TWO CASE STUDIES FOCUSING ON

INFORMATION SYSTEM ORGANIZATION AND USE OF

THE CRITICAL SUCCESS FACTORS METHODOLOGY

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                                        Thesis Supervisor

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        Chairman, Departmental Committee on Graduate Students

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ABSTRACT

The Information System function still remains a major focus for management, and managers are still asking the question: "How can we successfully manage this function?" In this document, we try to answer this question through two case studies focusing on the information system organization and use of the critical success factors (CSFs) methodology.

The methodology involves informal but structured interviews with the organization's managers to identify the goals and objectives, the critical success factors, and their measures. The CSFs and their measures provide a direct indication of management's information needs. Through this research, we have found that in identifying, describing and prioritizing CSFs of the information system manager, we have a tangible description of what it takes to succeed in the management of this function.

Thesis Chairman: John F. Rockart

Title: Senior Lecturer of Management Science

ACKNOWLEDGEMENTS

To my grandfather, "Rahamem"
from whom I learned the
independence and mastery of
the environment.

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PROLOGUE

I do not presume to think that this treatise settles every doubt in the minds of those who understand it, but I maintain that it settles the greater part of their difficulties. No intelligent man will require and expect that on introducing any subject I shall completely exhaust it; or that on commencing the exposition of a figure, I shall fully explain all its parts. Such a course could not be followed by a teacher in a "viva voce" exposition, much less by an author in writing a book, without becoming a target for every foolish conceited person to discharge the arrows of folly at him ...

Moses MAIMONIDES

(12th Century, The Guide
of the Perplexed)

CHAPTER I: STATEMENT OF PROBLEM

As an introduction to the purpose of this document, I thought
it would be useful to open with several quotations on the subject
of interest; namely, the Data Processing Executive's function:

> "Data Processing professionals have to carry the
> job of building, maintaining and operating information
> systems in organizations, and they often have neither the
> inclination nor the perspective for academic contemplation...
>
> Their relatively outdated training, plus this pace
> of technological change, puts pressure on many heads of
> data processing to concentrate on the computer in and of
> itself, at the expense of focusing on the companys business
> needs." (1)
>
> "It has been said, nothing in this world is certain
> except death and taxes and the fact that data processing
> projects will take longer, cost more and do less than
> expected." (2)
>
> "A majority of users are disappointed with the results
> obtained from their computer." (3)
>
> "Very few EDP people perform, in part because they are
> arrogant, in part because they are ignorant, and in part
> because they are too enamored of their goddamed tool." (4)

These following two quotations from Norbert Wiener show really
why the Data Processing function is a critical link in any organi-
zation:

> "... any organism is held together by the possession of
> means of the acquisition, use, retention, and transmission
> of information."
>
> "Control is the art of decision and information is the
> measure of decision."

All these quotations are recent and we might expect that in 1979 this function could be more successful or merely well established like any other function in any organization. However, in 1979, this function still remains a major focus for management, and managers are still asking questions: "How can we successfully manage this function?" The answer to this question is the main purpose of this document.

The primary tool used in this research is: "The Critical Success Factor" (CSF) methodology developed by J. F. Rockart[5] at the Massachusetts Institute of Technology (MIT), Center for Information Systems Research (CISR). Previous reports have applied the CSF approach in studying an Oil Company,[6] Universities,[7] Medical Groups,[8] Airline Management,[9] and a Manufacturing Company.

Through this method, we will try to:

- Describe the Data Processing executive's function as a business.

- Identify the information needs of Data Processing managers at different levels in the corporate hierarchy.

- Understand the management controls necessary for the successful management of this business.

In order to understand the background for the present research, in the next two chapters we are going to explain what the Critical Success Factor Concept is and the environment of the Data Processing executive's function.

CHAPTER II: CRITICAL SUCCESS FACTORS CONCEPT

Information Flow

Management Information is a key resource, the value of which

must be appreciated as being as important to an organization as capital

funds and human resources.

Information is the basis of decision making as well as the main

element for the measurement of that decision; this demands that there

be highly reliable information in both the input process and the

output process. A rapid look at Figure 1, "Complexities of Growth

(Communication, Delegation, Information)" and Figure 2, "Classical

and Actual Approach to Organizational Information Flow" shows that

managers have to identify, define and design their information

systems to support their needs. This problem of identifying

information needs is the basis of the critical success factor concept.

Information Needs

In the field of determining manager's information needs, many

works have been done, e.g., Daniel,[10] Anthony,[11] and Rockart.[5]

They show that information needs can be understood by defining the

Critical Success Factors (CSFs) underlying the goals and objectives

of each manager. But the person who has really gone deeply into this

approach, defined the limits and applied it in a variety of industries

is J.F. Rockart. In all cases, the method has proved to be useful
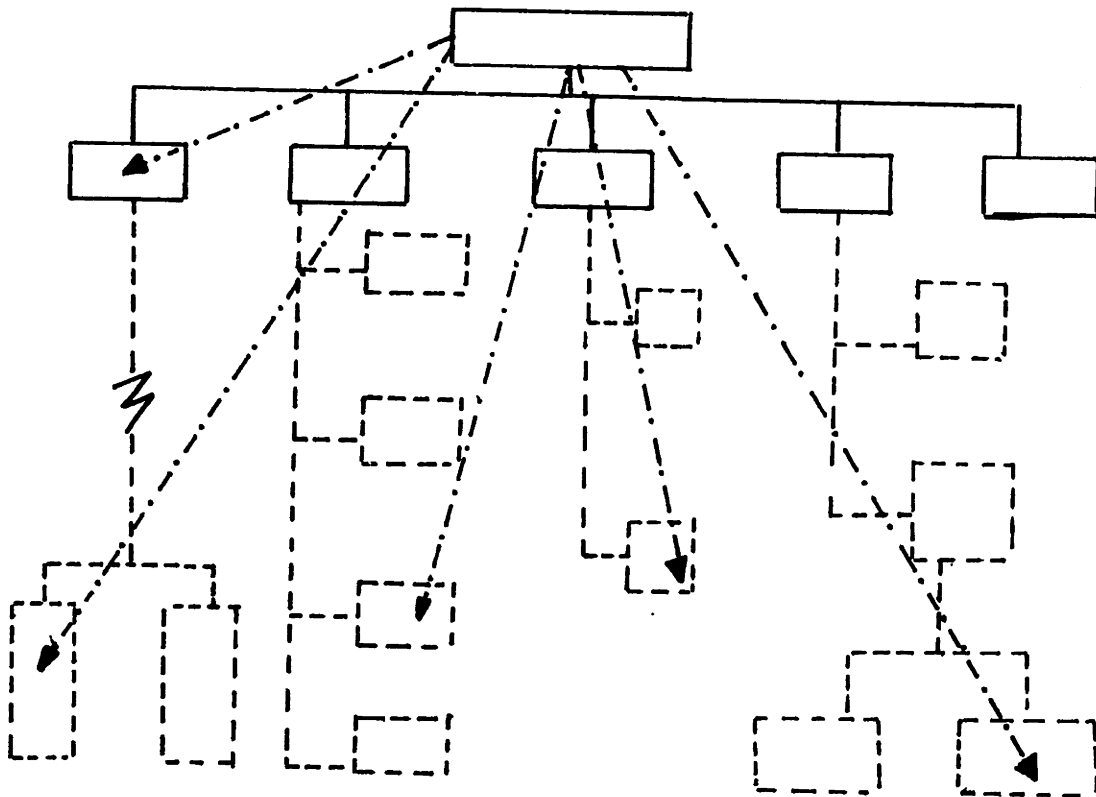
——————— Before Expansion

— — — — — After Expansion

—·—·—·—· Lengthening Lines of Communication

Figure 1: Complexities of Growth
(Communication, Delegation, Information)*

*Adapted from Joel Ross, Modern Management and Information Systems,
Reston,   , 1976.

Classical Authority

Actual Information Needs
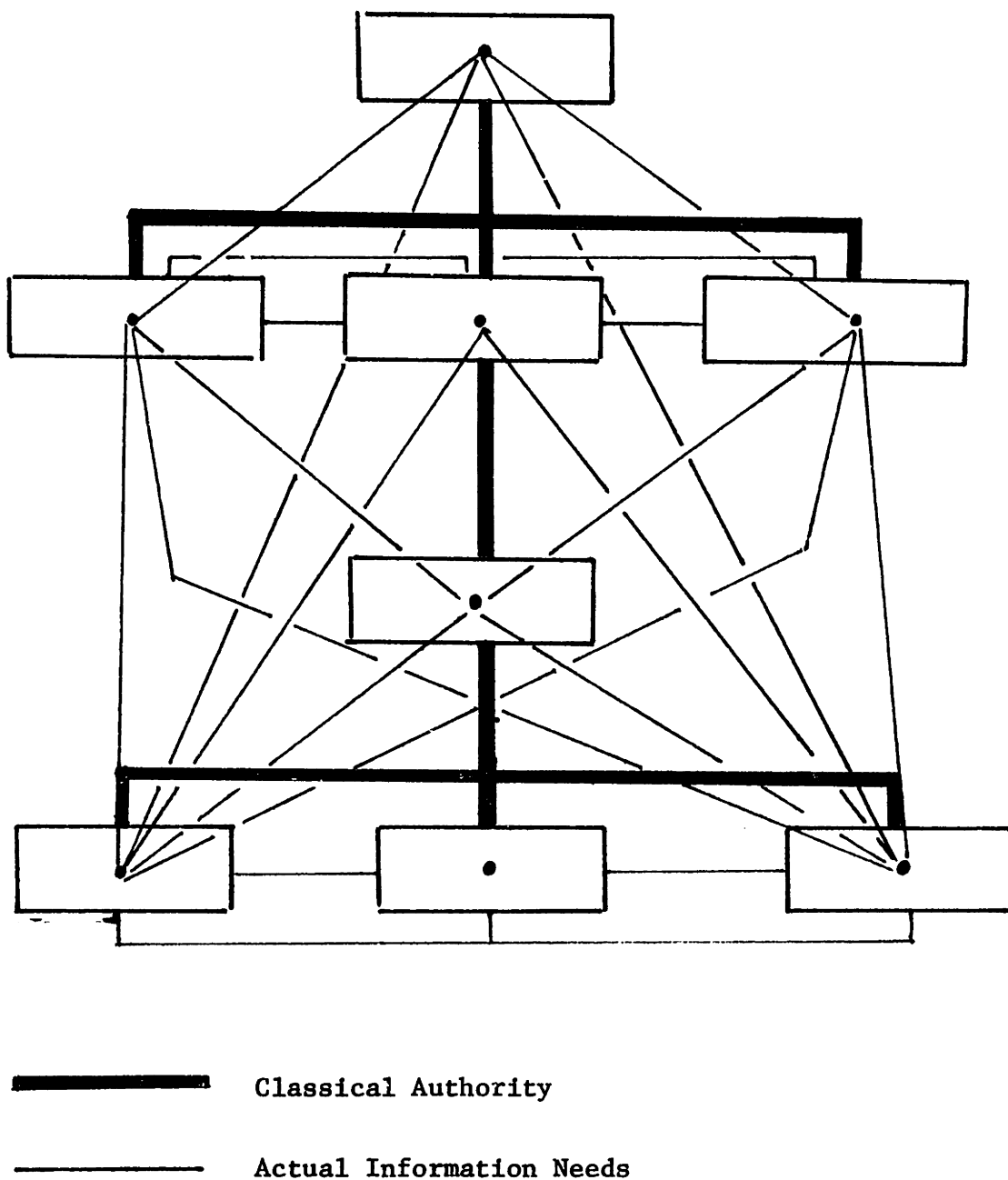
Figure 2: Classical and Systems Approach
to Organization Information Flow

in accomplishing the research goal of understanding the manager's job. We will use this approach in this thesis.

In his paper, "A New Approach to Defining the Chief Executive's Information Needs", Rockart described four traditional approaches to determining an executive's information needs:[5]

(1) The By-Product Method

This method has the advantage of providing for the inexpensive processing of large amounts of paperwork, but the inconvenience of providing much less useful managerial information.

(2) The Null Approach

This method has the advantage of taking into consideration, the "soft" environmental information needs, but in doing so, places too much stress on the strategic and person-to-person roles of an executive. It therefore concludes that a top executive's information needs cannot be specified well enough to be part of a computer-based information system.

(3) The Key Indicator Method

This method has the advantage of providing a significant amount of useful information. However, this method often results in many undifferentiated, heavily financial variables.

(4)   <u>The Total Study Method</u>

This method has the advantage of developing an overall

understanding of the business, but suffers from all the

problems of "total" approaches (e.g., difficulty of

serving an individual manager's needs).

Any of these methods can focus on the individual manager <u>and</u>

on each manager's current information needs both "hard" and "soft";

however, few executive information systems were designed using these

methods.

Critical Success Factor Methodology

Critical Success Factors are for any business, the limited

number of areas in which results, if they are satisfactory, will

ensure successful competitive performance for the organization. They

are the few key areas where "things must go right" for the business

to flourish. If results in these significant areas are good, the

business will be successful.

To illustrate this concept, we will use Figures 3 and 4 to

support the following explanations:

The first schema (Figure 3) shows the possible "Sources of the

CSFs"; we can formulate the CSFs in the following manner:

$$CSF_i = \mathcal{F}(T,M,G,O,S_j)$$

CSF_i is function of (T,M,G,O,S_j) where:

- CSF_i represents the critical success factors and the subscript "i", the ranking number assigned by a specific manager.

- T is the Time Horizon.

- M is a variable which represents the specific stage of the function in the organization (for example, in Data Processing, we will use the four stages of the EDP by Richard L. Nolan[12]).

- G represents the Goal that the manager hopes to reach.

- O represents the Objectives of the organization.

In this document, we will use the definition of Vancil[13] of "Goal" and "Objective":

- A goal is an achievement to be attained at some future.
- An objective is an aspiration to be worked toward in the future.

Structure of Particular Industry

Organizational
- Position within the Industry
- Geographical Location

External

Internal

CRITICAL SUCCESS FACTORS

CSF time, manager

Environmental Factors:

- Economic
- Political
- Population
- Personal

Temporal Organizational Factors:

- Inventory control
- Random events....
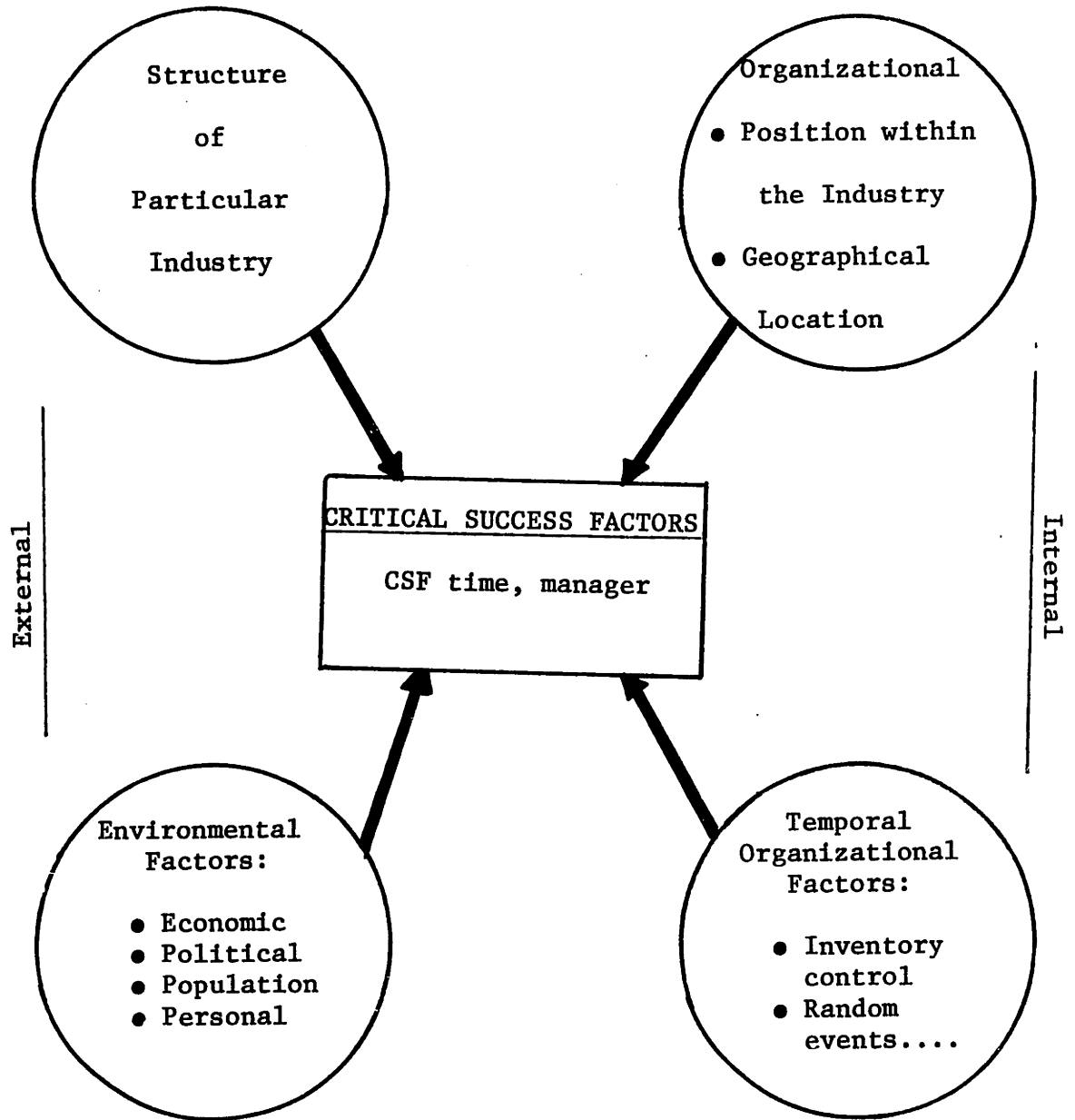
Figure 3:   Sources of the CSF's

	Time Frame	Specificity	Focus	Measurement
Objective	Enduring Unending	Broad General Terms	External Organiz.	Ident. (quantitative)
Goal	Temporal Time-Phased	Specific results at specific date	Internal Organiz.	Ident. (quantitative)

- S_j represents the different sources of the CSFs; in the Figure 4, we have S_1, S_2, S_3, S_4; and the subscript "j", the specific source.

- S_1 represents the "Structure of the Particular Industry." Each industry has a set of critical success factors which are determined by the characteristic of the industry itself.

- S_2 represents the "Organization's position within the industry and geographical location". The individual situation of the organization is determined by its history and current competition strategy. The effect of large companies on the small companies as well as its location have an effect on the CSFs.

- S_3 represents the "Temporal Organizational Factors". (examples: Inventory Control, Strike, Rebuilding an Executive Group)

Internal Organizational considerations often lead to "Temporal CSFs."

- S_4 represents the "Environmental Factors"

  [examples: Economic Factors (Unemployment,

  Inflation, Energy, Supply Availability)

  Political Factors (Governmental Regulations,

  Unions, Foreign Policy...), and Population

  (Growth, Skills)]

When this first step (see Figure 4, Step 1) of determination of the CSFs is over (this process would be repeated for each manager within the organization), we start the process described in Figure 4, "Utilization of the CSFs".

Step 2 is the process of measurement of performance of the CSFs; this acquisition of information might be automatic, in the case of the "hard" data semi-automatic or manual for the "soft" data.

Step 3 is the dispatching of this information in an adequate form, in order to be understood in the same way by different managers at different levels of the hierarchy.

Step 4 is the self-analysis by the managers of their results; we can observe that at this step. We have two alternatives:

(1) The organization's efforts for the period will be less than desired; or

(2) business will be successful.

In both cases, the CSFs methodology helps insure that these significant factors will receive careful and continuous scrutiny. The periods of scanning of this close loop depend on the periods of measurement of CSF_i.

Step 1 — Critical Success Factors (time, manager) see Figure 4

Step 2 — Measurement of Performance (CSFs) / Acquisition of the Information

Step 3 — Distribution of this Information: Reporting Structure

Step 4 — Analysis and Assessment of the Results

Not Adequate — The Organization's Efforts for the Period will be less than Desired

Good — Business will be Successful

Step 5 — Business will be Successful

Careful and Continuous Scanning

Figure 4: Utilization of the CSFs

We are going now to describe the current procedure used at the Center for Information Systems Research (CISR) to accomplish research based on this methodology.

CSF Research Procedure

The CSF research procedure requires a good understanding of:

- company background

- company objectives

- company structure

- the function studied (in the present case of the Data Processing Function)

- the environment of this function (internal and external to the organization).

This is obtained by use of an interview outline, in order to have a guideline during the informal discussion with the appropriate managers. This interview generally contains questions regarding:

- the company (resources...)

- the interviewee (and identification of this person's responsibilities and authority)

- goals and objectives

- relationships with superiors, peers, subordinates (internal relationships)

- external relationships, peers, vendors, etc.

In addition, there is a section of the interview in which the CSF concept is explained and the interviewee is asked to:

- identify the CSFs

- describe how they are measured (if possible)

- rank them by order of priorities.

We also interviewed the first level above the main interviewee and also one level below in order to have a better assessment of the function. We wanted to see if the three levels have the same interpretation of what the CSFs are plus how they are measured for that particular function.

All the points listed above will be illustrated when we will describe the "interview outline" for the present survey.

In the next chapter, we are going to explain the environment of the Data Processing Executive Function.

CHAPTER III: ENVIRONMENT OF THE DATA PROCESSING EXECUTIVE

Introduction

An understanding of the environment of the Data Processing

Executive Function will permit us to better understand the interview

outline and to better interpret the case descriptions which will be

presented.   This environment is mainly composed of:

- The suppliers of systems (Hardware + Operating System)

- The suppliers of software (Applications)

- The staff of the Data Processing Department

- The users.

Each of these components has changed tremendously in the past

decade.   The dynamics of the process have been great; the process

itself is unique among all the new methodologies or tools introduced

in the field of management   (see Figure 5).

The Suppliers of the System

The key point here is the Hardware Technology.   The ratio/cost/

performance has been improved each three years from the technology of

vacuum tubes to the L.S.I. (Large Scale Integration) and V.L.S.I. (Very-

Large-Scale-Integration).

The best way to show the effect of this reduction of cost is to

look at some graphs (Figures 6,7,8) presented by "Advanced Computer

Techniques"[14] during the INFOTECH congress in London (March 13-15,

1978).

STAFF

- Salary
- Skill
- .....

SUPPLIERS SYSTEMS

(Hardware and
Operating System)

- New System or
  New Technology
  each 3 years

DATA

PROCESSING

EXECUTIVE

FUNCTION

USERS

- More and More
  Exacting and
  Sophisticated

SUPPLIERS OF SOFTWARE

(Packages)
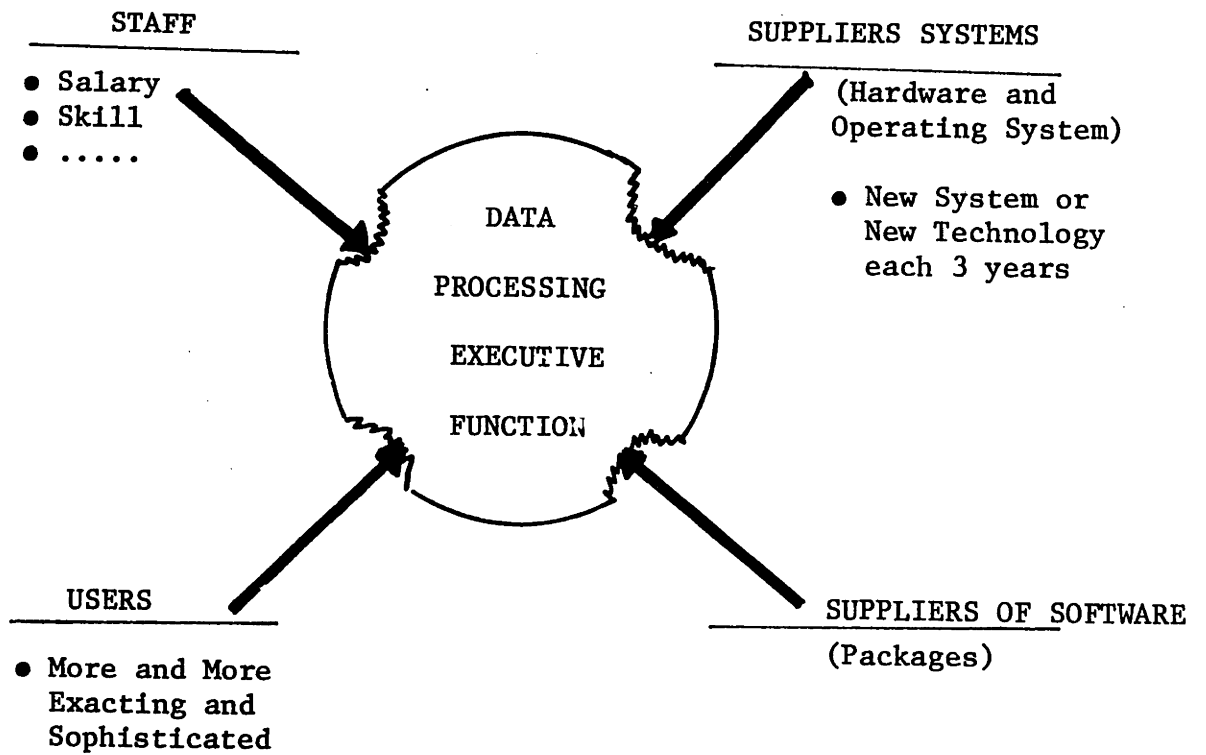
Figure 5: Environment Data Processing Executive
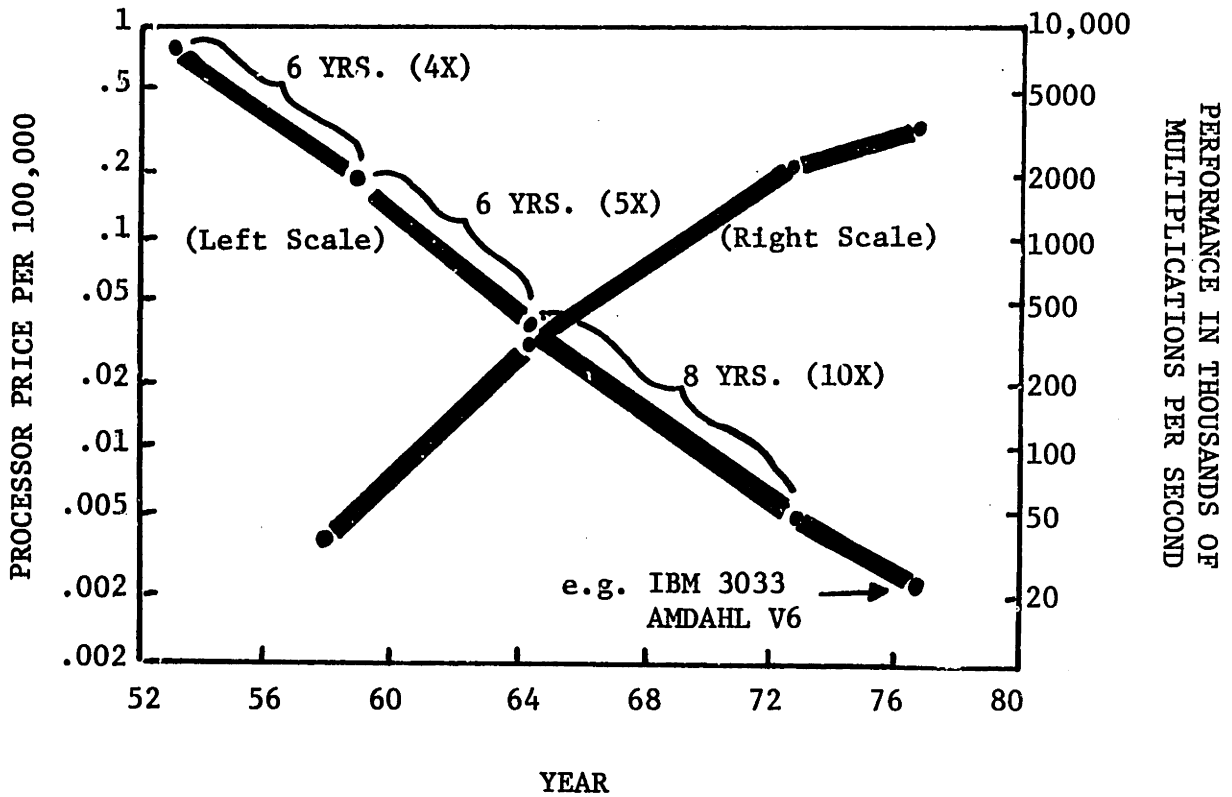
Figure 6: Processor Price/Performance Trends*

* Excludes "Special Purpose" CPU's
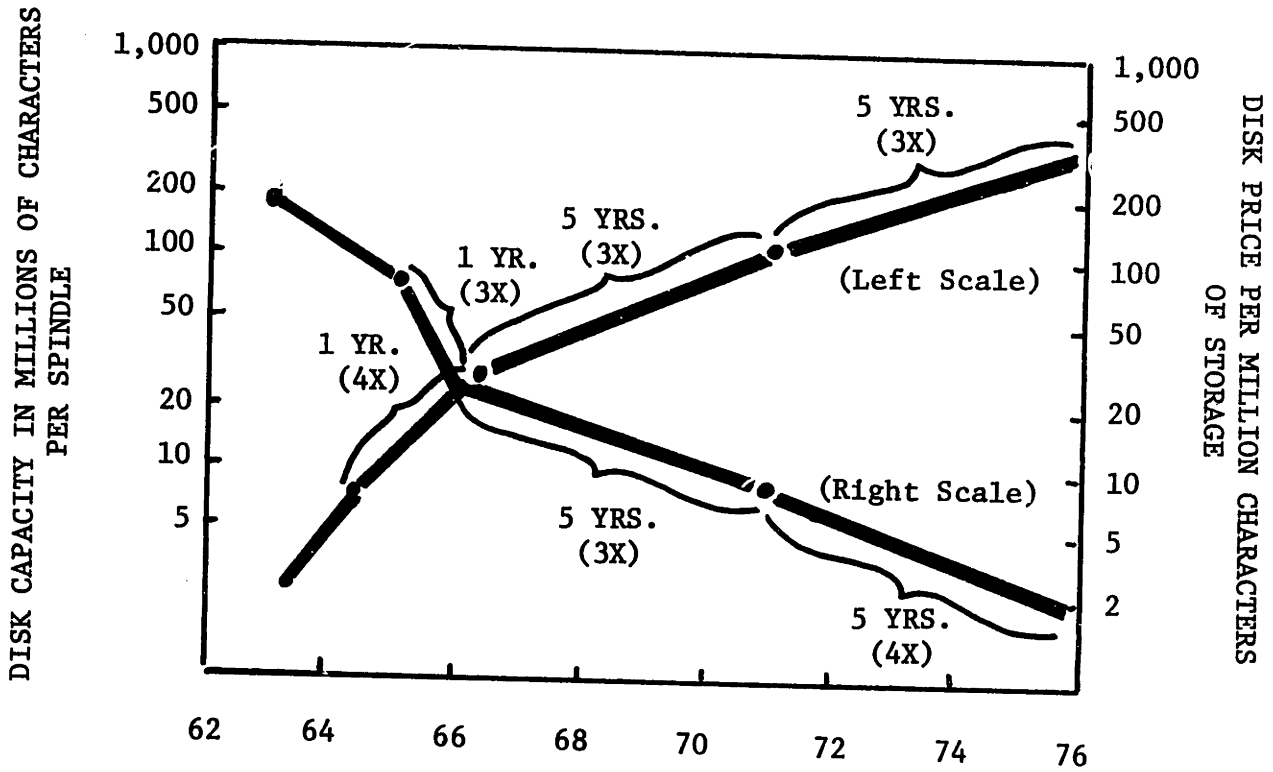
Figure 7: Disk Price/Capacity Trends

83-87%
(Estimated)

100%

60%

60%

21%

12%

1967 1968   1975   1980
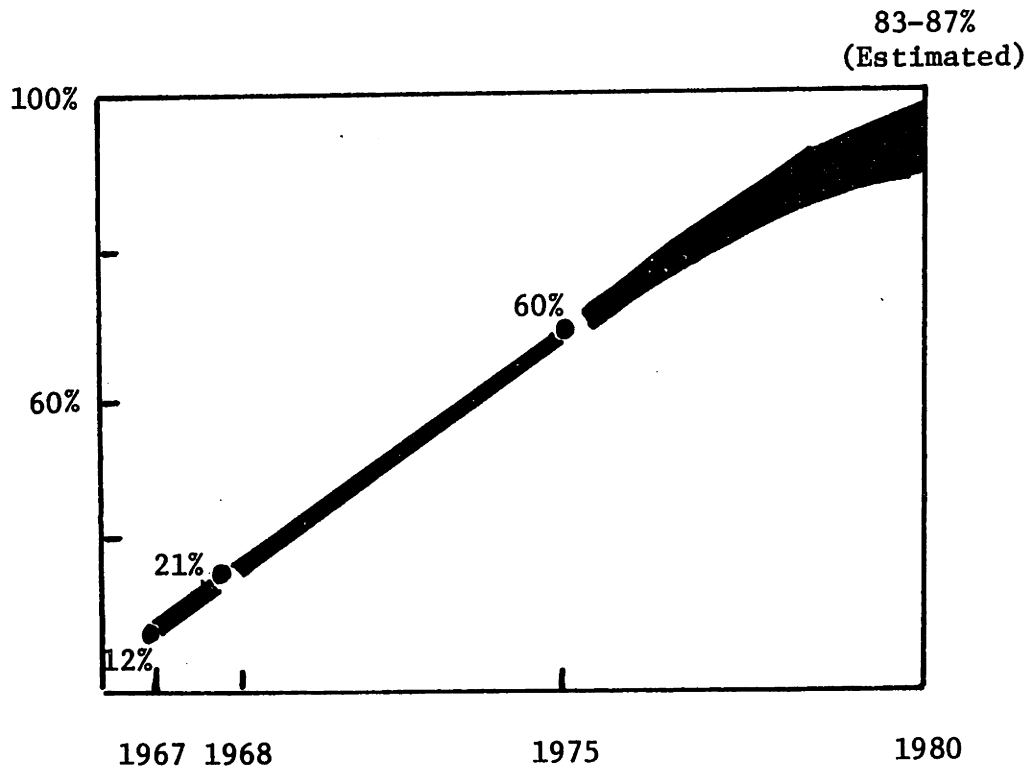
Figure 8:   Communications Technology Trends Data

Communications Oriented Systems

These curves graphically represent an example of "What's been going on in the hardware and communications technology area?" The other impact of the technology is the appearance of the "minicomputers" and "microcomputers". These innovations, as we will see later, introduced a new type of "user" to the market and also allowed the suppliers (and particularly the vendors) to approach the organization without necessarily going through the traditional channel, the Data Processing Department.

The last point is the development of the Operating Systems technology and more specifically the Data Base Management Systems (DBMS). The schema in Figure 9 shows the evolution of the combination CPU/Data Base/Systems.

As we can observe in this short description, the one real dilemma for the Data Processing Executive is the tradeoff between "STABILITY VERSUS INNOVATION".

The Suppliers of Software

Compared to technology trends in hardware, the software technology unfortunately has not followed at the same pace. Many organizations were forced to write their own "software" to improve the operating system provided by the vendor or by some independent software groups.

The proliferation of packages "each one better than the other" (in order of creation) did not help to meet the needs of standardization and normalization in this area. One example of the difficulty of choice

Multiple CPU
+ "N" Data Base
with Redundancy

Multiple CPU
+ One Data Base
with Redundancy

Multiple CPU
+ "N" Data Base
Non Over-
lapping

Simple CPU
+ one Data
Base

| Basic | Time | On-Line | Systems |
| Batch | Sharing | Update | Evolutions |
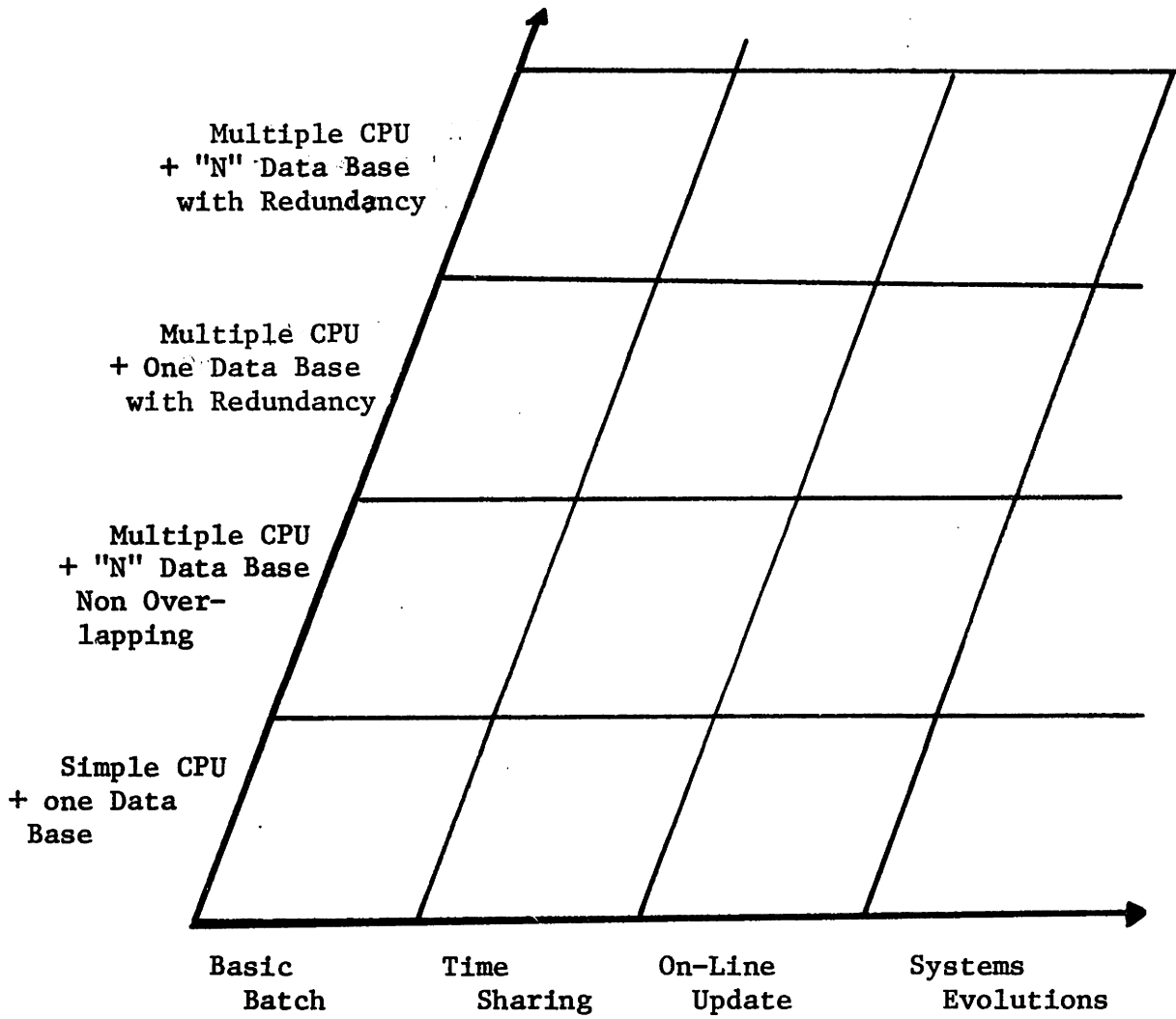
Figure 9:   Stability Versus Innovation

that the Data Processing Executive could have is the survey made by
DATAPRO in 1977.

- We took two similar packages listed in the
  survey:

     LIBRARIAN (APPLIED DATA RESEARCH) and

     PANVALET (PANSOPHIC SYSTEM).

Both were implemented more than 3,000 times; the users on eight
different criteria gave exactly the same rating. Of the thirty-two
listed packages, only thirteen received awards from DATAPRO.

In the same way, we can also ask the question, "How many payroll
and accounting systems have been written?" The cost of software
development is universally higher than the cost of hardware, primarily
due to the labor-intensive nature of the task. Purchased packages
are always higher than the actual capability and because of diverse
requirements:

- Requirements of the users (or end users)
- Flexibility at the system level (maintenance)
- Ability to be used after a short training period.

For the Data Processing Executive, this generates another dilemma --
"MAKE OR BUY".

The Staff of the Data Processing Department

The human issues in the field of Data Processing are crucial. This "Strange Population" is characterized by:

- a high turnover rate

- an inflationary salary scale

- a critical career path plan

- a need for constant training and updating

- a sentiment of frustration.

The time when some advertisements proposed to make you an analyst in three months (without any background) is over. We now understand that a programmer of systems software and a programmer of applications software are totally different and require different training. The Data Processing industry generated in only two decades a great number of new functions which require a background ranging from an advanced degree to the simple experience of an office clerk.

Most organizations had their own program of education and were suspicious of the college educated applicant. Most of these functions did not have a precise job description and if one did exist, there was little similarity from one organization to another.

These human issues are explored in the paper "Management of Increasingly Decentralized Data Processing".[15]

Specifically, these issues are discussed:

- Career Path Problem

- Travel Burden on Data Processing Staff

- Changing Personnel Needs (more staff skills)

- Measures of Performance

- Matrix Management.

For the Data Processing Executive, there is yet another dilemma: MAINTAINING THIS SCARCE RESOURCE by managing all the issues listed above without EXCEEDING HIS BUDGET. (This dilemma is even more difficult in the case of highly skilled people.)

The Users

In this section, we will describe the role "users" play in the environment of the Data Processing Executive. We need to define the terms used.

We have two types of users:

- The users who directly input data and may be in indirect contact with a computer. [Example: The clerk who fills the coded forms or the clerk who introduces the data directly by terminal (CRT in time-sharing or on-line updating).] We call them "U_c".

- The users who are the "decision-makers" and have authority over "U_c".

To represent the pressures of these users vis-a-vis, the

Data Processing department or the Data Processing Executive, we

will use the symbol "P_j", where the subscript "j" indicates the

origin of the pressure.

With these symbols, we can now analyze the following diagram

(Figure 10). The pressure begins generally by U_c who tries to solve

the problems directly with the data processing staff which results

in LI. When U_c feels that he is not getting anywhere, he protects

himself by calling on and applying pressure to U_m (U_m may also have

a top-down pressure). This reaction first generates loop L.2, and

either L.3 or L.4. If U_m has a personnel contact in the D.P.S. or

if he understands the issue, he will use L.3.

If he does not understand the issue or if the reaction time of

the DPS is too long, he will use L.4. This "crescendo" will

continue if the problem is not resolved, with the loops L.5 and

L.6 and with most probably, at the same time, a deterioration of the

climate throughout the system.

This flow of communication can be shown for any kind of service

provided by the Data Processing Department under the authority of the

Data Processing Executive. All this plus the chargeout system and

the hypothesis that the organization is in the fourth stage of growth

in their applications[12] make the loops L.4, L.5 and L.1 more

problematic.

Independently, the fact that U_m are now the target of the vendors

of mini-systems creates a new kind of pressure on the DPE. The time
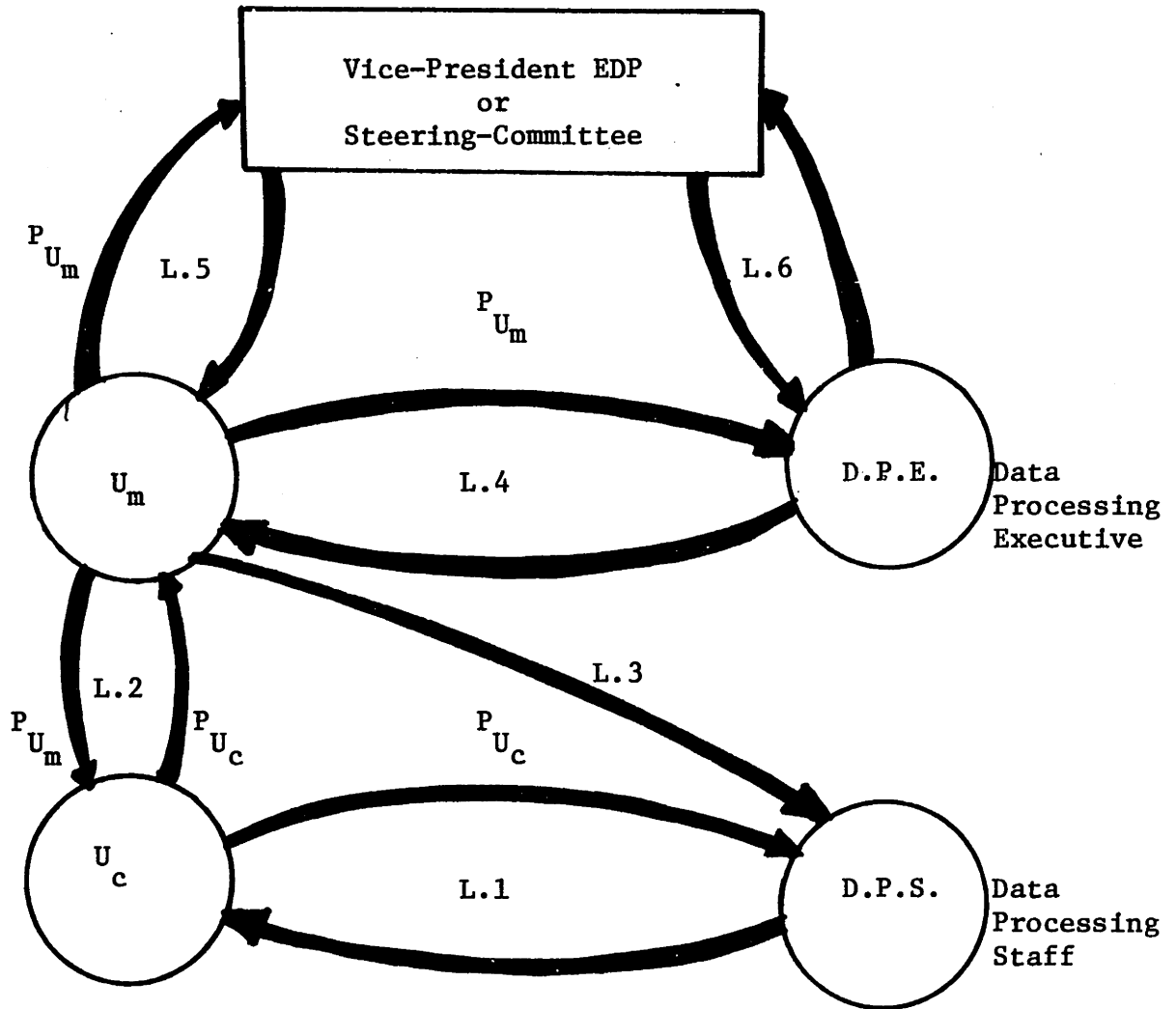
Figure 10: Diagram Users/Data Processing Executive

when the users considered the computers as the "magic machine" is over and nowadays they are more sophisticated, mature and more easily accept their role of accountability.

For the Data Processing Executive, there is now another dilemma -- should a centralized authority be maintained, or SHOULD THE SYSTEM AUTHORITY be distributed?

Conclusions

We see that each of these environments generates a major dilemma for the Data Processing Executive:

- Stability versus Innovation in technology

- To make or to buy software

- To maintain the scarce human resources without exceeding his budget

- To maintain a centralized authority or to distribute it to user managers.

Many questions remain:

- How does he manage these dilemmas?

- Of what help is planning?

- How is he measured?

- What should he do to make his function successful?

We hope to answer these questions in the next chapters where we will describe the interview outline used in two organizations with different approaches to getting the job done. The results of these interviews will be presented as case descriptions.

CHAPTER IV: DESCRIPTION OF THE INTERVIEW OUTLINE

As we have seen in the CSFs methodology, we use an interview outline (see Appendix I) to both support the interviewer and ensure uniformity between interviews. The interview outline was made in collaboration with Christine Bullen (CISR), who is involved in several research projects on the Information Systems/Data Processing department.

In this survey, we have considered three types of interviewees defined as follows:

Interviewee	Type of Interviewee	Comments
I.1	Primary Interviewee	Data Processing Executive Manager
I.2	Manager within the Department of Primary Interviewee (I.2)	Might be the Manager Operations, Manager Systems, or Manager Programming.
I.3	User Area Manager	User of the Data Processing deparment (Operating Manager, Payroll, Accounting...

The objective of these interviews is to collect all the information useful for the understanding of the I/S Function. This set of information will allow us to delineate in the next chapters (Case descriptions No. 1 and No. 2), the following characteristics:

● Background of the company

● Location and Organization of the Data Processing Department

- Main Applications

- Management Process of the I/S function

  - Budget

  - Communication

  - Human Resources

- From the Point of View of the Manager of the I/S Department:

  - Goals and Objectives of the I/S function

  - Critical Success factors of the I/S function

  - Measurement of CSFs.

- From the Point of View of the Manager within the I/S Department:

  - Goals and Objectives of the I/S function

  - Critical Success factors of the I/S function.

- From the Point of View of the User:

  - Goals and Objectives of the I/S function

  - Critical Success factors of the I/S function.

After a presentation in a descriptive mode of the results of these interviews, we will analyze (in Chapter VII) how these companies accomplish their jobs and how they deal with the current issues seen in the previous chapter.

The informal discussion/mode which is the basis of the methodology, necessitates care in capturing any type of information related to the subject and, at the same time, remaining in the guidelines of the interview outline. For this reason, a good working knowledge of the function by the interviewer is required.

In the next chapter, we are going to describe the results of these interviews, presented as case descriptions. All the interviews are confidential and neither the names of the interviewees nor the name of the organization will be used.

CHAPTER V: CASE DESCRIPTION NO. 1 -- "HEXAGON"

1.0 Description of the Company

"Hexagon" is a diversified multinational industrial manufacturer with more than 22,000 empolyees. The company is a corporation of seven "businesses" (Abrasives, Petroleum Products, Safety Products, Industrial Ceramics, Plastics, Mining Products, and Chemical Process Products). These seven business lines are grouped into three main divisions which are completely decentralized: Abrasives, Diversified Products, Petroleum and Mining Products and Services.

The three divisions are organized into Investment Centers (see Organization Chart of the Company, Figure 11). In the following table are represented the Net Sales and the Operating Profit for the years 1973-1977.

One remark concerning the Abrasives division -- this division is highly structured and also the primary producer of sales, earnings and cash flow for Hexagon.

2.0 The Data Processing Department

As we have seen in the Organization Chart (Figure 11), the Data Processing Department is located in the Financial Division and it is called "Computer Systems and Services" (CSS). CSS is a completely centralized Information Systems Function (Operations, Development, Management).

Table 1: Financial Statement Hexagon

NET SALES (Dollars in Millions)

	Abrasives	Petroleum Products	Safety Products	Industrial Ceramics	Plastics	Mining Products	Chemical Process Products	Other Products
1973	370	3.0	10	30	20	25	20	60
1974	450	40	25	40	25	35	25	45
1975	400	55	30	40	25	40	30	40
1976	480	55	45	40	40	40	30	40
1977	550	70	55	45	40	40	35	35

OPERATING PROFIT* (Dollars in Millions)

	Abrasives	Petroleum Products	Safety Products	Industrial Ceramics	Plastics	Mining Products	Chemical Process Products	Other Products
1973	42	5	2	1.5	3	2	1.5	1.5
1974	35	10	3.5	2	4	5	2	1.0
1975	35	15	3	5	2	6	6	2
1976	45	13	3	6	4	4	5	1
1977	55	14	5	5	5	5	5	4

* Income before income taxes, interest expense, interest and dividend income derived from corporate cash and marketable securities, equity in earnings of associated companies, minority interest and eliminations of operating profit in beginning and ending inventories not attributable to businesses.

One remark concerning the Abrasives Division: this division is highly structured and also the primary producer of sales, earnings and cash flow for Hexagon.

Source: Hexagon Company Annual Report 1978

```
                          ┌─────────────┐
                          │  President  │
                          │ CEO Officer │
                          └──────┬──────┘
       ┌──────────┬─────────────┼─────────────┬──────────┐
  ┌────┴────┐ ┌───┴────┐ ┌──────┴───┐ ┌───────┴──┐ ┌─────┴────┐
  │Executive│ │Executive│ │Executive │ │Financial.│ │   V-P    │
  │   V-P   │ │   V-P   │ │   V-P    │ │   V-P    │ │  Admin.  │
  └─────────┘ └────────┘ └──────────┘ └──────┬───┘ └──────────┘
```

Petroleum   Abrasives   Diversified
  and   Products
  Mining
Products   (Location
  and   of the In-
Services   terviewee
               3) User

                                          ┌──────────────┐
                                          │   D.C.S.S.   │
                                          └──────────────┘

                                          Director Computer
                                          Systems and Services
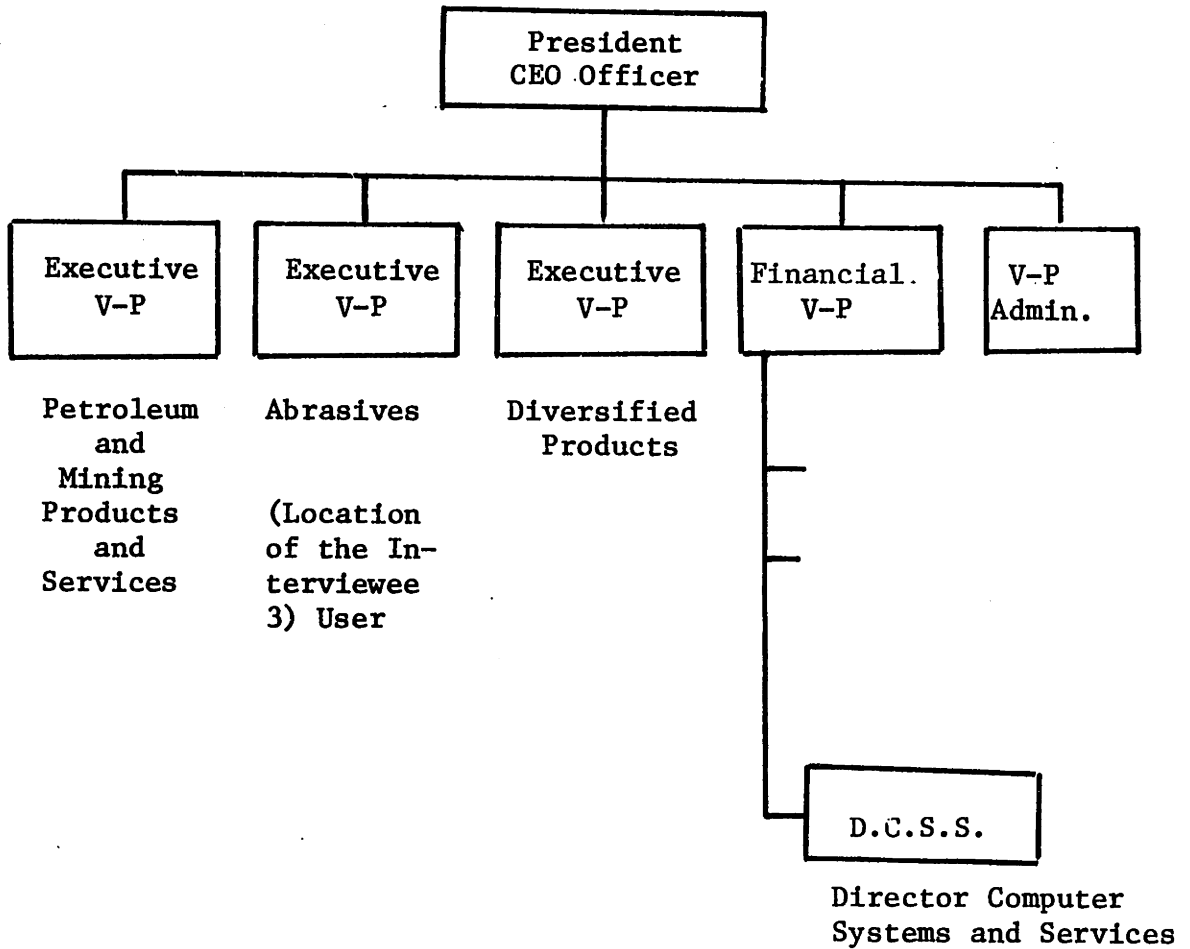
Figure 11: Hexagon Company: Organization Flow Chart

*(Interviewee 1)

```
┌─────────────┐     ┌─────────────────┐     Director Computer
│  Steering   │─────│    D.C.S.S.     │     Systems Services
│  Committee  │     │                 │
└─────────────┘     └─────────────────┘
```

*(Interviewee 2)

```
┌─────────────┐  ┌─────────────┐  ┌─────────────┐  ┌─────────────┐
│ Information │  │ Planning and│  │  Technical  │  │   Work/     │
│ Services    │  │ Control     │  │  Services   │  │ Operations  │
│ Section     │  │ Section     │  │  Section    │  │  Section    │
└─────────────┘  └─────────────┘  └─────────────┘  └─────────────┘

┌─────────────┐  ┌─────────────┐  ┌─────────────┐
│ Account     │  │ Information │  │ Data Center │  North America
│ Team 1      │  │ Services    │  │ NARDAC      │  Data Center
└─────────────┘  └─────────────┘  └─────────────┘

┌─────────────┐  ┌─────────────┐  ┌─────────────┐
│ Account     │  │ Domestic/&  │  │ Distributed&│
│ Team 2      │  │ Inter-      │  │ Software    │
└─────────────┘  │ national    │  │ Services    │
                 └─────────────┘  └─────────────┘

┌─────────────┐  ┌─────────────┐  ┌─────────────┐
│ Account     │  │ Computer    │  │ Allication  │
│ Team 3      │  │ Services    │  │ System      │
└─────────────┘  │ Department  │  │ Programmer  │
                 └─────────────┘  └─────────────┘
```
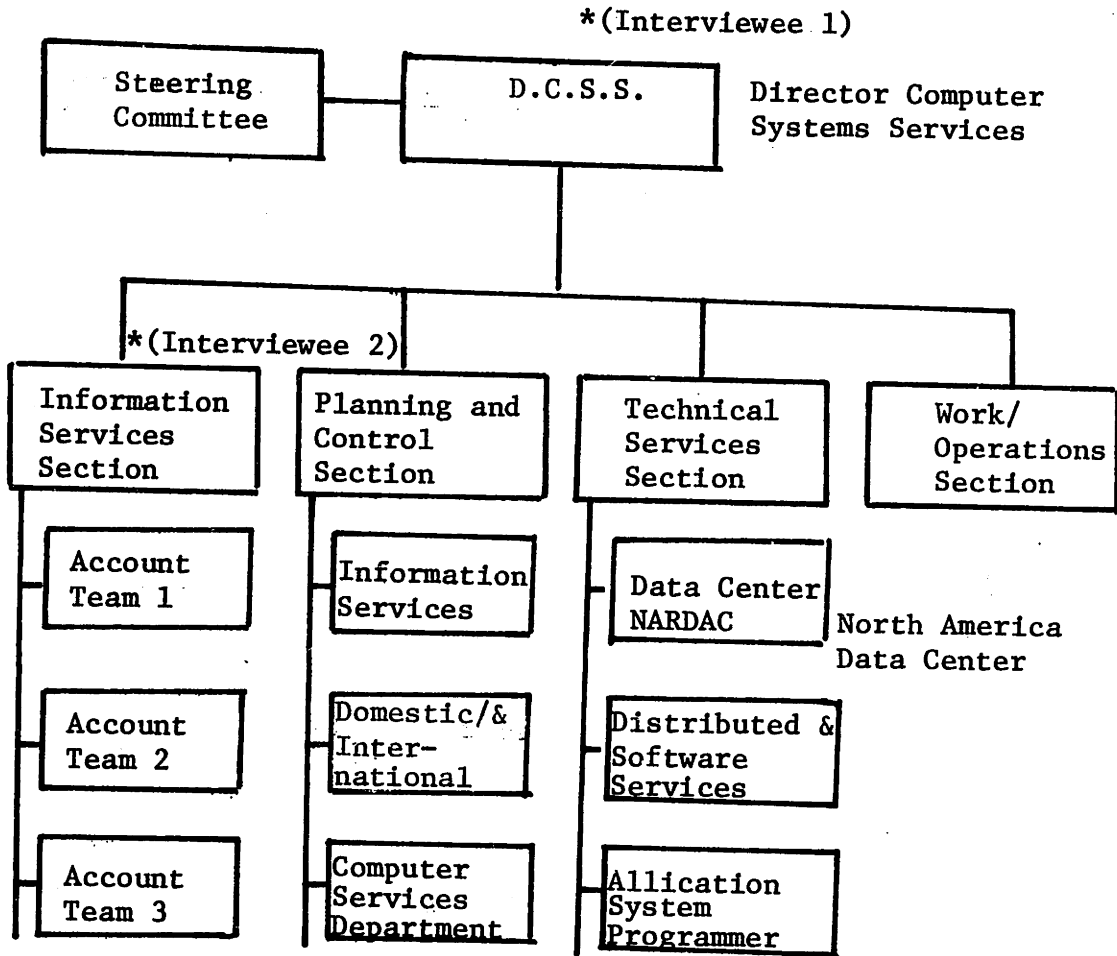
Figure 12: Organization Chart of the C.S.S.

*Location of our interviewees

2.1 Organization of the CSS

In this section, we are going to describe the organization of this department (see Figure 12, Organization Chart of the CSS). The Data Processing Manager is called "Director of Computer Systems and Services" (DCSS) and he reports directly to the Financial Vice-Preseident. We will describe each section in CSS.

Steering Committee

The Steering Committee is comprised of three executive Vice-Presidents (Diversification, Abrasives, North American Abrasives, V.P. Finance) and the DCSS. It was created in 1974. Its role is to:

- overview the budgets, master plan
- initiate all the projects
- coordinate
- advise.

The committee meets quarterly. It has no authority in case of disputes.

Information Services Section

In this section, there is a certain number of teams; each team represents an account (major users). The size of a team is between eight and eighteen. The role of an Account Team is to:

- develop new software applications
- maintain the applications
- help the users in their expression of needs
- help the users in their elaboration of the "master system plan"
- sell the CSS to the users.

The information service organization started in 1977. Before that, the system consisted of a pool from which the Information Services Manager responded to the demands of the users.

The Information Services section employs almost seventy people. Each account manager has one corresponding User called the Business Systems Manager (BSM). We will come back later to this function.

The Planning and Control Section

The Planning and Control Section includes three groups:

- Information services (do not confuse with the previous section)

- Domestic and International

- Computer Services.

Information Services

This group provides "internal services" (SCC). These services are:

- Education (new methodology, new technology, etc.)

- Project Control (primarily Arthur Andersen programs)

- Data Base Consulting

- Consulting (Tool of measurement of production)

- Planning (use of the "stages" methodology of Nolan[12]).

  - help the account manager and business system manager to build the one year plan

  - run the planning session

  - problem solving role

We will come back later on the planning when we will describe the tools used in SCC.

Domestic and International

This group has a counciling role in the domestic market and in the international market. The difference between the previous group is that it has no authority regarding the quality of work. The job of this section is to counsel on:

- the Master System Plan (MSP)
- Projects
- Time-Sharing
- the financial software "PLANCODE"
- "sell new programs, new developments, to the users'.

Computer Service Department

A part of Planning and Control, this group has the responsibility for:

- chart of accounts
- physical planning
- budget process
- security - uses "secure" data security package
- purchasing.

One of the main jobs of this group is to be sure that the presentation of the figures in the chargeout is clear to the users.

Technical Services Section

The technical services includes three groups (twenty persons).

- **The Data Center**: Computer utility (NARDAC: North America Data Center). The Data Center uses an IBM 370/158 under MVS with TSO and IMS; the users are connected to the computer via a network and a set of terminals (80).

- **Distributed Software Services**: This group is mainly oriented to the operating system. They are in charge of its maintenance and they play the role of consultant by staying informed on new technology (Hardware and Software).

- **Application Systems Programmer**: They are technical consultants for account team.

Work/Operations or Production Services Section

This section is in charge of the day-to-day operations (sixty-five persons). They run the remote computer department; they are in charge of the scheduling and are in direct contact with the users. HEXAGON considers this function to be critical to the business.

It is important to note that the "Technical Services" Section and "Work Operations" Section were under the responsibility of the same manager until this manager took over as Manager of Information Services. The DCSS then reorganized this section into two distinct sections. (We will see the impact of this decision in the next chapter.)

2.2 Main Applications

Almost all applications are batch processed. HEXAGON has made extensive use of the Nolan stage theory.[12] Their assessment shows

that the divisions of HEXAGON are in different stages of development,
with the majority in late II/early III stage of applications
portfolio development. Using "Anthony's concepts", we categorize the
major applications as follows:

- The majority of automated applications are in
  the operational control area:
  - Manufacturing ⎫
  ⎬ (Sales and Production)
  - Order Entry ⎭
  - Personnel (Payroll).

- The next largest number of automated applications
  are in the Management Control area:
  - Manufacturing Control (use under time sharing
    as a complement to MRP, a Forecasting System)
  - Marketing Control (Sales mainly)
  - Financial Control (use of PLAN-CODE financial
    package under Time sharing.

There were very few in the "Strategic Planning" area.

An important concern of CSS is the commonality of the program
in this decentralized organization. They have tried to standardize
in the domestic market some basic applications like:

- Payroll
- Accounting
- Financial Control.

3.0 Description of the Interview of the DCSS:

In this section, we have grouped first all the information concerning the management process (budget, human resources, user relationships), then the goals and objectives of the DCSS and, finally, his Critical Success Factor and their measurements.

3.1 Management Process

The budget of CSS is about $8.5M (1.4% of sales), the financial structure of CSS is that of a profit center with an objective of zero profit. This has the advantage that CSS reports to the different investment centers the reduction of cost, particularly in the cost of hardware. The primary management tool used by CSS is the Master System Plan (MSP).

The MSP is created through the cooperation of the CSS account managers and the user business system manager. The time horizon of the MSP may vary from 1 year to 3 years, and is reviewed on a yearly basis. As a result of these cooperative efforts, the MSP clearly reflects the users needs.

One way of looking at the relationships between the users and CSS is provided by Figure 13. HEXAGON uses the Nolan concepts as a framework to facilitate the flow of communication and to provide a common language for both users and data processing professionals.

In the area of human resource management, the concept of a skills inventory has been developed. The skills inventory consists of a definition of all jobs in the CSS area and the skill required for each position. Using the inventory, a person interested in his/her career

planning can check the type of education needed to reach the expected positions, and create a plan to acquire the necessary skills.

The DCSS noted that the turnover decreased from 26% in 1976 to 22% in 1978; excluding transfers, the decrease was from 22% to 12% in 1978. He is pleased with the concept of the skills inventory, however, he still recognizes the existence of some problems in the areas of motivation and incentives.

In the area of user relationships, the primary goal of CSS is User Satisfaction. Every task which is undertaken has this user satisfaction orientation. As a way of measuring their own performance in this area, CSS developed a "Customer Satisfaction Index" which consists of a survey of users carried out on a yearly basis.

Five years ago, the users considered the CSS as an "Ivory Tower", peopled with individuals who did not understand their needs. As a result, the user survey showed a very low customer satisfaction index.

The current survey indicates that the index is much higher. CSS sees this as a direct feedback as to the quality of their relationship with the users .

Through the BSM, the user has one communication path with CSS, to the Account Manager (AM). The BSM in his/her liaison role commits the users and his signoff authority on all projects or modifications. He sets the priorities and only he or she can negotiate any modification with the CSS through the AM.

The BSM is located in the user division and therefore he is evaluated and rewarded by the user. Traditionally, the division manager

Communications Through
The Stages (Nolan)

Strat-
egy

Management
Control

Operations

USERS
(BSM)

C.S.S
Personnel
(Account Manager)
• Steering
Committee

• D.C.S.S.

• Review progress of MSP

• Re-evaluate direction of MSP

• Update MSP
  • scopes
  • priorities
  • schedule

• Develop Yearly Data Processing
  Budget and a Mutli Year
  Systems development
  Commitment

• Receive Updated MSP's
  from Users

• Review user Stage
  Benchmark

• Adjust based on User
  Stage Status

• Summarize and Update
  Technology Structure
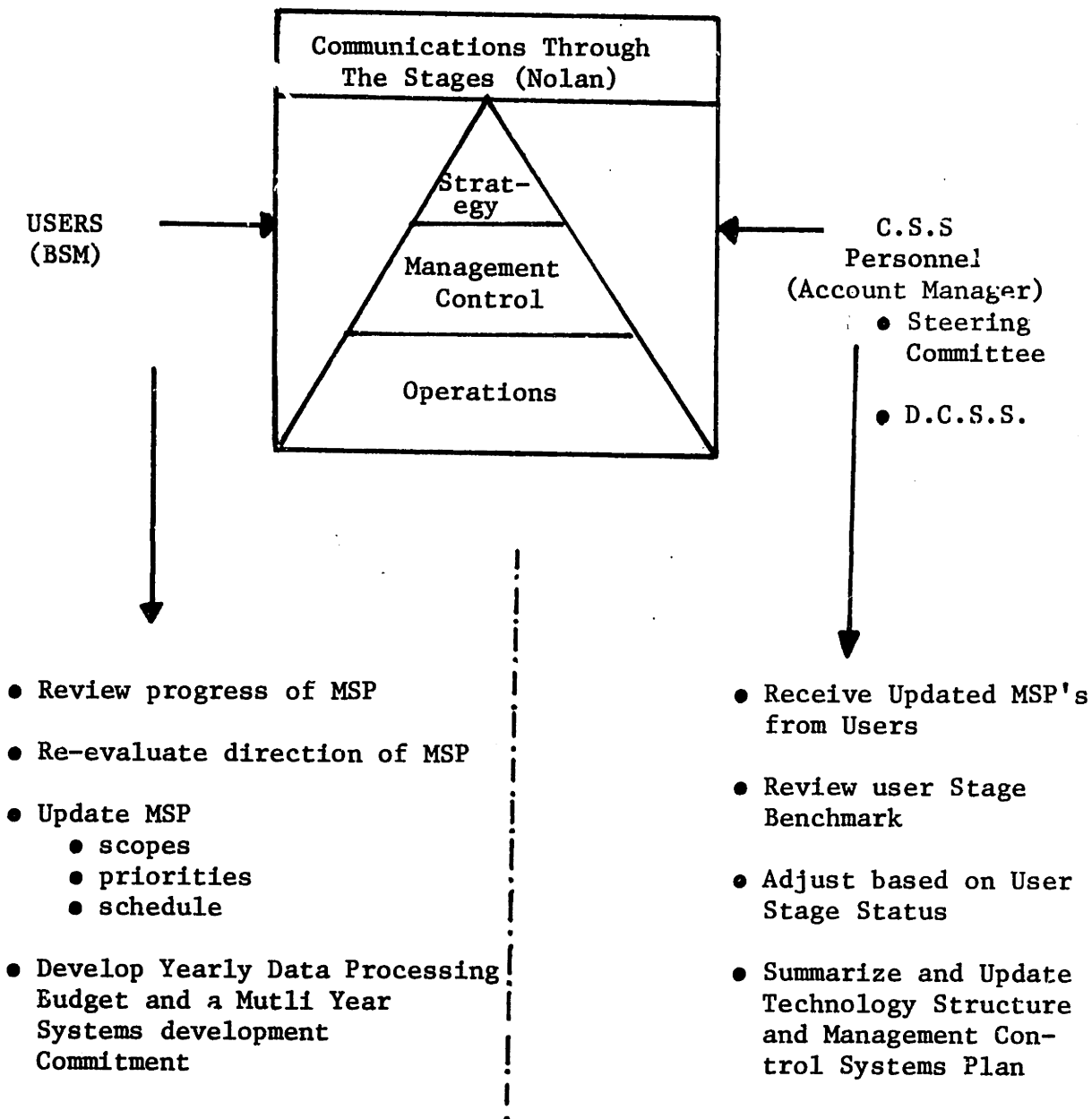 and Management Con-
  trol Systems Plan

Figure 13: M.S.P. Setting and C.S.S. Budget Assessment

confers with the DCSS on the performance of the BSM. The DCSS

reciprocates by conferring with the division manager when reviewing

the AM.

CSS has organized some educational programs for the users to

acquaint them with techniques and software facilities which they

may find useful:

- Division Information System Structure

- Problem Solving Questions

- Use of Easy Trieve (Time-Sharing System) for

  a direct utilization of the computer by the users.

As it is the case for most data processing organizations, CSS

uses a chargeout system as a management tool. The chargeout system

is based on two parameters. The first one is the estimate of cost

given by CSS to the users at the beginning of the year (or the period)

based on past usage. The second one is the cost generated by a formula

for the use of computer resources and one based on the actual number

of hours by CSS personnel to a particular project. The DCSS has

developed a "Menu" of human resource services as follows:

- the "Strategic" -- brand new design,

  New Development

- The "Tactical" -- enhancement of

  applications ($2500)

- "Maintenance" -- modification of applications.

Differences between the CSS estimate and the actual services used are reconciled by the DCSS and the BSM.

Finally, as an additional communication tool, DCSS publishes a monthly newsletter to keep users up-to-date on activities and services provided by CSS.

3.2 Goals and Objectives of the DCSS

Background

The DCSS has been with the organization for five years in his current position. He came to HEXAGON from a computer manufacturing company where he was Salesman. He was brought into the company in order to "turn over a new leaf" in the user satisfaction area.

Goals And Objectives Set by HEXAGON for the DCSS

The following are the goals and objectives set by HEXAGON for the DCSS:

(1) Manage Operational Systems to insure that they perform accurately, on schedule, efficiently, effectively and with sufficient integrity.

(2) Ensure that divisional computer service requirements are satisfied by working with divisional personnel in concert with each Business Systems Manager.

(3) Counsel the computer services steering committee in the most effective use of computers and information systems for HEXAGON.

(4) Ensure quality products by providing appropriate people for project teams, and assuring that the computer services resources can and do meet the commitments made.

(5) Computer Services must be an entity within the company which fosters an environment of effective, open and concerned communication.

(6) Select and develop a qualified and motivated staff in a business climate where individual talents can grow, providing opportunities for individual initiative.

(7) Develop and use computer services resource in the most efficient and effective way in balance with the collective requirements of the company.

(8) Market processes and innovations that could prove beneficial within the company.

(9) Line Management: Provide effective line management of the computer services organization.

(10) Accounting System: Provide an accounting system that meets computer services objectives and satisfies the company's management control system.

Goals and Objectives Set by the DCSS for Himself

The following are the goals and objectives set by the DCSS for himself.

(1) To provide an environment with both satisfied customers of CSS and maintains a work atmosphere which satisfies employees of CSS.

(2) To maintain the CSS as an entity within the company which fosters an environment of effective, <u>open, concerned communication</u>.

(3) To develop and use CSS resources in the most efficient and effective way in balance with the collective requirements of the company.

(4) To increase CSS credibility.

(5) To improve the quality control measurement.

3.3 Critical Success Factors of the DCSS

The DCSS listed the following critical success factors in support of his goals and objectives (they are not arranged in priority order):

- Retention of trained, quality personnel.

- the ability to interact with top management.

- the improvement of "Software, Hardware".

- the enhancement of the job satisfaction for CSS personnel.

- Improve CSS track record for the delivery of products.

- Increase Management Control functions.

3.4 Measurement of CSFs

The DCCs stated that from his point of view, if the Vice-President of Finance does not receive any complaints from users, he considers that the job has been done. This is his primary measurement for all CSFs.

4.0 Description of the Interview of the Manager within the CSS

Our second interviewee was the Manager of the Information Services Section. He was formerly the manager of both Technical Services and "Work Operations". HEXAGON company had previously had a lot of problems in the Information Services Section. As a result, after performing successfully in the Technical Services and Work Operations, our interviewee was moved to CSS. The DCSS explained that our interview was able to resolve the problem in the year after he took over.

- Goals and Objectives of the DCSS function from his Point of View:

    - The CSS department must be a Good Service organization.

    - The DCSS must maintain the Quality of services.

    - The DCSS maintains Communications - good strong open communications.

- CSFs of the DCSS Function from his Point of View:

    - Maintain user satisfaction.

    - Improve performance on delivery of products.

    - Improve Budget Performance.

    - Keep CSS staff happy.

    - Manage user perceptions through improved communication.

    - Build the Team Work Concept within CSS.

Our interviewee elaborated on the atmosphere of CSS by describing what he felt were the main constraints and preoccupations of CSS at this moment:

- Accountability

- Production Statistics

- Throughput Operations

- Multiprogramming Factors

- Establishment of a double standard from the point of view of CSS and from the point of view of the "terminal user".

- Establishment of a Programming Production Committed (Account Team and System Programmer and System Operation).

5.0 Description of the Interview with the User

The user interviewed is the BSM of one of the main divisions of HEXAGON and it is interesting to quote him in his description of his job.

- "I am the primary interface for the requirements between the users and CSS."

- "I support the CSS department."

- "I am viewed by the division as the manager of CSS."

- "I am the customer: I pay, they perform."

- "I set the priorities."

- "I advise the users in their utilization of a budget of $15,000."

- Goals and Objectives of DCSS from his point of view:

    - Support the strategy of the "Investment Center".

    - Give to the user what the user wants to have.

- CSFs of DCSS from his point of view:

    - Good communication with the division manager.

    - Maintenance of satisfied customers.

    - Acquisition and maintenance of Human resources capable

        of doing a high quality job.

    - Structuring an effective organization.

    - Providing adequate computers response time.

    - Reduction of costs.

    - Constraints and main preoccupations of CSS at this

        moment.

The BSM delineated two problems:

(1) The "Project Manager" for a specific software project does not report to the BSM. This individual is a user area manager in charge of the joint CSS-user group developing a new system.

    However, in practice, the project manager does report to him, because he is the primary connection with the DCSS. It is the BSM's opinion that in a stage IV organization, the structure would require that the project manager report to him.

(2) When the staff of Information Services are working on a project for him, the BSM did not perceive the need to have them to work directly with him. However, he felt the need for the authority to directly intervene in question of planning for the project.

4.0 <u>Conclusion</u>

This chapter had for an objective to give to the reader an in-depth description of HEXAGON CSS. This section was intentionally descriptive and did not include any analysis or evaluation. The assessment of HEXAGON CSS will be done later in Chapter VII.

CHAPTER VI: CASE DESCRIPTION NO. 2 -- "HONEYCONE"

1.0 Description of the Company

HONEYCONE is a diversified industrial manufacturer with more

than 22,000 employees. The company is a corporation of five

"businesses", (Cement, Chemical, Aggregate, Aerospace, Aluminum).

These five business lines are grouped into five main divisions and

are completely decentralized. In addition to the divisions,

HONEYCONE is the owner of six subsidiaries, one of which is the

HONEYCONE Data Process in which all the information systems

resources are located.

In this case, we are going to describe the relationships between

HONEYCONE Data Processing and a specific division of HONEYCONE, the

Aerospace Division (see organization chart of the company in

Figure 14).

Table 2 below represents the Net Sales and Operating Profits

for the years 1973 - 1977:

Aggregates (in Millions)	1977	1976	1975	1974	1973
Sales	$130	120	110	110	115
Earnings before interest and taxes	30	30	17	20	20

Aluminum (in millions)					
Sales	$400	320	260	350	300
Earnings before interest and taxes	60	50	20	100	20

Aerospace (in millions)					
Sales	$650	500	450	550	600
Earnings before interest and taxes	50	30	30	30	30

Cement (in millions)					
Sales	$150	150	125	150	125
Earnings before interest and taxes	20	15	11	20	20

Chemicals (in millions)					
Sales	$200	150	120	115	100
Earnings before interest and taxes	45	40	30	30	30

Statement of Earnings for years ended December 31 (in Millions)

HONEYCONE Corporation and Consolidated Subsidiaries*		1977	1976
	Net sales	$1500	$1200
	Cost of sales, other costs, and expenses	1360	1100
	Earnings from Operations	240	100
	Other income	25	20
		265	120
	Interest expense on debt	17	18
	Earnings before Taxes on Income	248	102
	Taxes on income	124	51
	Net Earnings	124	51
	Net Earnings per Common Share		
	Assuming no dilution	4	3
	Assuming full dilution	4	3

(*) a separate financial statement for the subsidiaries not available

Table 2: Net Sales and Operating Profits (1973-1977)
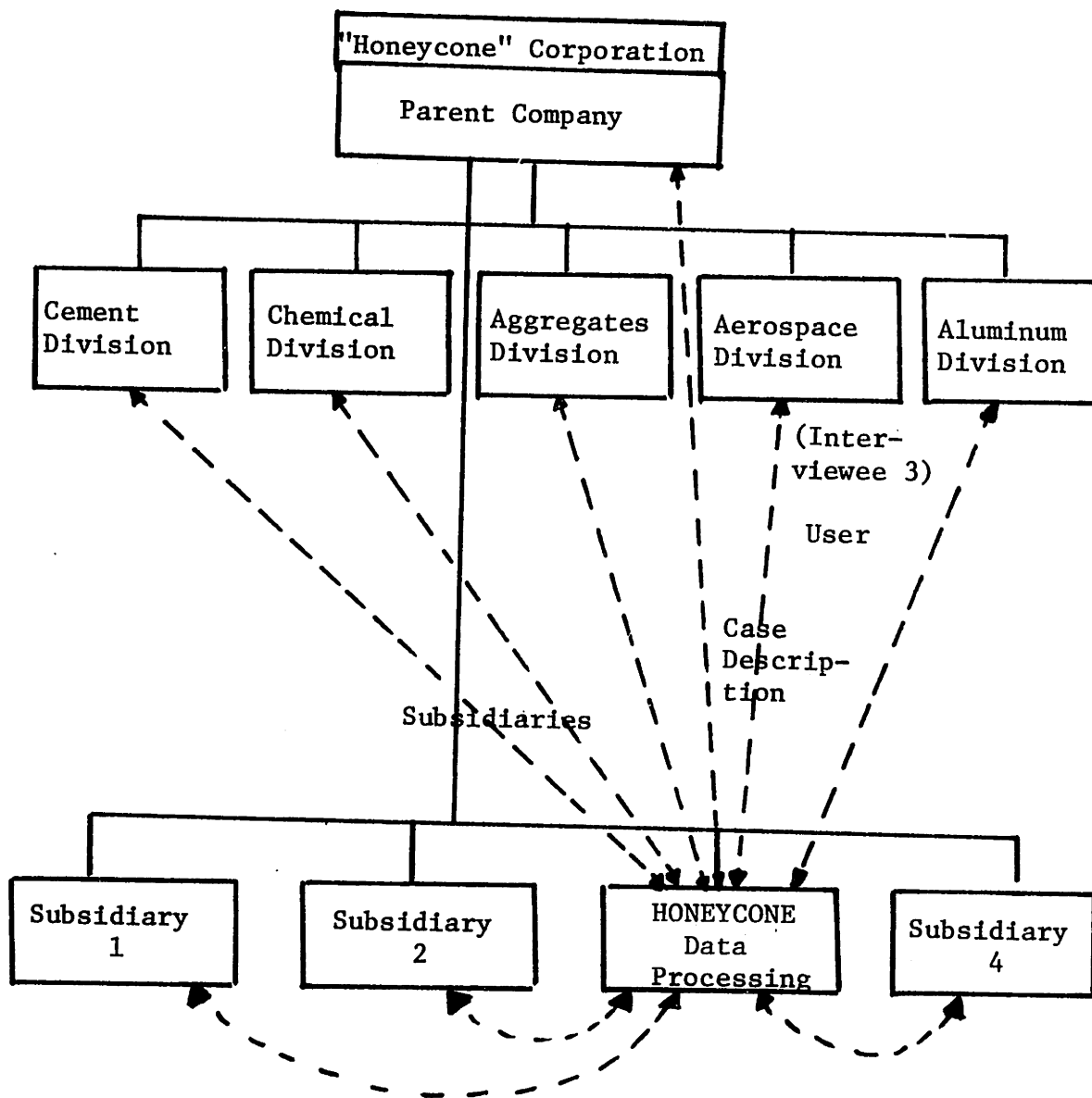
Figure 14: Organization Flow Chart

2.0 HONEYCONE Data Processing

As we have seen in the organization chart (Figure 14), the
Data Processing Resources are concentrated within the Honeycone Data
Processing subsidiary (HDP). In this section, we are going to
describe the internal organization of HDP.

2.1 Organization of HDP

HDP employs 1,800 professional and clerical personnel skilled
in automated data processing support and annually delivers over
$145 Million in data processing services. Processing resources
include multiple CPU's. The financial structure of HDP is that
of a Revenue Center. As we can observe in the organization chart
of HDP (Figure 15), there are three main divisions -- the Computer
Product and Services, the Commercial Group and the Federal and Central
Support Group. It is in this last one that our two interviewees,
the Director Location 1 (DL1) (Information System Function) and the
manager within the department (Account Interface) are located.

In HDP, as well as in the Aerospace Division, there is an
intensive use of Matrix Management. (This explains the arrows
crossing the flow chart in Figure 15.)

-63-

Figure 15: Organization* Chart H.D.P.
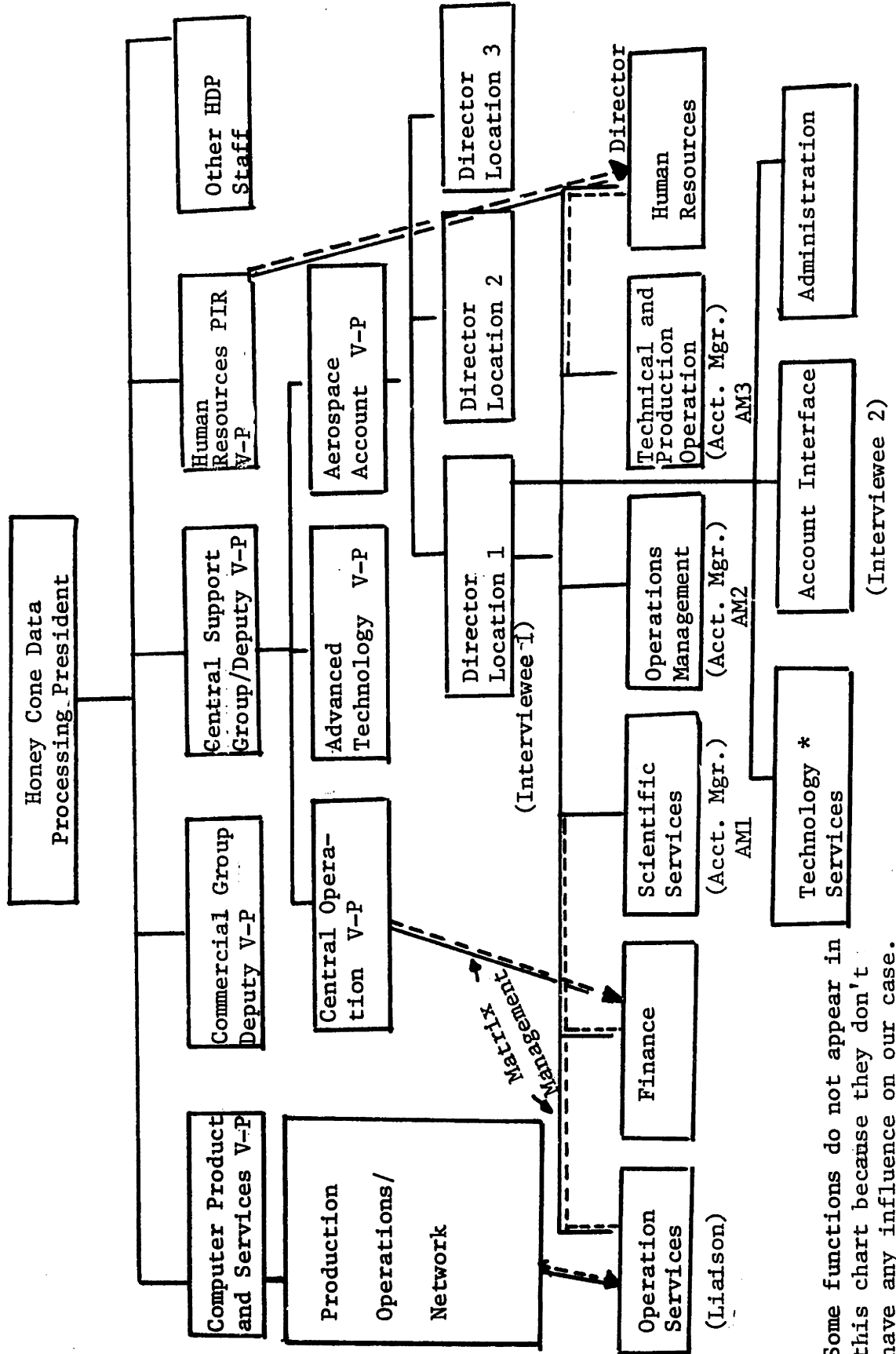
*Some functions do not appear in this chart because they don't have any influence on our case.

The DL1 has 230 people who report to him and he is in charge of all the data processing support of the Aerospace division (6,600 persons) located at the "Location 1". We can refer to this department as the Data Processing Department of the Aerospace Division Location 1 (ADL1). ADL1 does not control the production operations (computers). We will describe the major groups within HDP.

Computer Product and Services Group

This group is in charge of the following resources:

- Processing Resources (multiple CRU's, networks)

- System Software (human resource)

- Liaison with different Account (see Figure 15:
  Operation Services)

- Operations

Location 1 is a Host Center which provides the capabilities of an IBM 370/3033 (8 million bytes) and dual IBM 370/168 Model 3 (7 million bytes each) mainframes. These mainframes allow a broad spectrum of interactive and Remote Batch Users (TSO, IMS, CICS, System 2000 ...).

The Liaison, Operation Source, is located as close as possible to the Host Center. As we will see later, the liaison person is the primary contact of the account teams for any issue related to production/operation. This person is reviewed by the Computer Product and Services Department with input from the DL1 (Matrix Management).

The Computer Product and Services group also has a Customer

Service function that we will describe later (User Relationships),
and is responsible for all the capital budget, facility acquisition,
contracting and contract administration (for all hardware) for HDP.
That means that any supplier is obliged to go through this channel.

Commercial Group

The second group is the Commercial Group (Figure 15). This
group is in charge of selling the Resources of HDP outside the
Parent Company. We will not go deeply into a description of this
group, because we are more interested in the internal organization of
HDP as it delivers services to the parent company (Aerospace Division).
Nevertheless, the fact that we know that HDP markets services to
the external market will help us to understand later, in the user
sections, their efforts to improve the quality of services.

Central Support Group

The third group is the Central Support Group (Figure 15). This
group is mainly oriented to internal services. It includes the
Central Operations, Advanced Technology and the Account Teams:

- Central Operation is mainly a financial control/controller group,
  which has a direct liaison to the finance department located under
  the DL1. Again, the effect of matrix management can be seen here
  as the finance personnel are reviewed by central operations with
  input from DL1.

● <u>Advanced Technology</u> is primarily a research group, investigating such areas as mini-computer, distributed data processing, microcomputer, liaison with universities. There is one person, (vice-president), in this function who can call on the other departments for additional resources.

● <u>The Aerospace Account Group</u> is similar to Computer Product and Services in that it has an operational function. It includes the Account Management Teams which provide resources (to the user).

    - Systems and programming personnel

    - Consultation services for (i) training and development and (ii) hardware and software technologies to improve cost effectiveness to meet the goals and objectives.

The basic principal of the Account Management Teams is represented schematically in Figure 16.

In Figure 15, under the DL1, we have nine groups, which can be grouped and described as six major groups.

The first group is the "Operation Services" that we saw a liaison with Computer Product and Services who manages computer operation for all users at ADL1.
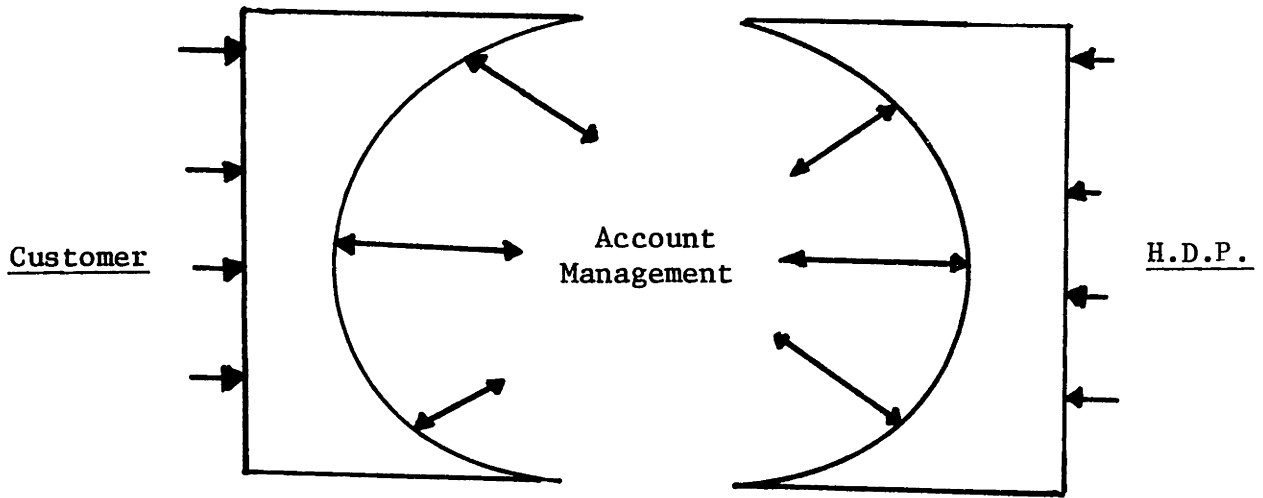
Figure 16: Overall Interface Customer/H.D.P.

·The second group is the "finance" that we saw as a liaison with the Central Operations.

The third group includes "Scientific Services", "Operations Management", "Technical Productions Operations" (Account managers for the three main divisions of Honeycone Aerospace), and the "Account Interface".

The first three groups work closely with the "Account Interface" who plays the role of facilitator vis a vis the users. On the schema represented in figure 17, we have an overview of how the Account Managers are related to the different user departments, and how the Account Interface managers are relationships between the users and the account management teams.

This organization was implemented in order to resolve some interface problems in the past:

- Proposals made by user to external HONEYCONE Customers which included computer services, but were not properly costed

- Inaccurate cost inputs

- Poor estimates of time and schedule for projects

- Inaccurate DP, Long Range Planning

- Poor machine utilization

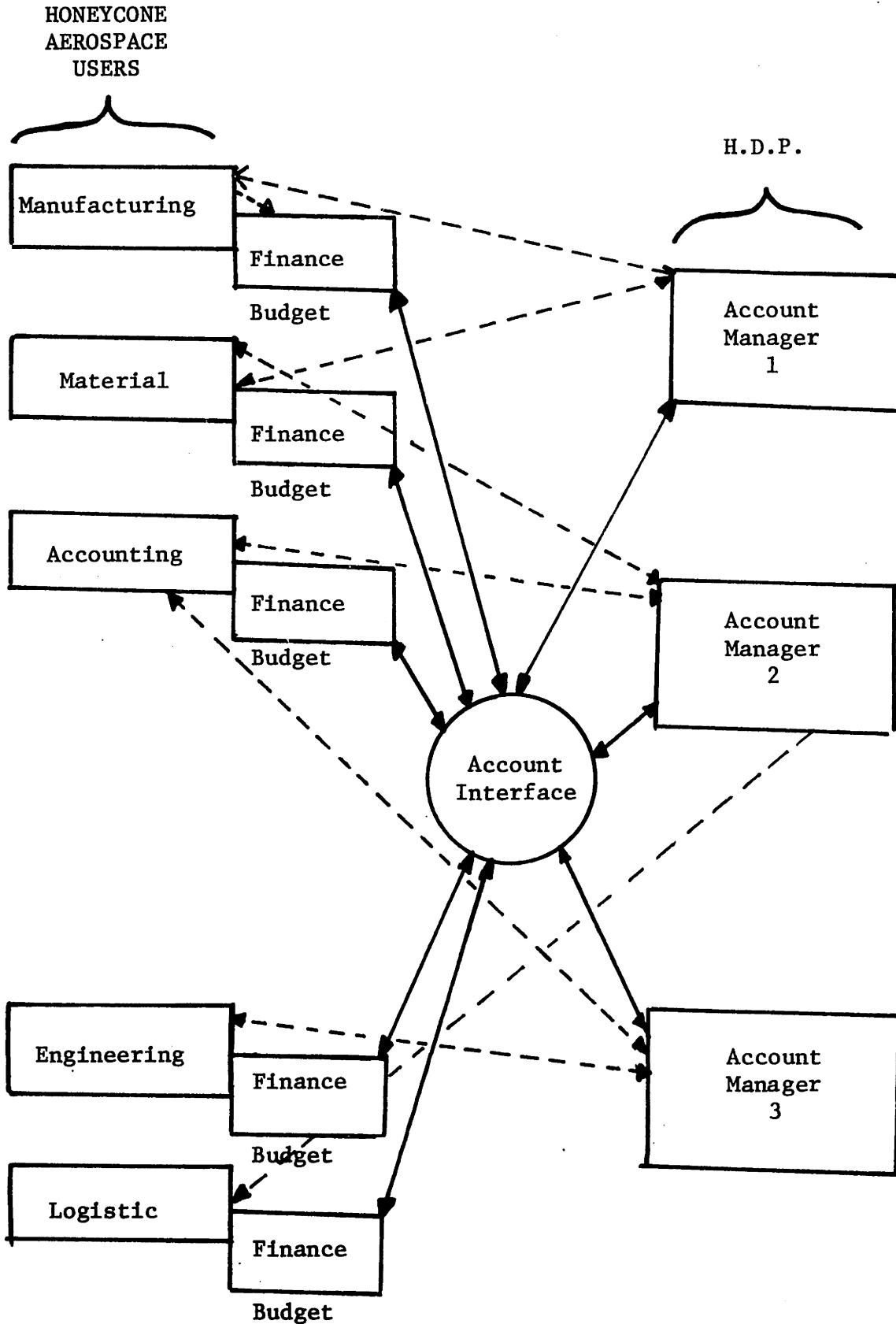- No program control of HDP, therefore, inappropriate.

Figure 17: Aerospace Relationship Account Interface/Account Manager

The Account Interface responsibilities are:

- Represents HDP to the Aerospace Program Directors and their staff.

- Provides a single point of contact and input for all major Aerospace program proposals.

- Maintains and disseminates program information to the HDP account management teams.

- Establishes continuity between Aerospace Long Range Planning and HDP Long Range Planning through the Statement of Work (SOW: contract on one year basis, between user and HDP, we will describe this tool in the "Management Process of DL1.)

- The Account Interface will not encumber or use up the functional relationships between HDP account managers and the Aerospace divisional personnel.

- He will not provide information to users that's not approved by the account manager.

- He will not prepare or submit estimates without the concurrence of the account manager.

The "Technology and Services" group is in charge of the data base administration, minicomputers and other technical services and advises the account management team personnel.

The Administration group is in charge of:

- Correspondence Center

- Library

- Quality

- Security

- Technical Training

The Human Resources group is in charge of general training, recruitment, performance evaluation; this group is reviewed by the "Human-Resources" PIR (Personnel Industrial Resources) with input from DL1.

2.2 Main Applications

The analysis of the different applications reflects a great deal of automation of operational control and management control applications, and some automation of strategic planning applications.

List of Applications (strong utilization of advanced computer capabilities -- Data Base Inquire, Network, T-S, BATCH, Remote Batch):

- Accounting

- Administrative/Personnel

- Business: Planning and Forecasting

- Data Management

- Engineering

- Graphics

- Information Retrieval

- Order Entry and Distribution

- Inventory Control

- Manufacturing/Production

- Mathematical and Statistical Applications

- Operations Research

- Project Planning and Projection

- Scientific Applications

- Simulation

- Text Editing/Word Processing

- Interactive Training

- Engineering Proposal Pricing

- Application Programming Documentation

- Quality Assurance

- Purchasing and Procurement

- Computer Output Micro Film (COM)

All these applications generate approximately 350,000 data base transactions each week. From the point of view of the automation of applications, we say that HDP is in Stage 4.[12]

3.0 Description of the Interview with the DL1

In this section, we have grouped, first, all the information concerning the management process (budget, human resources, user relationships...), then the goals and objectives of the DL1 and finally, his Critical Success factors and their measurement.

3.1 Management Process

HDP has an annual data processing budget of $75 million. The primary tool used for the management of HDP resources is the Statement of Work (SOW). The SOW is the annual contract between

the users and the DL1, where they agree upon the charging

methodology, services and performance criteria, and definition

of work that must be done. This document is then the main input

to the budgeting process of HDP. The DL1 develops a cost pool

budget from this information.

Before the implementation of the organization described in

Figure 17, the users often forgot the data processing costs, and at

a corporate level, the figures coming from HDP and the users

did not reflect the actual needs and usage of data processing services.

In addition to the SOW, HDP account managers use a planning

tool called System Development Methodology (SDM). This helps the

account managers to establish with their users a scope of work,

master plan and project schedule that provides the checkpoints and

control needed to verify progress.

The human resources management are each person within the

department (including the DL1) goes through a formal performance

evaluation (once every year). This evaluation includes a report of

all the work assignments for which the individual had responsibility,

accomplishments in these areas, and the supervisor's evaluation of

performance.

In addition, there is a development plan prepared with the

employer in which he/she makes a strong commitment to strive to achieve

the desired results. A major concern of the DL1 is the current

turnover rate. He would like to see this decreased and is hopeful

that the human resource management techniques will aid in reducing

this rate.

The primary elements in the management of the user relationship is the account management team and the account interface. User communication takes place through the project managers or the system analysts on the Account Team, who generally have a professional background in the functional area they are supporting, such as engineering, finance or manufacturing. While some requirements to originate from within a user's organization, the lead is generally taken by the analyst who is sensitive to the need for applications where computer processing can provide an economic advantage for the functional user. Agreed upon developments, once economically justified, are presented to management for their approval for implementation.

The Users are also supported by a full-time Customer Service department (located in Production Operation/Network: Figure 15). It provides information, start-up assistance, problem resolution and other utilization services. This department is designed to prevent problems; it is why the department is supported by specialists in telecommunications systems software, data base management and systems applications. The profile of each customer's hardware, software, and telecommunications, as well as his normal data processing application, is maintained. Customer Serivce is primarily oriented to helping the customers which are connected to Host Center by Remote Butch Terminals or on-line devices.

Direct user communication on development or modification of

already approved programs is carried out through the project manager, located in the Account Team. This is done in writing with a form signed-off by the user, where he describes his needs.

The chargeout system for HONEYCONE Aerospace is described in the following section. Every user department is required to submit their requirements on a yearly basis (SOW) as to the processing services they will require, task by task. These are then compared to the processing services provided the prior year and the resources used to provide that service. Based on that comparison, statistical data projections of resources are made, and equipment configured to meet that level of service. A unit cost for DP resources is then calculated and distributed among the users. The user receives a statement each week which reports the number of transaction and the cost related to each. This statement helps the user to optimize the cost of runs.

There are two user steering committees, one for all the scientific applications and another for the business applications. User representatives from the specialized areas serve on each.

3.2 Goals and Objectives of the Director of Location 1 (DL1)

The current DL1 has been in the position for eight months. Prior to that, he was with another part of HONEYCONE Corporation. His goals and objectives are expressed in a list of actions that he thinks each manager of HDP must follow:

(1) Recruit and develop personnel much more rapidly than the industry standard:

a) Hire motivated and flexible people

b) Develop formal training programs

c) Live with equivalent problem of high turnover

d) Entrust personnel with responsibility and authority and take limited risk

e) Watch personnel closely enough to control risk

f) Educate users to our changing environment.

(2) Identify individuals who can take authority and want it as well as those who do not - what are true career goals?

a) Interview all persons

b) Use training program to assist

c) Monitor new assignments closely.

(3) Performance Reporting:

a) Compare and evaluate personnel -- they must be compared with one another

b) Merit Increases and Promotions must be used as a recognition tool.

(4) Sustain and improve relations with User:

a) Develop and maintain trust

b) Mutually understand baselines and priorities

c) Realistic schedules and commitment

d) Anticipation of non-ideal conditions

e) Solicit user feedback.

(5) Innovation:

    a) Receptivity to new ideas

    b) Awareness of changing tides

    c) Familiarity with new technology/cost effectiveness

    d) Accept a balance between central control/local control.

(6) Support Management:

    a) Positive vs. Negative

    b) Unselfish vs. Selfish

    c) Be willing to run faster if necessary, "extra mile".

3.3 Critical Success Factors of the DL1

The following are the CSFs of the DL1:

- Proper administration of Financial Matters

- Demonstrated ability to solve user problems

- Competitive cost/Benefits for user

- Ability to sustain performance while reaching to new initiatives

- Proper planning and goal setting

- User understandability of the function

- Performance of Production

- Public Relations Types Activities

- Employee morals and career development

- Shared decisions (with customer) on Data Process Priorities

- Credibility and Trust of the user.

3.4 Measurement of the CSFs:

From the point of view of the DL1, he measures the user related CSFs by statistics on the complaints, attitude of the users in the steering committee, and if his boss does not receive any complaints.

The morale of the employer is perceived during the informal discussion that he has with him.

3.5 Constraints and Main Preoccupations of the DL1:

The following are the constraints and main preoccupations of the DL1:

- The first one is the retention of personnel.

- How many people we have to affect to $ X Million of Sales.

- Too many people report directly to him (12 persons in 200).

4.0 Description of the Interview of the Manager Within the Department of DL1:

Our second interviewee is the account interface. He has been in the company for twenty years. His job is broadly described in the organization of HDP paragraph. He is well known in the company and was formerly with the logistic department (user).

- Goals and objectives of DL1 from his point of view:

    - Make the HDP the most profitable.

    - Provide to our customers the most cost effective systems that are available today and in the future.

    - Develop a HDP team of personnel that grows with the organization.

- CSF's of the DL1 function from his point of view:

    - Create a professionally strong HDP team personnel.

    - Growth of customer services.

    - Provide equipment that works (production performance).

    - Success in Data Processing implementations.

    - Provide competitive Computer Service prices.

    - Develop an organized systematic approach to providing

      computer services.

    - Provide HDP management that will listen and

      communicate.

    - Maintain high visibility and political clout.

5.0 Description of the Interview with the User

The user interviewee is an engineer responsible for the management of one data base. He provides computer services within his department.

- Goals and objectives of DL1 from his point of view:

    - Support the users to meet their objective.

    - Give more attention to communication with the user.

    - Create an effective organization.

- CSF's of DL1 from his point of view:

    - Provide technical expertise to users.

    - Advise on feasible alternatives.

    - Keep up state of the art.

    - Provide systems with good cost/benefit ratio.

    - Make available resources with good response time.

- Monitoring of performance (people and equipment).

- Communicat ion (user/data systems, creative climate of

trust).

- Reliability of equipment.

Constraints and Preoccupations of User Interviewee

The following are the constraints and preoccupations of user

interviewee:

- More control of the HDP priorities.

- Want more participation of the users in system development.

- Wish to have the people who develop program for him located

in his area.

- Wants more communication with DL1.

Emphasizing the communication he said: "I never met the current DL1,

the former DL1 often came to have informal discussions with me...".

He said that these informal discussions made him feel that the DL1

was concerned and that makes a lot of difference.

This completes the descriptive piece of the case study.

In the next chapter, we are going to analyze the two companies,

HEXAGON and HONEYCONE and their approaches to providing data processing

services.

CHAPTER VII: ASSESSMENT AND ANALYSIS OF "HEXAGON" AND "HONEYCONE

1.0 Introduction

In the previous Chapters (V and VI), we tried to give to the

reader an objective view of the two companies interviewed. We

presented the environment of the Data Processing departments, the

management process of the Data Processing Managers, their goals

and objectives, as well as their critical Success Factors as viewed

by each DP manager, one manager within the department and one user.

In this chapter, we are going first to assess the stage of

the Data Processing department; second, the analysis of their strengths

and weaknesses in the areas of organization and Management Process; and

third, present the CSFs analysis.

2.0 Evolution of the Data Processing Departments

As there is no standard method to categorize the state of

evolution of the two Data Processing Departments, we are going to

present below three ways of assessment of their respective evolution.

Through these assessments, we can observe the differences and the

similarities:

- The first position (see Figure 18) helps to determine the

  degree of complexity of the two departments and demonstrates

  that HONEYCONE is more advanced technologically than HEXAGON.

Multiple CPU
+ "N" Data Base
with Redundancy

Multiple CPU
+ one Data Base
with Redundancy

Multiple CPU
+ "N" Data Base
Non Overlapping

HONEYCONE

Simple CPU
+ one Data
Base

HEXAGON

Basic
Batch

Time
Sharing

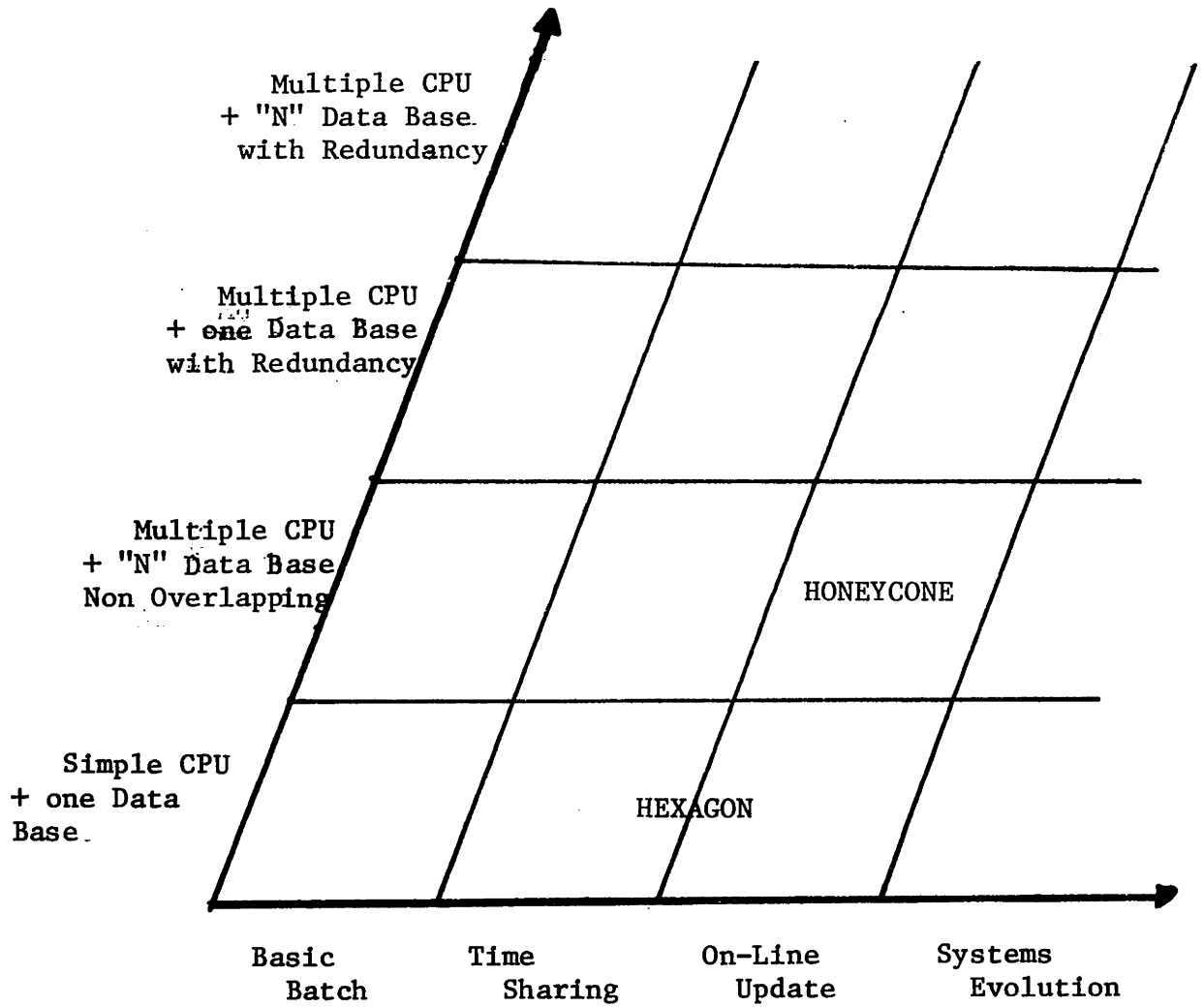On-Line
Update

Systems
Evolution

Figure 18:   Evolution of the Combination

CPU/Data Base/System

However, both have plenty of room for increased technological complexity. (The growth used in Figure 18 was described in Chapter III, Figure 3, evolution of the combination CPU/Data Base/System.)

- The second way to assess the two Data Processing departments is through the NOLAN[12] stages. This assessment is presented in the Table 3.

We can see from this analysis, that there are some inconsistencies between areas in the same company. For example, HEXAGON's application portfolio and management control techniques are a stage behind its organizational structure and its users awareness. HONEYCONE finds itself in a similar position. We could hypothesize from this analysis. that both organizations have serious concerns in the user relationships area because the users are sophisticated enough to demand move of the Data Processing Organization than it is in a position to deliver.

- The third way of assessment is by the mapping developed by CISR[15] where we will place the two companies on these major dimensions (see Figure 19). The first is the centralization, distribution, or decentralization of "operations". The second dimension on which an organization can either centralize or recentralize, the "system development" dimension. The third data processing function which can be either centralized or decentralized is the "management control function".

Table 3: Assessment by Nolan Stage

Growth Process Company	Application Portfolio	Data Process. Organization	Data Process Management Control	User Awareness
HEXAGON	Late Stage II Beginning Stage III	Stage IV	Late Stage III Beginning Stage IV	Stage IV
HONEYCONE	Late Stage III Beginning Stage IV	Stage IV	Beginning Stage III	Stage IV
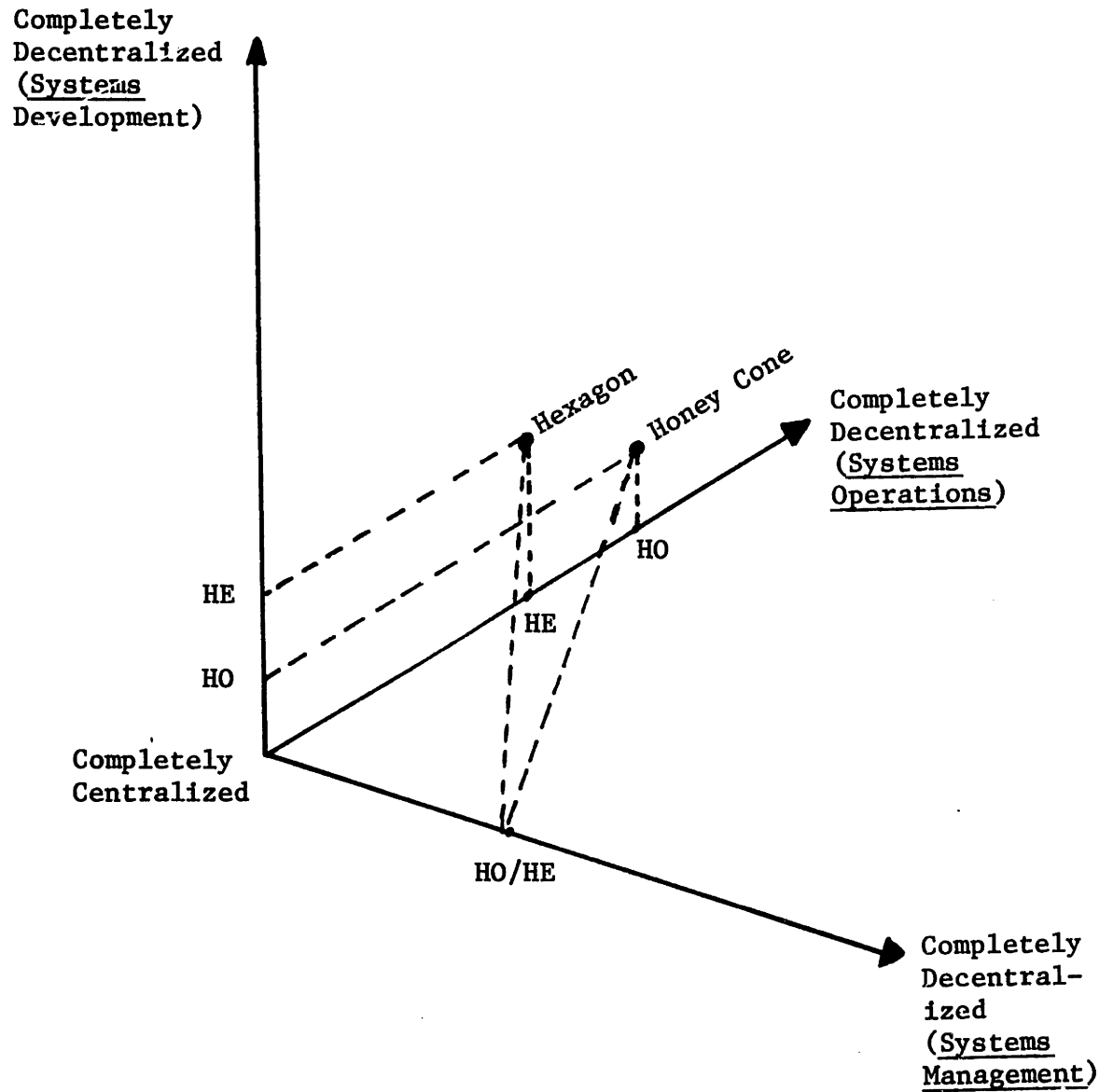
Figure 19: Dimensions of Centralization/Decentralization

We can see from this third analysis[15] that:

- <u>The system development</u>: process of designing and implementing new computerized information systems is more centralized for Honeycone than Hexagon;

- <u>The system operations</u>: process of "running" computerized information systems (this process involves accepting current input, updating the appropriate files/data bases, and generating reports) is quite centralized for Hexagon and less for Honeycone;

- <u>The system management</u>: the process of managing the information system function (this process includes setting of strategy, planning, setting standard, etc. ...) is quite centralized for both organizations.

3.0 <u>Strengths and Weaknesses</u>

The analysis of the strengths and weaknesses use a list of issues that were reported on by John F. Rockart,[15] Christine V. Bullen and John N. Kogen in their paper on "The Management of Distributed Processing". These issues will be graded from 1 to 3 ; these issues were listed and ranked by heads of data processing from twenty-nine DP departments of major U.S. companies as the significant issues facing information systems management today:

Grading System
- Good ---→ 1
- Fair ---→ 2
- Poor ---→ 3

Technical Issues with Managerial Implications

ISSUES	Hexagon	Honeycone
- Design and control of network	1	1
- Ability to cope with technological constraints on decentralization	1	1
- Hardware and Software (system) Maintenance	1	1
- Reliability of the data base	1	1

Human Issues

	Hexagon	Honeycone
- Career Path Planning	2	2
- Ability to cope with personnel needs (more staff skills)	2	2
- Ensuring user relationships	1	2

Management Control Issues

	Hexagon	Honeycone
- Cost effective use of computer resource	2	1
- Development of Common Systems	2	2
- Vendor Control	1	1
- Development of Corporate Data Base	1	1
- Ability to deal with matrix management	1	2
- Control over Planning	1	2
- Control over Projects	1	1
- Control over Budgets	2	2
- Control over Priorities	1	2

It is clear from this ranking that both HEXAGON and HONEYCONE are doing a good job in the Technical Area. It is in the human resource management and user communication area that there is room for improvement.

Critical Issue

Both HEXAGON and HONEYCONE are getting the job done; however, in different ways with different organizational structures and techniques.

This does not mean that they do not have any problems. In the System Organizations area, both companies are doing well. The areas where the two companies seem to have some difficulties are the Systems Development and the Systems Management areas.

In HEXAGON, the approach they have taken to resolve these problems is through the communication link between the BSM and the Account Manager. Through this mechanism, they have created a stable, continuous relationships with the users.

However, in HONEYCONE, the account interface plays the role of "users correspondent" without being user. He must represent all the different departments of Aerospace, objectively. It is clear from our interviews that there is some barriers to this system. The three account managers have their own relationships plus communication lines with the users. The system of an account interface was mainly implemented to watch for any proposals from the user, to check whether or not Data Processing services are included. This original "watchdog" role is not conducive to establishing a good communication

link between the users plus HDP. The users do not view the

Account Interface as their major link to HDP, as a result

the users do not have a clear structural view of the HDP

organization.

The user interviewee of HDP told us that he does not have a

particular person who he feels is his liaison with HDP. He also

emphasized the importance of communications which can improve the

situation. Both companies have felt the need for the development

of systematic tools for facilitating communication plus the user

relationships. Table 4 summarizes the tools plus their use.

Table 4: Systematic Tools

Tools \ Companies	Honeycone	Hexagone
Methodology	SDM	"Arthur Andersen Concept"
Planning	SOW	Master Plan
Communication Users/Data Processing	NONE	Nolan Stages

As we can observe in this table, HONEYCONE did not develop a tool

of communication as Hexagon did. This is an important difference

between the two and can reflect on the success each encounters in

their user relationships.

The final analysis of the weaknesses and strengths is provided

by the CSF's of the "captain of the ship", namely the data

processing executive.

4.0 Critical Success Factor Analysis

We have three sets of CSF's per company. First, we are going to analyze the congruence of the CSF's among the set of three interviews for each company.

HEXAGON

The CSF's of the Data Processing Manager clearly show congruence and harmony with the CSF's of the other managers interviewed. The major CSF's are:

- Communications with Users (Trust)

- Production Quality

- Quality of Team Work.

The strategy and the objectives of the DCSS are clear, well understood, agreed upon by the different partners (users and ess. managers), and well balanced between internal and external issues.

Honeycone Data Processing

The CSF's of DL1 as compared to the CSF's of the other interviewees do not overlap as well as those in Hexagon. The following three do show congruence:

- Communications with Users

- Cost Benefits of Data Processing Services

- Better Management Control Techniques.

Comparison Across Case Studies

There is a lot of similarity between HDP user and those of HEXAGON user. Both are particularly interested in the communication (with a creative climate of trust) with the data processing development.

The CSF's of the DCSS (HEXAGON) seems to be clear and well understood by the users compared to the CSF's of the DL1 who is more worried by the understanding of the data processing function by the user and resolution of his internal management issues. Interestingly, both data processing managers feel that if their supervisors do not receive any complaints from users, that the job has been done and that each has been favorably measured in their management of the function. They also measure their success through direct feedback from the users through steering committee, meetings, etc.

The fact that these two executives consider that the users attitudes are their standard of quality measurement is very important. If we go back to our schema in Chapter III on the diagram "Users/Data Processing Executive", we can confirm now that this issue is a key point (Figure 10) for the data processing manager.

It is also interesting to note that the DCSS (HEXAGON), right from the beginning of our interview, told us clearly that his main objective was user satisfaction. He appears to clearly understand that this is a critical task for him.

Another important area revealed by the CSF's is human resources management. We did not find any clear solutions to these problems, but it is significant to note that both of our main interviewees are searching for good approaches to this problem.

Our major conclusion resulting from the use of CSF's is that the two important factors for successful management of I/S

function are:

- the management of human resources

- the delivery of services to the users.

One result of these findings is a clear need to determine the information necessary to assess these two factors. For the first one, we saw that HEXAGON used the career planning and the skills inventory tools. Measures of these include turnover rate, transfer and motivation as determined through informal feedback. In HDP, they use the performance evaluation report described in Chapter VI, but have not tried techniques like the skills inventory.

In the area of assessing the delivery of services, the following tools might be implemented:

- Users satisfaction index (HEXAGON)

- Statistics on production - time, cost

- Statistics on complaints

- Educational program for users

- Creative communication tools (e.g., official newsletter)

- Permanent informal contact with the key users by the data processing manager.

Finally, it is interesting to note that we did not have any Technology factors as critical success factors. This will be a focus for the conclusion.

CHAPTER VII: CONCLUSION

When we began this thesis, we focused on some quotations, which present the data processing manager as a specialist in the field. We then outlined the issues that are often presented as the main issues of this function, such as cost reduction of technology, software cost, human resources, users relationships. We tried to understand these issues by an in depth interview of two companies and use of the critical success factor methodology.

The results of the two case studies and their assessment (CSFs) revealed two major conclusions:

(1)   That this function does not necessarily need to be handled by a specialist, and

(2)   the criteria of success are basically the fundamental criteria of success of any manager; namely:

● management of the human resources

● quality of services (users satisfaction).

The manager of this function has to build a framework of management control (tools of communications, planning, methodology) in order to "pilot his ship" in his specific environment which has a particular profile. In addition, he must have the characteristics of leadership needed to make him successful in this function, such as human relation skills, concerned with equity, and charisma. The

data processing manager must communicate with and participate

in top management and, finally, be able to "sell" data processing

and the logic and discipline of how one does business in a

particular technological environment.

My last comments will be for the CSF's methodology. This

technique was useful in providing an easy method to determine

the management issues in each organization. It provided a

mechanism language.

In this survey, the methodology worked and all the interviewees

liked the way to approach the management issues. In one of the

case studies, one manager built the goals and objectives of its

subordinates through the CSF's methodology.

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APPENDIX

INTERVIEW #1

INTERVIEW OUTLINE

FOR

CRITICAL SUCCESS FACTOR RESEARCH

IN THE MANAGEMENT OF THE

INFORMATION SYSTEM FUNCTION

Center for Information Systems Research
Massachusetts Institute of Technology
Alfred P. Sloan School of Management
E53-420
50 Memorial Drive
Cambridge, Massachusetts   02139

January 1979

BACKGROUND INFORMATION

1. Name _____ 2. Title _____

3. Division/Department _____

4. Organization _____

5. Address _____ 6. Telephone _____

   _____

7. Description of Company (get Annual Report)

   _____

   _____

   _____

8. Industry Classification

   _____ Manufacturing (Industrial)

   _____ Banking (Financial Institution)

   _____ Insurance (Diversified Financial)

   _____ Non-profit (Government, Health Care, Education)

   _____ Other _____

9. Statistics (from Fortune, etc.)

   Size -- Revenues _____

        -- Assets _____

        -- # of Employees _____

   Revenue of Growth Rate _____

   Profitability -- Short Term _____

                 -- Long Term _____

Interviewer: _____ Date: _____

10. Number of years in current position _____

11. Number of years in current organization _____ _

12. Significant experience:

a. <u>Field</u>   b. <u>Position</u>

____ Data Processing   ____ Line Management

____ Finance   ____ Staff

____ Manufacturing   ____ Other, specify: _____

____ Marketing/Sales   _____

____ Other, specify: _____   _____

_____   _____

I. DESCRIBE THE INFORMATION SYSTEMS/DATA PROCESSING ORGANIZATION

INCLUDE:

A. <u>Organization Chart for the Company as a Whole</u>:

B. <u>Organization Chart for the I/S Department</u> (If there is more than one I/S Department, describe where each fits in the total organization as well as each I/S Department's internal organization. Indicate in which area interviewee is located.):

C. <u>Describe the Management Process</u>:

    1) Strategy, Planning, Priority-setting, User Communication

    2) Budgeting (include total dollar amount, major breakdowns, % I/S vs % User Department)

    3) Financial Responsibility Center Structure

        Standard Cost Center: . . . . 　☐

        Profit Center: . . . . 　☐

        Investment Center: . . . . 　☐

    4) Customer Set, major users

5) People in I/S and Roles/Career Path/Human Resource Management

   Comments:

Personnel: (Number) ____ (Total)____	Current	Planned Increases/Decreases
Analyst (Applications) _____		
Systems Analyst _____		
Programmers (Applications) _____		
Programmers (Systems) _____		
Console Operator _____		
Control and Distribution Clerk _____		
Transaction Control Clerk _____		
Control and Servicing Record Clerk _____		
Others: _____		
_____		
_____		
_____		

6) Controls, standards, make vs. buy policies chargeout system(s),
   approval process. (If interviewee had described the existence
   of both centralized and distributed processing, differentiate
   between controls and standards for each type of processing.)

7) Corporate Review of I/S Function -- is there a Steering Committee
   (formal or informal), or top executives who review I/S policy and
   operations?

8) Are any changes in the above anticipated for the future,
   i.e., new directions which require new strategies, new role
   for I/S, technology impacts, etc?

D. Describe the Systems Development Area:

1) Organization and Process, e.g., are they organized along customer or product lines, solid or dotted reporting relationships?

2) People and roles

3) Main Applications: answer only if information is readily available:

Application	Batch	Remote-Batch	On Line	
			T-S	Database-Inquiry

4) Changes anticipated, positive and negative aspects of the organization

E. <u>Describe the Operations Area:</u>

1) People and roles

2) CPUs, networks, other computers, terminals (characterize facilities as to degree of centralization)

CPUs

Vendor	Model	Quantity	Date of Installation

Terminals

Vendor	Model	Quantity	Date of Installation

Data Entry Methods:

Keypunch: _____   Key/Disk: _____   On-Line Keyboard: _____

Others: _____

3) Outside services, i.e., time sharing

4) Anticipated changes

F. In general, how would you characterize the relationship between I/S and user area (communication, degree of satisfaction, etc.)?

II. CRITICAL SUCCESS FACTORS

Definition: CISR has been conducting research in the area of
developing a method to assist managers in looking at the way
they manage and in determining their information needs. This
technique focuses on identifying those factors in a manager's
environment which must go right in order for the manager to
achieve his/her goals and objectives. We call these the critical
success factors.

Give examples appropriate to the organization being interviewed.

List major goals and objectives:

A. Given to the interviewee by his/her management, tradition, etc.:

B. Set by Interviewee for Self:

Identify Critical Success Factors (include both short range,
and long term, those coming out of the internal organization,
those resulting from external pressures (competition, regulation,
technology), those dealing with higher levels of management
as well as those resulting from the management of subordinates,
those which are organizational, financial or technology
related, etc.

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

If possible, rank order CSFs.

Identify measures interviewee would use for each CSF.

1.

2.

3.

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10.

III. MEASUREMENT

    A. How is the interviewee's performance measured by the organization, and/or his/her management?

    B. How does the interviewee measure his/her own performance?

    C. How does the interviewee think his/her performance should be measured?

SOME DEFINITIONS

Standard Cost Center: Standard quantities of input resources for each output unit are specified.

Objective: minimize actual budget

Revenue Center: Expense Budget is given to manager.

Objective: maximize revenue for given expense

Discretionary Expense Center: No practical way to relate inputs and outputs; discretionary expense budget given to manager.

Objective: spend budget to produce the best quality service

Profit Center: Manager is responsible for best combination of costs and revenues.

Objective: maximize revenues minus costs

Investment Center: Manager is responsible for best combination of cost, assets, revenues.

Objective: maximize (revenue minus cost)/assets   (ROI)

Difference Objectives and Goals: (definition F. Vancil)

- An <u>objective</u> is an aspiration to
  be worked toward in the future.

- A <u>goal</u> is an achievement to be
  attained at some future.

	Time Frame	Specificity	Focus	Measurement
Objective	Enduring	Broad General Terms	Extern. Organ.	Ident. Quantitative
Goals	Temporal Time-Phased	Specific Results at Specific Date	Extern. Organ.	Ident. Quantitative

I N T E R V I E W   #2

INTERVIEW FOR MANAGERS WITHIN

DEPARTMENT OF PRIMARY INTERVIEWEE

1. Name _____ 2. Title _____

3. Div/Dept. _____

4. Organization _____

5. Address _____ 6. Telephone _____

   _____

7. Number of years in current position _____

8. Number of years in current organization _____

9. Significant experience:

   a. <u>Field</u>   b. <u>Position</u>

   _____ Data Processing   _____ Line Management

   _____ Finance   _____ Staff

   _____ Manufacturing   _____ Other, specify: _____

   _____ Marketing/Sales   _____

   _____ Other, specify: _____   _____

   _____   _____

I. List the major goals and objectives of the I/S function as seen by the interviewee.

II. Identify the critical success factors necessary to achieve the goals and objectives (rank if possible).

1.

2.

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8.

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10.

III. What measures would the interviewee use for each CSF?

INTERVIEW   #3

INTERVIEW FOR USER AREA MANAGER

1. Name _____ 2. Title _____

3. Div/Dept. _____

4. Organization _____

5. Address _____ 6. Telephone _____

7. Number of years in current position _____

8. Number of years in current organization _____

9. Significant experience:

    a. Field   b. Position

        ____ Data Processing   ____ Line Management

        ____ Finance   ____ Staff

        ____ Manufacturing   ____ Other, specify: _____

        ____ Marketing/Sales   _____

        ____ Other, specify: ____   _____

        _____   _____

I. List the major goals and objectives of the I/S function as seen by the interviewee.

II. Identify the critical success factors necessary to achieve the goals and objectives (rank if possible).

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

III. What measures would the interviewee use for each CSF?