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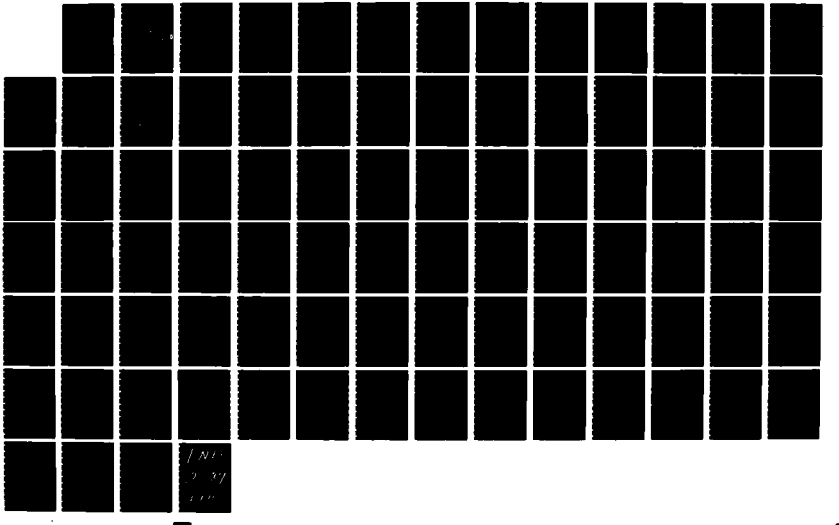

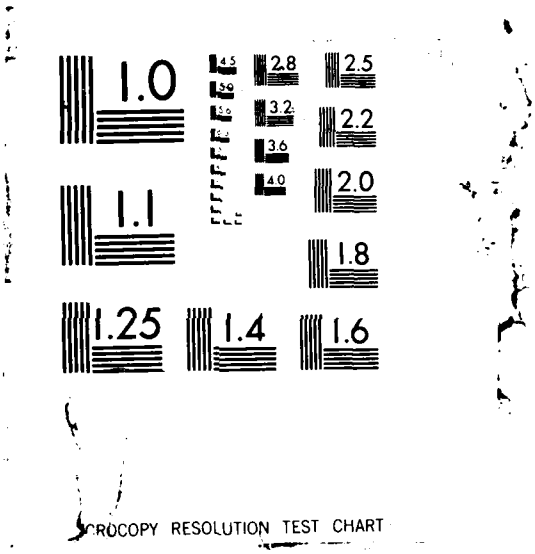
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NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

AN INVESTIGATION OF IBM'S BUSINESS SYSTEMS PLANNING (BSP) AS A SUITABLE METHODOLOGY FOR STRATEGIC INFORMATION SYSTEMS PLANNING FOR THE NAVAL RESERVE

by

Frederick B. Duckworth

September 1986

Thesis Advisor: Michael P. Spencer

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An Investigation of IBM's Business Systems Planning (BSP) as a Suitable Methodology for Strategic Information Systems Planning for the Naval Reserve

by

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ABSTRACT

This research examines the Naval Reserve organization, information systems (IS) planning, and IBM's Business Systems Planning (BSP) methodology. The Naval Reserve is analyzed in the context of IS planning requirements. The information needs of the organization are examined as well as that organization's current IS planning process. BSP is investigated as an alternate planning methodology. A partial analysis of the Naval Reserve using BSP is used as an illustration of the methodology. It highlights some of the information related complexities and organizational influences that confront the IS planner.

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I. INTRODUCTION

Information is a key resource in any organization. The Naval Reserve is no exception. But is it treated as a key resource? How is it managed? Clearly, the management of information within the Naval Reserve is dependent upon the larger issues of strategic policy and organizational philosophy regarding information systems management. It is not a question of whether the Naval Reserve should plan the evolution of their information architecture, because some kind of planning is taking place, mandated at least by the budgeting process. The question is how well articulated is that planning process and what is the methodology behind it? IBM's Business Systems Planning (BSP) is one such methodology. Would it be an appropriate information systems planning guide for the Naval Reserve? The purpose of this thesis is to evaluate BSP as a methodology for analyzing the Naval Reserve in order to determine information systems (IS) needs.

This thesis is limited to an evaluation of BSP as a methodology for understanding information flow in the Naval Reserve in order to enable information resource decisions to be made in a coherent and consistent manner. To adequately evaluate this methodology it is necessary to examine the entire Naval Reserve structure. This organization will be

examined by itself and as a part of the larger Navy organization.

This thesis attempts to answer the following questions:

1) What is the structure of the Naval Reserve and what is the information flow that supports that structure?

2) What are the current information systems supporting the Naval Reserve and how effective are they?

3) Does the Naval Reserve have a long-range IS strategy, and if so, what is the methodology behind it?

4) Is BSP a feasible approach for IS planning in the Naval Reserve?

Chapter II examines the structure of the Naval Reserve organization. The context of that examination is in the supporting information flows, both internal and external. The information systems of the organization are also evaluated in this chapter. The purpose of Chapter II is to familiarize the reader with the organization and its functions in a general way and to gain an appreciation for some of the complexities facing the IS planner.

Chapter III looks at some of the issues involved in strategic IS planning. BSP is introduced here in relation to other planning methodologies. Finally, this chapter examines the IS planning process of the Naval Reserve.

Chapter IV examines the BSP methodology in more detail. This is done in the context of the Naval Reserve. A partial analysis of the organization is undertaken utilizing the BSP methodology.

Chapter V presents the final conclusions of the evaluation process.

II. A DESCRIPTION OF THE NAVAL RESERVE ORGANIZATION

A. INTRODUCTION

There are two main objectives for this chapter:

1) To describe the organizational structure of the Naval Reserve and the interfaces it has with other commands. The focus of this discussion will be on the internal and external information flows.

2) To present a description of the automated information systems in place within the organization and an evaluation of the extent to which they appear to satisfy the functional needs of the organization.

The structural relationships are represented by five diagrams (Figures 2-1 through 2-5). Figure 2-1 shows the internal hierarchical structure of the Naval Reserve. Figures 2-2, 2-3, and 2-4 are the organization diagrams for the staffs of Commander Naval Reserve Force (CNRF), Commander Naval Air Reserve Force (CNARF), and Commander Naval Surface Reserve Force (CNSRF) respectively. Although they may be great fun to look at, the utility of organizational charts in describing what is happening within an organization and the relative power of each box is dubious at best. They do little to describe the political reality of the organization. The most important part of any organization is what happens between the blocks, the mechanisms for communication and conflict resolution. This same caveat applies to the fifth diagram (Figure 2-5). It depicts the interfaces between the Naval Reserve and various outside

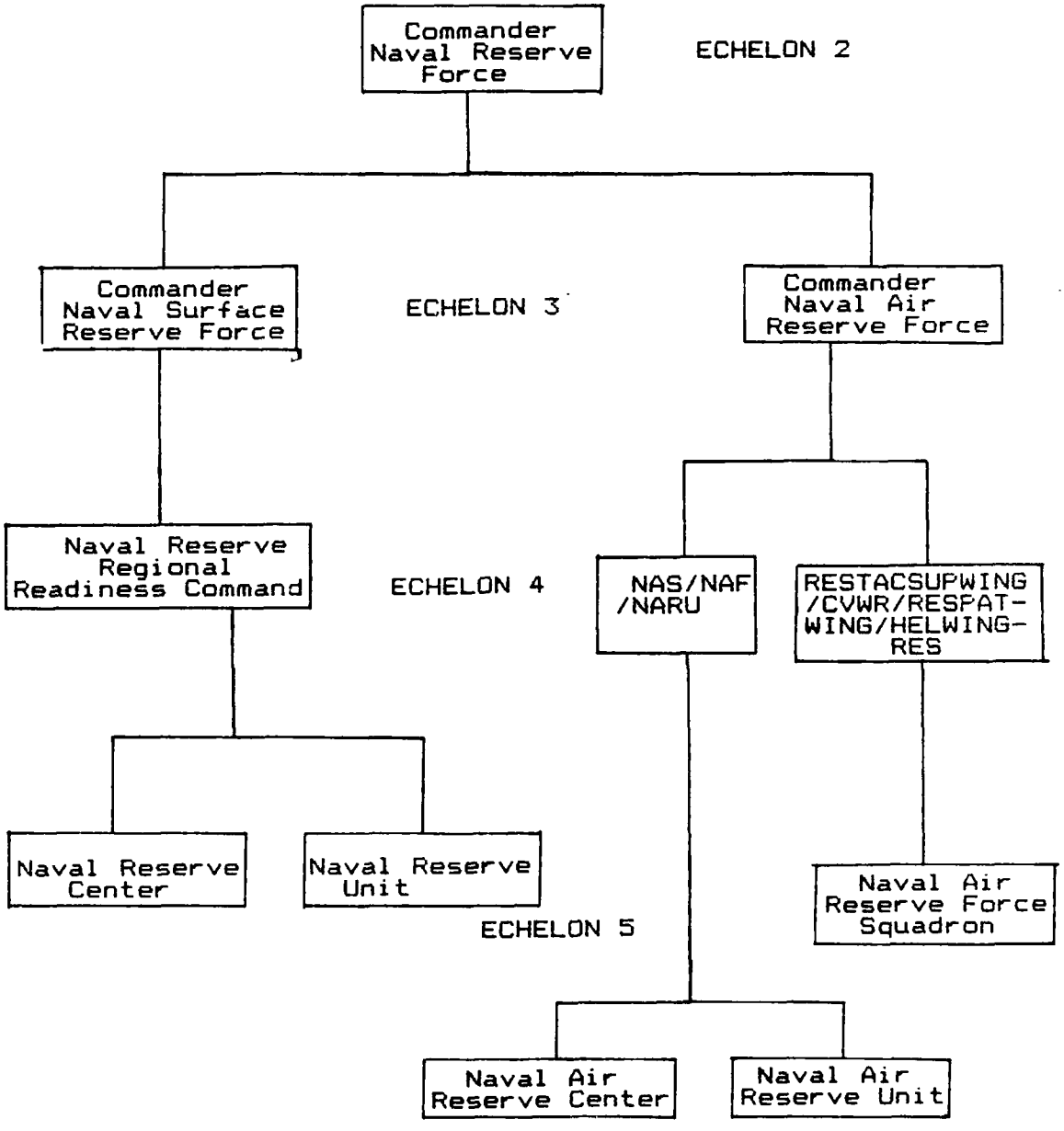

Figure 2-1 Naval Reserve Hierarchy

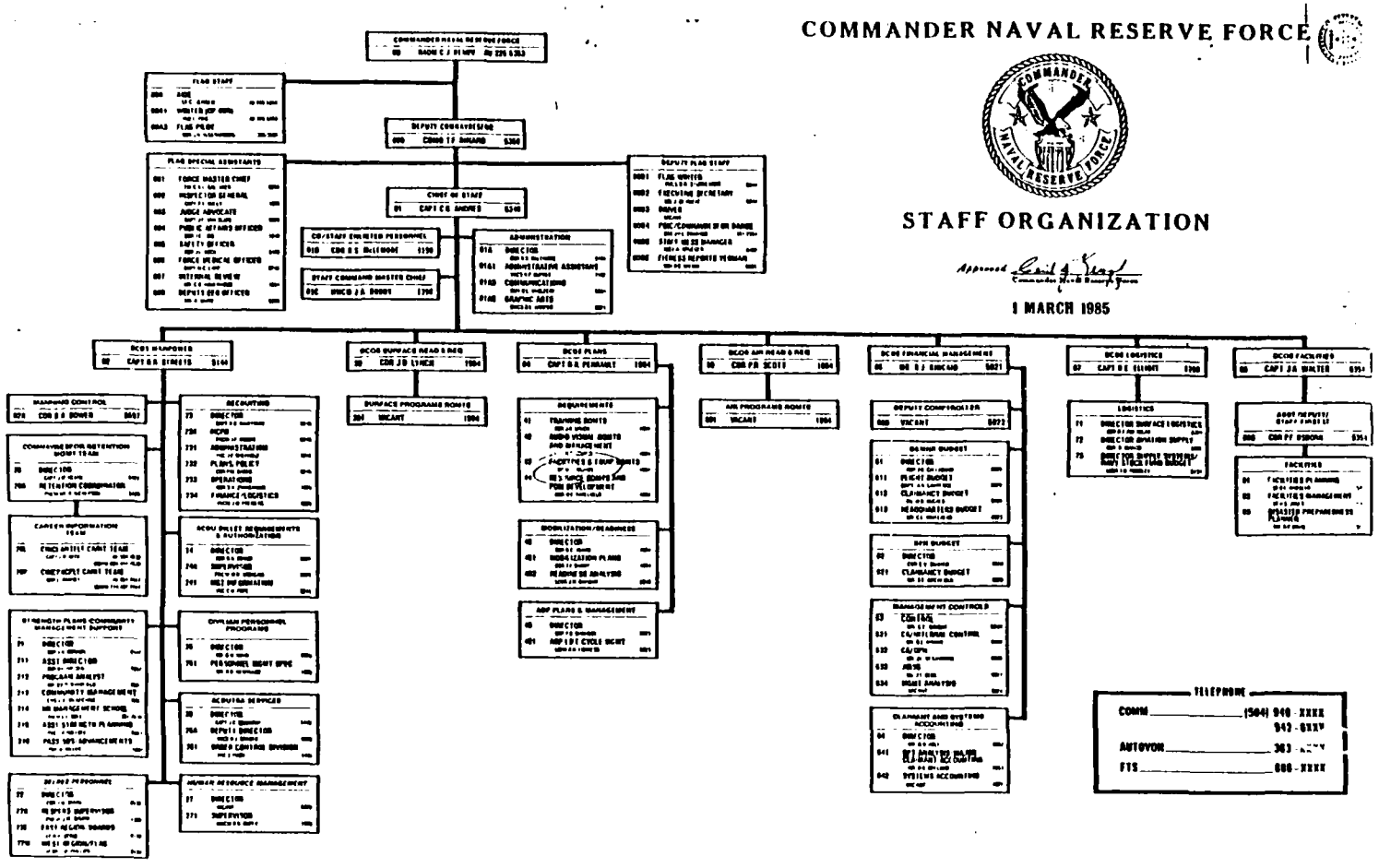

Figure 2-2 Naval Reserve Force Staff Organization

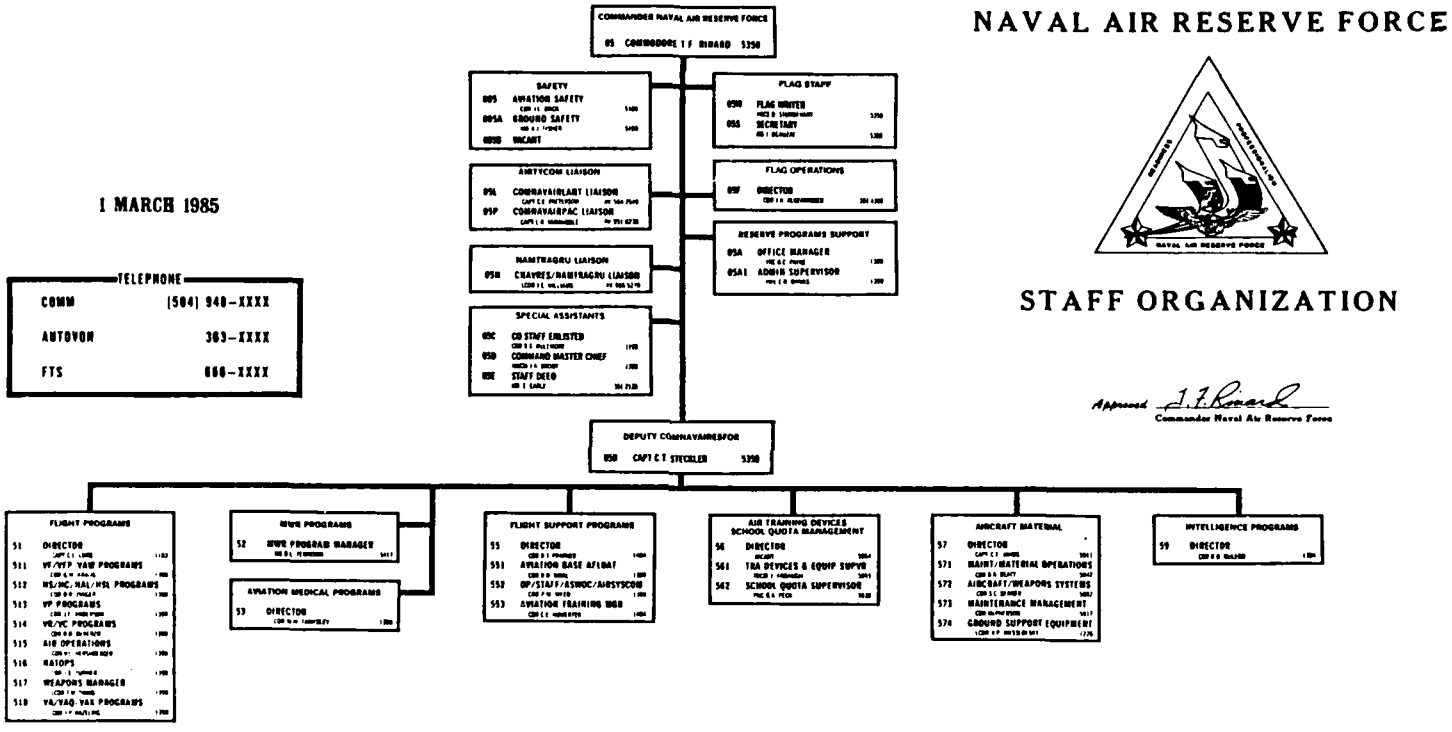

Figure 2-3 Naval Air Reserve Staff Command Structure

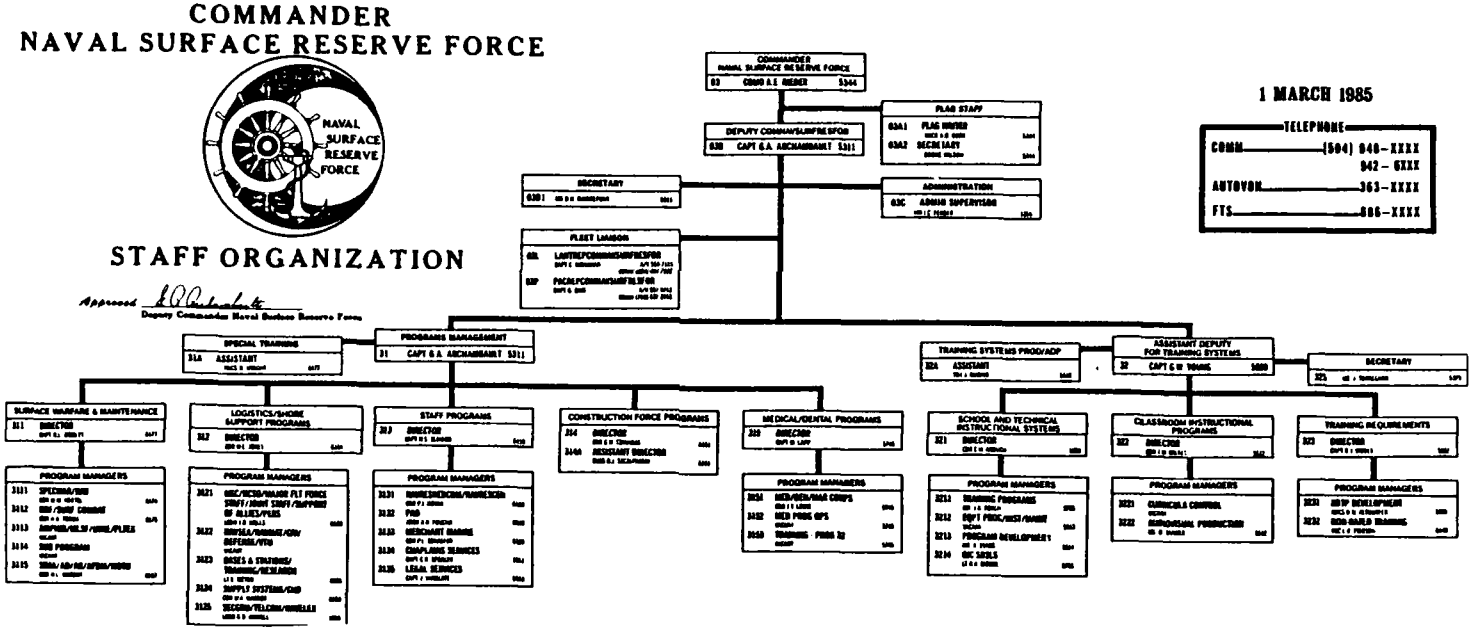

Figure 2-4 Naval Surface Reserve Force Staff Command Structure

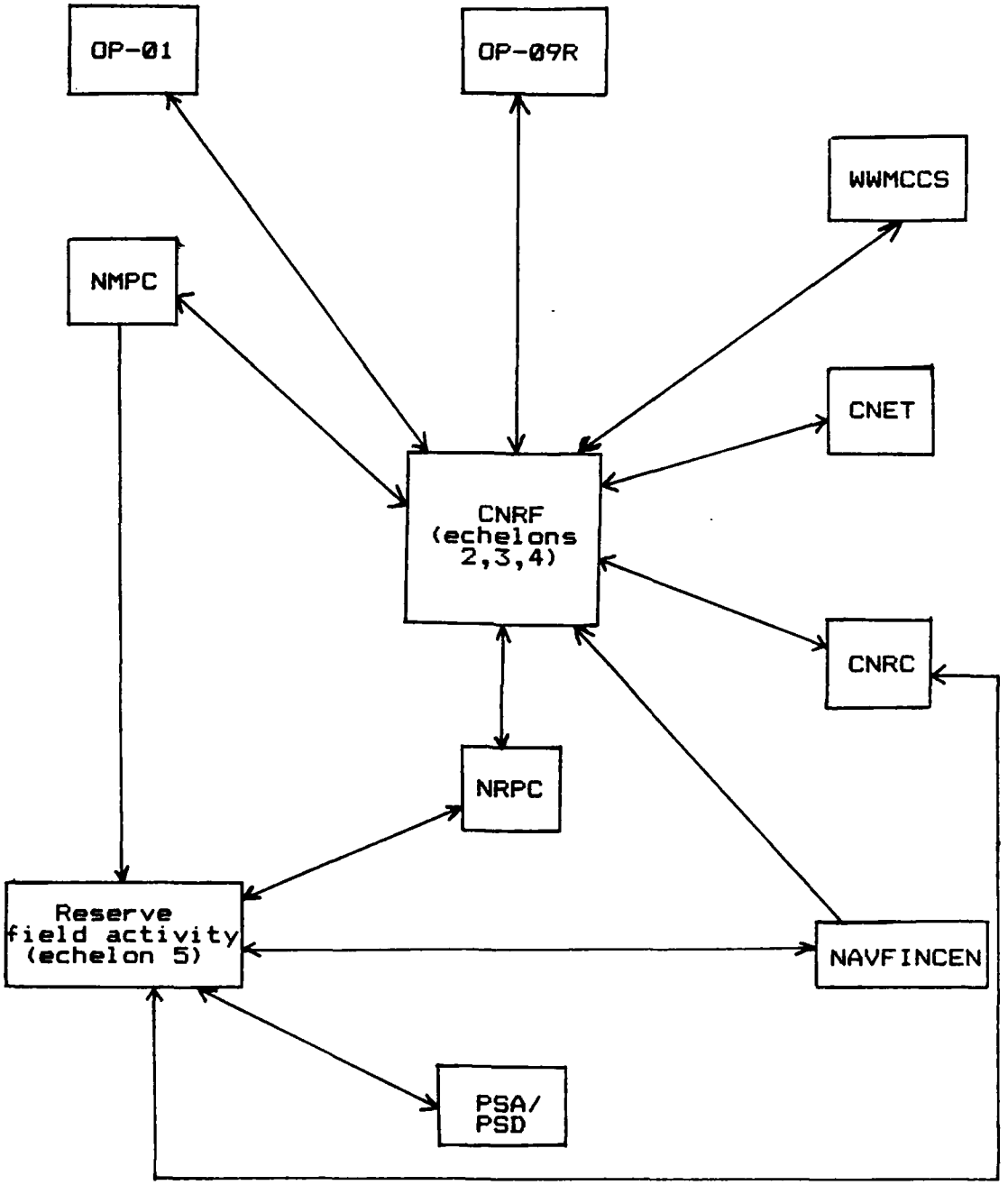

Figure 2-5 Naval Reserve External Information Flows

commands. It is not as clean as the other diagrams because there exist external interfaces at various internal organizational levels.

The following discussion will focus primarily on the information flows represented by the arrows in Figures 2-1 and 2-5. As can be readily seen, to describe the Naval Reserve organization and its supporting information flows, even in a general way, is no simple task, due principally to the complexity of the external interfaces. This discussion will concentrate on the manpower, personnel, and training functions of the Naval Reserve. The areas of logistics and facilities management will not be examined. This is not because they are not important, but to keep the analysis from becoming too burdensome; and because they can be broken out fairly cleanly, that is, their processes and information flows are separate and distinct from the areas under consideration here.

B. THE INTERNAL ORGANIZATIONAL STRUCTURE

The mission of the Commander of the Naval Reserve is the training and administration of all Naval Reserve forces. The Naval Reserve Command manages and administers over 120,000 personnel; 3000 drilling units at over 300 drill sites; assets in excess of four billion dollars; and annual expenditures in excess of 900 million dollars. With resources such as these, it is imperative that information concerning personnel, money, equipment, and most

importantly, the relationship of these factors to overall readiness be accurate and readily available. The overall goal of automated information systems within the Naval Reserve should be to support efficient and effective resource management, track training and personnel mobilization readiness, and provide an efficacious mechanism for the support of mobilization. The rest of this chapter will explore the functions of the different command levels, the scope and source of the information necessary to effectively perform those functions, and the role of existing automated information systems in support of that performance.

The concentration here will be on those functions which are essential for accomplishing the mission area objectives of the Naval Reserve. Although none of these functions is wholly confined to any one level of the organizational hierarchy, the degree and requisite information at each command level should be different for each function. The major manpower, personnel, and training (MPT) functions of the Naval Reserve are: 1) reserve pay and personnel; 2) manpower management; 3) mobilization; 4) training; and 5) recruiting.[1]

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[1]As will be discussed in the next chapter, OP-094 is responsible for developing the Navy's high level information architecture; and the Director, Total Force Information Systems Management Division (OP-16) is responsible for developing the information architecture for MPT functions. All of the functional sub-areas identified by OP-16 are not presented here. The additional five functional areas were intentionally omitted because they are felt to apply only peripherally or as part of a broader functional area. The

A decomposition of functional processes and their related input/output data reveals seven major categories of information required to support the MPT functional processes. These categories of information, their definitions, as well as a discussion of the source and extent (at what command levels the information is needed) of that information follow:

a) MANPOWER--Information related to billet/position requirements (quality and quantity), billet authorizations, and strength. The source of this information is outside the Naval Reserve organization at the OPNAV level. The preponderance of this information is needed at the upper command levels for planning and program management. The individual unit C.O. has need for this information only as it applies to his unit.

b) PERSONNEL--Personal information needed to train, mobilize, promote, assign, retain/separate individuals. This information originates at the Reserve unit level. The need for this data in anything other than summary format above the echelon 4 level is questionable.

c) PAY--Information relating to the expenditure of funds from the RPN appropriation. The source of the expenditure data is the Naval Finance Center (NAVFINCEN) and it is used in varying degrees by all command levels. The individual reservist is concerned with his paycheck, the comptrollers their budget, and the Personnel Support Detachments (PSD) their disbursements. The source of the data from which the expenditures are derived is at the echelon 5 level, the unit and Reserve Center. Any area where real money is involved is a sensitive one. The accountability measures and potential for fraud have thus far precluded this process (at the unit level) from automation.

d) TRAINING--Information needed to plan and manage training, including evaluation of selected reserve (SELRES) readiness. This information originates at both ends of the spectrum. The requirements are defined at the program sponsor (OPNAV) level and refined at the

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interested reader can refer to Reference 1.

echelon 2, 3, and 4 levels. Readiness is evaluated at the unit level and flows in a condensed and summarized format back up the chain and to gaining commands outside of the Naval Reserve organization.

e) MOBILIZATION--Recall and status information required to mobilize the total force. Again this is information that originates at both ends of the spectrum. The critical issue here is not so much the information but the communication of that information. Present mobilization procedures utilize a poor mix of old and new technologies.

f) POLICY--Higher level guidance which ensures business is conducted in a consistent manner. Military policy usually is dictated from above and flows downhill, but information from which those policies are derived comes from many different sources.

g) PPBS--Information relating to POM and budgeting process. Ideally this information originates at the lowest command levels and moves upward in a summary format. Generally the level of detail is greater at the lower levels for any individual line item while the breadth of information is greater at higher command levels.

The idea of the varying extent of each of these categories at different command levels is presented graphically in Figure 2-6.

No analysis of the internal organizational structure is complete without an obligatory reference to the staff wiring diagrams (Figs. 2-2, 2-3, and 2-4). As was mentioned at the beginning of this chapter, the diagrams are of limited value because they often do not accurately describe the organization. Nevertheless they do draw attention to a few interesting relationships. One is what they say about the relative importance of the MIS function within the organization. There is no formally identified focal point on the Air or Surface staffs for MIS matters; and that function on

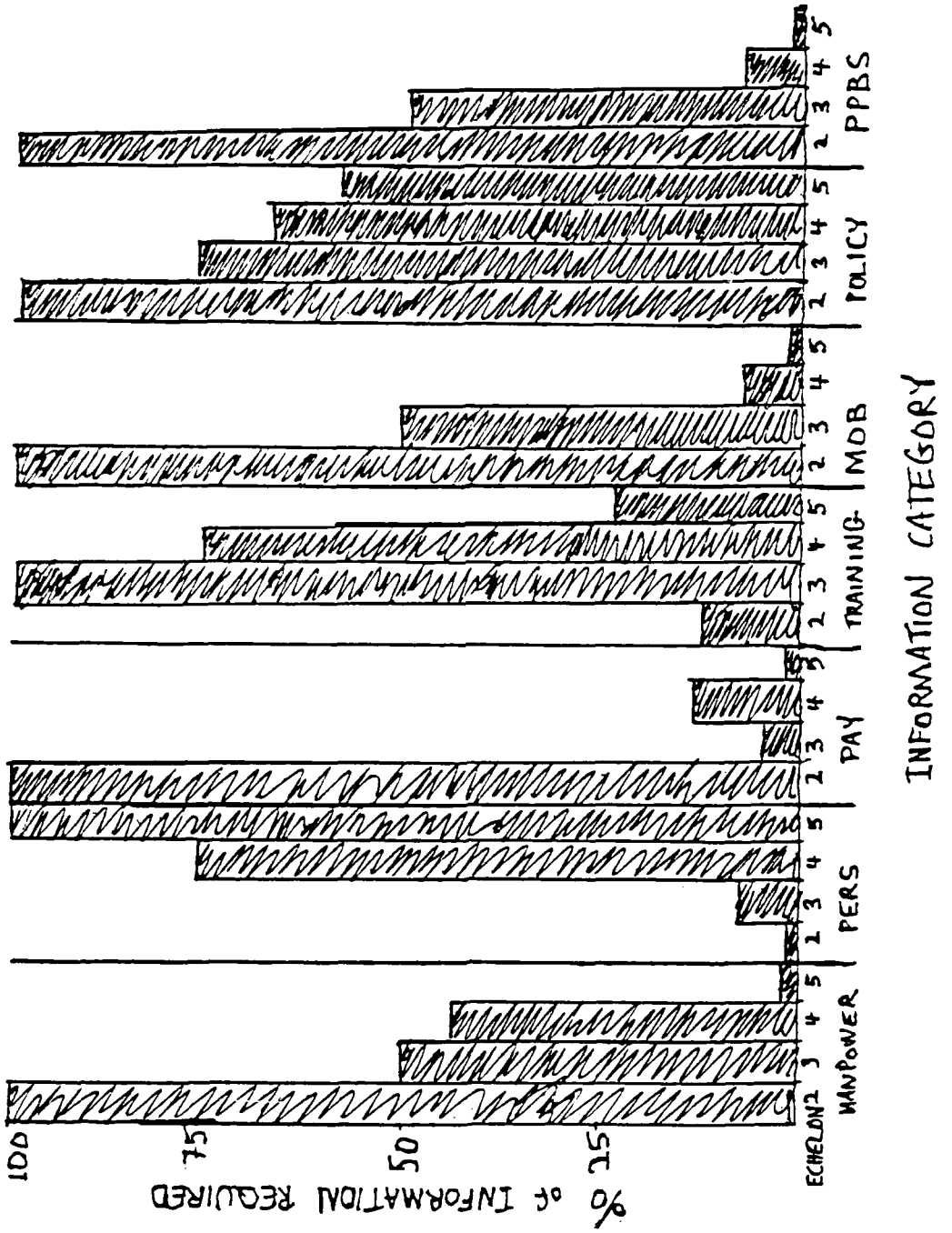

Figure 2-6 Information Requirements By Echelon

the CNRF staff is low in the hierarchy and separate from other functional areas. It is, however, formally in the planning department and supposedly responsible for ADP planning. Although these are officially three separate staffs, they are physically located in the same building. They are not as separate and distinct as the organization charts would seem to suggest. The senior flag, Air or Surface, also serves as Commander Naval Reserve Force. These are important distinctions to remember when looking at how information systems planning is being done and who is doing it.

C. EXTERNAL INFORMATION INTERFACES

One useful way of looking at the information requirements of the Naval Reserve is to view that information as a total force requirement in relation to the individual reservist. That individual reservist can then be perceived as both the raw material and the finished product of the Naval Reserve subsystem.

The functions of the users of the different categories of MPT information can be placed in one of three broad classes: planning, control, or execution. These are analogous to the functions of top (strategic), middle, and line (operations) management in the business environment. The characteristics of the requisite information resources is different for each of these processes. Information required for operational control functions will generally need to be

more accurate, structured, detailed, and timely than information used for strategic planning purposes. The Naval Reserve and the interfacing external commands can therefore be looked at as being concerned with the individual reservist in either a strategic planning role, program control role, or program execution role.

The primary organizations that are responsible under the total force management concept, for the participating reservist are: for planning--OP-01 and OP-09R; for control--CNRF (echelons 2 through 4), Naval Military Personnel Command (NMPC), Naval Reserve Personnel Command (NRPC), and NAVFINCEN; for execution--CNRF (all echelons) and PSDs. This is by no means a complete list. Other interfacing organizational entities include: Congress, Office of the Secretary of Defense (OSD), Joint Chiefs of Staff (JCS), resource sponsors, Navy Comptroller (NAVCOMPT), Chief of Naval Education and Training (CNET), Commander Navy Recruiting Command (CNRC), and World-Wide Military Command and Control System (WWMCCS).

The general way in which the sources or end users of different categories of information are outside the scope of the Naval Reserve organization has been described in the previous section. The thrust of this section has been to describe the information related interfaces between the Naval Reserve and external organizations in a less parochial more gestalt manner. This discussion has focused on the

relationships depicted in Figure 2-5. The matrix below relates the different types of information to some of the external commands by showing what categories of information go beyond the Naval Reserve organization and the other commands that are involved.

INFO CATEGORIES	EXTERNAL COMMANDS: OPNAV	NMPC	NRPC	NAV-FINCEN	CNRC	CNET	WWMCCS	PSA/PSD
MANPOWER	x							
PERSONNEL	x		x	x	x			x
PAY	x	x	x	x				x
TRAINING	x	x	x		x	x		x
MOB	x	x	x				x	x
POLICY	x	x						
PPBS	x	x	x		x			

The purpose of examining the nature and extent of the external information interfaces is to recognize the impact of this complex network of data interdependencies on information systems planning. Much of the data are owned and/or defined by these external organizations. Although these definitions should be consistent across different commands, it is too often the case that they are not. The problem of data administration is central to the development of any coherent information architecture in the MPT arena. Unfortunately this cannot be addressed in much more than a

reactionary mode at the CNRF level for data externally defined.

D. CURRENT NAVAL RESERVE AUTOMATED INFORMATION SYSTEMS

This section will describe the automated information systems being used within the Naval Reserve organization to support those functions outlined in the previous sections. An attempt will also be made to evaluate the effectiveness of those systems. The efficiency of those systems will not be considered unless it was designated a pivotal critical success factor in the design of the system; or if an effective system is plainly inefficient. The reason for this focus of evaluation is that it is very easy to get sidetracked in efficiency issues while losing sight of the big picture. You may be spending all your time evaluating the speed and proficiency of the ambulance crews in the valley when you should be asking why there is no fence on the cliff.

There are at least two levels of analysis of the effectiveness of an AIS. The obvious evaluation is to determine if it is accomplishing the function(s) for which it was designed. The second, sometimes less perceptible, concern deals with the legitimacy of the design. It is examining the utility of the function in light of the organization's missions. Should the function be performed? If so, should it be automated?

1. The Reserve Training Support System (RTSS)

The Reserve Training Support System (RTSS) is an outgrowth of, and essentially the same as, the active duty system known as the Aviation Training Support System (ATSS). The ATSS concept was designed in 1971 as a training support system oriented toward enlisted aircraft maintenance training, and was developed out of a need for relief in assigning courses and tracking students. Its early success led to duplication and adaptation by other communities. The Naval Air community currently uses ATSS. The Submarine community uses VTS. The Reserve community named their adaptation RTSS. These systems all have the same basic configuration.

The original procurement of the DEC PDP 11/40 computer as the initial hardware for the ATSS system in 1971 was exempted from the lengthy and complex Automatic Data Processing Equipment (ADPE) approval requirements by the Chief of Naval Material because it was designated solely a training device. In order to keep the designation as a training device certain design alternatives, such as expanding the system to include requirements for other related information systems, had to be traded-off as the system evolved. The decisions not to expand ATSS were based on the perceived need to maintain exemption status under the ADPE acquisition regulations. This is an important implication in the development of RTSS inasmuch as it was fashioned after the model of ATSS.

The Chief of Naval Reserve became interested in ATSS as a viable training and administration tool in 1977. ATSS was chosen as the most cost-effective method to achieve its required personnel training and training management support. One justification was that savings would be realized by adopting an existing system and avoiding the time-consuming and expensive systems development process. Many of the shortcomings of the present system can be traced back to this basic fallacious assumption. For funding and control purposes the system was renamed the Reserve Training Support System (RTSS). It consisted of three major component systems: RTSS(TM) for training management, RTSS(Surface) for surface/ashore, and the RTSS(Air) for aviation. This analysis will focus primarily on the Training Management (TM) and Surface components of RTSS. CNAVRESINST 5230 [Ref. 2:p. 2-1] established policy for the development as follows:

> The Reserve Training Support System (RTSS) is an automated training management support system. The purpose of the system is to provide training management support to field Naval Reserve training administrators and to increase the quality of training readiness information reporting at all Naval Reserve Command levels. A dual system approach will provide for a field training system in support of Naval Reserve field administrators and a Regional Training Management System in support of staff functions.

Another subsystem (RESULTS) has recently been added to support new recruit tracking. The RTSS(TM) is the primary component of the three and the objectives of the other components are mostly subsets and elaborations of its objectives. The RTSS(TM) was designed to support training

management, mobilization assignment, readiness measurement, and mobilization and readiness reporting. The long-term objectives of the system are [Ref. 3:pp. 2-2,2-3]:

a) Increasing the quantity and quality of Selected Reserve mobilization billet assignment capability at all command levels.

b) Integrating personnel and training record data under a single system accessible from remote locations.

c) Providing a methodology for the real-time measurement and reporting of personnel training readiness.

d) Increasing the efficiency and effectiveness of scheduling training for the drilling Reservist.

e) Providing more timely and accurate information for mobilization reporting.

f) Improving the reliability of training information at all command levels.

g) Reducing the administrative and clerical workload of operating units.

h) "Capturing" input data at the source, thereby eliminating intermediate error-inducing steps.

i) Providing limited stand-alone local processing capabilities for the Naval Reserve Center.

j) Providing an integrated communications capability enabling the localized units to exchange/update data with CNAVRES RTSS(TM) centralized data base and other RTSS (Surface) units.

When the system was first conceived the long-term goal was for the three components to be fully integrated into a consolidated and centralized database to provide real-time information for personnel, mobilization, recruiting, readiness, and training management. At present they are still three separate systems in that there are separate

duplicated files for each system. The Air and Surface files are updated from the TM on a periodic basis.

All RTSS hardware is obsolete off-the-shelf equipment owned and maintained by CNRF. The RTSS(TM) consists of a PDP-11 series Central Processing Unit, associated peripherals, terminals, interface components, and communications equipment. The PDP-11 is being upgraded to a DEC/VAX 780 this fiscal year which will require redesign of the operating system and database management system. Communication between the central computer (New Orleans) and remote dumb terminals (at 31 locations throughout the U.S.) is accomplished through asynchronous modems connected to a dedicated line via local call access. Three nodes share one line. The RTSS (Surface) hardware is essentially the same, there is just more of it. Currently there are 17 PDP-11 series minicomputers at 15 Regional Readiness Commands and two Central Drill Sites (Central Drill Sites are essentially just big Reserve Centers). The goal is to have these minis at 80 sites throughout the country. All Reserve Centers either have or are getting microcomputers.

The RTSS central site software consists of the DEC Resource Sharing Time Sharing/Extended (RSTS/E) operating system, several Higher Order Languages, applications support programs, and applications programs. Software is centrally designed, developed, and tested. Programming capabilities

are not available except through the central RTSS site in New Orleans.

The majority of the Data Processing personnel are in New Orleans. Each Readiness Command (REDCOM) has one DP trained civilian on its staff. Any additional DP skills at command levels below New Orleans (Echelon 2) are of the home-grown variety.

The principal component of RTSS are central files kept at New Orleans with remote terminals at each Readiness Command and Naval Air Reserve sites for data entry and limited file queries. The route which data follow into those files is circuitous and confusing. The process begins at the Reserve Unit level at each drill site (Reserve Center). Each drill weekend the unit must complete a personnel diary form and an RTSS input form to record any personnel related data changes (i.e., affiliations, NOBCs, NECs, mobilization billet readiness). This information is reviewed for accuracy by the Reserve Center staff and the RTSS form is mailed to the cognizant regional Readiness Command; the diary to the Naval Reserve Personnel Center New Orleans. The data on the two forms should be identical. The diary information is input to the Inactive Manpower And Personnel Management Information System (IMAPMIS) database by personnel in New Orleans. The RTSS information is reviewed at the REDCOM and input to the RTSS files. Once a month, tapes are swapped and the two files update each other

(theoretically), with IMAPMIS updating all the fields in RTSS except for two, Individual Readiness Assignment Designator (IRAD) and Mobilization Assignment (MOBA). The IMAPMIS files are updated from RTSS for these two fields. Although this crossover is supposed to be taking place monthly, reports generated by the two systems infrequently coincide. There are recognized problems in the IMAPMIS system as well as the interface between the two, which are being worked on.

In general, RTSS output is used as a cross-check on IMAPMIS data, but the latter is given priority, not because IMAPMIS produces more accurate or timely data, but because it is the recognized, official source for management purposes, including pay and retirement points. In fact, RTSS is perceived as the more accurate source of information but it is not used as the primary management tool because IMAPMIS is the official source.

The current distribution of data processing within the RTSS system, using Lorin's [Ref. 4] model, finds the system components slowly spreading outward, the DP skills centralized, and the management centralized by design but distributed through neglect. In the words of a special panel which looked at the Information Systems requirements of the Naval Reserve in 1984, "In effect, the distribution of computing is beginning to occur without a plan, and with great potential for duplication and ineffective effort."

[Ref. 5:p. 5-2] There is no reason to assume that the situation has improved in the two years since that study was completed.

How well does the present system satisfy the design objectives? It has not increased the quality of mobilization billet assignment capability at all command levels, and although the quantity of assignments has increased, that growth cannot be attributed to RTSS. Since IMAPMIS is still used as the official source of personnel information, the advantages of easier access to the RTSS database have not been realized. Program Managers still use the monthly IMAPMIS reports for tracking the quality of mobilization billet assignments.

The RTSS has, to some degree, integrated personnel and training record data. It is an improvement over the previous non-automated system. Integration problems, however, still exist. This data is definitely not accessible from remote locations (Reserve Centers), and its accessibility from the REDCOM level is constrained by the logistics of three nodes sharing one line to access the central database.

It has not provided for the real time measurement and reporting of personnel training readiness. The data are not input to the files at the source (Reserve Center), but instead are mailed to the REDCOM where they are input. The only method the Reserve Unit Commanding Officer currently

has to determine the file contents for his unit is by referring to a monthly hardcopy report from the REDCOM.

The use of RTSS has provided some improvement in the area of mobilization reporting, although it is still far short of the original goals for this area. An effective mobilization process is the cornerstone of a viable Reserve force and depends on a reliable communications network and sound data. The problems associated with this area in the Naval Reserve are still considerable and the current RTSS architecture does little to resolve them.

The RTSS has not reduced the administrative or clerical workload of the operating units. It has not provided stand-alone local processing capabilities for the Naval Reserve Center, except for that which is provided by microcomputers, which are not part of the RTSS.

The system has certainly not provided an integrated communications capability between the local units and the central database. This is the realm in which the RTSS offered the greatest promise and has produced the greatest disappointment. Processors are being distributed with little or no thought being given to communication. Furthermore, this is just internal to the system. There are a myriad of other problems associated with the external interfaces, such as the IMAPMIS discussed earlier.

Clearly, the current RTSS is not getting the job done. It does not provide for easy information retrieval in

desired formats. It contains duplication of data, with inconsistencies in definition processing and data entry which has lead to confusion and inaccurate measures of effectiveness. The present system was developed mostly during a period when available hardware and software were more expensive and had less capability. It has been developed on a piecemeal basis in response to particular needs or crises, without full attention to possible duplication or potential interfaces and interactions, and often without adequate design participation from the users. [Ref. 5:p. 3-1]

There is little question that there were some serious problems with the planning and implementation of the RTSS. In the words of one of the contractors who developed the system, "It was developed heuristically, like a police artist." This is not to say that heuristic design is invalid, but that heuristic planning is. Actually to characterize the planning of the RTSS as heuristic implies a discernible methodology which the evidence indicates was lacking. The manner in which RTSS has been planned and implemented can best be presented as a lesson on how not to design an automated information system.

2. Reserve Financial Management/Active Duty For Training System (RESFMS)

The Reserve Financial Management/Active Duty for Training System (RESFMS) is the other major automated information system being used by the Naval Reserve. Its purpose

is to provide operational, management, and planning information about ACDUTRA and RPN accounting to the Commander, Naval Reserve Force.

Before the RESFMS system was developed, the Reserve personnel, Navy (RPN) accounting system and the Active Duty for Training (ACDUTRA) order writing system were on two separate minicomputers. Financial accounting data generated in the ACDUTRA system regarding commitments, obligations, modifications, and cancellations were forwarded to the RPN system via magnetic tape. Many manual procedures still existed, especially in the financial planning and program management areas, which resulted in information delays and inaccuracies. The situation continued to deteriorate with increasing ACDUTRA expenditures and the inability of the two systems to keep up. In 1979 CNAVRES overexpended their allotted funds, a serious error. RPN accounting was over six months behind; they had no idea what their current RPN balance or expenditures were. This crisis led to the formulation of plans to develop a more comprehensive and responsive ACDUTRA and RPN accounting system. The new system, which began as a project in February 1981, was envisioned as part of a larger effort to automate several aspects of the Naval Reserve operations under one system. Approximately two and a half years later the initial system was on-line. This interactive system supports the ACDUTRA operational functions and informational needs of five areas at CNRF

including Manpower, order writing; program management for Surface and Air readiness; the passenger transportation section of the Personnel Support Detachment (PSD); RPN accounting; and financial management. The development has occurred in two phases. Phase I addressed ACDUTRA order writing, modification, and cancellation at CNRF headquarters including processing to handle the estimation and obligation of the funding for executing orders. This initial system was installed on the NARDAC UNIVAC 1100/60 in New Orleans in March 1983. The still on-going phase 2 effort has as its objective the extension and distribution of ACDUTRA order writing to the field activities in the Naval Reserve.

The overall goal of the RESFMS is to provide CNRF with a comprehensive system for the management and control of RPN funds and to provide echelon 3 and 4 more efficient management of the Naval Reserve ACDUTRA programs. More effective management, in this case, is not a goal because this system was not intended to conceptually alter the manner in which ACUDTRA is being managed. Its purpose is to speed up the process; to automate time-consuming manual procedures. Some of the more specific objectives of RESFMS are [Ref. 6:pp. 2-1--2-1; Ref. 7:pp. 2-2--2-4]:

a) Establish, at Echelon III, IV, and V activities, the capability to process ACDUTRA applications, modifications, and cancellations by means of an automated information system (AIS).

b) Design the completed ACDUTRA System so that it functions as a subsystem of the Reserve Financial Management System, sharing common data and providing the

transfer of data to other subsystems, particularly the RPN Accounting Subsystem.

c) Provide on-line access to those users whose functions require it, allowing them to access and input source data necessary to generate ACDUTRA orders and to schedule system programs as needed.

d) Provide the capability to edit and validate all user transactions storing them for problem solving, monitoring, or auditing needs.

e) Reduce the time interval between ACDUTRA application, return of the resulting order, and subsequent RPN accounting transaction posting.

f) Provide the capability to track and monitor the processing of an ACDUTRA application through final expenditure or cancellation.

g) Provide the capability to access and report information on an ad-hoc basis.

h) Provide the capability to properly interface between automated IMAPMIS and EPMAC information required to produce ACDUTRA orders.

i) Provide improvement in the productivity of data entry through elimination of redundant data elements.

j) Provide financial management with system data sufficient for use in planning and budgeting at the claimant, OPTAR, responsibility and Work Center levels.

k) Provide the capability to produce hard-copy transportation documents.

The RESFMS hardware consists of a UNIVAC 1100/60 host computer (owned, operated, and maintained by NARDAC New Orleans), which contains the database and all data processing and storage capabilities. Users at CNRF headquarters have access to the computer via VDT terminals with direct, on-line access to the computer. The equipment to support the phase 2 implementation includes the hardware in place,

on order, or planned to support RTSS at the echelon 4 and 5 levels.

RESFMS data files are designed and organized based on UNIVAC's Data Management System (DMS) 1100 which is a CODASYL standard network database system. There are approximately 1400 application programs written in COBOL developed by NARDAC and SYSCOM (an outside contractor). In addition, DMS 1100 also has a Query Language Processor (QLP) software package that is used to support ad hoc application requirements on a limited basis. Limited because the processing overhead required for running it is very high. Finally, a non-procedural language software package, MAPPER, is available to support additional ad hoc user needs.

RESFMS interfaces with a number of other systems and subsystems. The five subsystems within RESFMS are: ACDUTRA order writing, financial management, RPN accounting, travel, and program management. The RESFMS database serves as the sole repository for all data entered manually into the system by the users, and for data obtained from other systems which interface with it. This database is fed from the following external systems:

a. NRPC provides personnel, mobilization and unit address data from the IMAPMIS system via magnetic tape for use in the production of ACDUTRA orders.

b. The Enlisted Personnel Management Center (EPMAC) provides unit active address status data via magnetic tape for use in the production of ACDUTRA orders.

c. Integrated Disbursing and Accounting (IDA) expenditure transactions are passed from the FIPC/IDA system to the RPN accounting subsystem via magnetic tape.

d. STOCKFUND expenditure transactions are passed to the RPN accounting subsystem via magnetic tape.

e. Centralized Expenditure/Reimbursement Processing System (CERPS) expenditure transactions are passed to the RPN Accounting subsystem via magnetic tape.

On a daily basis, RESFMS supplies ACDUTRA information to RTSS and on magnetic tape. This eliminates redundant entry of ACDUTRA data related to training for the RTSS, but it does not eliminate the redundant entry of this information for the IMAPMIS system.

In anticipation of the extension of the ACDUTRA subsystem to the field activities (which is now taking place), CNRF conducted studies to determine the most effective means. The two possibilities were to extend the already on-line interactive system, or to go to a distributed system. The decision had to be based not only on the ACDUTRA program, but had to also consider the issues of costs, long-term CNRF and DoD information systems planning, availability of existing hardware, hardware for which funds had been programmed, and development of telecommunications support. An economic analysis, addressing these issues, was completed early in 1984. The result was that RESFMS will be extended to the field as a distributed system.

In the distributed configuration, selected processing capabilities and databases are distributed to field activities. The central database will remain on the UNIVAC

1100/60. Database subsets will exist at designated processing centers. They are to be updated by a two-way process of down/up-loading from the central database. This system configuration is pictured in Figure 2-7.

In operation, ACDUTRA applications would be entered in the system at selected field activities. Information on the applications is validated against personnel data from the local database. Applications are then flagged for routing to the appropriate approval authority. At specified intervals during the day, applications are file-transferred over telecommunications facilities to the appropriate locations. Software for approval procedures at these locations enable the approval authority to further process the application and approve or disapprove it. Disapproved applications are then file-transferred back to the point of entry. Approved applications are file-transferred to program managers at CNRF headquarters. After final approval at CNRF, the complete application is file transferred back to the point of entry where orders are printed on local printers. In addition, the transportation subsystem interface will make it possible to also have the airline tickets printed at the point of entry.

The procedures described above represent a dramatic improvement in efficiency over the non-automated procedures. The phase 2 implementation is slowly (incrementally) taking place.

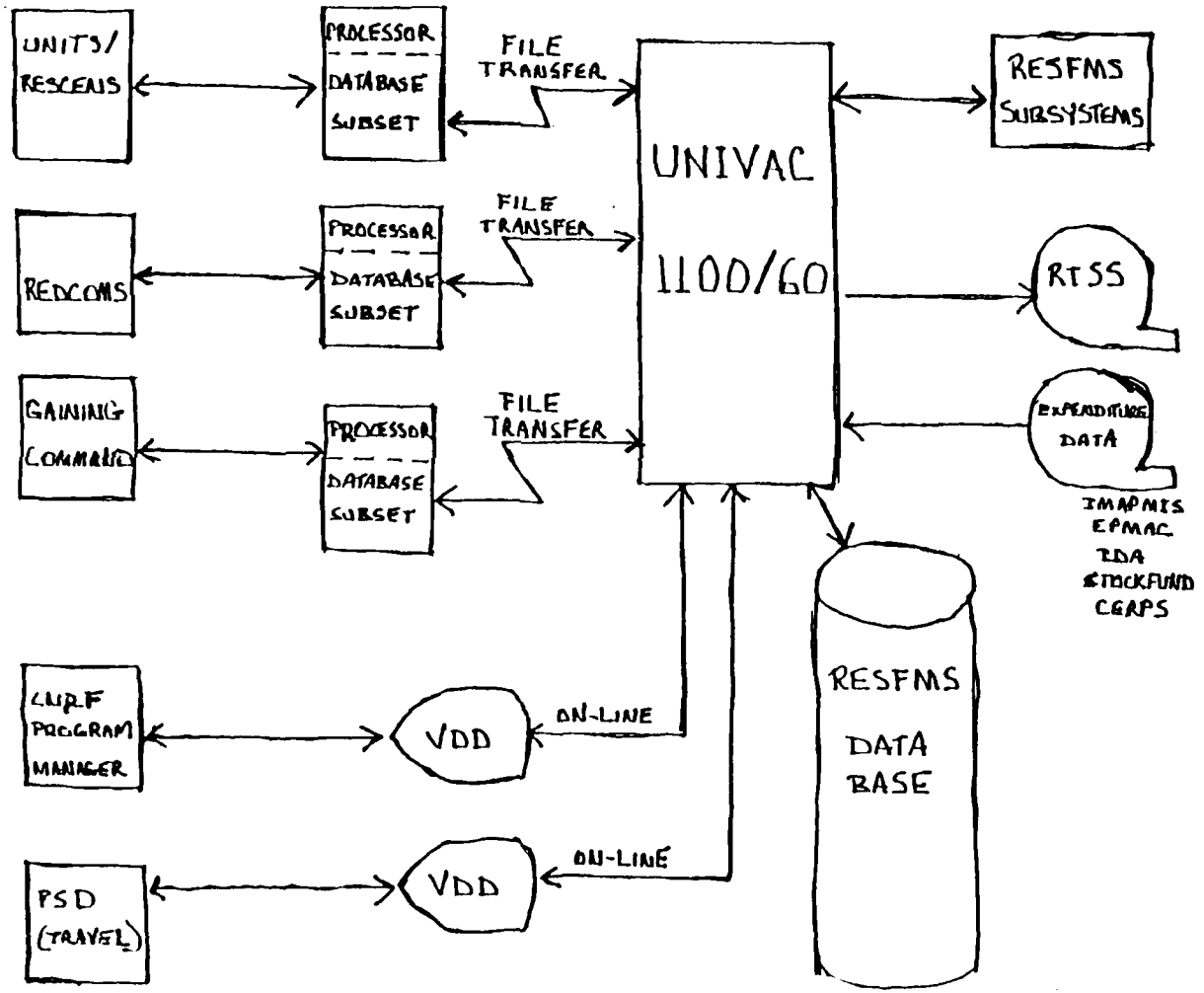

Figure 2-7 RESFMS Logical Configuration

An analysis of this system shows that it has realized most of the objectives for which it was designed. The cause of the crisis which precipitated the development of the system, the six month lag in RPN accounting transaction posting from the execution or cancellation of ACDUTRA orders, has disappeared. The system provides virtually up to the minute RPN accounting information. The improved efficiency which has resulted from the automated ACDUTRA processing procedures has made possible the elimination of the order writing division of the Manpower department at CNRF and has also enabled all echelons of the organization to perform ACDUTRA processing in a much faster and more reliable fashion.

One shortfall of the system is that it has not really increased the effectiveness of the program management function. This relates directly to the objective of having the capability to access information and produce reports on an ad hoc basis. However, this is really a minor criticism of the implementation, not the planning or design, of the system.

A more serious concern is with the telecommunication costs. The design of the system called for it to use the NARDAC network until DDN is operational throughout the Naval Reserve. This means using leased lines to connect the distributed processing sites to the nearest NARDAC node. The telecommunications costs are already considerable and

will only increase as more field activities are brought on-line. Although the Naval Reserve is not now on the DDN, there is some concern as to whether being part of the DDN will solve the problem. It would be significantly cheaper, now, for the distributed sites to tie into the closest DDN host or TAC than it is to go to the nearest NARDAC node. This is pictured in Figure 2-8, where the dotted lines represent the distance to the DDN entry points and the solid lines represent the distance to the NARDAC Network entry points. Why isn't this being done? Because the NARDACs are not part of the DDN. Unless this problem is resolved the ballooning communication costs could eventually bring this system to its knees.

There seems to be little fault to find with the design process used in RESFMS. Again we see a development process called "heuristic," but unlike RTSS, this one has been fairly successful. It has been a process in which the system has been developed step by step with constant consultation and trial by users. This method was intentionally chosen (again a contrast to RTSS) to avoid the usual pitfalls of a system that had been designed from the top down by analysts before users had any real chance to try out the product. The heuristic design philosophy, in this case, is a refreshing departure from the rigid and often inappropriate Life Cycle Management model of system design.

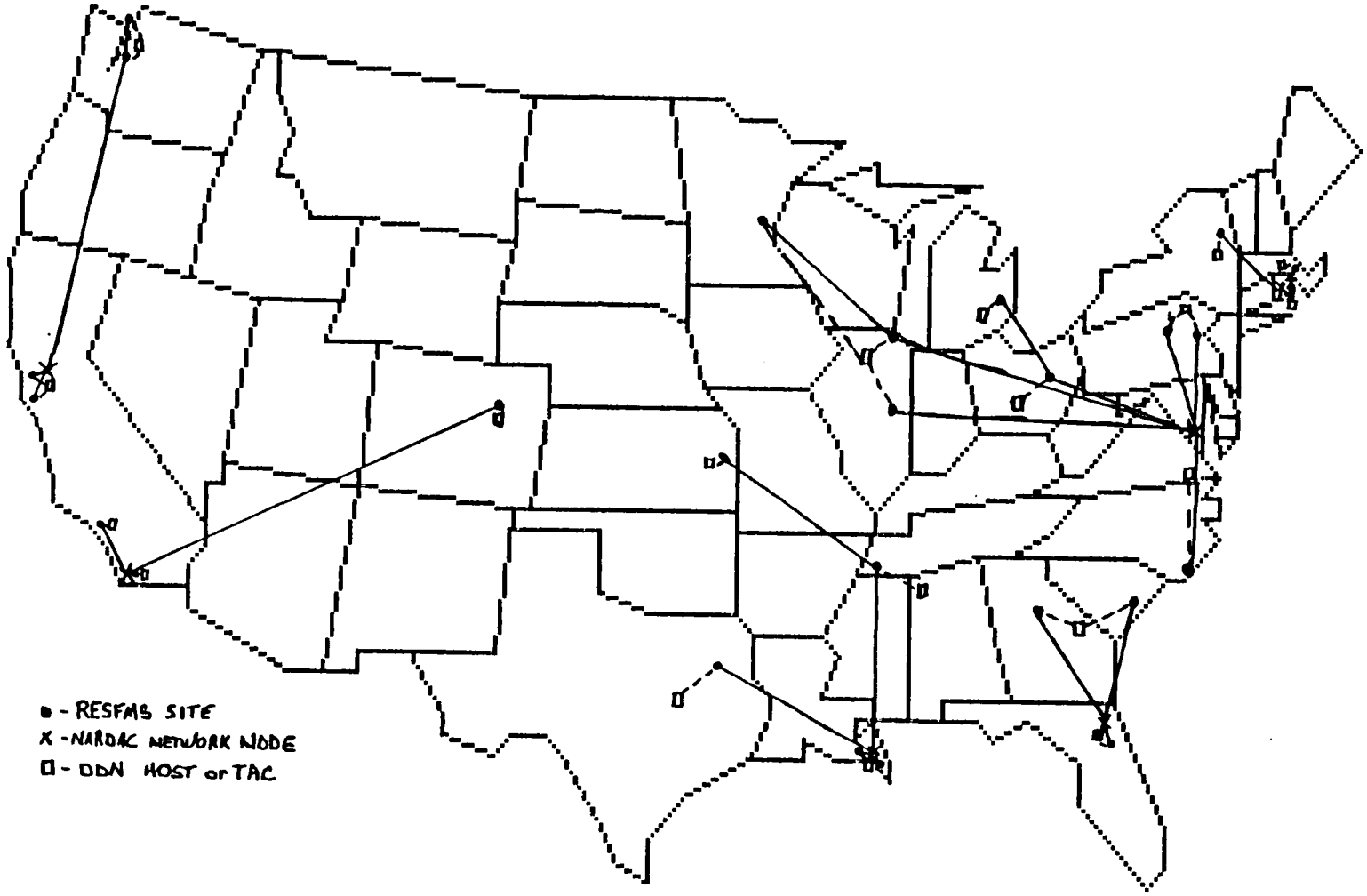

Figure 2-8 RESFMS Communications

E. SUMMARY

This has necessarily been a broad-brush simplified view of the structure and information flows of the Naval Reserve. Its purpose was to familiarize the reader with the organization and its functions in a general fashion. Any systems planning methodology would need to perform a much more sophisticated refinement of the information presented in this chapter.

III. STRATEGIC INFORMATION SYSTEMS PLANNING

A. INTRODUCTION

Planning is not a popular activity in many organizations. It deals with a distant and uncertain future. Any benefit comes later, as does the satisfaction it would provide. There is no perceived immediate advantage to planning. In fact, the immediate effects seem to be only negative. Planning takes valuable manpower away from the day to day business. Often it is felt to be of more importance to solve the immediate crisis than to give consideration to more distant effects. This is particularly true in the military, where immediate crises abound, and where no one is in any job long enough to realize (take personal credit for) the benefits of strategic planning. Planning's reputation has been further tarnished by the fact that it has often been carried out as a meaningless mandated ritual, doomed to a forgotten existence on some dusty bookshelf.

A heavy price has been paid, in many instances, for failure to plan adequately. A considerable fraction of the less successful information systems undoubtedly suffer from poor planning and implementation. Better strategic information systems planning can help assure that resources will be applied in the future in a near optimal manner and that

systems development fiascos of the kind that have plagued many organizations in the past will be avoided. At its best, planning can make it possible to select systems projects that offer the greatest future benefits to managers and other users; projects that extend the role of information systems into critical areas from strategic to operational management.

What, exactly, is strategic information systems planning? The answer often depends on who you ask. In some instances, application project plans have been labelled as "strategic" plans. In others, planning goals have been so broadly stated that they bear little relevance to the practical problems of systems management. Clearly, a reasonable definition lies somewhere between these two extremes. The available literature does not reveal a clear consensus as to the nature and scope of this kind of planning activity. Strategic information systems planning is concerned with formalized and disciplined approaches to identifying requirements beyond the immediate future. The environmental pressures making this type of planning necessary are the increasing complexity of information systems which require an increasingly large share of the organization's resources and are typified by long lead time development processes. Organizations can no longer afford not to plan.

Planning is the process of formulating a program of action which systematically outlines the steps and

procedures required to achieve a goal (long term) or objective (shorter term). Strategic planning has to do with the overall conduct of large scale operations. It reflects the concern of top management with the future direction and needs of the organization.

The remainder of this chapter will explore the following issues:

1) How to determine the proper quantity and quality of strategic information systems planning required by an organization; and, using those guidelines, determine what is appropriate for the Naval Reserve.

2) Evaluate IBM's Business Systems Planning (BSP) in relation to other planning methodologies.

3) Determine how strategic information systems (IS) planning is currently being performed in the Naval Reserve organization.

B. INFORMATION SYSTEMS PLANNING--HOW MUCH IS ENOUGH?

Strategic planning, by itself, does not necessarily include information systems planning. By the same token, information systems planning does not, of necessity, have to be closely tied to corporate strategic planning. How closely coupled the two should be is dependent on the role of MIS within the organization. If the function is one of only peripheral support, such as payroll processing, then it may be inappropriate, or at least unnecessary, for IS planning to be concerned with corporate strategic planning. On the other hand--and this is becoming more the norm as information systems become integrated into more business areas--if the organization has a critical dependence on their

information systems, then the two planning processes need to be closely related. For some organizations, IS activities represent an area of great strategic importance, while for others they play a cost-effective and useful role but one which is distinctly supportive in nature. There is not a discrete difference between these two organizational environments. They should more accurately be viewed as two ends of a continuum. The key is to determine the location of any specific organization along that continuum; to ascertain the criticalness of IS activities in relation to the company achieving corporate goals.

The idea of strategic impact of IS is just one of several contingencies that should be considered in the development of a comprehensive planning process. Such a planning process, to be effective, must also deal with the realities of the organizational culture, planning culture, and stage of IS development. The idea of strategic impact is the only one which will be explicitly dealt with in this section. The other considerations will be examined in Section D of this chapter.

In the case of the Naval Reserve this issue should be addressed on at least two separate levels. One level stems from the fact that the Naval Reserve is not an autonomous, independent organization, but an integral part of a larger Navy. Therefore, it makes sense for it to have some role in the information systems planning process for the entire

Navy. It will surely be a recipient of the plan regardless of whether it participates in the planning process. By the same reasoning, an awareness of the Navy's overall strategic information systems plan is a necessary input to the Naval Reserve's information systems planning process.

The second level of IS planning is that which takes place within and for the Naval Reserve. This planning is based primarily on the internal requirements of the organization without being overly concerned with outside factors. The analysis of this section, as well as the larger issue of BSP suitability, will be in the context of this planning environment. The Navy has its strategic information systems planning process, of which the Naval Reserve is one part; and the Naval Reserve has its own internal planning process which is in turn affected by the larger total Navy process.

The current role of IS within the Naval Reserve is one mainly of support, but a kind of support that is becoming increasingly more mission critical. RTSS and RESFMS, although important, were probably not originally to be considered mission critical systems. The evolution of these systems, however, is toward a more integrated and pervasive role within the organization. RESFMS impacts on many more functional areas than does RTSS. This trend argues for IS planning to become more closely tied to the strategic planning activities of top management. This would help insure that future IS development effectively expands into the

crucial functional areas of the organization. Where, in the past, the IS planning process did not need to be closely tied to the overall corporate planning process, the growing dependence on these systems requires that the two processes become more in tune. The complex task of effectively managing the Naval Reserve is fast reaching the point where it will be critically dependent on automated information systems. There is little doubt but that current levels of ACDUTRA and Weekend Away Training (WET) could not be supported without RESFMS. A successful mobilization of the Naval Reserve could not happen without a system with the ability to quickly retrieve, update, and communicate large amounts of accurate data.

The successful management of the Naval Reserve hinges on an effective IS planning system. The evaluation of any IS planning methodology must consider how well it interacts with the top-level strategic planning process. Gone are the days when IS planning could afford to be an isolated myopic process. Strategic information systems planning in the Naval Reserve calls for a well-articulated, coherent, and effective methodology. The cost, complexity, and growing criticalness of these systems demands it.

C. THE BUSINESS SYSTEMS PLANNING (BSP) METHODOLOGY

Information systems planning is a process that uses a descriptive model to reflect the detailed methods of the organization's mission. The planning methodology builds

this model by decomposing the data, processes, and data/people relationships. The degree of effectiveness of the system(s) that are subsequently developed from this model will depend on how well the model represents the reality of the organization. The underlying assumptions of different planning methodologies will affect the usefulness of the resulting models. The tools with which the model is built are as important as the pieces of the model. They will, in essence, determine what those pieces will be. It is imperative that an appropriate methodology is used because that methodology will determine what is analyzed and how it is analyzed.

The [illegible] is an important element of the planning process, but it is still only one part. The intrinsic environmental factors of the organization that were discussed in the previous section also need to be considered in developing that planning process.

This section will not attempt to answer the question of whether BSP is the right methodology for the Naval Reserve. The intent here is to point out how it differs from other methodologies and examine its strengths and weaknesses in that context only. This section will provide an important part of the conceptual foundation that will make it possible to answer that larger question in a rational manner.

In the broadest sense planning methodologies can be said to focus on technology, data, or information. A technology-based methodology is concerned with the management of applications and processing. It views the technology as the corporate resource around which the planning should be based. The Stages of Growth (SOG) model is of this type. The data-based, or datalogical, models see the organization in the context of data objects which are processed at various organizational levels to form information objects at other organizational levels. Data Flow Diagrams (DFD), Structured Analysis and Design Technique (SADT), and Systematic Activity Modeling Method (SAMM) are in the data-logical category. The third category is the information-based, or infological, models. Their focus is on the information structure of an organization. They generally take a more macro perspective of the organization than the datalogical models. They try to determine what is information to what level in the organization, who owns the information, and who needs the information. BSP, as well as Business Information Analysis and Integration Technique (BIAIT) and Critical Success Factors (CSF), is representative of this category.

The datalogical models provide a detailed view of each process or task, which facilitates the IS design. On the other hand, this microscopic view often forces the

forfeiture of top management involvement. The big picture is hidden by the mass of detail.

The infological models concentrate on the macro view to the extent that the exact details of how a system will accomplish the processes and tasks are not explicitly defined. This promotes top management involvement while making the IS design problem more difficult (than the data-logical approach).

All the models will not be examined here. Those that are will be so only to the degree necessary for background in describing BSP. The purpose of this thesis is not to find the best IS planning methodology but to evaluate the suitability of BSP.

Stages of Growth (SOG) [Ref. 8] was the first of the planning methodologies to be widely used. It was in vogue at a time when the first large scale systems development projects were being undertaken. It is still in use today, although not as an explicit planning model. It derived from the social sciences a notion that organizations must assimilate this kind of change through a predictable sequence of steps at a modest pace. It is based on the theory that the sequence, with stages of initiation and expansion followed by consolidation and maturity, would be similar for all organizations. The focus of SOG is on the management of technology. This planning approach has been seriously dated by technological change which has forced a change in the

planning perspective, with the emphasis shifting from applications and processing management to data and information resource management [Ref. 9]. This is not to say that SOG is not a valid descriptive model, only that it is not complete enough to be a basis for comprehensive IS planning. It realistically stresses the need for an organization to know where it stands today before trying to plan where it can go tomorrow.

The planning response to the new environment caused by technological change is well represented by IBM's Business Systems Planning (BSP) package. "BSP focuses less on developing organizational structures and disciplines necessary to manage the computer room than on conceptualizing and designing the overall corporate data resource." [Ref. 9:p. 4] As an evolution of systems planning it changes the goal from one of following universally described actions to one of developing highly customized goals. Architectural recommendations are derived from the construction of an empirical model of the business enterprise.

BSP seeks to provide such a plan by emphasizing a top-down approach to analysis that builds an infological model. The key to the success of the top-down approach is in getting people involved, starting with top management and working down. The analysis stresses the perspective of top management by working from the broad to the detail level.

Through this analysis BSP attempts to translate business objectives to information requirements.

BSP provides a structured methodology that, if properly followed, would show the organization the logical way they deal with data classes (information) and groupings (of data classes) that would reflect major activities of information handling. The study determines information flow within an organization. It displays the information/subsystem relationships and the processes supported by each subsystem. These results can then furnish a basis for informed information resource decisions. This is where computer support and development priorities can be made. These implementation priorities are determined as part of a comprehensive plan evolving from current systems. Broadly stated, BSP stresses top-down design and bottom-up implementation.

An important basic assumption of the BSP methodology is that an organization should view data as a resource that is as important as personnel, cash, facilities, or materials. It assumes that in order for management to have a wider perspective of the organization and to be in a position to make effective multifunctional decisions, information should be available not just to individual functions or departments but throughout the business. The assumption is, in short, that the organization has a need for a company-wide information system.

The BSP methodology presumes this conceptual perspective as a starting point. Some of the organizational elements that it sees as impediments to the successful development of company-wide information systems are: that executive commitment and involvement have been absent from the planning process; that IS objectives and strategies are not consistent with the organization's overall business (mission) objectives; that the company-wide systems have not been developed as part of a comprehensive plan evolving from current systems; and that information resource management functions have not been put in place to adequately manage the resources. The Naval Reserve has exhibited, to varying degrees, all of those tendencies. The BSP methodology was developed to abate those organizational factors. The output of this methodology should be a dynamic viable IS plan.

> An information system plan should allow a modular approach to implementation, providing confidence that each module will fit and function properly to form an integrated system and will interface properly with the present operational systems. The plan should also allow for better decisions concerning the efficient and effective commitment of information system development resources. With such a plan, the required information can be more readily obtained. [Ref. 10:p. 1]

One of the criticisms of BSP is common to all infological models, and that is that it does not readily provide a language for the system analyst to perform detailed system design. BSP does, however, seem to provide a better link to this type of activity than do most other infological models. This shortcoming should be considered in light of the

objectives of strategic planning which concern the development of information systems in long-range general terms. What BSP can provide is a comprehensive methodology for understanding the processes of an organization in terms of information needs.

The next chapter will consider the exact steps of the methodology in much more specific detail in the context of the Naval Reserve. The purpose of this section has been to introduce the conceptual basis and objectives of BSP.

D. NAVAL RESERVE INFORMATION SYSTEMS PLANNING

In concert with the attributes of IS planning put forth in Section B, two planning perspectives will be considered here. One will be the Naval Reserve's role in Navy IS planning; the other will be that planning which takes place within and for the Naval Reserve. This section will also explore the influence of organizational and planning culture on IS planning within the Naval Reserve. The focus of this discussion will be on long-range strategic planning activities rather than on specific system design.

In May 1983 the National Academy of Sciences reviewed the Navy's ADP management processes and made recommendations for improvements. One of the recommendations was that the Navy develop a high-level information architecture which depicts the flow of functional information needed to conduct the Navy's business. OP-94 is responsible for developing the high-level information architecture; and the Director,

Total Force Information Systems Management Division (OP-16) is responsible for developing the information architecture for manpower, personnel, and training (MPT) functions. OP-16 divided the MPT world into functional subareas. In order to compile the information needed, OP-16 has tasked the organizations with primary responsibility for the selected functions to develop subarchitectures. Commander, Naval Reserve Force is one of these organizations and is responsible to OP-16 in this planning process.

OP-16 has been working on a methodology that uses a tri-level hierarchy of architectures. The methodology, still not fully articulated, seeks to develop first an "Information Flow Architecture" than a "Data Architecture" and finally a "Technical Architecture."

The information flow architecture is a logical model of the business processes of an organization. It is meant to be the highest logical level of abstraction that documents the functional activities and classes of information required to meet the mission and goals of the organization. Information flow architectures are designed to show the organizational units (subsystems) that participate in the business processes. Development of an information flow architecture is a planning process that identifies the information an organization requires to plan, control, and execute its mission. The intent of this process is not just to document the current information flow but to identify

associated problem areas and develop recommended "target" information flows to correct them.

The second phase, data architecture development, is an extension and refinement of the information flow architecture and is designed to produce a set of logical models that will provide the basis for information systems planning. These logical models should reflect: the functions of the business and the data needed to accomplish those functions; the structure, characteristics, and interrelationships of the data; and the availability of the data required to support the organization.

The development of a technical architecture is the third phase of this planning process. This architecture is a model of the technical resources that are designed to the information flow and data architectures. The model should depict the relationships among AISs, communications networks, data bases, or computers used to process information. As the final step in this planning methodology developed by OP-16, the development of a technical architecture is a design process that conveys to the user how technology has or will be applied to provide the information required by the business processes.

This methodology is not inconsistent with the objectives of BSP. It is, however, not as rigorous or formalized as the BSP methodology. It leaves much of the interpretation of the methodology to the user. This inherent ambiguity

should make it relatively more difficult to use. It will be used, however, because it has been mandated by OP-16.

This planning methodology is being used by the ADP planning department of CNRF. Its usefulness, however, is suspect for it appears that the product is being prepared for external consumption only. There does not seem to be much interest within the Naval Reserve organization in this planning process, particularly outside of the ADP planning department. CNRF is participating in this planning process only to the extent that they have been ordered to do so. This seems to be the scope of the Naval Reserve's role in total Navy IS planning. In fact, a good case could be made that this is the extent of formal IS strategic planning being accomplished by the Naval Reserve.

Any strategic IS planning that is taking place within and for the Naval Reserve is being done not as part of some formal process but through the default method of planning through neglect. Internal strategic planning does not seem to be taking place. The type of planning that is being done is neither formalized nor consistent and is generally of a short time horizon (less than 5 years--typically much less). At its best it is tactical planning working toward specific isolated objectives without any enunciation of overall business goals. This is the type of planning of which RESFMS is a result. At its worst it is strictly political; the consequence of someone selling their latest idea to the

Admiral. Internal IS planning is typified by different factions planning diverse projects with no thought being given to compatibility or long-range interoperability.

This type of planning can best be explained as part of the organizational culture and, to a lesser degree, the planning culture. The Naval Reserve's organizational culture is, in many respects, a microcosm of the larger Navy culture. In this respect it is a hierarchical bureaucracy with a well-established chain of command. It can also be characterized as a highly centralized organization. Although it is geographically dispersed it is functionally centralized. The organizational culture of the Naval Reserve is probably more politicized than that of the Navy in general. That is, much of the organizational behavior can be explained by the internal politics of the organization.

The planning culture of the Naval Reserve has two faces: one is the formal, as exemplified by the Planning, Programming, and Budgeting System (PPBS); the other is the informal, ad-hoc, and often reactionary planning that is part of the day-to-day operation. The PPBS process has minimal impact on strategic IS planning primarily because it is budget focused. It is oriented toward individual line items. The core of this type of planning, in the IS environment, is on specific projects vice the management of the overall data resource. The informal planning culture

has a much more direct influence on IS planning because it is within the context of that culture that most IS planning is taking place. This is crisis-driven planning, personality-driven planning, planning that takes place as a byproduct of bureaucratic inertia. It is the desire to see immediate results, the kind that can be reflected on fitness reports. It is primarily due to the influence of this planning culture that little or no strategic IS planning is taking place. In fact, one would be hard-pressed to find reasonable examples of any type of strategic planning taking place within the Naval Reserve.

E. SUMMARY

It has been the intent of this chapter to explore some of the conceptual and practical aspects of strategic IS planning. The BSP methodology was introduced in that context. An important distinction was made between a planning methodology and the planning process. The planning methodology is just one part, albeit an important one, of the planning process. An assessment of IS planning in the Naval Reserve showed that planning is taking place without the benefit of any formal methodology. The type of planning that is taking place within the Naval Reserve is largely ineffective because the organizational factors working against strategic planning are more influential than those favoring it.

IV. THE BSP STUDY

A. INTRODUCTION

The Business Systems Planning (BSP) methodology, as developed by IBM, is a structured methodology based on the premise that ". . . there exists within the organization a need for significantly improved computer-based information systems (IS) and a need for an overall strategy to attain them." [Ref. 10:p. 5] As was pointed out in the last chapter, because information systems are fast becoming a critical component of the Naval Reserve and because they will continue to represent major investments of time and money, it is essential that they support the organization's true business needs and directly influence its objectives. BSP offers a process that can translate business strategy into IS strategy. If the organization does not have an apparent business strategy, as seems to be the case of the Naval Reserve, then BSP can help it express its long-term goals and objectives. Senior management recognition of the importance of articulating long-term goals and objectives will help guarantee a meaningful BSP study.

Two of the problems manifest in the Naval Reserve which BSP is designed to correct are data inconsistencies and non-integrated systems design. These are problems that are usually a result of the "bottom-up" evolution of systems.

The data inconsistency problem for the Naval Reserve is not exhibited as much between their internal systems as they are as a result of external systems interfaces. This is a "bottom-up" evolution of systems in the context of the entire Navy, with each organization developing their own systems. The question is whether BSP can adequately address this situation. This is not to say that there are not internal reasons for these problems, only that some of the cause is external to the organization.

The BSP methodology stresses an analysis that works from the top down and an implementation strategy where the information support is implemented in a modular building-block fashion over time. This allows the implementation of systems to remain consistent with the organization's business priorities, available funds, and other shorter-term considerations.

The first step of the BSP analysis is to define the business objectives. This requires top-level management involvement. The next step is to define the business processes and then to define the business data. This data definition is accomplished by identifying what things (entities) are important to the business and what data are required to manage those entities. The final step is to define the information architecture which becomes a statement of the long-term IS objective. From the

information architecture the individual modules can be identified, scheduled, and built.

There are two major steps (activities) that precede a BSP study and eleven in the study itself. The first two are: gaining the commitment; and preparing for the study. The eleven major activities of the study are: starting the study; defining business processes; defining business data; defining information architecture; analyzing current systems support; interviewing executives; defining findings and conclusions; determining architecture priorities; reviewing information resource management; developing recommendations; and reporting results. The remainder of this chapter will examine these steps in detail in the context of the Naval Reserve. This will not be, by any means, a complete study, only a general examination of processes and data sufficient for evaluating the methodology. The level of detail required for a full BSP study is well beyond the scope of this thesis.

B. PRE-STUDY ACTIVITIES

The success of a BSP study depends heavily on the commitment of all the participants. An assessment of the commitment of all concerned (particularly at the executive level) should be made before the study is started. Some of the other activities to be performed during this phase include: establishing the study scope; setting the objectives; and selecting the study team.

The scope of the study does not have to include the whole organization. It can focus on just one department or functional area. In the case of the Naval Reserve, for instance, it could be limited to echelon 3 or to the training function. For purposes of this evaluation the entire Naval Reserve organization will be examined. A full BSP study, if undertaken for the Naval Reserve, would probably be most beneficial if its scope included the entire organization.

> Businesses whose activities span multiple functional units tend to gain more from a BSP study than those that are more simply structured since BSP deals well with complexity. It is designed to identify the requirements for data integration across multiple functions. [Ref. 10:p. 14]

One of the most important commitments is the commitment of manpower and resources to the study team. A full BSP study will require 4 to 7 people full time for 8 to 12 weeks. These team members should not be the 6 most junior officers who just reported aboard, nor should they come from the ADP department. They need to be from upper and middle management with several years experience in the Naval Reserve. If the pressures of day-to-day operations make it impossible to devote this amount of manpower to the study there is still a way to get it done. This other option is to use Selected Reservists (SELRES). There is more than enough talent available. This approach has been used successfully before. [Ref. 5]

Once the commitment of all participants has been gained and the decision made to continue with the study it is necessary to complete the remaining actions that lead up to the actual start of the study. During this phase interviewees are selected and scheduled, a study work plan is developed, business and IS information is gathered, and administrative support is established. At this time a start-up meeting should be convened and full-time activities will commence. This start-up activity and the next 5 major activities are all aimed at understanding the business requirements and data processing support as they exist today as well as the business requirements for the future.

C. DEFINING BUSINESS PROCESSES

The basic step for gaining an understanding of how the business accomplishes its overall mission and objectives and for defining key data requirements is to define business processes. Business processes are defined as groups of logically related decisions and activities required to manage the resources of the organization.

The method for determining the processes is to first identify the product/service and supporting resources of the organization. The product and supporting resources life cycle is then described. For purposes of this discussion the individual reservist will be looked at as the product of the organization. The life cycle stages of that reservist are: to recruit, to train, to mobilize, to retire. The

supporting resources are the recruiting, personnel management and training programs, facilities, and pay. There are many business processes that could be identified for each of these resources in each life cycle phase. After this first rough identification, the processes are then grouped or split as necessary to reduce inconsistencies and commonalities. The team should then write a description of each process.

The final major activity of this step is to relate the business processes to the organization. This is done through the development of a process/organization matrix. It illustrates the degree of involvement of the various organizational units in each of the processes. The four possible degrees of involvement are: major responsibility and decision maker (**X**), major involvement (X), some involvement (/), and no involvement (blank). A simple process/organization matrix for the Naval Reserve is shown in Figure 4-1.

D. DEFINING BUSINESS DATA

Once the business processes have been identified, the next step is to identify and define business entities, data classes, and their relationships.

A business entity is something of lasting interest to an organization. It can be a person, place, thing, or idea about which data are collected and stored. They are what the organization manages and their identification serves as

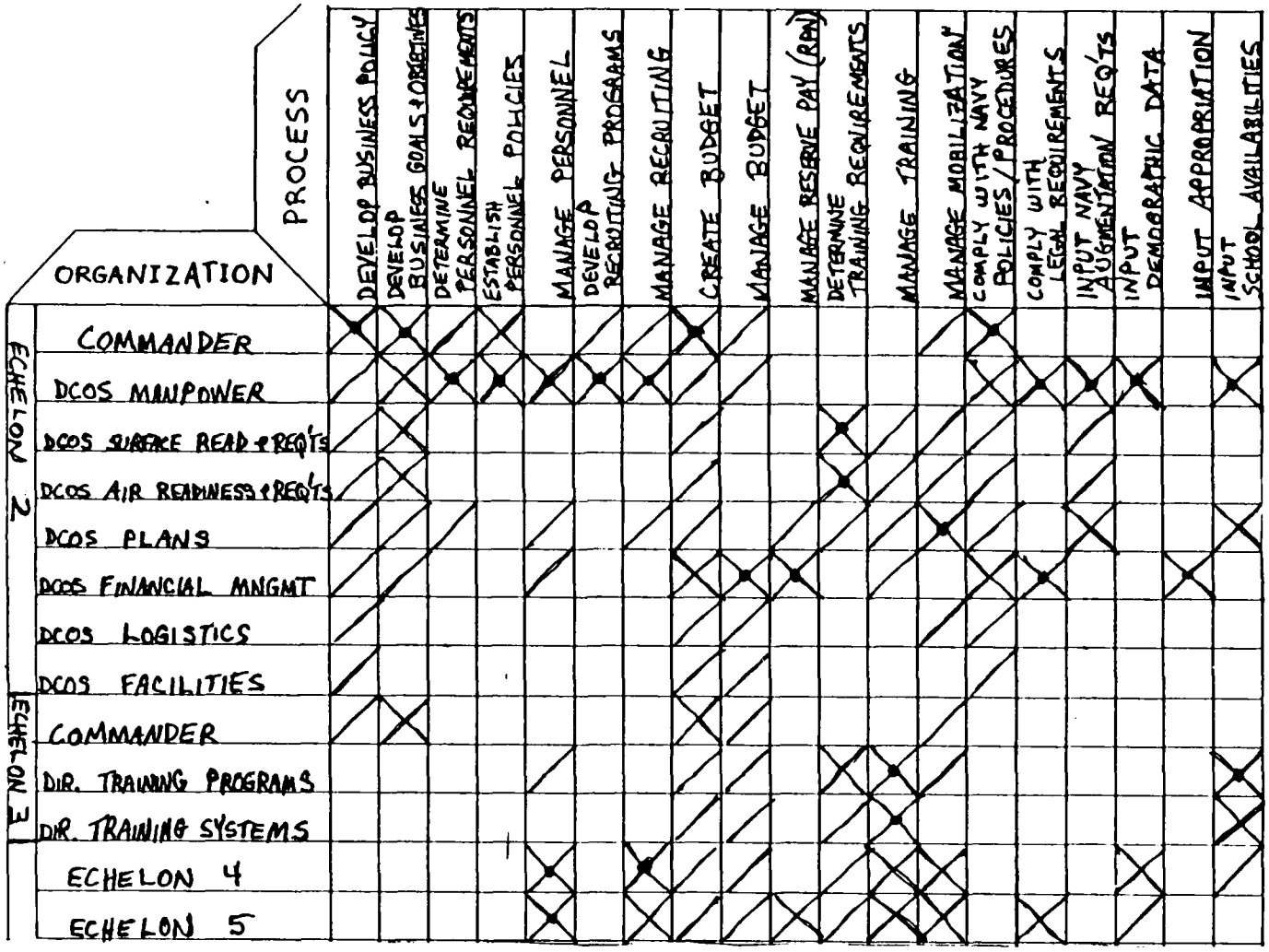

Figure 4-1 Process/Organization Matrix

a basis for identifying the data needs of the organization. Each entity should be able to be uniquely identified. Some of the business entities of significance to the Naval Reserve are: the reservist, billet, reinforcing (reserve) unit, augmented (active) unit, readiness, appropriations, expenditures, orders, end strength, equipment, facilities, and schools. Each entity should be carefully defined in detailed and complete sentences.

The second part of this process is to specify what data must be available and what data are created by each business process. Each type of data identified is then matched to the entity it describes. This forces a clarification of business entities.

The knowledge of the relationship of data to processes leads directly to the identification of data classes. A data class represents a category of information about an entity. To ensure the integrity of data, there must be no more than one source for the creation of each data class. The final step in this activity is to define each data class completely.

E. DEFINING INFORMATION ARCHITECTURE

After the data classes have been identified, it is necessary to establish the relationship between data classes and business processes. The tool used to establish these relationships is the information architecture (process/data class matrix). The relation can be one of three types. The

first type is creation (C), where the process creates the data class. The second relation can be usage (U), where the process uses the data class. The third type of relation is no involvement (blank). Once all the relations are labeled, the process/data class matrix is rearranged so that groupings of Cs and Us begin at the upper left and move to the lower right.

What is the benefit of all this relationship labeling and column juggling? The groupings that are obtained from this process can be related to organizational personnel and structure. That is, data classes (and therefore data elements) are grouped into proper parts of the organization. A BSP study can show the organization the logical way they deal with data classes (information), and groupings that would reflect major activities of information handling.

The next step is to identify the flow of data between process groups. Whenever there is data used by a process and that data is created by a process in some other group, an arrow is drawn from the creating group to the using group. When all Us are examined and the necessary data flows represented, the result will be a flow diagram.

Figure 4-2 is an elementary process/data class matrix that has been transformed into a flow diagram for the Naval Reserve. The process column starts with strategic activities followed by a mix of management and operational control activities. It may not accurately represent all the

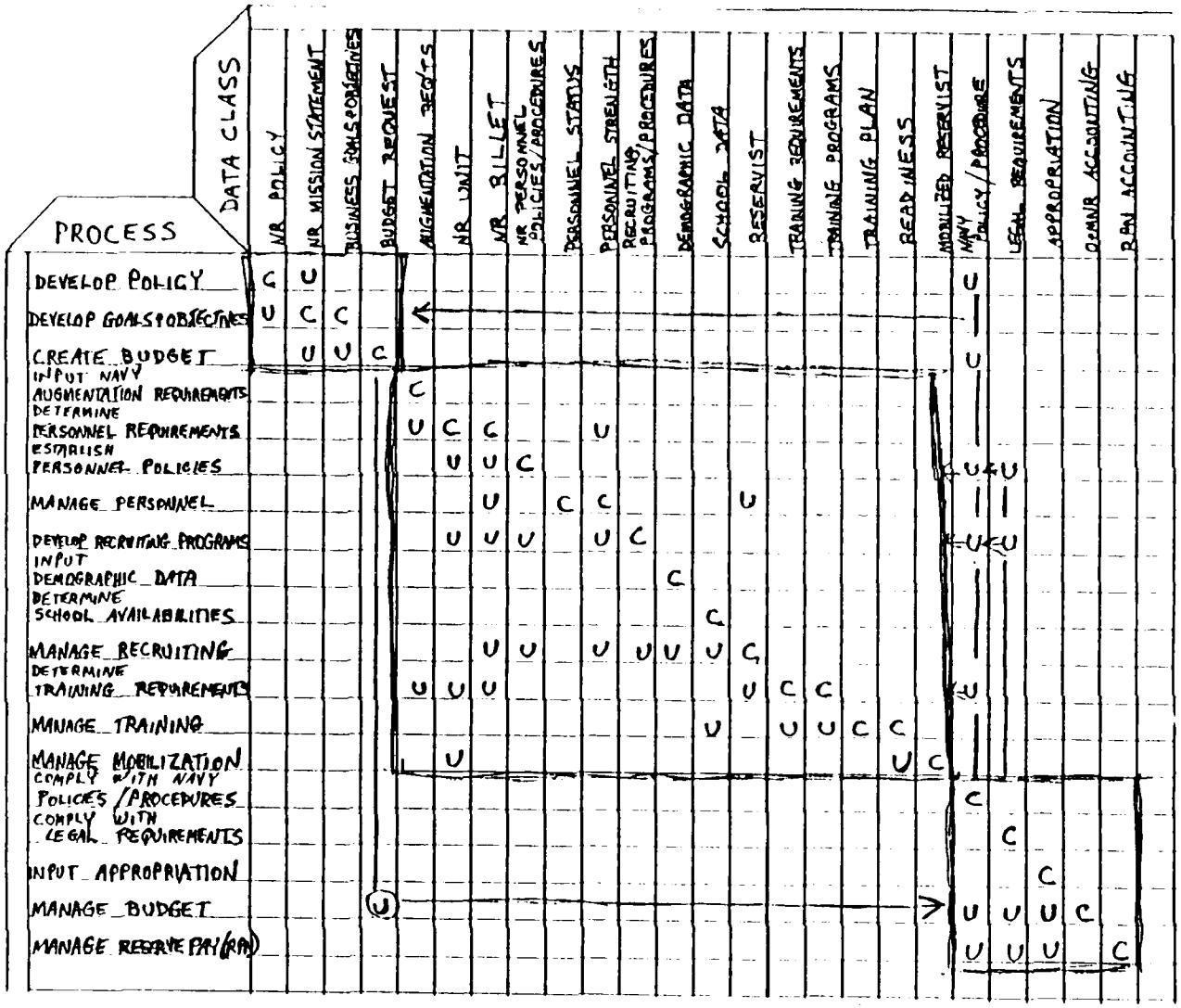

Figure 4-2 Information Architecture

information flows because it does not contain the level of detail necessary to precisely reflect the processes and data classes of the Naval Reserve. A full BSP study would further decompose and refine the processes and data classes shown here. The significance of Figures 4-1 and 4-2 is not in the information they contain but only as an illustration of how the matrices would be used in analyzing the Naval Reserve.

A question raised at the beginning of this chapter was whether BSP could adequately consider data derived from sources external to the organization. This situation can be represented by creating a separate process for each instance where external data are required. These processes would then become the creation points for the internal representation of those data. This type of transformation activity is represented by the "comply with" and "input" processes in Figures 4-1 and 4-2.

The information architecture thus developed is an important product of the BSP study. It yields information flow within an organization, displaying relationships to subsystems and the processes supported by each subsystem.

The completed architecture drawing is a very useful management communication tool because:

* It is the team's recommendation for long-range information systems implementations.
* It identifies the information systems (the blocks or boxes) that form the long-range plan.

* It shows the data controlled by each information system (reading vertically).

* It shows the business processes supported by each information system (reading horizontally).

* It shows the flow of information between the various information systems (the lines and arrows) and thus shows the flow of information through the business itself. [Ref. 10:p. 45]

From these results, information resource decisions can be made. That is, decisions concerning subsystems to receive computer support and development priorities of the computer subsystems can be made.

None of these decisions, however, can be made using the simple graphic which is Figure 4-2. About all that can be discerned from that figure is that it seems to indicate that all aspects of the management of the reservist are closely related. It helps explain the interfaces and duplication of data that exist between RTSS and RESFMS. Even this simple graphic argues for the integration of those two systems.

F. THE FINAL STEPS

The activities up to this point have been to look at the organization in terms of business processes and the data classes necessary to perform them. The next step in the BSP process is to analyze current systems support. It uses the process and data class information developed by the previous steps. Much of this analysis was presented in a different format in Chapter II. The importance of this examination is to ensure that computer system development decisions are

based not only on the information architecture derived from the business information but also on current computer systems.

After the team has examined all the business and IS information, it is necessary to get executive input. The requirement for this input is dictated by the top-down approach of BSP. The executive perspective is gained by conducting interviews with personnel from the top levels of management. These interviews serve to validate the processes, data classes, organization, and their interrelationships. They help to clarify the future direction of the business and its impact on information requirements. They also should identify and document the business problems so that they may be related to business processes and data classes.

At this stage the fact gathering is complete. Now it is time to arrange the facts, analyze them and draw conclusions. Architecture priorities can then be determined.

In addition to determining information architecture and setting application priorities, BSP also stresses a need to ensure that the information resource is managed properly to support the functional needs of the business. This includes: seeing that the information architecture is implemented in an orderly fashion; consistent attention to the effectiveness of information systems; that the responsiveness of information processing is assured; and that a

viable information resource plan exists. "The basic premise of information resource management is the ability to make information available to whomever needs it when and where it is needed." [Ref. 10:p. 69]

The BSP study team evaluates the information resource management environment and recommends any changes necessary to keep it in consonance with these objectives. Some of these issues were addressed in Chapter II. In addition to those comments (of Chapter II), a further recommendation of a BSP study for the Naval Reserve may be to form a steering committee from the functional groups of the enterprise to oversee the information resource organization. If properly implemented, this committee could be instrumental in changing the perspective of the organization in regard to the proper role of information resource management. In focusing on the information resource management functions of the organization, BSP tries to ensure that the study will be more than just an isolated inconsequential occurrence; but that it would be a cornerstone of a dynamic, responsive, and effective information resource organization.

G. SUMMARY

This chapter explored how well the BSP methodology would fit the Naval Reserve organization. This cursory examination showed that not only would it fit but that it would also go a long way toward resolving some of the major problems of information resource management and planning that

were discussed in Chapters II and III. A partial analysis of business processes and data classes highlighted the need for the integration of RTSS and RESFMS, the two major information systems of the Naval Reserve. The bottom line of this chapter is that BSP is a structured and comprehensive planning methodology that would prove to be very beneficial if properly applied to the Naval Reserve organization.

V. CONCLUSIONS

The Naval Reserve is a complex and geographically dispersed organization, the effective management of which is a non-trivial problem. It is an organization rich in information but poor in the management of that information. Effective information resource management is a pivotal prerequisite for the successful administration of that organization. A task which is further complicated by the nature and extent of external information interfaces. Information systems in the Naval Reserve are dependent on various data that are owned and defined by external organizations.

Information systems are becoming increasingly critical to the management and day-to-day operations of the Naval Reserve. It is critical that their development be as a result of careful and comprehensive strategic IS planning. Many of the shortcomings of the present information systems can be attributed to ineffective long-range planning. The critical nature of current and future systems demands effective IS planning. Unfortunately, the planning environment of the organization is short-term crisis oriented. The organizational culture is contrary to any kind of strategic thinking. This is the major problem of the Naval Reserve; one which no planning methodology, by itself, can solve.

Some fundamental conceptual changes need to take place within the organization in order to facilitate, not only more effective information resource management, but also more effective overall management.

In determining the suitability of BSP for strategic IS planning, several salient issues must be considered. The most important of these is how well it conforms to the planning culture and other important environmental organizational factors. BSP, and all that it stands for, is an anathema to the organizational culture of the Naval Reserve. There would have to be a substantive change in the perception and implementation of planning activities in the organization before a BSP study could be of any real benefit. At this point it would probably be little more than an academic exercise with insignificant organizational impact. It may, however, be more palatable than a blatant call for strategic planning because it does offer some short-term benefits in determining architecture priorities.

A related issue is the extent to which BSP would fit into the Navy's strategic IS planning process. Just as hardware and software compatibility is important in computer to computer communications, so too is planning methodology compatibility important between levels of the same organization. Although it is not strictly compatible with the planning methodology mandated by OP-16, it is not

incompatible. It also seems to be more useful than that still evolving methodology.

In BSP, the validation of the study is a product of interviews with top-level management. This presupposes that these managers have a far-sighted and undistorted perspective of the organization and a thorough understanding of its functions and problems. This could prove to be a dangerous assumption in the case of the Naval Reserve. The question is whether these managers have a sufficient knowledge of the functions and problems of the lower echelons of the organization. A related question is whether the study would get adequate input from these lower echelons. Since top-level managers may not fully appreciate the needs of the entire organization, it is imperative that the study team thoroughly examine the entire organization. They could not complete the study without leaving New Orleans. They would need to travel to a variety of lower echelon commands in order to get a true picture of the organization.

BSP could be a principal component of a viable planning process. It is not, however, an easy solution for the institutional neglect of strategic planning activities. Although a BSP study could offer significant benefits, it is still just a tool that, if used improperly or in the wrong environment, could do little for the organization. BSP can provide a comprehensive methodology for understanding the processes of an organization in terms of its information

needs. This is something that has not been done in the Naval Reserve and is sorely needed.

LIST OF REFERENCES

1. Chief of Naval Operations, Letter: Serial 160D, Subject: Information Flow Architecture Methodology for Manpower, Personnel and Training (MPT), 5 December 1984.

2. Chief of Naval Reserve (Code 46), Functional Description for the Reserve Training Support System (RTSS) for Air, 30 March 1981.

3. Chief of Naval Reserve (Code 46), Functional Description for the Reserve Training Support System (RTSS) for Training Management, 15 November 1983.

4. Lorin, Harold, Aspects of Distributed Computer Systems, John Wiley and Sons, 1980.

5. U.S. Department of the Navy, Commander Naval Reserve Force, Analysis of Commander, Naval Reserve Force Information Systems Management Requirements, by Naval Reserve CINCPACFLT Detachment 420, January 1984.

6. Commander Naval Reserve Force, Reserve Financial Management/Active Duty for Training System (RESFMS) Phase II Functional Description, August 1984.

7. Commander Naval Reserve Force, Reserve Financial Management/Active Duty for Training System (RESFMS) Update to the Functional Description of August 1981, 6 September 1985.

8. Gibson, C.F. and Nolan, R.L., "Managing the Four Stages of EDP Growth," Harvard Business Reviews, pp. 76-88, January-February 1974.

9. Sullivan, Cornelius, H., Jr., "Systems Planning in the Information Age," Sloan Management Review, pp. 3-12, Winter 1985.

10. IBM Corporation, Business Systems Planning, Information Systems Planning Guide, (GF20-0527-4), 4th Edition, July 1984.

BIBLIOGRAPHY

Booth, Grayce M., The Design of Complex Information Systems: Common Sense Methods for Success, McGraw-Hill, 1983.

Cash, James I., Jr., McFarlan, F. Warren, and McKenney, James L., Corporate Information Systems Management: Text and Cases, Richard D. Irwin, Inc., 1983.

Gore, Marvin and Stubbe, John, Elements of Systems Analysis, Wm. C. Brown Co., 1983.

Lurhman, Steve, A Methodology for Naval Bases and Stations Requirements Analysis: The Case of the NAS Moffett Field, M.S. Thesis, Naval Postgraduate School, Monterey, California, September 1985.

Martin, James and Finkelstein, Clive, Information Engineering, Vols. 1 and 2, Savant Institute, 1982.

National Academy of Sciences, Navy Nontactical Automatic Data Processing Policy, Organization and Management, by Committee on the Review of Navy Long-Range ADP Planning, July 1983.

Senn, James A., Information Systems in Management, Wadsworth, 1982.

U.S. Department of the Navy, Deputy Chief of Naval Operations (Manpower, Personnel, and Training), OPNAV P160-P1-84, Manpower, Personnel, and Training Information Systems (MAPTIS) Program Strategic Plan for Program Objective Memorandum (POM) 87, October 1984.

Weinberg, Gerald M., Rethinking Systems Analysis and Design, Little Brown & Co., 1982.

Winslow, Michel J. and Seeger, Howard C., A Design Methodology and Prototype for the Reserve Training Support System, M.S. Thesis, Naval Postgraduate School, Monterey, California, March 1985.

Yadav, Sueya B., "Determining an Organization's Information Requirements: A State of the Art Survey," Database, Spring 1983.

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