement actions and procurement lead times. There is no central data base of existing contracts to enable NPPS to determine contractual cost estimates for work to be performed.
- j. Reprographics Inventory - this system is currently operating in a C/I environment in an on-line real-time mode. This system provides vital information to NPPS in managing the Navy's inventory of reproduction and duplicating equipment. A need exists to integrate this system into a total management information system.
- k. Cost and Financial - this system is currently operational in a C/I environment and provides vital information relative to the investment and disposition of the labor, materials and financial resources of the NPPS NIF and operates in a remote batch mode. A need exists to enhance and integrate this system into a total information system in an on-line, real-time mode to provide timely and accurate information.

3. Existing and Programmed Capabilities

NPPS currently operates an automated financial management system that provides financial condition statements and consolidated management reports to satisfy the requirements of the ASN/FM. These reports are, however, limited to consolidated financial reporting data and are not available to Headquarters, division and plant personnel in a timely manner to effect resource optimization. This system has no interactive capability, is limited to batch processing, and is not designed to accept or maintain the necessary data elements for effective production management. Additionally, the financial condition statement output by the current system is not readily processed or available to plant and division managers.

A second automated management information system is operational to support NPPS Headquarters in the management of the Navy's reprographic equipment.

C. Constraints

1. Navy Industrial Fund (NIF) data must be reported monthly by the 15th of the subsequent month to the ASN(FM). NAVCOMPINST 7331.4 and ASN(FM) Management by Objectives memos indicate this requirement.
2. The statutory requirements of Section 2208, Title 10, US Code must be met. This statute requires reports on "the financial condition and operations of working capital funds to be made annually to the President and to Congress".
3. The statutory requirements of Section 3679, Revised Statutes (31 USC 665) must be met. This statute "prohibits the obligation and expenditures of funds in excess of the amount of funds/monies available." The inability to collect cash would eventually cause the NIF to become depleted thus violating Section 3679.
4. The system has to compensate for increased functional responsibilities delegated by higher authority without corresponding increases in resources. For example, OPNAV Instruction 10461.8 assigned NPPS additional functional responsibilities for centralized management for reproduction and duplicating equipment, Navy-wide, without a corresponding increase in resources.
5. The existing automated capabilities must be enhanced while the recommended functional areas must be developed over a period of time to provide for an automated integrated management information system.
6. Continued teleprocessing support for existing systems and the support for the future systems must be addressed in terms of operating through commercial teleprocessing services or in a different configuration architecture.
7. Because of limited headquarters resources for the development of a system to alleviate the aforementioned deficiencies, most of the work will require contractors support.
8. The system must be designed for users who are non-ADP oriented and with little or no ADP experience.

D. Alternatives To resolve the deficiencies in the functional areas listed above, an automated, interactive, integrated management system is necessary. Maintenance of a "status quo" position will not resolve the deficiencies. The following alternatives will be considered in the development of any ADP system to alleviate the deficiencies:

1. Expanded automated data processing support via Commercial/Industrial Resources.
2. Data processing support via Navy/Government Resources.
3. Data processing support via NPPS resources which would required the acquisition of ADP hardware, software and personnel by NPPS.

E. Recommended Solution

1. A systems engineering assessment must be conducted to determine the specific system characteristics needed to support Headquarters, division and plant requirements for interactive management information.
2. Based on the above analysis, an AIS must be developed and implemented to satisfy the requirements, resolve the deficiencies and to integrate the functional areas into a total Management Information System.

APPENDIX G

DETAILED FINDINGS

MG:mg:1826
28 May 1981

MEMORANDUM

From: M. Gray
To: PRIMIS file

Subj: Notes from PRIMIS Workshop

1. The information in this memo was derived from notes taken by Joe Garner, Jim O'Donnell, and myself during the PRIMIS Workshop held from May 5 to 7.

2. The materials inventory subsystem was viewed as high priority with applications for the larger plants that have significant inventory levels. The current inventory system is manual, too time-consuming, unable to properly track material costs through to the customer, and prone to error. Not only does Navy direction mandate inventory control, but 25% of the cost of printing jobs represents material costs. All inventory receipts and issues, and their associated costs impact directly on the "moving average price computation" specified by NAVCOMP and used to charge plant customers for materials. Since material costs keep rising, it is important to maintain material prices in terms of the moving average as up-to-date as possible. Tight control needs to be maintained over orders, receipts, and material issues. Receipts must be checked against orders and invoices and an amount payable for every invoice automatically created. Material must be tracked from receiving to storage, and issues must be monitored. Subsystem should compute optimum reorder points, generate automatic purchase documents based on demand history, and produce monthly summary reports of material inventory. Benefits of automatic inventory are more accurate financial statements, reduced labor costs, and better utilization of scarce storage (especially at EPS).

3. The equipment inventory subsystem is most interesting to NPPSMC for use in fixed asset accounting. A catalog of equipment, both owned and rented, with acquisition costs, expected replacement costs and times, and useful life is required to compute depreciation. Questions arose as to whether maintenance histories should be collected and at what level. Maintenance actions are currently entered by cost centers only and are not associated with individual equipment items. NPPSMC would like to collect maintenance data for each individual piece of equipment. However, DPS indicates that data collection costs associated with such an operation could be significant and suggests that equipment data should be collected by cost center.

4. The key goal of the customer account subsystem is to produce timely and accurate maintenance information on open requisition accounts. Customer status should be checked when jobs are received and work should not proceed on the job unless sufficient funds exist. Customer accounts should reflect funds obligated for the job when the job is accepted and charged to the account on completion. Jobs should be tracked continually to provide customers with monthly account reports itemizing jobs, date and cost, and back-up billing. This subsystem will decrease paperwork and overbilling, increase availability of funds, and increase customer satisfaction.

5. The production monitoring subsystem will find most applicability in monitoring large jobs. For example, for the many large jobs performed at DPS a continuous tracking capability would be required, while Norfolk needs only to track 30 to 50% of its jobs. At Norfolk many small jobs are not planned and not itemized on customer bills. Jobs could cost as little as \$.75. Also, 95% of the jobs go through the plant in less than one day. Generally, the production subsystem needs to be versatile and selective in order to meet the varied needs of different size plants. The subsystem should track jobs by cost center and estimate costs, efficiency, and production levels. Basically, job numbers and cost center can be keyed in for a job as it moves through plant. Output could be used for billing and production analysis, e.g., measuring average turnaround time for jobs and work flow by cost centers.

6. Additional comments were

- * the purchasing subsystem should be integrated with the materials inventory subsystem
- * present description of procurement subsystem needs to be rewritten to reflect NPPS requirements more accurately
- * automatic printing of shipping labels would be very helpful

Michael Gray

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