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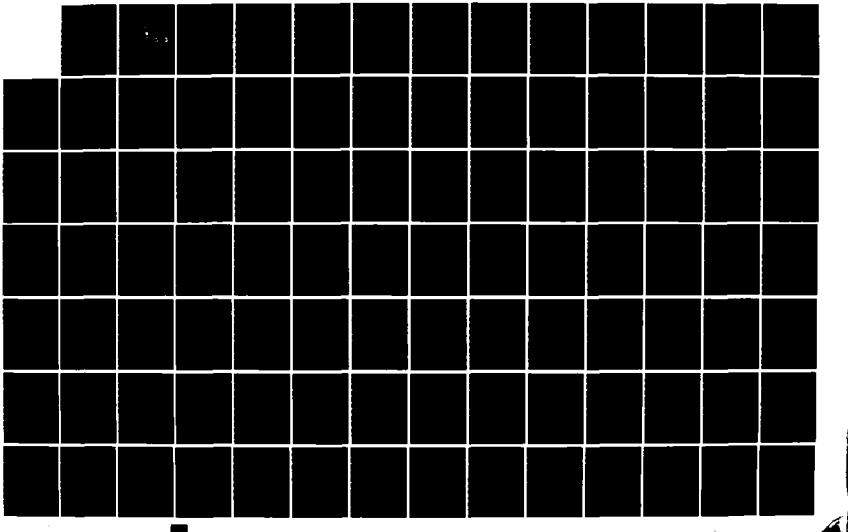

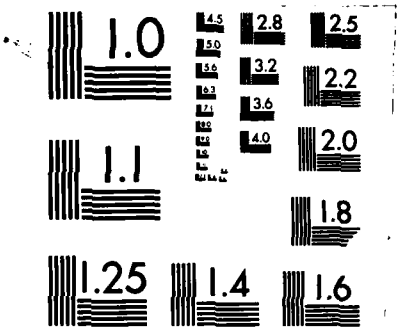

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

AN EVALUATION OF INDUSTRIAL FUNDING
FOR MARINE CORPS NON-DEPLOYABLE ADP ASSETS

by

Gary A. Ham
and
Robert M. Weidert

March 1985

Thesis Advisors: Dan C. Boger
Carl R. Jones

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This thesis examines the effect an industrial funded chargeback system would have on management and control of Marine Corps non-deployable ADP resources. Within this framework, current Marine Corps ADP structure and planning is discussed, along with regulatory, organizational, and economic issues. The Naval Data Automation Command (NAVDAC) experience with industrial fund implementation is reviewed and a Marine Corps proposal (Continued)

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An Evaluation of Industrial Funding for Marine Corps Non-Deployable ADP Assets

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ABSTRACT

This thesis examines the effect an industrial funded chargeback system would have on management and control of Marine Corps non-deployable ADP resources. Within this framework, current Marine Corps ADP structure and planning is discussed, along with regulatory, organizational, and economic issues. The Naval Data Automation Command (NAVDAC) experience with industrial fund implementation is reviewed and a Marine Corps proposal for industrial funded ADP is developed. While this thesis does propose a method for implementation of industrial funding, it also points out concerns which remain unresolved. Accordingly, it does not conclude that industrial funding is the best solution, only that it is possible, has much to offer, and therefore warrants consideration.

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LIST OF ACRONYMS AND ABBREVIATIONS

AC	Average Cost
AIS	Automated Information System
ADP	Automatic Data Processing
ADPE	Automatic Data Processing Equipment
AOR	Accumulated Operating Results
C4	Command, Control, Communications, and Computer Systems Division
CIP	Central Investment Program
CMC	Commandant of the Marine Corps
CPU	Central Processing Unit
DoD	Department of Defense
FASC	Force Automated Services Center
FGAP	Federal Government Accounting Pamphlet
FIPS PUB	Federal Information Processing Standards Publication
FMF	Fleet Marine Force
FY	Fiscal Year
GAO	General Accounting Office
HAC	House Appropriations Committee
HQMC	Headquarters Marine Corps
JARS	Job Accounting and Reporting System
ISSC	Information Systems Steering Committee
M3S	Marine Corps Standard Supply System
MAB	Marine Amphibious Brigade

MAC	Military Airlift Command
MC	Marginal Cost
MCCDPA	Marine Corps Central Design and Programming Activity
MCDN	Marine Corps Data Network
MR	Marginal Revenue
NAVDAC	Naval Data Automation Command
NAVDAF	Naval Data Automation Facility
NARDAC	Naval Regional Data Automation Center
NIF	Navy Industrial Fund
OMB	Office of Management and Budget
O&MMC	Operations and Maintenance Marine Corps
OSD	Office of Secretary of Defense
POM	Program Objective Memorandum
RASC	Regional Automated Services Center
RESCU	Resource Cost and Utilization System
RJE	Remote Job Entry
SABRS	Standard, Accounting, Budgeting, and Reporting System
SAC	Senate Appropriations Committee
S&IS	Surveys and Investigations Staff
SSR	Standard Stabilized Rates

2. Headquarters (C4 Division)

Although having no line responsibility, C4 Division maintains strong control over computing assets. The Director has operational control over MCCDPA functions. All new Headquarters, Marine Corps sponsored (Class I) systems require C4 (CCIS) approval. All equipment procurements are handled by C4 (CCIR) or must be delegated to local contracting officers. Senior military data processing personnel assignments are recommended by C4 (CCIR). Although personnel assignment is a Manpower responsibility, these recommendations by C4 are generally approved by Manpower.

3. The Functional Manager

Each functional area in the Headquarters is a 'functional manager' for one or more systems (e.g., Fiscal Division is responsible for the various accounting systems). Functional managers are "responsible for defining their requirements, including determining current needs, forecasting future needs, validating those needs, and providing funds to support ADP program initiatives." [Ref. 18] A section of personnel within the functional sponsor's organization may be assigned to monitor a system, recommend changes, and document new requirements within its functional area. These requirements are forwarded to C4 Division (CCIS) for approval and then to the appropriate MCCDPA for design and implementation. Design and implementation are

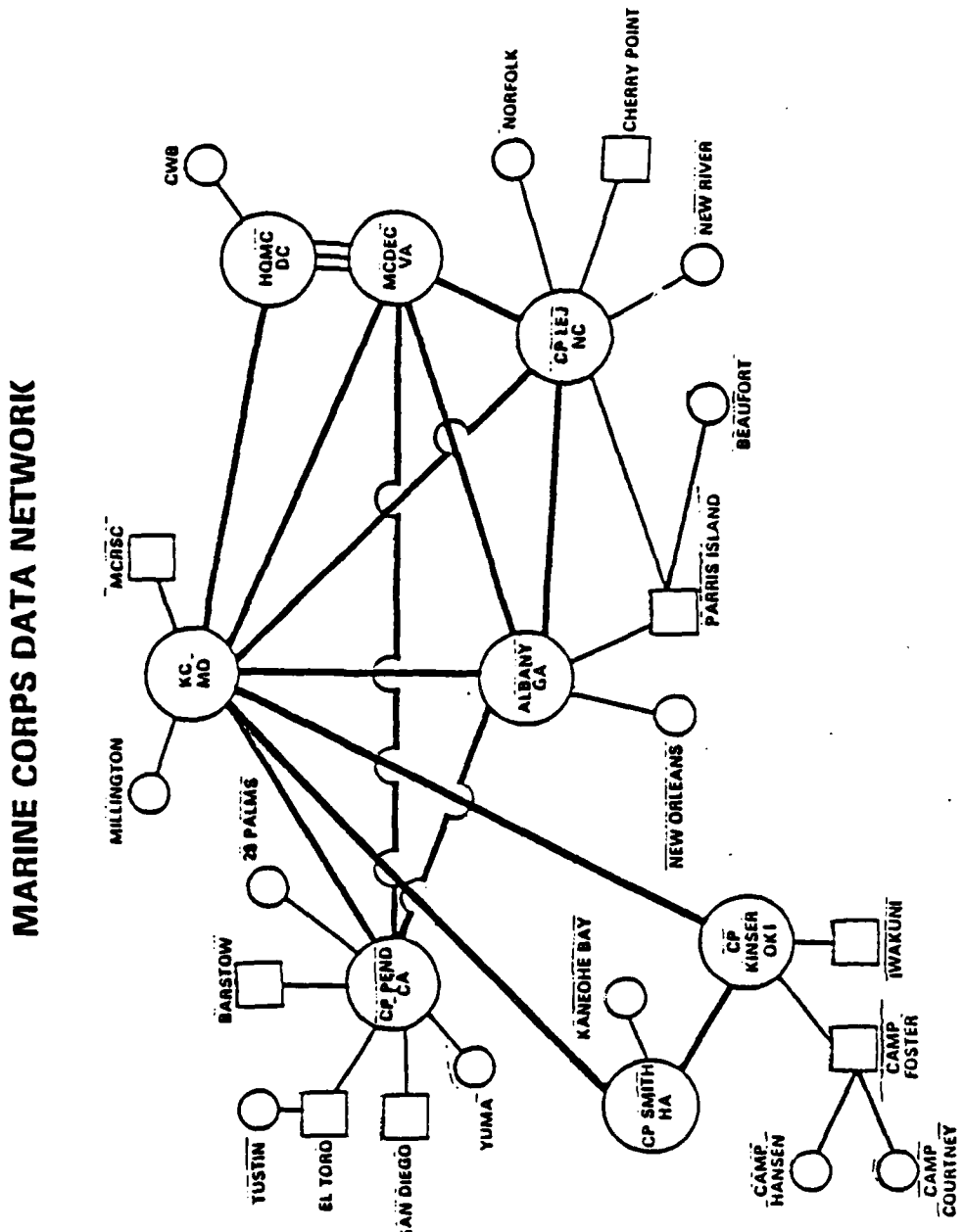

Figure 2-2 Marine Corps Data Network

Corps Data Network (MCDN). (See Figure 2-2). [Ref. 16]. It is possible, for instance, to query a personnel record in Kansas City from an ADP terminal in Camp Hansen, Okinawa using satellite links to the mainland, leased landlines within the Continental United States, and switches in the form of communications processors at intervening RASC's. Since most of these sites are separately funded, a single transaction can encompass operating costs and capacity utilization for several different operating budget holders, many of whom have no direct interest in the transaction.

C. · LINES OF AUTHORITY

Although "Marine Corps policy is to centralize technical direction, policy formulation, and resource management at HQMC under the Director, C4 Division, while providing ADP support on a regional basis" [Ref. 17], the actual lines of authority can be described from four separate points of view:

1. Military Chain of Command

The base or station commander is considered responsible for the operation and maintenance of facilities which are part of his organization. This commander has administrative control and is responsible for personnel matters, facilities, and O&M funding. This commander also has operational control as commander of the unit to which the computer facility belongs.

2. Other sites

In addition to the three MCCDPA's which also function as major operational processing centers, there are six Regional Automated Services Centers (RASC's) with the primary mission to "provide day-to-day production support for all assigned AIS's." [Ref. 14] "The regional centers operate as a service center in that multiple functional areas are supported and the computer is a shared resource." [Ref. 15] Four of the RASC's (located at Camp Pendleton, CA; Camp Lejeune, NC; Camp Hansen, Okinawa; and Camp Smith, HI) have similar, although somewhat smaller, capacities and the same operating systems (IBM compatible) and major systems software as the MCCDPA's. All major applications programming is designed to run at any or all of the seven major sites (three MCCDPA's and four of the RASC's). The remaining two RASC's (located at Marine Corps Air Stations, El Toro, CA and Cherry Point, NC) support only Naval Aviation unique applications and are not considered part of the 'seven major sites' although they are connected to them via remote job entry (RJE) facilities. In addition, there are twenty-five other RJE sites and approximately 2,000 terminals located throughout the Marine Corps. All are connected to the 'backbone' of seven major sites.

3. Marine Corps Data Network (MCDN)

Virtually all sites are connected by data communications facilities known collectively as the Marine

(7) Developing plans, policies and procedures regarding ADP security." [Ref. 12]

CCI is composed of the following four sections:

1. The Resources Management Section (CCIR) controls budget preparation, equipment procurement, and personnel management.

2. The Systems Engineering Section (CCIE) controls configuration management, equipment and systems software planning, and statistical analysis.

3. The Administrative Programs Section (CCIP) controls forms and reports management and office automation planning.

4. The Systems Analysis and Review Section (CCIS) coordinates development of all new ADP systems and establishes policy regarding such systems. This section is responsible for preparation of ADP plans and for monitoring compliance with the Life Cycle Management (LCM) directives [Ref. 13] and proper software development procedures.

B. FIELD ORGANIZATIONS

1. Marine Corps Central Design and Programming Activities (MCCDPA's)

There are three Marine Corps Central Design and Programming Activities. MCCDPA Kansas City, Missouri is responsible for personnel records and disbursing. MCCDPA Albany, Georgia is responsible for supply and maintenance systems. MCCDPA Quantico, Virginia, with its subsidiary site at Headquarters, handles most other requirements. Other field units do some programming, but that capability is limited by internal regulation, and by the fact that field units are not given program development manpower, nor sufficient funding to contract for ADP programming services.

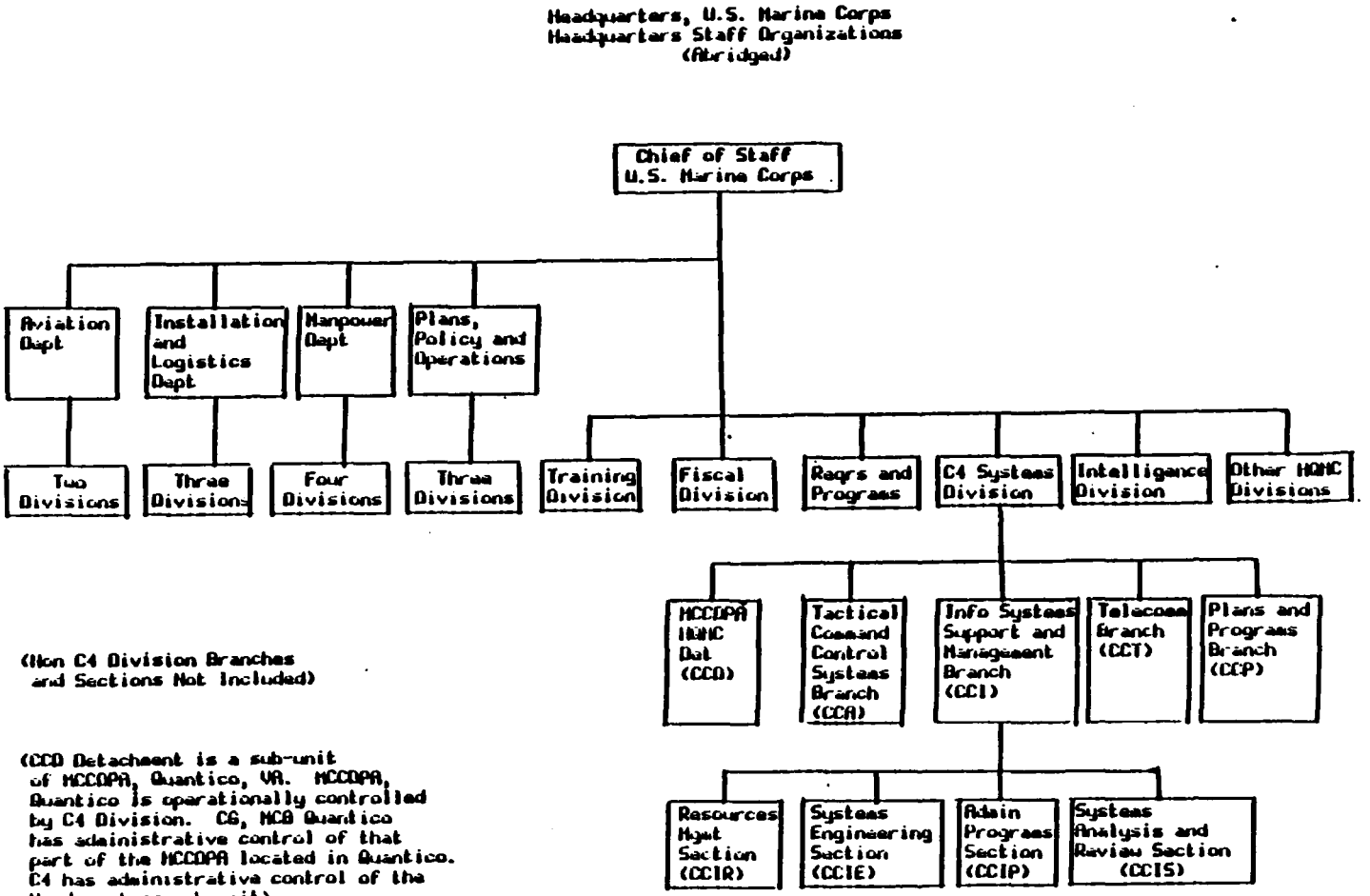

Figure 2-1 Headquarters Staff Organizations (Abridged)

II. MARINE CORPS ADP ORGANIZATION

A. HEADQUARTERS

Command, Control, Communications and Computer Systems (C4) Division is an independent headquarters division organization reporting directly to the Chief of Staff, U.S. Marine Corps. (See Figure 2-1). Headed by a Brigadier General (and sometimes filled by a senior colonel), C4 must deal with the politically more powerful departments (headed by Lieutenant Generals) and other divisions which are headed by Major Generals or a civilian of equivalent status. Separate division status, however, does give a direct line to the Chief of Staff when necessary.

Management of non-tactical computers within C4 is provided by the Information Systems Support and Management Branch (CCI). Duties include:

"(1) Providing technical direction to Marine Corps ADP activities through the development and promulgation of ADP policies, procedures and standards.
(2) Formulating Marine Corps policies, procedures and standards for the development, implementation and management of AIS's.
(3) Assessing current and projected ADP support requirements.
(4) Programming and budgeting for the acquisition and maintenance of ADPE, software, facilities and personnel.
(5) Exercising technical direction of and advising on the requirements for technical training and assignment of military and civilian ADP personnel.
(6) Providing technical support for major ADP procurements and allocating hardware, software, and services for all Marine Corps activities.

and cons of possible methods of implementation by the Marine Corps. Chapter VII describes how the Naval Data Automation Command implemented industrial funding and discusses its future plans and concerns. Chapter VIII presents proposed guidelines for adoption of industrial funded ADP by the Marine Corps. Chapter IX reviews advantages of the proposed system in relation to the issues originally raised in this chapter. Finally, Chapter X imposes cautions and concerns, particularly emphasizing the firm commitment to change which must be in place before the evolution toward industrial funding can begin.

D. METHODOLOGY AND THESIS ORGANIZATION

Research included review of regulations, case histories, operating manuals, budget and planning documents, published texts, magazine articles, and previous research. Topics emphasized were industrial funding, ADP management and control, financial management, ADP chargeback, Federal and DoD regulations, and ADP economic issues. Interviews were conducted with ADP and financial management personnel located at the Naval Data Automation Command, Defense Communications Agency, and Headquarters, Marine Corps in Washington D.C., and Marine Corps Logistics Base, Barstow CA.

Chapter I presents the purpose of the thesis, basic themes it will emphasize, and research methodology. Chapter II presents an overview of the current Marine Corps management structure and mission with an emphasis on non-deployable assets. Chapter III provides a brief history of Marine Corps ADP, a definition of currently identified trends and deficiencies, and steps being taken to correct those deficiencies. Chapter IV brings in a discussion of the intertwined effect on Marine Corps ADP management of Life Cycle Management, procurement, budget, Commercial Activity, and ADP cost accounting regulations. Chapter V presents a discussion of economic theory and market effect upon ADP operations. Chapter VI specifically discusses chargeback, its advantages, its disadvantages, and the pros

'backlogged' requirements which cannot be produced 'in-house.' Commercial contracting is limited, however, by the requirement to keep "inherently governmental" [Ref. 9] systems in-house and to provide, in the interest of "national defense" [Ref. 10], shore rotation billets for ADP personnel. There is also political opposition to commercial contracting in Congress [Ref. 11] and by civil service personnel. Finally, there is a history of less than successful commercial contracting efforts, although it cannot be stated unequivocally that these failures were the fault of the contractors involved.

C. SCOPE

This thesis will view Marine Corps ADP management and control in light of these issues, with specific focus on how industrial funded ADP management could best be implemented. Accordingly, other methods of ADP management and organization are covered to the degree necessary to provide background for discussion of the applicability of industrial funding, but not to the degree necessary to conclude that any particular method is the 'best'. Rather, it is the objective of this thesis to examine the concept of industrial funding for Marine Corps non-deployable ADP assets, with an emphasis on the advantages its offers, and the problems which can be foreseen.

processing of the raw data, preparing and verifying the bills, reviewing and certifying charges, and accounting for and transferring funds."

Even where chargeback is accepted as the way to do business, the actual chargeback method to be used is often questioned. Industrial funds have been criticized as inefficient because these funds can easily pass along their inefficiencies to a captive clientele [Ref. 6]. Similarly, rate stabilization places restrictions on industrial funded activities which may discourage effective management [Ref. 7]. Reimbursement to mission funded units is a problem where one system, and perhaps even one transaction within a system, crosses many different budget boundaries. There is no accurate way to fairly allocate charges. A third alternative, statistical chargeback, calculates system cost estimates for user awareness but often lacks accuracy. Because there is no bill to pay, there is no real incentive to manage costs; yet, there is still a significant overhead involved in gathering and managing the cost data.

Finally, the issue of what degree of commercial contracting for ADP services is appropriate creates another forum for policy dispute. ADP is defined as a Commercial Activity under OMB Circular A-76 [Ref. 8]. As such, commercial contracting is encouraged where favorable cost differentials can be established. Given the current capacity and manpower constraints with the DoD, commercial contracting provides an opportunity to contract for

> areas in which it is applied. Thus, if computing is applied mainly to centralized financial activities, centralized control of computing should be appropriate. On the other hand, if computing tends to be a general-purpose resource used for many different kinds of applications at the department level, and departmental managers have considerable autonomy in how they run their operations, some decentralization of control to these managers might be appropriate. The goal is to ensure that the arrangements for controlling computing are not widely out of keeping with other organizational practices. Computing should not be thought of as a tool by which the basic structures and behaviors of organizations can be changed."

Computing should be a tool to be used within the structure of the organization without any attempt to seriously modify the way in which an organization conducts its business.

Similarly, there have been numerous arguments on the value of industrial funding in general and ADP chargeback in particular. Arguments for chargeback center around elimination of the "free good" syndrome where "users are motivated and even encouraged to make use of ADP services for practically any amount of marginal benefit no matter how small." [Ref. 3] This position is supported by OMB Circular A-121 which requires "accounting for the full cost of operating data processing facilities" and "allocating all costs to users according to the service they receive." [Ref. 4] Arguments against chargebacks center around the high overhead costs often needed to administer the chargeback system. As stated by Hamrick and Ragland [Ref. 5],

> 'Fee-for-service' is not cheap, especially since it produces no <u>direct</u> benefits... Besides the initial development and implementation costs involved, there are costs associated with the collecting, storing, and

I. INTRODUCTION

A. PURPOSE

The purpose of this thesis is to analyze the effect an industrial funded chargeback system would have on management and control of Marine Corps non-deployable ADP resources. A general methodology will be proposed for achieving industrial funded ADP, if necessary.

B. BACKGROUND

There are many differing opinions on the degree of centralization required for effective ADP resource management. Some favor centralized management. Others favor decentralized management or some compromise between the two. King [Ref. 1] has pointed out that cost is not the primary issue. Arguments about lowered cost and increased effectiveness can be made on both sides of the issue. The real question is one of control. King [Ref. 2] describes the situation as follows:

> "The prevailing norms of the organization can provide guidance for dealing with control over computing. If the organization is highly centralized in most of its operations, a highly centralized control arrangement for computing is possible and probably sensible. Similarly, if the organization follows highly decentralized control policies, such as establishment of operating units as profit centers, decentralization of control might be necessary and desirable. Most organizations have a range of control arrangements, depending on what is being controlled. Decisions about control over computing should parallel those organizational arrangements governing the

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At MCLB, Barstow, CA: Mr. Pat Lorelli of the Comptroller's Office.

At Naval Data Automation Command: Mr. Carl Bolter, Mr. Robert Wagner, and Mr. Vince Serio, all of the Comptroller's Office.

At Defense Communications Agency: Mr. John Casteel of the Comptroller's Office.

At our homes: Linda and Mimi, our wives, who supported us; and Maria, Alexander, Christopher, and Nicholas, the Ham children.

monitored by a formally chartered AIS Steering Group composed primarily of users with an interest in the project along with some representation from C4 Division. This Steering Group also has the power to "redirect or terminate the project if the project is not progressing satisfactorily." [Ref. 19]

4. The MCDN Hierarchy

MCCDPA, Kansas City forms the 'Master Node' of the MCDN hierarchy. Changes which involve data communications must begin at MCCDPA, Kansas City. Because MCDN is designed to be a hierarchical system with standard communications protocols, other nodes in the system must adapt their methods to match changes adopted by nodes at a higher level. Since most Headquarters Class I systems operate at several nodes in the network, changes made at one node to either the operating system or communications system interfaces must be replicated throughout the network.

D. SUMMARY

As in most military staff support functions, control of ADP is performed through a matrix of shared authority between line command and staff direction. In addition, control of ADP is shared with users as a third entity due to the fact that responsibility for design, implementation, and funding of new systems has been imposed on separate functional managers and user controlled AIS Steering Groups.

Finally, the physical structure of the Marine Corps ADP systems themselves form a fourth entity of control. To provide effective ADP support, the goals and incentives created by all four entities must not conflict.

III. HISTORY, PLANS, AND CONCERNS

A. HISTORICAL PERSPECTIVE

> "The absence of a control system...to encourage appropriate appraisal of the new use in terms of cost and benefits to the organization...may result in explosive growth (often unprofitable and poorly managed) with new capacity required every one or two years or, alternatively, little growth with frustrated users obtaining services surreptitiously (and more expensively)." [Ref. 20]

Controls on ADP abound, both within the Marine Corps and as imposed from outside.[1] The 'appropriateness' of these controls is questionable, since Marine Corps information systems management has exhibited both explosive growth and frustrated users.

Until about 1980, the no-growth symptom was prevalent. The 1970's were an era of limited resources. All efforts went toward most effective use of outdated equipment and limited capacity. Systems development policy became more and more restrictive and authority more and more centralized. Programming assets were centralized at the three Marine Corps Central Design and Programming Activities (MCCDPA's). Field activities and local bases and stations

---

[1]The perspective presented in this section is based primarily on Major (then Captain) G.A. Ham's experience as the Budget Officer, Resources Management Section, Information Systems Support and Management Branch, C4 Systems Division, Headquarters, U.S. Marine Corps, April 1980 to July 1983.

were left with little, if any, organic programming capability.

This approach was reasonable for the 1970's, but information needs continued to grow in spite of efforts to discourage that growth. Yet, there was no capacity to handle growth. There were minor upgrades here and there, but the IBM 360 CPU's first obtained in 1965 were still the only major processors as late as 1981. Because there was no capacity to accommodate new systems, analysis and programming functions tended to atrophy. New personnel could not be justified without new systems requirements, and new systems could not be brought on board due to capacity limitations. Without new systems or new challenges, current employee skills tended to atrophy as well. New skills were not needed on old equipment. Many people who needed to grow in their jobs, both civilian and military, left the Marine Corps for more challenging positions elsewhere. Many who remained could be described as an 'old guard' who were highly resistant to change.

Users still had requirements that had to be met. Those users whose data processing needs tended to be fulfilled had either the requisite political horsepower or had requirements that could be satisfied with minimal in-house resources. Where funding was available, outside contractors were sometimes used. However, funding tended to be short in the 1970's, and outside contracting was mostly limited to

those users with the necessary power to press their own needs. Manpower Department at Headquarters, Marine Corps contracted-out several of their modelling systems and, in the late 1970's, began contracting for a commercially time-shared Recruit Management System. Requirements and Programs Division at HQMC used contractor support for Program Objective Memorandum (POM) development which also included computer processing. However, most other user requirements were stuck in the eternal wait mode. It was hard to justify money for computers when there were significant table of equipment deficiencies within FMF units.

About 1980, events began to force a change in this restrictive method of computer management. First, old equipment and systems began to break down. In many cases, it became more expensive to operate the old equipment than to buy new equipment. Unreliable supply and manpower management systems brought more and more complaints from the field and 'readiness' worries from Marine Corps planners. The Marine Corps 'deployable' Force Automated Services Centers (FASC's), which were supposed to move with a Marine Amphibious Brigade (MAB) rear echelon to provide processing of battlefield supply and logistics requirements, would go down if someone only bumped the trailer hard from outside. Deployability was questionable at best.

Secondly, users were becoming less tolerant of outdated, ineffective service. They had been exposed to other organization's systems (airline reservations, banks, etc.) and knew that Marine Corps computing was a very poor example of what could be done. They began designing new systems of their own, first within the ADP management structure, and, when they could not get support, outside the MCCDPA's in their own development groups, sometimes aided by civilian contractors.

Finally, as a result of the increase in perceived need by the users (who often also made budget decisions), and a generally less restrictive military financial climate, the money to move became available. Beginning about FY 1980, O&MMC funding for new systems development became progressively easier to obtain. New planning for on-line large scale database oriented systems was funded for supply, accounting, and manpower management. By 1984, there were more than forty new systems approved for development; in contrast, only two new systems were in development in 1977 [Ref. 21]. Approved equipment procurement funding for 1982 had increased ten-fold over 1975 levels.

But while funding increased, manpower to administer the system did not (Figure 3-1) [Ref. 22]. Few revisions were initially made to the highly centralized and restrictive management policies. These conditions resulted in excessive backlogs. Procurements were late. New system software

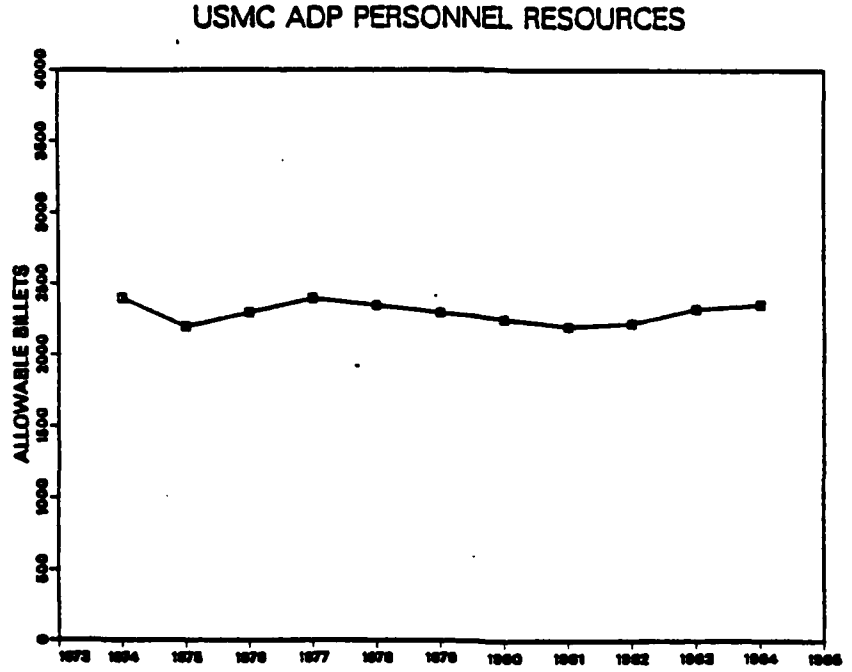

Figure 3-1 USMC ADP Personnel Resources

development milestones slipped with resulting time delays and cost increases. Because of both the hardware and software delays, funding for system development and equipment procurement was 'at risk' during budget reviews as the funding often could not be obligated within the required time frames.

When some users could not get results in-house from MCCDPA's or C4, they would try to develop their own system from within their own office, sometimes with the help of an outside contractor. Initially frowned upon by C4 data processing managers, this method later gained acceptance as the only way in which the huge volume of work required could

be accomplished. Results were sometimes good, but contractor products were often bad because contracts were let with poor Statements of Work (SOW's) or were not supervised adequately. Lack of adequate supervision sometimes led to improper contractor relationships and/or illegal contracts with resulting protests and regulatory problems.

Cost estimates for new systems were particularly poor. The Standard Accounting, Budgeting, and Reporting System (SABRS) economic analysis estimated a total O&MMC development cost of $2 million [Ref. 23]; the Marine Corps Standard Supply System (M3S) was also estimated at $2 million for implementation costs [Ref. 24]. Current O&MMC projections are in excess of $15 million and $49 million respectively [Ref. 25].

But, these two systems are both vital. With respect to the supply system,

> "The status quo is totally unacceptable. To maintain all systems in their present state is not realistic. The Marine Corps can not support the resource requirement to maintain all existing systems in their present state while accommodating Standard MILS changes in multiple systems. The cost of continuing such an effort is prohibitive in terms of efficiency and resources." [Ref. 26]

Some form of new supply system is necessary, in spite of escalated cost projections. Similarly, the multiplicity of current accounting systems are often unresponsive to management needs and do not meet General Accounting Office accounting system certification standards [Ref. 27]. A new

financial system which "will provide the Marine Corps with a standard financial system that will integrate the accounting, budgeting, and financial reporting systems into a single system" [Ref. 28] is clearly needed. There are many, many other new system requirements which have been documented [Ref. 29]. Despite inaccuracies in projected costs, the need for new systems is clearly evident.

Figures 3-2 to 3-4 show the stability of the 1970's in contrast with rapid increases in capacity since 1980 [Refs. 30,31]. For these figures, quantities shown through 1984 are based on actual equipment in place; outyear figures are based on the additional increases in equipment required by new systems currently approved and under development. As

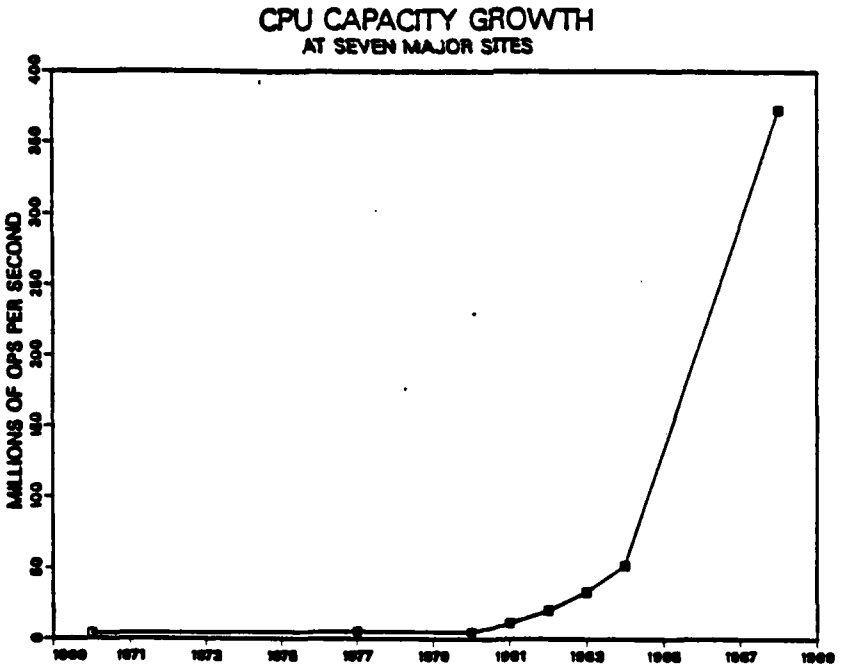

Figure 3-2 CPU Capacity Growth

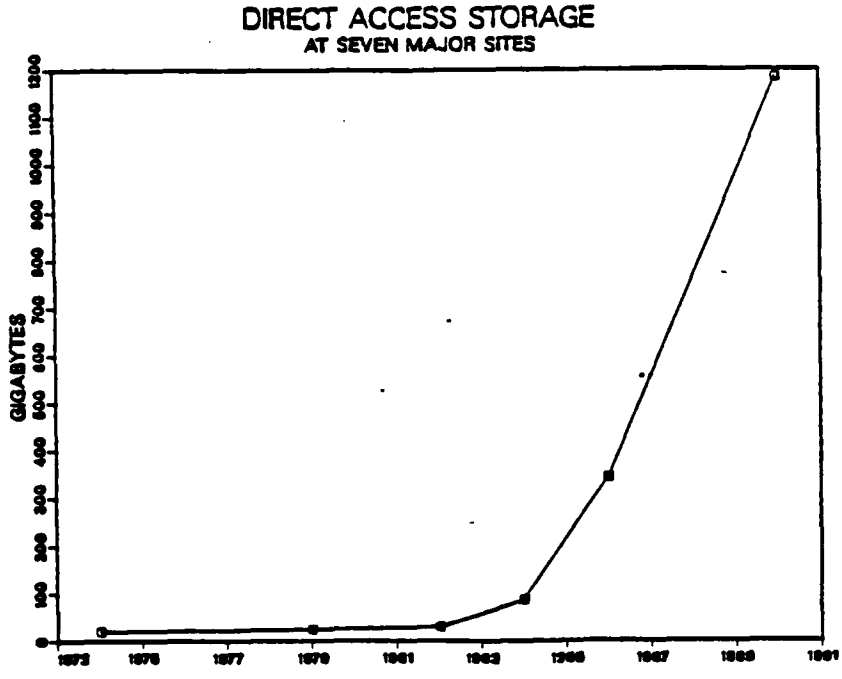

Figure 3-3 Direct Access Storage

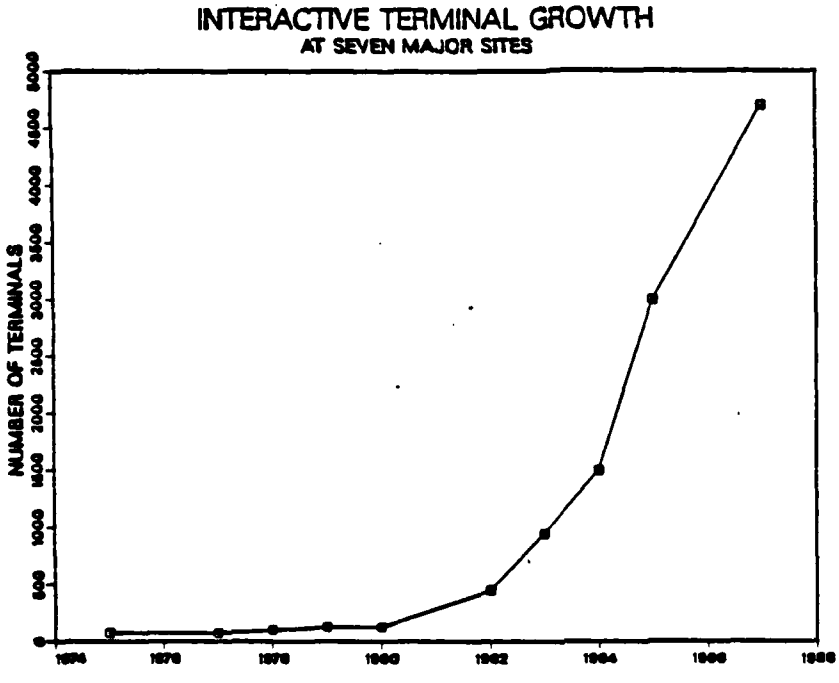

Figure 3-4 Interactive Terminal Growth

the figures indicate, the Marine Corps has jumped head first from a policy of excessive restraint to a situation where so many different systems are under development that foreseeable procurements, no matter how well executed, cannot achieve the necessary capacity.

B. IDENTIFIED DEFICIENCIES

The basic problems with Marine Corps ADP management have been recognized by Marine Corps ADP planners and were summarized as follows in a 26 July 1984 brief for the Assistant Commandant of the Marine Corps:

> "The primary weaknesses in the current management approach are in the areas of planning, visibility and priorities. The current automation planning process is an uncoordinated, bottom-up approach which is not guided by high level, long term Marine Corps goals. The visibility into the total scope, impact and cost of all developing information systems is obscured because of deficiencies or inconsistencies in the life cycle management and budgeting processes. The total cost of automated information systems is difficult, if not impossible, to determine because of the many pots of money and the disregarded cost of existing general support ADP assets.
>
> "The priorities of the developing automated information systems relative to each other do not exist. Available ADP assets are allocated on a first come first served basis with exceptions made on the basis of sponsor influence or the loudest cry for support.
>
> "In a time when ADP assets are limited and will not support all requirements, these weaknesses must be strengthened to avoid wasting or misusing our resources and the benefits that automation can provide." [Ref. 32]

C. CENTRALIZED PLANNING UNDER THE INFORMATION SYSTEMS STEERING COMMITTEE

The Marine Corps is taking specific steps to alleviate some of these difficulties. A formally chartered

Information Systems Steering Committee (ISSC) has been created consisting of a general officer representative from each major headquarters staff agency and chaired by the Director, C4 Systems Division. The responsibilities of the ISSC are:

"(1) Validating on-line administration AIS's by linking overall Marine Corps strategy with computer strategy.
(2) Setting strategic direction for management information policy and building a commitment to this policy.
(3) Establishing priorities for ADP support and mission essential processing requirements.
(4) Approving the Information Systems Support Plan.
(5) Approving the Long Range Information Systems Plan.
(6) Presenting specific recommended actions and/or alternative course of action regarding information systems issues to the ACMC Committee." [Ref. 33]

The primary purpose for the ISSC is to provide as much visibility as possible to the total scope of ADP in the Marine Corps to provide better prioritization and planning in the use and procurement of ADP assets. Its primary benefit is as a forum for open consideration of both political and economic issues. As such, it tends to make the bureaucracy more honest and discourages 'back door' systems. The ISSC also adds another layer of bureaucracy to the Life Cycle Management (LCM) process.

While the ISSC is a significant attempt to improve the ADP resource allocation process, it does not guarantee effective or efficient decision making. If economic issues are to have any clout in the forum provided by the ISSC, there must be an improvement in the visibility of the cost

of the systems themselves. Similarly, the backlog of requirements brought before the ISSC will never be reduced to a manageable level as long as users view ADP as a 'no-cost' option.

D. THE CHARGEBACK ALTERNATIVE

One possibility for addressing ADP capacity shortfalls suggested by Marine Corps ADP planners has been to "implement a cost reporting and chargeback system that includes time-of-day processing...functional managers would be made aware of and would have to fund for the ADP support they receive." [Ref. 34] This alternative has not been officially endorsed, but ADP planners have committed themselves to:

> "Conduct a feasibility study by fourth quarter FY 85 to determine whether the implementation of an ADP cost recovery and chargeback system can promote the effective and efficient management and use of ADP resources." [Ref. 35]

E. SUMMARY

By the early 1970's, Marine Corps computing could easily be associated with the third (control) stage of Nolan's organizational model for ADP development [Ref. 36]. Management and control of ADP resources were centralized under the management of the Headquarters, Marine Corps ADP staff. The MCCDPA's had a tightening grip on systems development. Because of resource limitations, controls

became so restrictive that new system development and growth virtually ceased.

In fact, it could be argued that regression occurred to the point that users became initiators (Nolan's first stage) outside, or at least separated from, the official control structure of new technology. As requirements grew and contagion (Nolan's second stage) set in, the user development structure reached compromise with the ADP management structure and new systems development began in earnest.

The current situation can best be characterized as the beginning of a second iteration of the third stage (control). Even users agree that effective control is again required. Central management (through the ISSC) is again being attempted; this time at a level higher than either ADP management or the user community. Finally, chargeback is being considered as a way of rationing ADP resources and reducing the load on the ISSC. The goal should be to create a system of control which will not stifle growth and which will allow movement toward Nolan's fourth stage of maturity. It will be a difficult task.

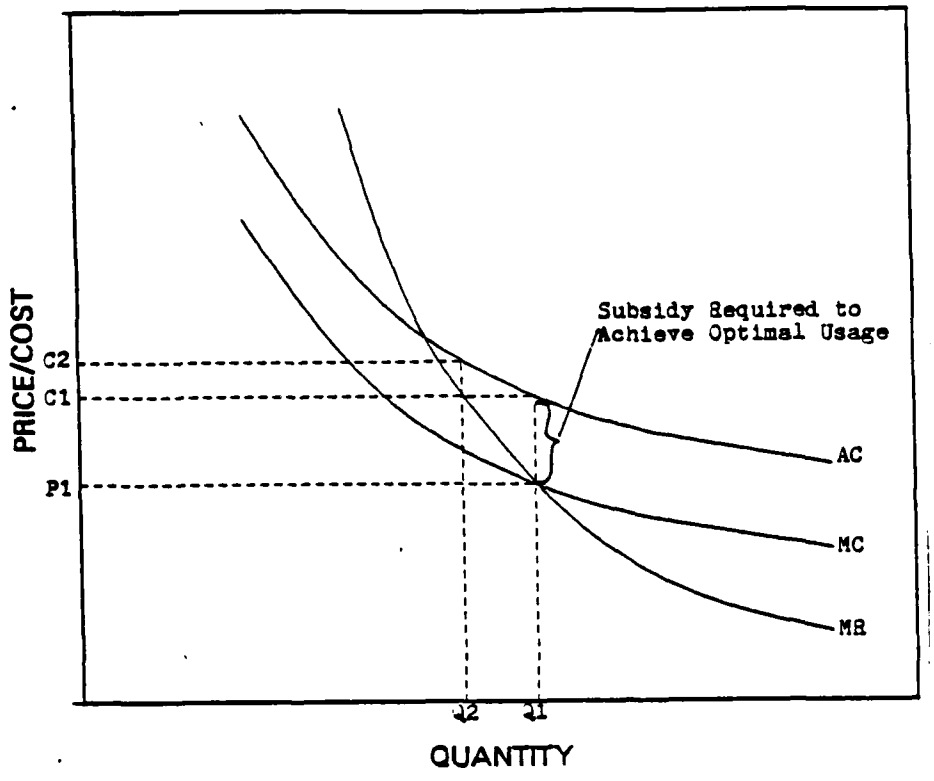

Figure 5-1 Pricing Under Increasing Returns to Scale

The conclusions drawn by Schechinger and Prack are valid to the extent that quantity demanded is relatively fixed; i.e., the customer base is captive. In the more dynamic situation, where the customer is not so captive, competitive factors exist which either force elimination or serious scaling down of service if subsidies are not provided. In Figure 5-1, if quantity demanded is reduced to Q2 from the optimal production at Q1 because a better price is available elsewhere, the average cost price will be raised to C2. If full reimbursement at average cost is required, as it is for

FIPS Pub 96 suggests full absorption pricing and internal, as well as external, chargeback and billing [Ref. 43]. This means, essentially, that users of ADP services should pay the entire burden for ADP services.

Schechinger and Prack [Ref. 44] have demonstrated that, according to classical economic theory, covering the entire expense of ADP operations may not be the most efficient method of allocation. The essential facts discussed by Schechinger and Prack are as follows. According to classical economic theory, maximum efficiency in the use of resources occurs when resources are priced such that the marginal cost of a unit of output equals its marginal revenue. Computing power has generally been considered subject to Grosch's Law which asserts that increasing returns to scale are the norm for computer processing [Ref. 45]. As argued by Schechinger and Prack [Ref. 46],

> "First, for a given output under increasing returns to scale, the price will be established at the intersection of the marginal value (MR) and the marginal cost (MC) curves such that the computer center will not recover its total costs. The price P1 and the quantity Q1 are determined where MC = MR but at this price the computer center will sustain losses of (C1-P1) Q1 and will not recover its costs." (Figure 5-1)

Thus, the assumption of increasing returns to scale means that marginal cost pricing would require a subsidy to cover the average costs, or conversely, that average cost pricing would be too high, thus inhibiting desirable computer usage.

the subjective perception of their effectiveness by their overseers (be it Congress or another government agency) than with actual effectiveness. The overseer should therefore attempt to ensure that perceptions and reality coincide to the greatest extent possible by developing evaluation criterion which can provide some objectivity to the judgement process.

For some forms of government activity, injecting some of the market mechanism into the evaluation process may be helpful. OMB Circular A-76 makes the notion of competition, where possible, into policy. It lets the level of internal effort by the government be decided by the market. Additionally, the basic "criterion for selecting Industrial Funding is its appropriateness for exploiting the buyer-seller relationship." [Ref. 42] As long as the buyer and seller are separate entities, even a captive customer will not be inhibited from exercising the right to complain to higher authorities if billings are excessively larger than charges for comparable commercial services. Thus, market prices can become at least a measure of efficiency, even where the buyer is 'captive', provided similar external products exist.

B. ADP MARKET PRICING

ADP is included as one of those government activities for which some degree of market pricing may be valuable.

the local level because individual managers use only the resource mix best able to accomplish their assigned mission. There may be inefficiencies in integration, however, due to the lack of standardization. Also, costs may be higher where economies of scale apply.

In the classical market, entities which are ineffective or inefficient are weeded out by the necessity for profit. Thus, to the extent that market forces are in effect, surviving entities are relatively well-designed in scale (level of effort) and resource allocation method (centralized versus decentralized) based on their individual environment.

Government agencies, however, do not generally have the threat of the market. (Other activities also try to reduce the threat of the market, as well, by political action vis-a-vis import quotas, subsidies, etc.) Level of effort is determined by the appropriation process and allocation by apportionment of the appropriation within the government agency. Both effectiveness and efficiency must be achieved by means other than the market. Alternative measures of output and input have been developed which attempt to measure both efficiency and effectiveness. Efficiency in providing a specific output is often measurable using quantitative techniques; effectiveness is generally a more nonquantitative, subjective value judgment [Ref. 41]. Government agencies therefore tend to be more concerned with

V. ECONOMIC CONSIDERATIONS

A. ALLOCATION AND LEVEL OF EFFORT DETERMINATION

There are two basic economic tasks in the management of ADP resources. One task is to allocate ADP resources; the second task is to set the appropriate level of effort. Both tasks require efficient operation and effective management decision making.

Similarly, although there are levels of degree, there are essentially two methods of accomplishing the two basic tasks. One method is the use of centralized planning and allocation wherein a central planning committee determines the level of effort allowable and the allocation of resources, setting quotas for results in accordance with an overall plan. The second method is a more decentralized approach where decisions concerning allocation of resources and level of effort are delegated to lower-level management based on tradeoffs faced by the local manager between the price of a commodity and its value for accomplishment of the overall tasks.

There are deficiencies in both methods. The first offers efficiencies based on standardization and economies of scale. Such planning is complex, however, and mistakes result in ineffective use of resources (both shortages and surplus). The decentralized approach is more effective at

the Office of the Secretary of Defense (OSD). The obvious danger in this attitude is that the OSD implementing directive may be forthcoming at any time with little conversion time allowed. As a result, the intended impact of A-121 has not been realized. When the DoD implementing directive is released, the military services will have to respond accordingly to the policies and procedures of OMB A-121. Appropriate contingency planning is necessary to ensure that conversion to the business-like procedures outlined within the Circular can be readily and efficiently implemented.

The Circular is applicable to all data processing facilities which are operated by, or on behalf of, a Federal agency; provide service to more than one user; operate one or more general management computers; and exceed $100,000 per year for the full cost of operation [Ref. 40].

The procedures which prescribe full costing and allocation of all costs to users based on services received have the potential for causing the most impact on ADP activities. To date, Marine Corps ADP activities have been mission funded. The identification of full costs within a mission funded activity is a difficult task. A variety of funding sources are often involved with different accounting and management systems. Given that all direct and indirect costs could be defined, the accounting system would also have to be able to support the cost capturing and reporting. Allocating all costs to users could even have more of an impact for ADP activities. Accomplishment of this objective will require the necessary visibility within the accounting systems to support the identification and assignment of costs to the users.

To date, the DoD implementing directive for OMB A-121 has not been released. Accordingly, the Marine Corps has adopted a 'wait and see' attitude; there is a reluctance to independently implement the Circular's provisions without first receiving the detailed implementing directives from

due to manpower ceilings. Even if authorization for hiring was possible, the expertise required was not available at civil service or military wage rates. The 'surges' in new systems have created a surge in capacity requirements which has been difficult to manage internally. One possible method for handling the surge would be to contract for some or all ADP operations allowable under A-76 regulations. The fundamental question is whether the Marine Corps can manage its contractors as well as it can its in-house operations. Given difficulties in equipment procurement regulations, civil service and military pay restrictions, and the rising tide of demand for service, the Marine Corps may have no choice.

F. ADP COST ACCOUNTING REGULATIONS

A second OMB Circular, A-121, Cost Accounting, Cost Recovery and Inter-Agency Sharing of Data Processing Facilities, was published in 1980. This Circular's intent was to "promote effective and efficient management and use of certain data processing facilities" through adherence to the following business-like procedures:

"(1) Account for the full cost of operating data processing facilities;
(2) Allocate all costs to users according to the service they receive;
(3) Share excess data processing capacity with other agencies;
(4) Recover the cost of inter-agency sharing; and
(5) Evaluate inter-agency sharing as a means of supporting major new data processing applications." [Ref. 39]

uncertainties that must be considered and included within appropriate contingency plans. In most cases, however, if an activity initially qualifies for an exemption to A-76, it should continue to requalify for the exemption based on the same justification.

For the military services, and the Marine Corps in particular, ADP should continue to qualify for exclusions to A-76. The deployment requirement of FMF units along with the need to maintain a rotation base should continue to exclude all FMF ADP assets and most supporting ADP assets. Additionally, the nature of some of the programs, such as the flying hour program or the Five Year Defense Plan, can be considered as proprietary in nature and would clearly not be in the best interests of the government to be contracted-out.

In spite of its defensive posture toward A-76, Marine Corps data processing management is not averse to contracting-out ADP operations. While there are many differences in political opinion concerning commercial contracting, Marine Corps ADP planners recognize that current in-house ADP assets will not handle currently documented requirements. Commercial contracting of new systems development started as a way of handling temporary 'surges' in programming needs. It has become a 'normal' process because the 'surges' have become permanent, but personnel increases to handle them have not been possible

activity is operated by military personnel in an area of national defense. Also excluded are those commercial activities which provide appropriate work assignments for military career progression or a military rotation base for overseas assignments. These exclusions exempt from the A-76 process those commercial type activities within DoD that qualify as national defense areas or those activities for which no acceptable private or commercial source is available.

Although most Marine Corps data processing requirements are commercial type applications and have been included in the Marine Corps Commercial Activities inventory, there has to date been minimal contracting-out of ADP. While the required studies are being performed, it appears that most Marine Corps data processing activities will be exempted from commercial contracting. Exemptions have been justified on the national defense needs of Fleet Marine Force units, staffing necessary to meet rotation base requirements, and the prohibition of contracting-out governmental functions.

Complying with the provisions of A-76 presents a series of on-going and recurring management challenges. The recurring requirement to inventory all commercial type activities maintains the visibility of all identified commercial activities. Those activities which are exempt for whatever reason must have their exemption status revalidated every fifth year. This requirement imposes

be procured through the private sector. This policy was implemented and revised in a continuing series of Bulletins issued by the Bureau of the Budget and its successor, the OMB.

In its latest version, A-76 actually requires competition with the private sector [Ref. 38]. Specifically, it requires federal agencies to inventory their commercial and industrial activities, to compare costs of doing the job in-house or by contracting-out, and to pursue, within specified objectives, the least cost alternative. Only commercial and industrial type activities apply under the provisions of A-76. Governmental functions are to be retained in-house. These are functions 'inherently governmental in nature' that in the public interest must only be performed by Federal employees. Governmental functions have been broadly categorized by A-76 as those that pertain to the act of governing or those that pertain to monetary transactions and entitlements. The 'management and direction of the Armed Services' is also defined within A-76 as a governmental function within the act of governing. This means that contracting-out management functions within DoD is not allowed; only commercial and industrial type activities may be considered for contracting-out. Additionally, governmental operation of a commercial activity is authorized when no satisfactory private or commercial source is available or the commercial

reduction) by budget analysts. Budget marks, even when valid, are bad for the political reputation of the project and the project manager. Thus, in order to achieve budget 'executability', programs are often pushed through without requirements updates or with unresolved technological problems. Because the contracting takes so long, ADP equipment procurements must often start before all system requirements are fully defined. Parallel action of hardware procurement and software development is envisioned to speed final implementation. Sometimes it does. Other times, however, it causes a mismatch of equipment and requirements.

E. COMMERCIAL ACTIVITY REGULATIONS

Office of Management and Budget (OMB) Circular A-76, Commercial Industrial Type Activities, was originally issued in 1955 and has been periodically revised and amended. This Circular is the Federal government's current policy statement concerning the 'make or buy' or contracting-out decision process associated with commercial type activities. A commercial type activity is one which provides a product or service needed by the Federal Government. The genesis of A-76 was within the Eisenhower Administration and its original premise was that the government should not compete with private industry in commercial/industrial type activities. More specifically, whenever possible, government required commercial type goods or services should

C. PROCUREMENT REGULATIONS

Even for approved systems, procurement difficulties are well documented. The Navy's Automatic Data Processing Selection Office (ADPSO) estimates 368 days to contract for a moderate size requirement which has been well defined in advance and has no particular technical or regulatory problems [Ref. 37]. Often, contracting authorities are reluctant to commence work on a contract until funds are provided. Thus, even well-managed ADP projects have difficulty achieving contract award in the year in which procurement funding is first provided. Even well-planned, on-time projects may begin with one strike against them in the budget review process.

D. BUDGETARY CONSIDERATIONS

Within this framework of uncertainty caused by the LCM and Federal Procurement Regulations, the ADP manager must also maintain his funding and defend his ADP program through the POM and Budget Cycle. Under current regulations, a new system cannot come under full scale development without POM approval. It also must show funding 'executability', i.e., contract award during the year for which funds are budgeted. A problem occurs when the LCM milestones are stretched beyond the length of the POM cycle due to changes in requirements or technical and regulatory difficulties. The program becomes a candidate for a 'mark' (i.e., funding

IV. EXTERNAL CONSIDERATIONS

A. INTRODUCTION

The Marine Corps ADP management must deal with more than internal problems. The problems discussed in the preceding chapters are complicated by external regulations and political realities over which the Marine Corps has little control.

B. LIFE CYCLE MANAGEMENT REGULATIONS

Perhaps the biggest problem facing any Department of Defense ADP manager is the requirement to match Life Cycle Management issues and Federal Procurement Regulations with responsiveness to user needs and technological change. Under current regulations, new systems development involves extensive and detailed documentation and justification. These documentation requirements are based on the fact that new systems, both hardware and software, are expensive. Both systems development and equipment procurement are often slow and tedious processes because all requirements must be spelled out in excruciating detail and be reviewed at numerous management levels. In the meantime, both requirements and technology can change to the degree that some systems are obsolete by the time they are approved.

industrial funds, prices will continue to rise as output volume is reduced unless quantity demanded becomes fixed by regulation. This occurs in spite of the fact that increasing utilization will actually lower overall costs and improve efficiency. Thus, to keep costs down, mandated use of an industrial fund activity which exhibits increasing returns to scale would appear to be a requirement in spite of apparent higher costs, so long as prices must be based on average cost.

This situation is illustrated by the experiences of the Military Airlift Command (MAC) [Ref. 47]. As an industrial funded activity, MAC was required to price on an average cost basis. Because alternative transportation could be priced at a marginal cost lower than MAC's average cost, all services tend to use MAC only to the extent required by regulation. For example, using organic or even commercial ground transport from Camp Pendleton, CA to Twenty-Nine Palms, CA can be considerably cheaper out-of-pocket since vehicle depreciation is not directly considered. The result is even higher prices for the remaining MAC users and a smaller than optimal MAC organization. It follows that computing, to the extent increasing returns to scale are evident, would have similar results.

There are compensating factors, however. First, limits to Grosch's law are becoming apparent as computers grow in size and complexity to the point where operating system

overhead becomes the most significant resource consumer [Ref. 48]. In software development, the cost of complexity and large systems integration may overcome the scale economies associated with standardized procedures and resource sharing. Thus, it may be that as computing matures, the traditional economic concept of initial increasing returns to scale, followed by diminishing returns, and finally negative returns at excessive scale, may come into play.

C. DIFFERENTIAL PRICING FOR ADP SERVICES

The above discussion of average cost pricing assumes a single product and a single price for that product. There are actually many ADP service 'products' which can be priced differently in a form of market segmentation based either on competitive position or demand. It is logical to assume that some products can be priced sufficiently above marginal cost to capture fixed overhead while other products are priced to cover only marginal cost.

The above discussion also assumes a single price for like ADP services. In practice, the single price may be difficult to develop. "It is not absolutely correct to say a job should be charged in proportion to systems resources used, since high usage of a single resource can inhibit the use of other systems resources." [Ref. 49] Thus, a system which uses eighty percent of available CPU memory might be

considerably more than twice as costly in real terms, because of congestion, than one which only uses forty percent. In the same manner, a new system which uses the last twenty percent of capacity, thus forcing an equipment upgrade, can be said to cost more in real terms than the old system which used thirty percent but was not the driving force for the upgrade requirement.

A similar situation results from the peak load pricing problem. The average cost of the current load is very low because high utilization spreads fixed costs thinly. Any additional load imposed during peak periods would require a significant equipment upgrade and therefore a jump in fixed costs causing higher average costs for all users. It is therefore rational to charge a higher price to these new systems based on their higher marginal cost. It may also be rational to charge more to all peak period users. This may not be possible until contract renewal where contracts are already in place or until rate recalculation where operations are conducted under industrial fund stabilized rates.

During non-peak periods, or at any time when utilization is low, the marginal cost for additional usage is below average cost. Greater utilization can be encouraged by pricing additional usage below average cost, so long as the original set of users are content to pay enough to cover the overhead necessary to cover average costs. While this

appears to violate the industrial fund mandate for average cost pricing whereby "the industrial fund activity shall secure full reimbursement for all goods and services produced" [Ref. 50], there is considerable latitude at the individual product level. The latitude is a result of the fact that ADP operations costs on multiple user systems are primarily indirect costs for which "any generally accepted method that is reasonably accurate and simple may be used to allocate indirect costs to individual jobs or services." [Ref. 51] General Accounting Office guidelines actually suggest different rates to properly "reflect the additional cost (both investment and operating) incurred to have enough equipment, personnel, and software to provide for the peak period, faster, or additional services." [Ref. 52]

GAO's guideline approving differential costing leaves room to adjust prices by application, a form of market segmentation, while allowing the industrial fund to recover all costs. This involves combining the two separate and often conflicting requirements to maintain stable rates and also breakeven in terms of financial gain and loss. Initial stabilized rates for each application are based on overall average cost criteria (perhaps adjusted to encourage non-peak usage or to respond to market conditions) necessary to breakeven. New applications are priced at marginal cost, either higher or lower than average costs. Rates for old customers are prevented from adjustment to 'equality' by the

requirement for stable prices for each product. New applications are appropriately encouraged or inhibited by setting prices based on the need to breakeven. Once applications are established, however, they are gradually repriced toward average cost as part of the changes in budgeted stabilized rates for future budget years. This may encourage system 'churning' whereby users attempt to get a lower rate by continually updating their applications. Accordingly, pricing for replacement systems would have to include the overhead which would have been charged to the system they replace.

This pricing method can only be effective where pricing is based on output with separate prices for each application. Since output rates set by application are actually different products, new applications require new rates which can reflect current conditions. Stabilized rates based solely on internal resource utilization do not have this flexibility because resource-based rates would cross product lines and, in an industrial fund, could not be adjusted during a fiscal year without approval of the Assistant Secretary of Defense (Comptroller) [Ref. 53].

While the goal of pricing in a government agency must include cost recovery, the methods of achieving cost recovery can include a variety of pricing techniques as long as certain basic norms are not violated. Bernard [Ref. 54]

describes the norms, or characteristics, of a good pricing scheme as follows.

> "Users must generally accept the scheme as equitable. This does not necessarily mean that prices must adhere rigidly to accounting costs, but deviations...will probably have to be justified to the user community.
>
> "The scheme must be understandable to users if they are to be able to trace the cause of variations in charges, intelligently seek ways of reducing them....
>
> "It should, as far as possible, yield charges that are controllable by the user.... Thus, if a user can make his program more efficient or eliminate an unnecessary report from a management information system, his charges should change to reflect his actions and do so in a predictable manner....
>
> "...the pricing scheme should give reproducible results...under conditions that vary outside the users control, the charge for the job should remain reasonably constant....
>
> "Finally, there is a need for stability in the charging structure.... Frequent changes in the charging structure weaken users' ability to budget for and control their charges."

Within these norms, prices may be set in a variety of ways depending on the service to be provided. Internal resource utilization is effective for strict timesharing applications where the user develops and maintains his own system and can have an effect on the resources used. Output-related processing is generally considered most appropriate where "the installation provides information services, rather than raw resources." [Ref. 55] Since the price is based on outputs, computer centers are not inhibited by reduced earnings from developing more efficient methods of producing output. In addition, users can count on stable, predictable prices regardless of overall computer center efficiency or inefficiency. Flat rate pricing for a

particular level or volume might also be effective where it "reduces the uncertainty in revenue and demand faced by the computer center, as well as the uncertainty in budgeting faced by the user." [Ref. 56] Finally, differential pricing between users for what are apparently the same resources or output measurements can be used to indirectly charge for non-measurable services provided for a specific user or to distinguish "between different qualities of service in terms of priority, response time, time of day, etc." [Ref. 57] Previous research [Refs. 58,59] concluded that flexible pricing was not allowed based on an undated NavCompt counsel memorandum. In fact, flexible pricing is recommended by GAO guidelines contained in FGAP 4 [Ref. 60]. The correct conclusion is that any combination of pricing techniques can be applied, but the prices used will only be successful to the extent that they are rationally and consistently applied in accordance with the norms listed in the previous paragraph.

D. BUREAUCRACY, COMPETITION, AND THE MARKET

It can be said that the primary, although perhaps not formally documented, focus of an organizational bureaucracy is self-preservation, with growth following closely in second place. This statement can be derived from achievement motivation theory which holds that individual managerial behavior in an organization is "influenced by a

desire for success (achievement), a search for power and a need for affiliation." [Ref. 61] Affiliation provides a feeling of personal security, which is endangered by any threat to the organization. Growth improves chances for promotion (a measure of personal success) and power as it creates the opportunity to increase the number of people and/or value of assets an individual controls [Ref. 62]. There are examples in business where growth becomes more important than the traditional concept of profit maximization [Ref. 63] and corporate goals are stated in terms of maximizing sales subject to a certain minimum level of profit [Ref. 64]. It follows that industrial funded government activities have the same basic incentives and goals as commercial industry except that the acceptable profit margin can be reduced to zero.

This situation should give the industrial funded activities a pricing advantage in a competitive situation. Under competition, managers will be encouraged by the organizational incentive for growth to accept work at lower margins than comparable commercial firms. A brake on growth is the requirement to break even overall, which encourages efficient operation in order to accommodate growth. Since industrial funds must use average cost pricing on an overall basis, output may never reach the theoretical ideal where marginal cost equals marginal revenue. However, the very real incentives to operating efficiency may outweigh the

theoretical inefficiencies of operating at some deviation from marginal cost pricing.

Remove competition, however, and the organizational incentive for growth reverses its effect. When output is strictly a function of plan, size can no longer be a function of efficiency. In fact, given a fixed output, size becomes a function of how inefficient a bureaucracy can become without getting into regulatory or audit agency problems. Thus, once competition is eliminated, significant regulatory effort (another bureaucracy) is required to monitor efficiency. Bureaucracy begets itself [Ref. 65].

E. SUMMARY

As with all theoretical discussion, actual implementation of the concepts presented in this and preceding chapters in a practical situation would be difficult at best. The primary conclusion of this chapter should be that there are incentives provided by economic forces. If these forces can be kept from conflict with regulatory edicts, organizational planning, and social norms, an effective control mechanism for governmental commercial activities is available. The 'invisible hand' of the market can work, but only to the extent that it is not stopped by an 'invisible brick wall' of anti-market culture and bureaucratic regulation.

VI. CHARGEBACK AND ADP

A. INTRODUCTION

> "A corporation may decide not to charge for computer services. The user could then consider computer services free. This is like opening the floodgates on a dam. After the initial rush only a trickle remains to address corporate needs...." [Ref. 66]

The same description is as relevant to data processing within the federal government. When users are unaware of the costs of processing their computer applications, there are few incentives in place for the users to pursue cost efficient ADP applications. For this reason, chargeback has been considered by Marine Corps ADP planners as an aid in allocating scarce ADP resources. For the same reason, chargeback is mandated, at least to some extent, by regulatory agencies. There are, however, both pros and cons to chargeback, as well as a variety of ways to accomplish implementation.

B. BRIEF HISTORY OF CHARGEBACK

In the early days of business computing, emphasis was on converting as many functional applications to the computer system as possible [Ref. 67]. Computers and use of computing services had to be justified by the workload that was being serviced. To encourage computer use, customers were not charged for the cost of their computer services.

The cost of computer support was usually treated as an overhead item. As a result, the number of user applications increased rapidly as did the costs of providing the computer services. A means to control and manage the applications and cost growths was necessary. Charging back to users the costs of operating and even developing specific applications was generally considered as a means to manage growth as well as increase the efficiency of ADP operations and usage. Early chargeback techniques worked well in uniprocessor-based, non-multiprogramming environments. As computer systems increased in complexity, chargeback techniques had to adapt to accommodate such features as multiple users and concurrent processing [Ref. 68]. Despite the increased complexity of chargeback management, the use of chargeback has continued to grow in popularity. In a recent survey of Fortune 1000 companies, 83.8 percent of the responding companies have a policy of charging users for all or some portion of data processing operations and systems development services [Ref. 69].

C. REASONS FOR CHARGEBACK

The suitability for the use of chargeback within an organization is heavily dependent upon the organizational environment in which the computer system operates. Four suggested reasons for the existence of chargeback systems are:

"1. Accurately state the total costs of user departments....
2. Avoid provision of unnecessary or unjustified services....
3. Ensure that the DP department, itself, functions in a cost-effective manner....
4. Encourage the judicious use of specific resources." [Ref. 70]

An advantage often cited for the use of chargeback is that a better allocation of resources will be attained. Since the responsibility for the cost management of user applications is borne by the user, applications with little or no marginal value are likely to be discontinued. Incentives in the forms of budgetary constraints and pricing considerations are in place and the user will strive for the effective and economical use of ADP services. The use of chargeback should also result in a better allocation of resources at the data processing centers themselves. The data processing center must operate on a more businesslike basis as costs of processing applications must be developed, reviewed, and justified [Ref. 71]. Increased user awareness and interest in the costs of data processing also forces efficiencies on the data center.

D. CRITICISMS OF CHARGEBACK

Criticism of chargeback can be generalized into three categories. First, administration of the chargeback system can be expensive. One study has claimed that "administrative and operating costs for a chargeback system often ranged from 6 percent to 24 percent of the total EDP

budget." [Ref. 72] Second, if sufficient controls are not maintained on data center operations, it may actually decrease, instead of increase, internal efficiency. With users paying the bill, there is no reason to worry about cost unless that worry is imposed by some other control mechanism [Ref. 73]. Finally, chargeback can restrict innovation. New applications with untested solutions may not be given a chance because of the cost considerations [Ref. 74].

E. POSSIBLE MARINE CORPS CHARGEBACK METHODOLOGIES

Chargeback can be implemented in a variety of ways. Essentially, there are three chargeback methodologies applicable to Marine Corps data processing: statistical chargeback; reimbursable chargeback; and industrial funding.

1. Statistical Chargeback

This method involves cost measurement only without user billing. Separate mission funding of the various commands would continue, but costs by AIS would be gathered and reported to both users and ADP management for 'information' purposes. This method has been recommended for the Marine Corps in at least one study [Ref. 75] and in fact may be the best interim solution to the chargeback problem.

There are several advantages. First, it does not require reorganization of command or financial structures.

otential turmoil in an extensive reorganization could be ery costly. Second, it does provide better tracking of AIS osts for evaluation by ADP planners, financial decision akers, and reports to regulatory agencies. Finally, tatistical chargeback meets cost recovery and reporting equirements established by OMB Circular A-121. The Marine orps is not required to bill ADP users since it provides irtually no ADP resources to users outside the Marine orps. It must, however, identify all costs in sufficient etail "that the cost data collected using these procedures an also be used with appropriate adjustments, but without ecompilation, to support any cost analysis conducted...in ccordance with OMB Circular A-76 and supplemental nstructions thereto." [Ref. 76]

Criticism of statistical chargeback can be made from wo directions. First, it is ineffective because it has no irect regulatory effect. Statistical costs have often been riticized as being 'so what' costs since cost data is eported for information purposes only. Second, if tatistical chargeback is to be made effective, it is not so nexpensive as it might initially appear.

The 'ineffectiveness' criticism has historical ustification. At one time, an ADP resource reporting ystem, the Resources Cost and Utilization System (RESCU), as used by Headquarters, Marine Corps (C4 Division) to rovide input on CPU utilization by AIS. RESCU was also "to

:o serve as the NIF Authorized Accounting Activity for the entire NAVDAC/NARDAC community.

Initially, rates to bill customers were to be established for each individual facility. The rates were to be based on resources utilized at the planned operating budget and expected service levels. The units of resource measurement to be used to develop the rates (such as CPU time, memory usage, etc.) were to be standard from site-to-site. Additionally, rates for each site were planned to include shift differentials to distinguish relative shift operating costs. Rates were to be stabilized, in accordance with industrial fund regulations, for an entire fiscal year.

The objective to establish individual rates for the separate facilities was not realized. Instead, stabilized standard rates (SSRs) for Fiscal Year 1984 were developed and published by NAVDAC for use by all NARDAC's. Problems with hardware, the chargeback system, and the lack of valid historical usage data at some of the activities precluded the use of separate rates in the first year. Additionally, differences in equipment mix between owned and leased equipment and differences in the civilian/military personnel ratios at different sites made prices originally computed vary significantly from site to site. SSRs were essentially weighted averages based on costs throughout NAVDAC. Thus, some activities would be expected to make a profit and

to support basic management decisions at each NARDAC including capacity needs, hardware and software requirements, and personnel needs. Additionally, the previous year funding base for ADP had to be realigned from the NAVDAC and NARDAC directly to the end users of the computing services.

Extensive validation of customer data had to be undertaken because statistical cost reports which were designed to accumulate utilization data were considered suspect and thus unreliable for basing ADP budget allocations. Since the customers had not been paying for their computer services, they had paid little attention to the statistical cost reports generated. Significant adjustments among users' initial budget allocations were required, once accurate data were developed.

Because of time constraints and cost considerations, a new accounting system was not developed. The existing, operational NIF accounting system at the Naval Ocean Systems Center, San Diego was modified to meet minimum ADP requirements. This NIF accounting system was chosen because of its simplicity of design. Although there were some conversion difficulties resulting from documentation problems, the NAVDAC did succeed in adapting a non-ADP oriented industrial fund accounting system to accommodate ADP. It was decided that a single site should perform all official accounting and the NARDAC, Pensacola was selected

establishment of an ADP NIF activity group. Accordingly, beginning on 1 October 1983 (FY 1984), all NARDAC's and NAVDAF's under NAVDAC were to be funded through the NIF.

D. METHODOLOGY

Within NAVDAC, a Navy Industrial Fund (NIF) Transition Team was formed to manage the conversion. Some of the initial projects were administrative in nature and required a great deal of effort to accomplish. These tasks included the justification required to accompany and justify the NIF charter request. Also, previously submitted Operations and Maintenance budget submissions had to be recompiled for presentation in NIF budget format.

The NAVDAC NIF Transition Team quickly recognized that an immediate concern was the education of both its own managers and its ADP customers with the operating characteristics of an industrial fund. To keep everyone within the NAVDAC community informed, a series of Transition Status Reports were published. These reports were informal in nature, issued as required, and the emphasis was on expeditiously passing as much information as possible.

One of the first areas of importance was the establishment of valid usage data for ADP services provided to customers. All NAVDAC activities were required to review the previous year's customer data and set up and maintain current year customer data. This customer data was needed

aspects of NAVDAC including its effectiveness in managing not only its own resources (including its regional data processing centers), but the overall Navy Automatic Data Processing program. The S&IS report concluded that NAVDAC had been relatively ineffectual in carrying out it mission responsibilities from a Navy wide standpoint. Included within this S&IS report was a recommendation "...that the existing customer payback or charge-back be retained." [Ref. 85] The basis for the HAC's position that the Navy should provide its ADP services on a completely reimbursable basis was that users should be allowed to make their own basic economic decisions in defining their own level of ADP support. This basis presumed that the individual Navy commands and activities had sufficient flexibility to define their own desired levels of ADP support [Ref. 86].

C. THE NAVY'S RESPONSE

On 20 August 1982, the Navy adopted the HAC recommendation that Navy Regional Data Automation Centers (NARDAC's), the Naval Data Automation Facilities (NAVDAF's), and respective subordinate activities be converted to a pay-as-you-go basis. To avoid conflict with Navy policy against intra-Navy mission funded reimbursement of any kind, conversion to industrial funding was required. On 4 December 1982, the Office of the Secretary of Defense Program Budget Decision Number 402 approved the

shared and provided services to a large variety of users representing many different major claimants.

After the reorganization was accomplished, reimbursement on any large scale was not initially envisioned. A program of statistical chargeback was developed to accumulate utilization and develop statistical reports. Additionally, mission funded reimbursables were accepted from some users to obtain the resources necessary to provide support beyond the level allowed within NAVDAC budget constraints.

Beginning in FY 1982, it became Department of the Navy policy to discontinue even this level of reimbursable funding for ADP. Specifically, mission funding was required except for the Navy Industrial Fund/Marine Corps Industrial Fund and non-Department of the Navy customers. Accordingly, the FY 1982 Congressional Budget included a fund transfer from previous reimbursable customers to the NARDAC's. The NARDAC's were to directly fund all internal operations and accept no further intra-Navy reimbursable orders for ADP services.

B. CONGRESSIONAL RESPONSE

Congressional interest in the NAVDAC reorganization was primarily fueled by an April 1981 House Appropriations Committee (HAC) Surveys and Investigations Staff (S&IS) report entitled "Effectiveness and Operations of the Naval Data Automation Command." The S&IS reported on various

VII. THE NAVDAC EXPERIENCE

A. REORGANIZATION

It was a reorganization of Navy ADP assets which eventually led to the industrial funding of the Naval Data Automation Command's (NAVDAC's) computing assets.[2] Industrial funding, or even chargeback, was not an original goal of the reorganization effort. Rather, industrial funding was the imposed result of a series of events surrounding the reorganization.

NAVDAC was formed in 1977 when six separate Naval Regional Data Automation Centers (NARDAC's) were combined within a single command. The principal objectives of NAVDAC, as defined by the Secretary of the Navy [Ref. 84] are:

> "...to improve the effectiveness of ADP systems in support of Navy operations, to exploit all the potentials of ADP and teleprocessing technology in multicommand and multifunctional ADP systems, and to improve the overall management of the Navy's ADP resources."

The one distinguishing feature of the facilities chosen to become part of NAVDAC was the fact that all facilities were

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[2]This chapter draws heavily upon an interview conducted by Major G.A. Ham and Captain R.M. Weidert with Mr. C. Bolter, Deputy Comptroller, NAVDAC; Mr. R. Wagner, Budget Officer, NAVDAC; and Mr. V. Serio, Accounting Officer, NAVDAC. The interview was conducted at the NAVDAC Comptroller Office, Washington Navy Yard, D.C., on 6 November 1984.

management or control. Mission funded reimbursable chargeback is desirable, but would require extensive reorganization to be practical. Such a reorganization might then force fully-costed chargeback in compliance with OMB Circular A-121.

Given a requirement for fully-costed chargeback, there are benefits to establishing an ADP industrial fund. Industrial funding requires essentially the same accounting techniques as mission funded reimbursables. Also, industrial funding offers a better response to procurement requirements and fewer duplicative administrative controls. Important considerations in establishing an industrial fund include minimizing administrative overhead, establishing a buyer-seller relationship, and maintaining effective and efficient use of resources. Finally, to accomplish industrial funding of ADP, the Marine Corps would need to undergo significant organizational changes in the control of ADP resources. Such a change could be traumatic.

While industrial funded ADP encourages 'standardization' because non-standard requirements tend to cost more, standardization can also be effectively enforced by centralized management. Industrial funding is not necessary to promote standardization or cost efficiencies. Central control and regulation can be just as effective.

Finally, there are serious organizational problems which must be addressed prior to imposition of industrial funding. Operational control and funding relationships would have to be realigned. The accurate identification of all current sources of financial support for ADP assets to be transferred to the industrial fund would be a tremendous effort in and of itself. The changes in command relationships would also be traumatic. Are the benefits of industrial funding worth the trauma and expense of such an organizational realignment?

F. SUMMARY

While chargeback for ADP usage is an established fact in most corporate environments and is 'encouraged' by government agencies, there is still criticism that the overhead involved in chargeback outweighs the benefit of holding the user responsible for the cost of ADP requirements. Three degrees of chargeback can be considered applicable to Marine Corps structure. Statistical chargeback is easiest to implement, but least effective for

the system may be imposed by higher commands which direct the processing frequency. On the other hand, there is local control over the shift schedule of users, and local conditions also may affect error rates. Who is responsible? The so-called 'buyer' must be determined if there is to be a 'buyer-seller relationship'.

Once a buyer is determined, is that buyer 'captive'? To the extent that the buyer is directed by Headquarters, Marine Corps to use a specific AIS, the user has no real control over cost. Similarly, although captive AIS's may be necessary to achieve economic utilization rates in an industrial funded facility, there is no direct incentive for efficient operation since cost increases can be routinely passed to the user.

Regulations do not provide for accurate pricing. "Because DoD does not allow for billing of military (personnel) expenses between DoD activities, some ADP facilities with heavy concentrations of civilian employees would have higher costs than a facility with military personnel." [Ref. 83] Similarly, depreciation of equipment not purchased by the industrial fund is a statistical but not a billable cost, while depreciation of industrial fund purchased equipment and/or lease costs are billable. Rates could vary significantly between facilities for the same basic service based on equipment mix.

as a 'free resource'. It does require additional accounting effort, but it can reduce administrative costs for new system development if dollars are used instead of bureaucracy to make allocation decisions. Finally, regulations were changed to allow internal funding for investment items [Ref. 80]. This change eliminates the need for separate procurement appropriation requests, allowing industrial funded activities to respond more quickly to customer requirements than can be done through appropriated funds. Because of these advantages, industrial funding appears to be a viable solution, but there are serious problems which must be considered before an industrial fund solution can be considered [Ref. 81].

The most important problem is minimizing overhead costs. A cost gathering system will require all the emphasis outlined for statistical chargeback in paragraph E.1 above, although it will not have to run as a duplicative parallel to the formal accounting system as JARS does today [Ref. 82]. In addition, a billing system would be required. Both must operate efficiently and at minimum cost, so that they do not counter the beneficial impact of a well-designed chargeback system.

Another important problem is defining just who the 'user' is. That is, is the user the local unit which physically uses the system? The local unit may have little or no control over how often the system is processed since

tracked through a complicated series of utilization measurement and resource billing software, but the operating system overhead would be significant. The sheer volume of accounting transactions required to reimburse the various service providers would be an even bigger problem. Management of ADP reimbursables is too complicated and too expensive to be considered on a practical basis, without a significant realignment of organizational structure.

Reorganization of ADP resources which serve multiple users into a single command with the generalized mission of ADP support could help in solving the user-provider definition dilemma. It would, however, make Marine Corps data processing susceptible to the required chargeback of 'full costs' under OMB Circular A-121 since there would no longer be any question that it served multiple users. This would negate the possibility of using partial chargeback schemes. As such, it would require a chargeback system similar to the accounting system required for an industrial fund. In fact, as will be discussed later in Chapter VII, the Naval Data Automation Command chose industrial fund accounting because Congress required 'full chargeback' as a result of a similar reorganization [Ref. 79].

3. Industrial Funding

Industrial fund accounting does provide for 'full costing'. It provides the visibility required by OMB Circular A-121. It eliminates the user's perception of ADP

which the users have little control, can be kept low or absorbed entirely by the ADP facilities. Other requirements, such as rush jobs or special jobs with very high utilization of critical resources, can be billed at full incremental cost. Thus, billing can be used as a management tool without the rigid controls of stabilized rates and breakeven requirements imposed by Industrial Funds.

The problem with this method is defining both the user and the provider. Mission funding is provided through a hodgepodge of different sources. Users may be providers, or even more confusing, partial providers of the resources used by a system. Finally, one AIS is often funded through more than one operating budget. For example, a single query to a personnel record located at MCCDPA, Kansas City from a terminal located in Camp Hansen, Okinawa would involve use of equipment and resources owned by RASC, Okinawa; RASC, Hawaii; RASC, Camp Pendleton; and MCCDPA, Kansas City. It would also use leased data communications lines funded separately through HQMC and equipment procured through the Procurement, Marine Corps appropriation. This single transaction would involve five separate operating budgets, four separate Budget Programs, and two separate appropriations.

Who is to be reimbursed and how that reimbursement is to be allocated among the various providers of funds could be

formal accounting system with audit cross-checks provided. Formulas for allocation of all costs (to include administrative overhead, utilities, and depreciation of both hardware and software) to the various AIS's would be required. A fairly extensive reporting system along with assignment of 'responsibility' for costs would also be required to ensure user awareness. Because statistics can be used for questionable purposes, there would also have to be some form of auditability for data provided. Finally, although data on which to base decisions would be better, the present allocation bureaucracy would still be required to determine the share of ADP resources to be allocated to each user. The backlog would not disappear. In short, the limited benefits of statistical chargeback in terms of user and management awareness have not been considered worth the resources required to make statistical cost calculation truly effective as a control on ADP systems development and operations costs.

2. Reimbursable Chargeback

The requirement for reimbursement by users would put 'teeth' in the system. This method assumes continued mission funding for ADP resources with mission funded facilities being reimbursed for services rendered. It offers the opportunity to tailor chargeback to the level considered appropriate by ADP planners. Billing for activities which are to be encouraged, or activities for

have been supplemented by statistical and indirect costs reported by other means." [Ref. 77] This system was never fully implemented. Software maintenance on the RESCU system was given such low priority that the system had to be abandoned as obsolete when new equipment was introduced. Subsequently, a commercial software package called the Job Accounting and Reporting System (JARS) was purchased. JARS, however, has not been used significantly for either the purposes of allocating or reporting costs. It is not that JARS is a particularly bad program for its purpose; it is just that sufficient resources have not been allocated to JARS to allow calculation and publication of fully tabulated, accurate results. The problem is that there are no 'teeth' in a purely statistical system. As Cash et al. [Ref. 78] state, "A memo about a charge does not have the same bite as the actual assignment of the charge." Both users and ADP managers lack interest in a system which has no direct financial effect. As such, there is a reluctance to commit significant resources to the system to ensure its accuracy or to take the command interest necessary to enforce its effective use.

Command interest would be expensive. It would require the commitment of significant resources to develop a comprehensive cost gathering system in parallel with the current financial accounting systems. Operations and Maintenance (O&M) cost data would have to be drawn from the

others to experience an equivalent loss over the year. Since NAVDAC wishes profit or loss responsibility to remain at the individual NARDAC level, local rates were established for Fiscal Year 1985 for most resources. Rates were adjusted, however, so that no site could maintain a significant price advantage due to large numbers of military personnel or owned but fully depreciated equipment. Such sites have been assigned to make a specified profit in recognition of this situation while sites with leased equipment and proportionally more civilian billets are allowed a specified loss.

In accordance with industrial fund accounting procedures, depreciation had to be recognized and billed to customers. The first step was to identify and assign costs to all investment assets. It was especially important to identify all assets because the larger the base for which depreciation was calculated, the larger the deprecation charges. All investment procurements (items costing more than $3,000 dollars) were to be centrally managed and funded by NAVDAC's Central Investment Program (CIP). The total depreciation expense in any one year defines the total amount of annual funding available for CIP procurements. While a significant investment base was required to generate sufficient depreciation to allow CIP procurement, too much depreciation overhead forces prices higher than competitive ADP providers.

Finally, NAVDAC planners recognized that under chargeback, some users could possibly find less costly processing alternatives than NAVDAC facilities. Customers would be able to make their own decisions regarding source of ADP support. Since stabilized rates had to be set far in advance of the budget year, rates could not be adjusted to compensate for lost business. Therefore, it was considered necessary to preserve the existing workload to protect the rates initially established. A three year moratorium on removing applications from NAVDAC facilities was proposed but only a one year moratorium was accepted by the Deputy Under the Secretary of the Navy (Financial Management). This moratorium expired on 30 September 1984. Since this date, the NARDAC's have been in a competitive market, where customers can use other sources of ADP services if it is more economical.

E. SUCCESSES

The NAVDAC was given only fifteen months to implement industrial fund management. Such a change in operating procedures represents substantial organizational change. Yet, funds were reallocated, the new accounting system implemented, and customers billed for services through the industrial fund without severe complication. In fact, official adjusted Accumulated Operating Results (AOR) for FY 1984 amounted to a gain of $50,000 on total revenues of

$155,039,000 [Ref. 87], a better match to target than most well established industrial funded activities. In terms of initial financial performance, success cannot be questioned.

F. CONCERNS

The development of standard rates was one of the areas of most concern to the NAVDAC planners. The lack of reliable historical data caused serious difficulty in the creation of rate estimates based on prior cost data. This problem was aggravated by the lack of time available in which to identify and capture costs. A time period of at least three years was considered the minimum activity base necessary to develop valid cost data for rate projections.

Another consideration is the mix of lease versus purchased equipment. With purchased equipment, it is difficult to adjust for varying service levels to meet fluctuating demands. Leased equipment provides flexibility in that the hardware mix can be more readily adjusted to support the required processing level. This flexibility has a short run price, but it does provide some long run protection from such factors as excess capacity or outdated equipment.

Since NAVDAC is now in a competitive market, a current problem is how the criterion of more economical is to be defined. Customers may be able to justify using an alternative source if the rates charged by the NAVDAC

facilities are higher. The potential problem is one of sub-optimization. Customers may define the most economical costs in terms of their own out-of-pocket costs, rather than overall costs to the Navy.

NAVDAC is currently experiencing some migration of applications off its computers, particularly through microcomputer applications. Many of these smaller applications probably should be removed. To the extent that applications support a single user, do not require continuous access to a large scale database, or require relatively insignificant computing power, small applications may not be efficient for a large mainframe computer.

In response to the new competition, many of the NARDAC's have begun limited marketing efforts to acquaint users with the services available, and to bring new, more appropriate applications on board. The backlog of requirements has not disappeared. The NARDAC's problem is to convince users that, with all the nuisance jobs out of the way, users can be provided more timely, dependable support at a reasonable price for the larger database and resource sharing applications which form the optimal processing base.

One problem is that operation of many of these new medium size systems can also be commercially contracted. Commercial contractors can set initial prices close to marginal cost, counting on contract adjustments due to changing requirements to achieve future profits. Stabilized

rates for resource usage, especially if based on a projection of unused capacity, make it hard to compete because stabilized rates for a particular fiscal year are set more than a year in advance of the fiscal year to which they apply and are not adjustable. Rates cannot even be reduced to a new lower average cost resulting from increased usage. Thus, it is hard to attract new users at the higher stabilized rates even if, in the long term, rates could be lowered based on increased usage.

G. OUTLOOK

The future of the NAVDAC managed industrial funded activity can be described as guardedly optimistic. NAVDAC has shown that ADP can be managed as an industrial fund. While there have been user complaints concerning the cost of ADP in a full costed industrial fund, it may be that this user awareness is beneficial in the long run. The full cost of a computer system is not hidden in several separate appropriations.

NAVDAC's primary concern is that it may not be able to compete with other ADP resource providers. That it is losing customers to microcomputer applications, since it now charges for service, may actually be good for the Navy because small applications may be more effectively used on a microcomputer. If the NARDAC's cannot offer competitive prices, it may be that NAVDAC will be forced to reduce its

industrial fund operation to only those systems which must be retained in-house for 'government reasons'. If so, these systems may pay a premium (similar to MAC users) due to lost economies of scale. That premium can be reduced (although not eliminated if economies of scale are evident) by adjusting capacity in the industrial fund to match the need. Hopefully, the savings achieved by appropriate migration of systems to other equipment can more than offset the premium.

In the meantime, the incentive for efficiency is there. Lower costs mean lower prices and lower prices mean more customers and more jobs for the industrial fund. This incentive alone may keep NAVDAC's industrial fund functioning. It may even allow it to grow, in spite of stabilized rates and resource-based pricing.

H. SUMMARY

The Navy has shown that industrial funding of ADP can be accomplished. It was done in a short time, with only moderate conversion costs. There was some turmoil for its managers and customers, but far less than might have been expected. In part, the relative lack of turmoil was due to the previous organizational restructuring which allowed the transition to industrial funding to be managed through a single, cohesive unit. There are still difficulties; but, with competition, there is incentive to solve them.

VIII. A MARINE CORPS PRESCRIPTION

A. INTRODUCTION

The Navy has shown that industrial funding of ADP resources is feasible. Although valid questions remain to be answered, industrial funding would also be possible for those Marine Corps ADP facilities which are connected via the Marine Corps Data Network (MCDN). In this chapter, a description of the characteristics of an industrial funded data processing network which would best suit the needs of the Marine Corps will be presented. Generalized guidelines for a proposed implementation will also be presented which should minimize disruption of mission requirements and provide for as smooth a transition as possible.

B. STRUCTURE

Industrial funding will require restructuring a significant portion of Marine Corps ADP assets into an organization similar to that of NAVDAC. The Marine Corps' seven major processing sites are similar to the NARDAC's in the sense that the sites serve several regional users and run a variety of different Automated Information Systems (AIS's). Although still funded by the local base or station commander and under that commander's nominal control, the Marine Corps processing sites are actually more integrated

than the separate NARDAC's. The separate processing sites are standardized in hardware and systems software. A large percentage of their processing involves standardized AIS's which have Marine Corps wide application. The sites are also interconnected via the MCDN and a significant and steadily increasing degree of processing involves data communications.

Because of this high degree of integration and similarity of structure, reorganization of a significant portion of Marine Corps Data Processing assets into a single industrial funded 'backbone' data processing capability, organized around the MCDN structure, is possible. This backbone would include mainframe processors, data communications, data structure administration, standard languages, protocols, and other systems software. The organization would include the seven major sites, the twenty-seven remote job entry (RJE) sites, all interconnecting data communications lines, and the personnel and other resources required for operation and support. Users would be responsible for the design and maintenance of their own applications within the framework provided, although the industrial fund could provide these services to the extent that it could compete with private industry and/or the individual user. Specifically excluded would be items of equipment used exclusively by a single user (such as end-user computing equipment), specialized equipment not

tied into MCDN, and any Fleet Marine Force deployable equipment.

C. COSTING

The cost of the various resource 'pools' can be kept by standard cost accounting methods whereby each 'pool' is assigned an appropriate job order number and costs are posted as they occur. Charges specific to a particular user (or AIS) could be posted directly to that account. This is essentially the same process as that followed by most industrial funds, as well as most private firms. Direct costs are allocated to a particular job order while indirect costs are assigned to an overhead pool, which is later allocated to the various job orders via a predetermined overhead application rate. Variances, the difference between applied overhead and actual overhead, are then applied as an adjustment to the final operating results.

The difference for ADP is that the application of indirect costs cannot be reasonably based on a percentage of direct costs, as is done in most manufacturing type operations. First, most ADP costs in a multiprogramming environment, other than system design and maintenance, are indirect costs. Second, there are many different 'pools' of indirect costs including CPU costs, data communications, disk storage, tape storage, input-output, and the standard administrative and factory (i.e., data processing

operations) overhead. All are used to different degrees by different applications. Therefore, it is necessary to gain a measurement of the usage by an application of as many of these pools as possible, in order to apply charges as though they were direct costs.

Most cost allocation schemes attempt continuous measurement of the use of each resource pool by each application as it runs, charging for the resource at the preplanned rate. The problem is that a single application will use different amounts of many of the resources depending on the program mix resident in the system, creating different prices for the same output. Additionally, there is considerable processing overhead in measuring and pricing each resource separately during each application run.

Exhaustive measurement and cost application for each individual run is not necessary, and may even be duplicative of tasks currently performed for capacity management. Capacity management involves the analysis of system utilization, determining where bottlenecks exist, and forecasting future trends. Armed with cost data on the various resource pools, and the utilization data by AIS required for capacity management, an analyst could develop statistically valid standard costs for overall resource utilization by AIS. Such standard costs could form the basis for valid cost estimates to be applied to AIS usage

without extensive remeasurement each time an application is run.

D. PRICING

The same basic methodology of combining capacity management techniques with resource pool cost forecasts can form the cost basis for pricing decisions. In a commercial firm, pricing a product to get a target rate of return involves first what the market will accept, and second, given that market, a determination of cost for the product based on direct costs plus a rational allocation of indirect costs. Fixed costs are allocated in pricing decisions only to the extent that they represent the opportunity cost of foregoing alternative production.

Industrial funds must, however, include fixed costs in their pricing decisions. In general, current AIS prices should bear the brunt of fixed costs (i.e., be priced to cover projected average costs), with some allowance for peak load pricing or similarly justified price variations. Pricing for new AIS's should be initially based on marginal cost (either higher or lower than average cost) and be gradually adjusted over a period of years (perhaps three) to average cost. Where increasing returns to scale are evident, this method of pricing grants an advantage to new systems and helps to reduce the tendency for chargeback to inhibit new development. It also helps to fight the

buy-in' by commercial firms by imitating their tactics. here increasing returns to scale are not evident, this ethod forces the new user to absorb the additional cost ncurred, rather than spreading part of the cost to the verall population of users.

In general, prices should be stated in terms of output transactions processed, pages printed, etc.) with separate ricing for each AIS based on the statistically generated tandard cost in terms of resources consumed. This puts the urden of efficient operation on the ADP manager where it belongs, since the ADP manager, not the user, must pay for excessive resource utilization per unit of output. At the same time, it leaves the decision concerning effective use to the user who must pay for the output received.

There are three variations from strict output pricing which are appropriate. First, for a Marine Corps database operation or any similar large-scale AIS, it may be appropriate to levy a fixed charge to the sponsor of the AIS for the fixed costs which can be allocated to it, in return for smaller transaction charges to encourage its update and validation. Second, should the industrial fund accept for processing AIS's for which it has no statistical data or which have significant variation in the level of resources used (system test and development is a good example of the latter), charges would have to be based on resource utilization, since in this case resources and not outputs

the products provided. Finally, terminal usage for a ticular AIS might be separately charged to the local user a connect time basis to encourage efficient terminal lization, while transactions through the terminal are arately charged to the AIS sponsor.

A key to pricing ADP services in an industrial fund is maintain sufficient pricing flexibility to respond to nging conditions, yet maintain the stability required by ustrial fund regulations for good customer relations. ce stability does not mean that the price of a one page ort for one AIS must be charged at the same price as a page report for another. The cost of generating the orts could be considerably different. What it does mean that the price of generating one particular report (or one particular product) for a particular AIS cannot be nged from the stabilized price unless the underlying putation basis for the report is changed by the user.

It is this concept of changing requirements which vides the opportunity for pricing flexibility. When the ustrial fund provides a new or substantially changed duct, the product can be priced at current costs. Old tomers are satisfied because pricing is dependable, yet uirements for new customers can be priced at rates which be adjusted to target the overall breakeven goal or meet ket conditions.

BILLING

It is the administrative cost of the physical process of ing and reimbursement which draws the concern of Marine s accounting managers [Ref. 88]. The proposed ganization helps to reduce the billing problem by iding a single source for billings. While separate s, or even separate functions within sites, might be ted as separate cost centers, the entire network must be ted as a single profit center for billing purposes. To therwise would defeat the purpose of reorganization ch is to end the confusion in price allocation between ces of services rendered which cross budgetary lines). Billings would be sent to appropriate users based on the ept of who has control of the system. In general, major operation would be billed, on a consolidated basis, to functional sponsor who directs its use. Local ications would be billed to the appropriate local major and. Special requirements would be billed to whichever nizational entity sponsors the request. Except for inal connect time, billings for an AIS for which usage irected by a higher authority would generally be billed consolidated basis to the higher authority. This both ces the cost of administering the industrial fund and urages more effective use of ADP by senior and middle gers.

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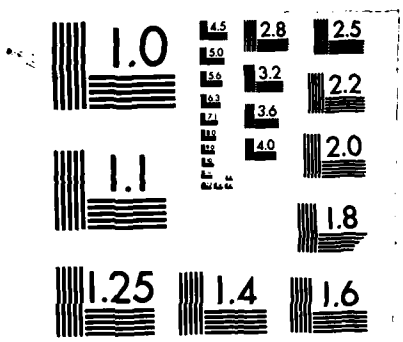

F. RULES AND REGULATIONS

1. Competition

Competitive selection of ADP services will be encouraged. Users will be required to include the ADP industrial fund as a bidder for all projects in which it chooses to participate. Conversely, only if a proposed AIS is considered 'governmental' would commercial bidding be forbidden. 'Contracts' would be developed between the industrial fund and users for large projects or continued operations of AIS's. Smaller operations could run on prices quoted by the industrial fund for a particular operation. All operations would require funding authorization by the customer prior to the performance of services in accordance with industrial fund regulations. To the extent that economies of scale exist, it is necessary to weigh the cost of possible lost efficiencies from underutilization against the incentive for inefficiency inherent in serving a captive user. This regulation presupposes that the 'governmental' activities which would be mandated to the industrial fund would provide sufficient activity to prevent severe inefficiencies from underutilization of possible scale economies.

2. Standardization

Standardization of languages, communications protocols, packaged software, and data description and structures will be encouraged within the industrial funded

operations by the need to maintain reasonable prices. The same standards must be applied to applications which are commercially developed or processed. Only if an application is 'portable' can the benefits of competition be achieved, particularly in the case of contract renewal. It is therefore necessary that all commercially contracted applications either be benchmarked as 'runable' on industrial fund assets or be specifically granted a standardization exclusion by the Information Systems Steering Committee (ISSC) based on a valid justification.

3. Staff Relationships

The role of C4 Division in ADP management would not change appreciably. C4 would still provide technical support, planning, and direction concerning ADP policies, procedures, and standards. In addition, C4 would oversee the administration of the ADP industrial funded activity.

C4 should, however, get out of the resource allocation business as far as users are concerned. Resource allocation should be the responsibility of the Program Objective Memorandum (POM), as it is for most other Marine Corps resources. Funding provided through the POM will permit users to make their best judgment of the resource mix needed to accomplish their missions.

There will be difficulties and disputes. The authority for final resolution of these disputes and the overall role of keeping ADP planning consistent with long

range Marine Corps plans should remain with the ISSC. The ISSC's range of interest would include both C4 planning and user requirements both inside and external to the industrial funded activity. This is little change from its current role. What change there is, is one of emphasis: away from resolution of allocation disputes and backlog management and toward policy decision making and enforcement of the discipline of standardization which makes decentralized resource allocation decisions effective.

G. HOW TO GET THERE

To be successful, conversion to industrial funding requires time. A systematic step-by-step approach, where each stage sets the groundwork for the next, is necessary to avoid major organizational difficulties. Abrupt change is too disruptive to established methodology. A slowly evolving plan must, however, have the commitment of top command to avoid inertial tendencies toward maintenance of the status quo. Thus, the first step toward implementation is to obtain commitment to the process from senior commanders. Without a firm commitment to support the project through to its final goal (both from senior ADP management and at the functional sponsor level of users at HQMC), every step in the process will be a timid 'testing of the waters'. Because the management of change in an organization is a complex process, there are bound to be

difficulties encountered. Decisive response to such difficulties is required.

The second step is reorganization. Those Marine Corps ADP assets which serve multiple users should be integrated under the direction and control of a single command. While this process has already begun on a de facto basis (e.g., consolidation of programming in MCCDPA's, headquarters directed standard AIS's, headquarters 'targeted' budgets for local ADP activities), it needs to be formalized in preparation for a single integrated chargeback system.

The next step, which can begin in parallel with reorganization, is to develop an effective statistical costing system and sufficient historical data on which to base initial funding allocations to users. The single command structure will make implementation easier. A concretely identified 'drop dead' date to begin chargeback will provide an incentive for accuracy. The 'drop dead' date should allow sufficient time to obtain the necessary historical data. A minimum of three years is recommended from the date reorganization becomes effective to the implementation of industrial funding and full cost chargeback.

A comprehensive, 'cookbook' approach to the specific tasks involved in developing and implementing a chargeback system is found in the Federal Information Processing Standards Publication (FIPS Pub) 96 dated 6 December 1982.

FIPS Pub 96 is intended as a guide to those agencies that are required to implement an ADP charging system under OMB Circular A-121. The guideline presents a step-by-step methodology consisting of the developmental and implementation decisions that must be made, the philosophical issues affecting these decisions, and a recommended order in which to make the decisions [Ref. 89]. The guidelines of FIPS Pub 96 should be followed, but the decisions made and chargeback characteristics implemented should reflect as much as possible the philosophy discussed in this chapter.

H. SUMMARY OF RECOMMENDATIONS

To facilitate conversion to industrial funding, a reorganization of Marine Corps selected ADP activities into a single unified command, similar to the current NAVDAC organization, is required. Costing of resources consumed should be based on standard costs developed from resource 'pools' and capacity planning data. While overall pricing must recognize the need to recapture all costs, new applications may initially be priced at marginal cost and eventually be adjusted toward average cost. Single source billing is recommended with the single bill sent to the user who has control of the system. Competition with other ADP sources can be an effective way of achieving efficiency in ADP operations. However, competition must be channeled into

a standardized framework developed to coincide with overall Marine Corps goals and strategies as defined through the POM, the ISSC, and ADP technical management and support provided by C4 Division.

If industrial funding is to be successful, it must be achieved through an evolutionary process. Time is required to allow the effective implementation of organizational change and to gather sufficient historical cost data to support initial user funding allocations. These proposals call for significant change in ADP management methodology. Accordingly, top level command support must be acquired or efforts at implementation cannot be successful.

IX. ADVANTAGES OF THE PROPOSED ADP INDUSTRIAL FUND

A. INTRODUCTION

Three basic areas of discussion were introduced in Chapter I: organizational effectiveness; efficiency and effectiveness via chargeback; and determination of the portion of ADP services to be contracted commercially. Each succeeding chapter related to one or more of these issues. This chapter provides a discussion of how the proposed industrial fund solution specifically addresses these issues.

B. BETTER COMPATIBILITY WITH THE EXISTING MARINE CORPS FINANCIAL CONTROL STRUCTURE

As is true in most military organizations, the Marine Corps is a hierarchical, command-structured organization. The Marine Corps is unique, however, in the responsibility and initiative it requires of its small unit leaders. Orders and tactics are provided as a standardized framework for action. The small unit leader is expected to use his own judgement within that framework to accomplish the assigned mission. It is this notion of independence of action and battlefield initiative, yet always achieved within the discipline of the Corps, that distinguishes the Marine Corps from either the undisciplined or the overly

regimented. It is the assigned mission which is important; how it is achieved is up to the leader to whom the mission is assigned.

The particular use of resources is also decentralized to the greatest possible extent. Overall operational funding (O&MMC), and therefore level of effort, is allocated to subordinates by each senior commander. These subordinates then reallocate their funds to their subordinates. In most cases, this process is followed all the way to the individual cost center level. While there are some restrictions on the use of local funding, generally imposed by regulations originating outside the Marine Corps, the local commander has fairly wide discretion in the way funds are applied for mission accomplishment.

"He who directs, pays!" is also a traditional Marine Corps norm within both the command and financial management communities. The basic concept contained within this phrase is that a commander's budget should not be held hostage to unplanned changes in the level of training or operations imposed by situations outside the commander's control.

Current ADP management within the Marine Corps violates both of the organizational norms described in the two preceding paragraphs. Operational funding for ADP is restricted by the publication of ADP targets for each local ADP operation in the annual Marine Corps Field Budget Guidance Bulletin. This bypasses the entire funding chain,

essentially setting a local cost center's budget allocation directly from Headquarters. This procedure has the effect of insulating intermediate commanders from responsibility, either to monitor efficiency, or to provide relief in a funding emergency. Similarly, a considerable portion of the processing involves transactions for Headquarters-designed and directed systems for which the local base or station commander has no control. Still, the local commander must foot the bill. As a result, the relatively effective budgetary control system used by most of the Marine Corps is severely hampered in its application toward data processing operations, with resulting inefficiencies in some units and funding shortfalls in others.

The dilemma is how to best manage a mixture of centralized, partially centralized, and local ADP applications with a decentralized financial control system. The solution to this dilemma begins with recognition that ADP is not a mission, in and of itself, any more than a pile of repair parts is a mission. Rather, it is a resource to be used by those who have specific missions assigned. In the Marine Corps, it is this mission holder who decides which mix of resources is best for accomplishment of assigned tasks. For ADP, it is this mission holder who is the ultimate 'user' of ADP services. The actual command level at which this 'user' resides varies. Some AIS's are tightly controlled with frequency and reports specified by

the Headquarters functional sponsor. The functional sponsor is the 'user'. Some AIS's are designed for local use. The local command is the 'user'. Some AIS's have both Headquarters prescribed and optional features. The 'user' relationship is mixed. If these resources were made to compete directly with other resources consumed by the 'user' at each level on a dollar for dollar basis, the use of ADP could become a rational choice made directly by the 'user' receiving benefits. A separate industrial funded ADP structure offers this benefit, without any change to the current Marine Corps financial control structure.

Similarly, because pricing for ADP services is explicit, it is easier for the user to decide where to allocate ADP effort most effectively. Essentially, three choices are available: use of in-house resources to buy microcomputers or minicomputers; use of the industrial funded backbone network of mainframes and data communications; or use of commercial vendors. For small applications, the local microcomputer solution might be best, unless the industrial fund can offer a lower cost. For larger applications, especially those with significant databases, the industrial fund network would be the obvious choice, unless a commercial vendor can offer better reliability and/or a better price.

C. MORE EFFICIENT OPERATION AND BETTER RESPONSIVENESS TO THE USER

A competitive industrial fund is both efficient and responsive to the user because it has to be. It is dependent upon continued user support for its very existence. It cannot grow without increasing sales. To increase sales requires a marketing orientation. Thus, the competitive industrial fund must be innovative both in technology and service to the user. It must also educate the user concerning what services it has to offer. Finally, it must be efficient. Competitive pricing creates expansion opportunity, but efficient operation is required to cover costs at the lower 'competitive' prices. Efficient operation is also encouraged by billing primarily on the basis of output instead of resources consumed. By increasing output without increasing the consumption of resources, the industrial fund gains more net revenue and can afford further expansion through lower prices.

D. MORE EFFECTIVE CONTROL OF THE ADP RESOURCE

The chargeback provisions of an ADP industrial fund will lessen the need for the Information Systems Steering Committee (ISSC) to act as an allocation device between competing sponsors. Instead, it can concentrate on its responsibility to "coordinate information system strategy with Marine Corps goals and objectives." [Ref. 90] Instead of backlog management, it can go forward with "setting

strategic direction for management information policy and building a commitment to this policy." [Ref. 91] It can set Marine Corps wide standards based on these strategies and goals and review new systems based on compatibility with Marine Corps information systems strategy, independent of the funding question, and with confidence that the incentives built into financial control structure will encourage as efficient an operation as possible.

E. THE A-76 SOLUTION

The requirement to use the lowest cost alternative for 'non-governmental' commercial activities is solved by encouraging direct competition. This saves overhead by reducing the scope of any commercial activity study. In fact, in applying commercial activity criteria to systems (i.e., applications) instead of facilities, the need for comprehensive commercial activity studies for facilities may be eliminated altogether. The industrial fund would expand or contract to the extent that it meets commercial competition. The requirement for "comparison of the cost of contracting and the cost of in-house performance" [Ref. 92] would be met in full.

The so-called 'governmental' ADP systems would have to remain in-house. While there might be some competition from end-user computing in the form of microcomputers or small minicomputers for the smaller systems, larger systems might

Management: Texts and Cases, p. 261, Richard D. Irwin, Inc., Homewood, Illinois, 1983.

79. House Appropriations Committee, Survey and Investigations Staff, Report on the FY 1983 Operations and Maintenance, Navy Budget Submission, pp. 141-146.

80. Department of Defense Directive 7410.4, Industrial Fund Operations, Appendix B to Volume V Navy Comptroller Manual, p. B-19, 16 April 1982.

81. Dowdle, Leroy, Industrial Funding the Marine Corps Regional Automated Service Centers, pp. 49-70, Masters Thesis, American University, Institute for Applied Public Financial Management, Washington, D.C., 1983.

82. Ibid., p. 32.

83. Ibid., p. 63.

84. Cullins, P.K., RADM, USN, "Why a NAVDAC," taken from Parish, Richard, Joseph, The Navy Industrial Fund and Its Applicability to the Naval Data Automation Command, p. 59, Masters Thesis, Naval Postgraduate School, Monterey, California, December, 1980.

85. House Appropriations Committee, Survey and Investigations Staff, Report on the FY 1983 Operations and Maintenance, Navy Budget Submission, pp. 141-146.

86. Informal Point Paper to SAC Conferees, Subject: Reduction of $11.3 Million in FY 1982 Navy Regional Data Automation Center (NARDAC) Program, undated.

87. NARDAC/NAVDAF FY-84 NIF Year-end Results; Undated Narrative to Support FY-84 NIFRS Budgeted vs. Actual Results.

88. Dowdle, Leroy, Industrial Funding the Marine Corps Regional Automated Service Centers, p. 80, Masters Thesis, American University, Institute for Applied Public Financial Management, Washington, D.C., 1983.

89. Federal Information Processing Standard Publication 96, Guideline for Developing and Implementing a Charging System for Data Processing Services, p. 5, U.S. Department of Commerce, National Bureau of Standards, December 6, 1982.

66. Rowland, Charles, A., "Figuring the Bill for MIS Services," Infosystems, p. 96, July 1984.

67. Rizutto, Christine and Rizzuto, Ralph, "Chargeouts: A Perspective for Change," Datamation, p. 125, December 1978.

68. Ibid.

69. McGee, Robert W., "How Companies Account for Data Processing Department Costs," NAA Research, Management Accounting, p. 73, June 1984.

70. Fried, Louis, "DP User Chargeback," taken from Hoffman, Michael J., "DP Cost Allocation: A Management Perspective," p. 18, Journal of Systems Management, January, 1984.

71. Schaeffer, Howard, Data Center Operations, p. 89, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1981.

72. Rogow, Bruce J., "Should EDP Costs be Charged Back to the User", taken from Data Center Operations, pp. 89-90, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1981.

73. Schaeffer, Howard, Data Center Operations, p. 90, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1981.

74. Ibid.

75. Dowdle, Leroy, Industrial Funding the Marine Corps Regional Automated Service Centers, p. 74,81, Masters Thesis, American University, Institute for Applied Public Financial Management, Washington, D.C., 1983.

76. Office of Management Budget Circular A-121, Cost Accounting, Cost Recovery, and Inter-Agency Sharing of Data Processing Facilities, p. 6, 16 September 1980.

77. Dowdle, Leroy, Industrial Funding the Marine Corps Regional Automated Service Centers, p. 41, Masters Thesis, American University, Institute for Applied Public Financial Management, Washington, D.C., 1983.

78. Cash, James L, Jr., McFarlan, F. Warren, and McKenney, James L., Corporate Information Systems

53. Department of Defense Directive 7410.4 Industrial Fund Operations, Appendix B to Volume V Navy Comptroller Manual, p. B-34, 16 April 1982.

54. Bernard, Dan; Emery, James C.; Nolan, Richard L.; and Scott, Robert H.; Charging for Computer Services: Principles and Guidelines, pp. 64-66, EDUCOM, the Interuniversity Communications Council, Inc., New York/Princeton, 1977.

55. Ibid., p.77.

56. Ibid., p.81.

57. Ibid., p.83.

58. Leonard, Robert P., An Automatic Data Processing Charge Back System for the Fleet Numerical Oceanography Center, p. 29,31, Masters Thesis, Naval Postgraduate School, Monterey, California, December 1979.

59. Parish, Richard, Joseph, The Navy Industrial Fund and Its Applicability to the Naval Data Automation Command, pp. 95,101, Masters Thesis, Naval Postgraduate School, Monterey, California, December 1980.

60. United States General Accounting Office, Federal Government Accounting Pamphlet Number 4, Guidelines For Automatic Data Processing Costs, p. 30, 1978.

61. Anthony, Robert N., Bedford, Norton M., and Dearden, John, Management Control Systems, 5th Edition, p. 39, Richard D. Irwin, Inc., Homewood, Illinois, 1984.

62. Alexander, Tom, "How Bureaucracy Keeps Growing," Fortune, pp. 164-165, May 7, 1979.

63. Anthony, Robert N., Bedford, Norton M., and Dearden, John, Management Control Systems, 5th Edition, pp. 97-98, Richard D. Irwin, Inc., Homewood, Illinois, 1984.

64. Sherer, Frederic M., Industrial Market Structure and Economic Performance, pp. 234-236, Rand McNally College Publishing Company, Chicago, Illinois, 1970.

65. Alexander, Tom, "How Bureaucracy Keeps Growing," Fortune, p. 165, May 7, 1979.

41. Anthony, Robert N., Bedford, Norton M., and Dearden, John, Management Control Systems, 5th Edition, pp. 196-197, Richard D. Irwin, Inc., Homewood, Illinois, 1984.

42. Comptroller General of the United States, Twenty-seven Years' Experience with Defense Industrial Funds, p. 12, Government Accounting Office Report No FGMSD-76-51, 5 October 1976.

43. Federal Information Processing Standard Publication 96, Guideline for Developing and Implementing a Charging System for Data Processing Services, pp. 72-73, U.S. Department of Commerce, National Bureau of Standards, December 6, 1982

44. Schechinger, Terry D., and Prack, Arthur E. III, An Analysis of the Computer System Chargeback Concept in the Naval Industrial Fund Environment, pp. 56-66, Masters Thesis, Naval Postgraduate School, Monterey, California, June 1983.

45. Ibid., p. 57.

46. Ibid., pp. 61,63.

47. Griffith, John, E., Industrial Funding: A Viable Management Concept?, pp. 33-41, Air War College, Air University, Maxwell Air Force Base, Alabama, April 1975.

48. Martin, James, Design and Strategy for Distributed Data Processing, p. 5, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1981.

49. Schechinger, Terry D. and Prack, Arthur E. III, An Analysis of the Computer System Chargeback Concept in the Naval Industrial Fund Environment, p. 65, Masters of Science Thesis, Naval Postgraduate School, Monterey, California, 1983.

50. Department of Defense Directive 7410.4 Industrial Fund Operations, Appendix B to Volume V Navy Comptroller Manual, p. B-31, 16 April 1982.

51. Ibid., p B-38.

52. United States General Accounting Office, Federal Government Accounting Pamphlet Number 4, Guidelines For Automatic Data Processing Costs, p. 30, 1978.

27. Larson, Jack DeWayne, The Use of the Marine Corps Standard Accounting, Budgeting and Reporting System to Meet Data Requirements of the Commercial Activities Program," pp. 44-45, Masters Thesis, Naval Postgraduate School, Monterey, California, June 1982.

28. CMC letter 5230/20 CCIS-20:cfb dated 5 November 1984, Subject: Marine Corps Information Systems Support Plan FY85-FY90, page VI-10.

29. Ibid., Section VI.

30. Ibid., pp. VII-2 to VII-4.

31. Computer Sciences Corporation, Headquarters Marine Corps CPU Augmentation Project, Final Requirements Analysis, Washington, D.C., 5 November 1984.

32. Information Systems Management, Briefing for the Assistant Commandant's Committee, Headquarters, U.S. Marine Corps, 26 July 1984.

33. CMC letter 5230/20 CCIS-20:cfb dated 5 November 1984, Subject: Marine Corps Information Systems Support Plan FY-85-FY90, p. IV-4, IV-5.

34. Ibid., p. VII-5.

35. Ibid., p. III-2.

36. Nolan, Richard L., "Managing the Computer Resource: A Stage Hypothesis," Communications of the ACM, Volume 16, Number 7, July 1973.

37. U.S. Navy Automatic Data Processing Selection Office (ADPSO) Instruction 4235 dated 29 July 1982, Subject: Contracting for Automatic Data Processing Equipment (ADPE), pp. 14-15.

38. Office of Management and Budget Circular No. A-76 (Revised), Subject: Performance of Commercial Activities, p. 1, dated 4 August 1983.

39. Office of Management and Budget Circular No. A-121, Subject: Cost Accounting, Cost Recovery and Inter-Agency Sharing of Data Processing Facilities, p. 1, 16 September 1980.

40. Ibid., p.1,2.

12. CMC letter 5230/20 CCIS-20:cfb dated 5 November 1984, Subject: Marine Corps Information Systems Support Plan FY85-FY90, p. IV-1.

13. MCO P5231.1, Life Cycle Management for Automated Information Systems (Short title: LCM-AIS), 9 August 1983.

14. CMC letter 5230/20 CCIS-20:cfb dated 5 November 1984, Subject: Marine Corps Information Systems Support Plan FY85-FY90, p. IV-2.

15. Ibid., p. IV-5.

16. Ibid., p. V-8.

17. Ibid., p. IV-1.

18. Ibid., p. IV-7.

19. Ibid., p. IV-4.

20. Cash, James 1, Jr., McFarlan, F. Warren, and McKenney, James L., Corporate Information Systems Management: Text and Cases, p. 256, Richard D. Irwin, Inc., Homewood, Illinois, 1983.

21. Information Systems Growth and ADP Resource Capacity, Briefing for the Assistant Commandant's Committee, Headquarters, U.S. Marine Corps, May 11, 1984.

22. Ibid.

23. Economic Analysis of an ADS to Provide a Standard Financial Management System for Use by all Authorized Operating Budget Holders within the Marine Corps, Figure 9, Headquarters, U.S. Marine Corps, 27 March 1980 (Revised 31 Oct 1980).

24. Economic Analysis for the Marine Corps Standard Supply System, p. K4, Headquarters, U.S. Marine Corps, undated draft of approximately December 1979.

25. FY 1985 NavCompt Budget Submission for Operations and Maintenance, Marine Corps.

26. Feasibility Study for Marine Corps Standard Supply System, p. A-6, Headquarters, U.S. Marine Corps, undated draft of approximately December 1979.

LIST OF REFERENCES

1. King, John Leslie, "Centralized versus Decentralized Computing: Organizational Considerations and Management Options", Computing Surveys, Vol. 15, No. 4, p. 320, December 1983.

2. Ibid, p.343.

3. Hamrick, Richard A. and Ragland, Everett L. Jr., ADP Fee for Service: Eliminating the Free Resource Syndrome," p. 11, Research Study, Air Command and Staff College, Air University, Maxwell Air Force Base, Alabama, May 1978.

4. Office of Management and Budget Circular A-121, Cost Accounting, Cost Recovery, and Inter-Agency Sharing of Data Processing Facilities, p. 1, 16 September 1980.

5. Hamrick, Richard A. and Ragland, Everett L. Jr., ADP Fee for Service: Eliminating the Free Resource Syndrome, pp. 13-14, Research Study, Air Command and Staff College, Air University, Maxwell Air Force Base, Alabama, May 1978.

6. Griffith, John E., Industrial Funding-A Viable Management Concept?, pp. 27,31,43, Air War College, Air University, Maxwell Air Force Base, Alabama, April 1975.

7. Schechinger, Terry D. and Prack, Arthur E III, An Analysis of the Computer System Chargeback Concept in the Naval Industrial Fund Environment, pp. 77-78, Masters Thesis, Naval Postgraduate School, Monterey, California, June 1983.

8. Office of Management and Budget Circular A-76 (Revised), Performance of Commercial Activities, p. 7, 16 August 1983.

9. Ibid., p. 2.

10. Ibid., p. 4.

11. Public Law 97-252, dated 8 September 1982.

limited and not become an inexhaustible fallback funding source to cover inefficient operation.

Another partial remedy for down-side flexibility which has been suggested is equipment leasing instead of procurement. Leasing allows for quicker response to increases as well as decreases in processing volume and easier upgrading to modern equipment. The difficulty with leasing is its cost. When outright procurement of ADP equipment is considerably less expensive over its estimated useful life, it is hard to justify leasing as a general practice. Although leasing might be applicable for specific short term applications, there is no single answer to what is best for all occasions.

F. SUMMARY AND CONCLUSION

If reorganization can be accomplished, industrial funding of non-deployable, multiple-user ADP assets is possible and can provide for effective decision making in the allocation of ADP resources. If a sufficient activity base can be maintained in the face of competitive pressure, operational efficiency can be assured as well. These are big 'ifs'. There are other smaller uncertainties to account for as well. Industrial funding is, however, a viable methodology and should be considered in future planning. It has much to offer.

E. FLEXIBILITY CONCERNS

To remain efficient, and therefore competitive, an industrial fund must be able to respond to changing requirements. It must be able to expand or contract capacity as requirements expand or contract. Expansion has been made easier by the change in procurement rules which allows reinvestment of depreciation, and the recent actions removing ceilings on civilian personnel employed by an industrial fund [Ref. 93]. Both changes (particularly the civilian ceiling removal) are subject to changes in political climate. In the event restrictions are reimposed, the growth capability of industrial funded ADP would be impaired. Commercial contracting would probably have to be substituted, even if its cost structure was not optimal. Hence, benefits from industrial funding would be reduced.

Contraction in size by the industrial fund, when warranted, presents unanswered problems. Reductions in force for civilian personnel are both time-consuming and expensive. Equipment base, once established, is difficult to write off. Thus, depreciation and excess personnel costs would have to be charged to existing customers and rates would become excessively high, unless new customers were found or a subsidy provided. Such a subsidy could be provided in the form of centrally directed new systems development or research and development efforts. It is important, however, that such a subsidy arrangement be

definition upon the user will require a delicate balance. Heavy top-down control will make the system as unresponsive as it was in the 1970's. Too much user definition of structure as well as requirements has caused the current dilemma of too many new systems with different design requirements imposing their needs on a structure which can not handle them all. While an industrial fund might survive as an entity in either environment, effective management of the industrial fund will require that a balance be maintained.

The industrial fund will not provide an answer to this problem. The proposed industrial fund is actually neutral on the tradeoff between the effectiveness of the central or global view and the efficiency of the user's understanding of individual requirements. Proposed requirements for resources may be defined at any level from the local users to HQMC. The only requirement imposed by the industrial fund is that whoever defines a requirement is billed for it. Who is allowed to define requirements is left to the policy makers on the ISSC and to the resource providers in the POM. Thus, the proposed industrial fund does not provide an answer to the top-down, bottom-up question, but it does provide the flexibility to follow either approach, or something in between, and to vary that approach between applications as desired.

efficiency. An industrial fund or even a separate command structure with ADP removed from line command would remove this control. This requirement for competition, however, presupposes that the industrial fund would have sufficient activity to exploit any economies of scale. If not, a certain level of activity would have to be mandated. The problem then becomes a matter of choosing the level of tradeoff between mandated activity, which provides scale economies but also an incentive for organizational inefficiency, and competition, which has organizational efficiency incentives but may not provide the level of activity necessary to achieve economies of scale. Setting the level of activity and the applications to be mandated would require delicate balance both operationally and politically.

D. TOP-DOWN, BOTTOM-UP, AND STANDARDIZATION ISSUES

Industrial funding, in and of itself, does not require standardization. An industrial fund, however, encourages standardization because standardization keeps costs lower for the large scale projects which are the best candidates for industrial fund operation. Because the industrial fund does not prohibit 'bottom-up' requirements definition, a top-down structural definition of standardization requirements must be enforced, particularly for smaller applications. To define structure without imposing task

an entire AIS without extracting 'allocated costs' from a hodgepodge of different funding sources.

Although reorganization has already evolved to some extent on a de facto basis, it will be difficult even with full support of senior commanders and staff officers. Without such support, reorganization can not be successful and should not be attempted. The specific methodology for achieving such a reorganization has not been discussed in this paper. It will require significant additional research and planning. Yet, reorganization must be accomplished before reimbursable billing for ADP charges to users is contemplated. Otherwise, serious operational difficulties, high overhead costs, and eventual abandonment of any large-scale billing system can be predicted.

C. COMPETITION

While an industrial fund could be formed without requiring any competition, its value would not justify such an action. It is the organizational incentive for growth in the face of competition which demands efficient operation. Otherwise, the growth can be achieved without an increase in service or output since a 'captive' user has no alternative to the industrial fund price. The incentive is toward inefficiency instead of away from it. Thus, without competition, user-command relationships, even if deficient to some degree, are necessary to exert some control on

X. UNRESOLVED CONCERNS

A. INTRODUCTION

Successful implementation of industrial funding is not a foregone conclusion. Many of the concerns expressed by critics of industrial funding are answered by the proposed approach, but there are issues which can block success. Adequate command support is required to prevent an unsuccessful ADP reorganization. Additionally, at least some degree of price and service competition is necessary as a stimulus to organizational efficiency. Finally, there are other issues of concern which would limit success by restricting effectiveness and/or efficiency to varying degrees.

B. REORGANIZATION

Reorganization is the key issue. Without reorganization, any form of chargeback beyond statistical costing cannot be considered a practical possibility. It is reorganization which makes the administrative efficiency of a single billing system possible. It is reorganization which provides sufficient definition of user and provider to allow a buyer-seller relationship to exist. Finally, it is reorganization that allows accurate costing and pricing of

end up paying some premium for their exclusivity. They would still benefit from the overall need for efficient operation of the industrial fund ADP network, but might require some protection from monopolistic pricing. The ISSC might find itself in a regulatory role for such systems. Such systems would guarantee the existence of an internal backbone system. The organizational incentive for growth would then provide the stimulus for efficiency under competition.

F. SUMMARY

The proposed system calls for centralized management of the central 'backbone' of ADP services, yet allows the more decentralized financial control structure of the Marine Corps to remain effective. It provides the efficiency afforded by economies of scale, along with the effectiveness of user decision making. Yet, it provides a control structure and a disciplined approach to that decision making. Finally, it provides a more efficient approach to choosing the appropriate level of outside contracting for ADP services. If successfully implemented, an industrial funded system will provide financial control, without inhibiting effective response to user requirements.

90. CMC letter 5230/20 CCIS-20:cfb dated 5 November 1984, Subject: Marine Corps Information Systems Support Plan FY85-FY90, p. IV-4.

91. Ibid.

92. Office of Management and Budget Circular A-76 (Revised), Performance of Commercial Activities" p. 1, 4 August 1983.

93. Office of the Secretary of Defense Report, Subject: Evaluation of the Effects of Lifting Civilian Personnel Ceilings in DoD Industrial Fund Activities, FY 1983, p. 1, 1 March 1984.

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