

THE CEO GOES ON-LINE

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Computer terminals are popping up everywhere in business today. Clerks have been using them for years. Middle managers are increasingly using them. So are key staff personnel. But the thought that the chief executive officer, or an other top corporate officer, of a billion dollar enterprise might also spend time utilizing his own terminal is usually met with an amused smile and a shake of the head. Somehow, the thought of a top executive taking time from his crowded calendar to access and use computer-based data just doesn't fit the executive image.

The widely held image of the CEO and his one or two key subordinates is built around a day filled with human contact. Meetings with key divisional officers, briefings, telephone conversations, conferences, public speeches, negotiations with vendors and customers, and similar events come readily to mind. What is more, most of the research concerning what top executives do confirms this image. For example, in a widely discussed study of chief executive officers, which replicates findings of other studies, one researcher found that top executives are verbally oriented and use little "hard" information.[1]

Henry Mintzberg provides considerable ammunition for those who predict that terminals will never invade top corporate offices, when he notes that ". . . it is interesting to look at the content of managers' information, and at what they do with it. The evidence here is that a great deal of the manager's inputs are soft and speculative -

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[1] See Henry Mintzberg, "Planning on the Left Side and Managing on the Right," Harvard Business Review, July-August 1976, p. 49-58.

impressions and feelings about other people, hearsay, gossip, and so on. Furthermore, the very analytical inputs - reports, documents, and hard data in general - seem to be of relatively little importance to many managers." [2]

John Kotter's recent findings from a study of 16 top line officers are very similar in this regard. [3] We have little doubt that both studies are valid. Almost all top corporate executive activities are intensely inter-personal, with little use of hard information.

Yet, for a number of top corporate officers today, this characterization is not altogether correct. For these executives, the soft and speculative inputs of inter-personal dealings are balanced against hard information generated from computer-based data and analyses. Their own computer terminal is an indispensable tool in these analyses. For these executives, terminal use is now an integral part of the daily management of the firm.

During the past two years, we have studied some sixteen firms in which at least one of the three top officers, most usually the CEO, accesses and uses computer-based information on a regular basis. The various uses are fascinating and appear to fit a logical and consistent pattern which will be discussed in this article. First, a few examples.

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[2] Mintzberg, op. cit., p. 54.

[3] John Kotter, personal communication.

. Ben W. Heineman, President and CEO of Northwest Industries, spends a few hours almost every day at a computer terminal in his office. Heineman not only accesses predefined reports on each of his nine operating companies, but actually creates his own reports and analyses using a vast store of available data and an analytic, easy to use computer language. The terminal has become the most important tool for his monitoring and planning activities at Northwest Industries.

. Roger E. Birk, President of Merrill Lynch and Gregory Fitzgerald, Chief Financial Officer, have daily access to a large number of continually updated reports concerning Merrill Lynch's worldwide operations, via computer terminals in their offices. The system was initiated by Donald T. Regan, former President of Merrill Lynch, now Secretary of the Treasury, as a vehicle for quickly generating and accessing information on the latest financial developments and important trends. A graphics package has been added recently to extend the analytical power of the system.

. John A. Schoeneman, President of Employers Insurance of Wausau, and Gerald W. Viste, Executive Vice President, maintain an on-line data base of information about their business and that of competitors to assist their understanding of trends in the insurance industry. At his terminal, Viste develops both numerical and graphical

analyses that assist in the development of the strategic direction of the company.

. George N. Hatsopoulos, President of Thermo Electron, writes programs in the APL language to analyse and format data contained in several of his company's data bases. He is able to analyse an extensive amount of information about company, market and economic conditions whenever he desires to do so.

These examples do not represent common practice for senior corporate officers today. But there appears to be little doubt that executives such as these are pacesetters in what is an emerging trend toward greatly increased terminal use in executive suites. In order to understand this trend, we undertook our study of companies where top executives are today utilizing the computer as a natural and fundamental tool to assist them in carrying out their jobs.

Why Now?

Our study suggests that this trend toward executive use of computer-based data is occurring for three primary reasons. First, the technology is now available to provide executive access at an acceptable price. Impressive new terminal facilities with user-oriented data access mechanisms and graphical capabilities are now available. Second, there is a growing knowledge in executive ranks of the ability and availability of the new technologies. Finally, there

is a growing desire among top executives for timely information and deeper analysis. Worldwide competition, volatile market conditions, escalating interest rates, ever rising wage rates, and a host of other factors are all placing a premium on careful monitoring of current conditions and increased attention to future plans.

Just a few years ago, an analytically oriented executive could do only one of two things. He could suppress the greater part of his analytical tendencies and rely on his ability to check his line or staff subordinates' analyses. Alternatively, he could do time-consuming manual analysis and charting himself. In most cases the first option won out. Today, however, for analytically oriented executives there is a very feasible third option, the personal use of a terminal for access to and analysis of computer stored data. This is the new option which the executives in our sample have perceived and seized. We believe that they are only the forerunners in the development of systems which we now term "executive information support" (EIS) systems.

Although outwardly different, the EIS systems we have observed display five striking similarities. These are:

- . a central purpose
- . a common core of data
- . two principal methods of use
- . two principal types of users, and
- . the presence of an expert "support organization" to aid users

Taken as a whole, these observations have led us to a "model" of EIS systems into which all of our sample of systems fit, and into which we can categorize the systems seen more recently since our study. This model, we believe, provides useful insights into the process of executive information support. It also sheds considerable light on key factors in the development of EIS systems for companies which want to move in this direction.

A Central Purpose

The major purpose of all EIS systems we have observed is the provision of information to top management for the monitoring of the organization's activities, analysis as to the reasons underlying favorable or adverse trends, and the development of the future path which the organization plans to pursue. In sum, the systems support the planning and control processes in an organization.

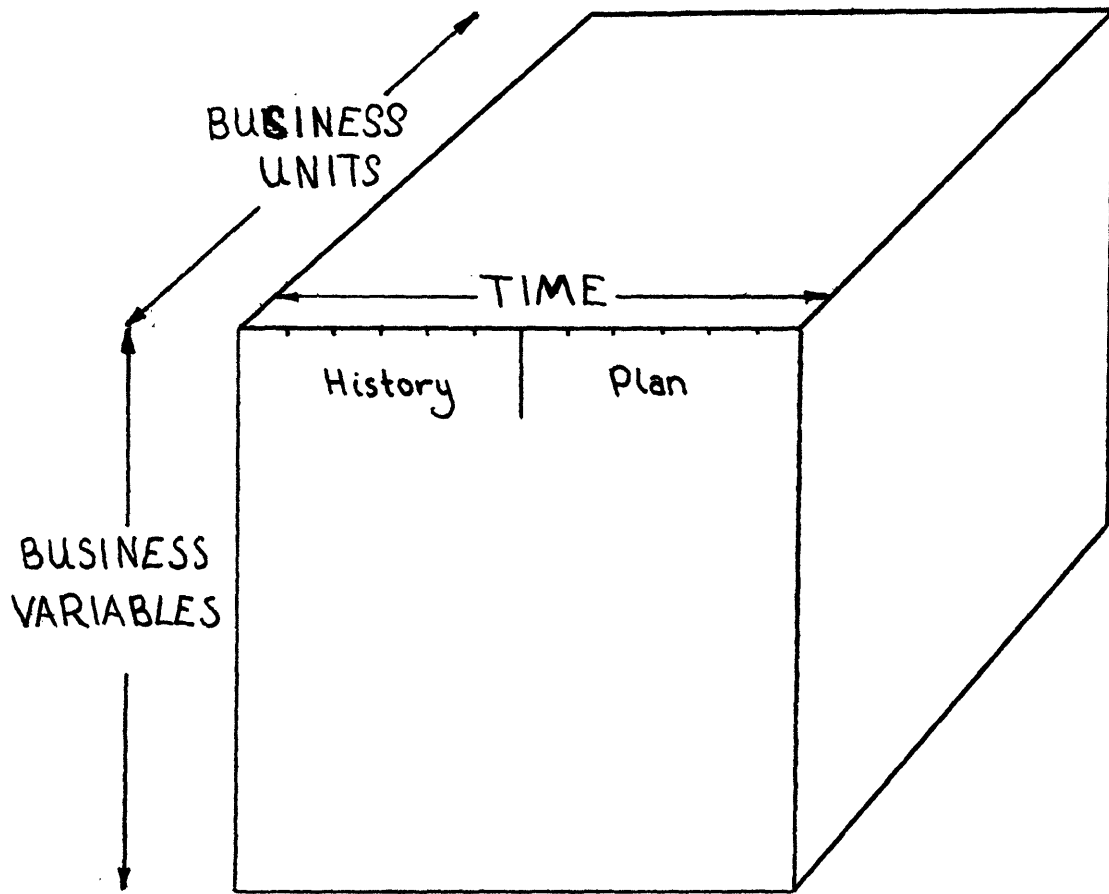
The provision of information to senior management for planning and control purposes is certainly not something new. In almost all companies there historically has been a flow of reports and analyses to senior executives for these purposes. At the top level, data are used at least monthly, and often more frequently, to monitor the progress of each subdivision in the company. Sales data are frequently scanned to keep abreast of major trends. Long range plans are reviewed and scrutinized in great detail. And, increasingly today, strategic data are assembled for top management use.

It is to better utilize these and other available data for monitoring and planning purposes that executive information support systems are being built. The top executives who have developed, or are developing, such systems have decided that they need to have more visibility into the workings of their corporations and the industries which they serve. To do this, they feel they need to have more timely access to a broader sweep of data, often at an increased level of detail.

A Common Core of Data

The data stored in the systems we have observed are aimed at satisfying this felt need. Although each system is different, there appears to be a "common core" of data which forms a foundation. This data can be conceived of as a "cube" of data as shown in Exhibit 1. Although the data is physically stored in different manners, its logical representation is built around three major data dimensions. One of these dimensions concerns business variables of interest. In every case we have seen, this dimension includes the major accounting variables for the profit and loss, balance sheet, and funds flow statements. In addition, however, to make these financial variables more meaningful, additional substantive explanatory variables (e.g., unit sales by product class) are almost always included.

The second dimension is time. The values of the variables are recorded in the data cube for a number of years in the past (quite often five years), most often in monthly snapshots. In addition, the same data is available in its projected (budgeted and forecast) form for several



THE DATA CUBE
EXHIBIT 1

years in the future. Most often this data is shown in monthly increments for the coming year and in quarterly or annual form for a number of additional years into the future.

The third and final dimension is business unit. Each of the organization's major subunits whether they be geographical, divisional or functional, is represented. Thus, slicing the cube from the top (Exhibit 2), each segment can be visualized as containing data concerning many business variables (dimension 1) over time (dimension 2) for a particular business (dimension 3).

This basic data cube allows executives to inspect their company's data in several useful and managerially meaningful ways. For example, Exhibit 3 shows a traditional accounting comparison of actual versus last year and budget for a single business unit. At any time a snapshot of a particular unit including all or a subset of business variables is available. In many systems, the same data is also displayable in appropriate substantive forms, such as unit sales or manhours, at differing levels of aggregation. Alternatively, the manager may wish to work with a few variables, such as working capital and its major components, across time for a single subsidiary (Exhibit 4). Slicing the cube in yet another way (Exhibit 5), the manager can analyze the position of a particular class of inventory across all subsidiaries. Obviously other more complex views of the data are possible, but these are the basic three.

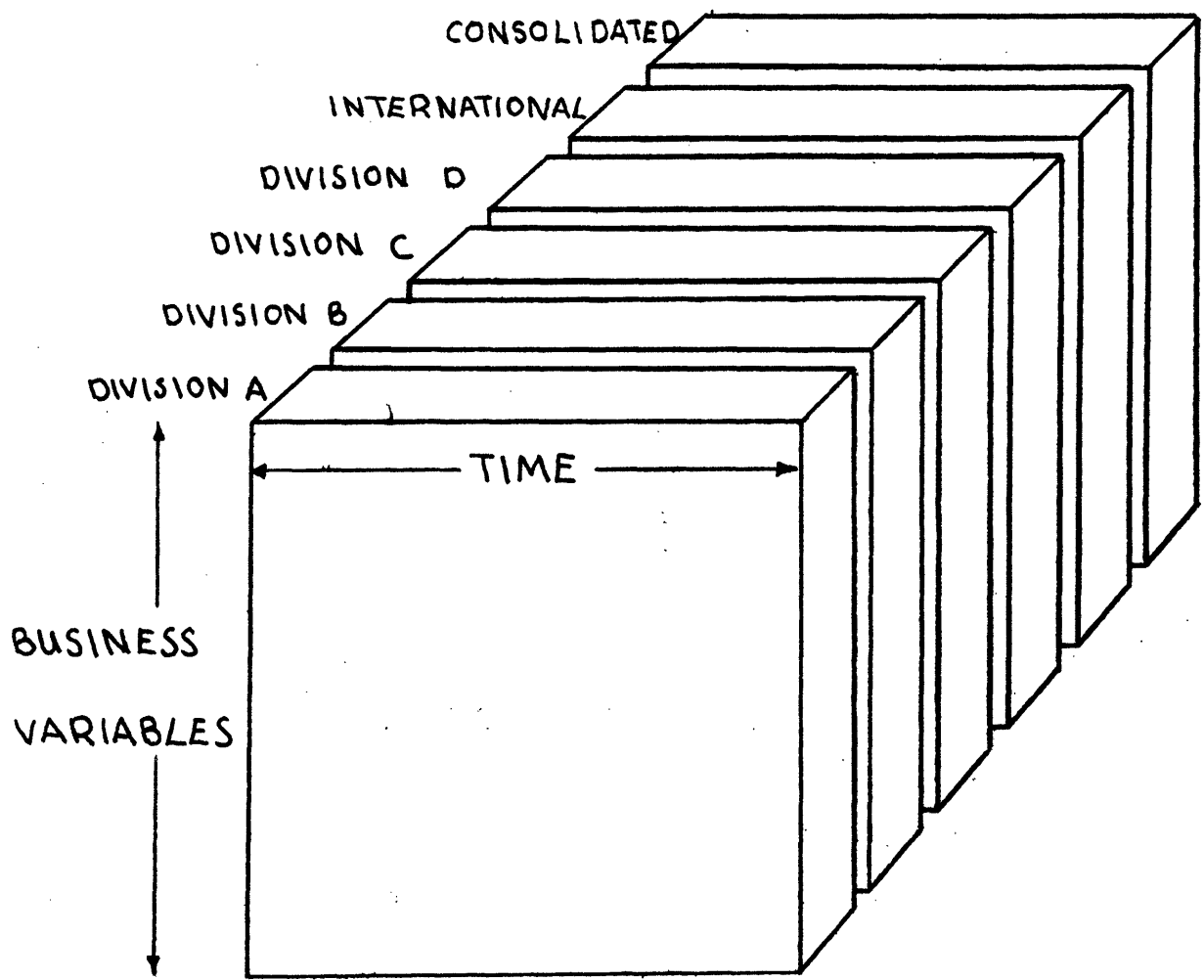


EXHIBIT 2

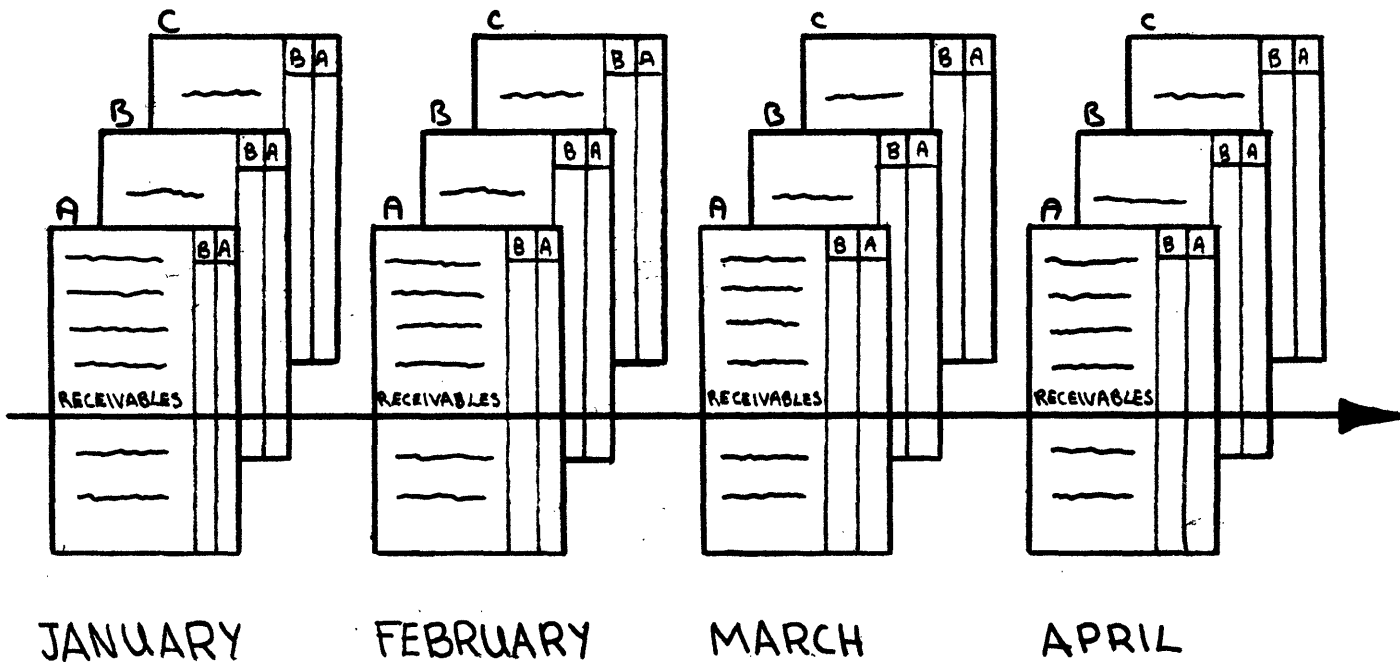
BUSINESS VARIABLES

DIVISION A				DIVISION B			DIVISION C		
	Last Year	Budget	Actual	L.Y.	B.	A.	L.Y.	B.	A.
REVENUE									
COST OF GOODS SOLD									
GROSS INCOME									
SELLING + ADMIN. EXP.									
INTEREST EXPENSES									
MISC. EXPENSES									
TOTAL EXP.									
NET INCOME									

LOOKING ACROSS BUSINESS VARIABLES

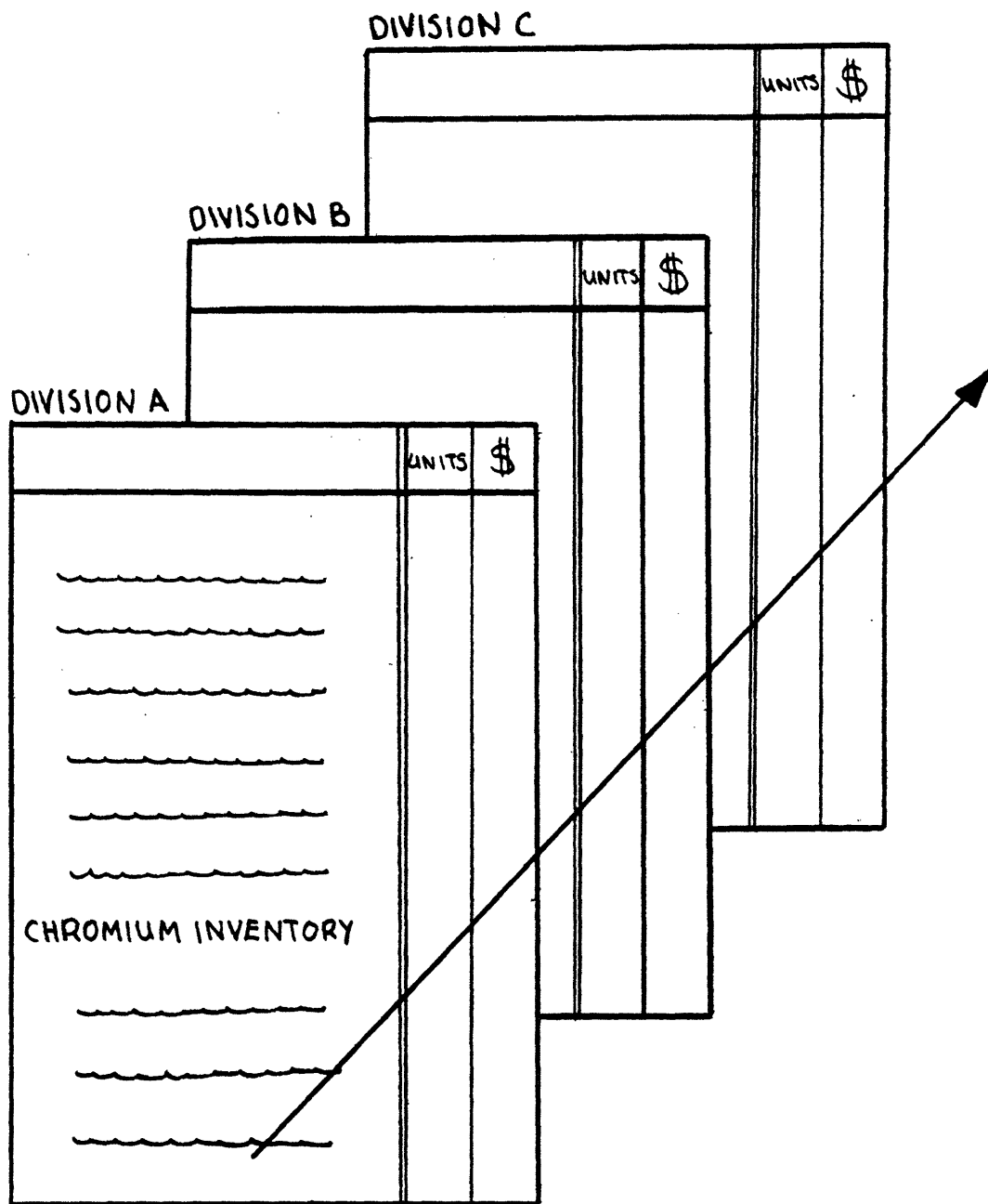
(TRADITIONAL MANAGEMENT ACCOUNTING)

EXHIBIT 3



LOOKING ALONG THE TIME DIMENSION

EXHIBIT 4



LOOKING ACROSS BUSINESS UNITS

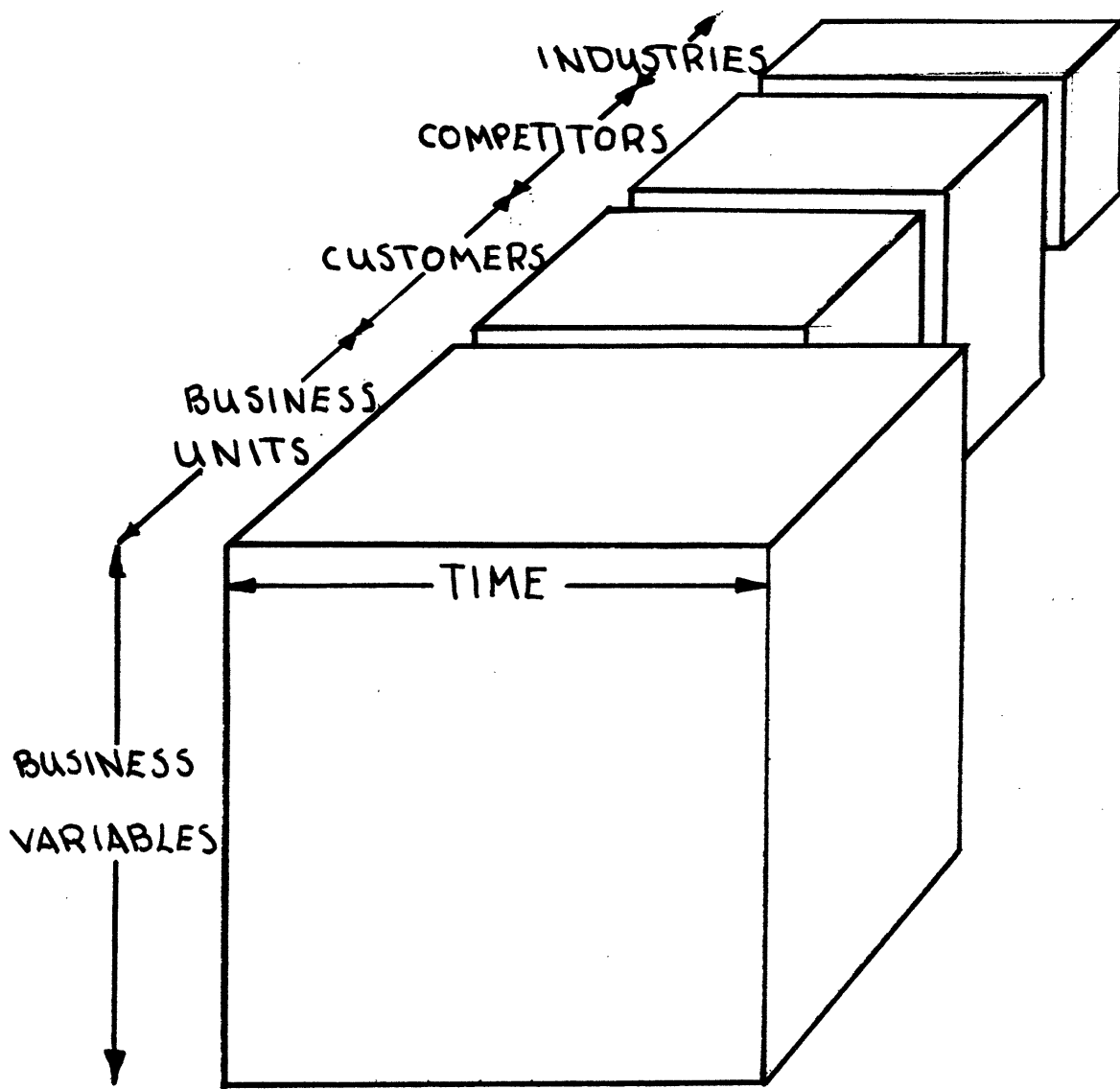
EXHIBIT 5

A number of companies have extended this cube to include important available business variables on major competitors, key customers, and industry segments of interest.[4] Conceptually, this "extended data cube" presents each of the sets of competitive and customer data in the same manner as that for each subsidiary slice (Exhibit 6). For these "external" organizations, however, each data set is usually less complete, containing a smaller number of variables and few future projections.

Much of the customer, competitive and industry data in the extended data cube are purchased today in the form of any of the several thousand machine processable data bases which are available from information vendors. For competitive financial data, one common source is the Standard and Poors' Compustat tape which provides data on 75 business variables for the past ten years. In an increasing number of industries other operating data is readily available from industry associations or other published sources. Some of the data, from sources such as customer surveys, market sampling, and internal planning processes is relatively "soft". But it is managerially useful data for planning and control purposes.

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[4] For one method of defining those variables which should be included, see John F. Rockart, "Chief Executive Officers Define Their Own Data Needs," Harvard Business Review, March - April 1979, p. 81-93.



THE EXTENDED DATA CUBE

EXHIBIT 6

Two Principal Methods of Use

When one observes the ways in which each system is used, two principal and strikingly different types of use emerge. Some systems primarily provide an executive with access to the current status and projected trends of the business. The most recent business reports are available as is the daily, often hourly, current status of business factors. Alternatively, some systems are designed primarily to allow an executive to go beyond status access and to perform personal analysis of the available data. Let us briefly look at each of these two modes of use:

Status access: This approach can be envisioned as an "automated set of reports." In this mode, the executive or staff member has "read only" access to the latest reports or the status of particular variables of interest. He can peruse the information requested, but can perform very little, if any, data manipulation. In industries where market conditions change rapidly, where there are many factors of interest, or where hour-to-hour operational tracking is of use, the status access provided by this mode appears to be of real use. This is the case at Merrill Lynch and in several other firms in financial industries.

The status access approach has been selected by some executives for two other reasons. First, it provides an easy to learn, low cost, low risk means of allowing an executive to become comfortable with a terminal. For these reasons, at Owens-Illinois the first stage in the development of an executive information support system will provide only status

access to the CEO and other senior executives. Second, this approach has also been espoused by some chief executives as a simple, low cost signal to the rest of the organization of an increased emphasis on quantitative analysis in the planning and control process. As one CEO put it, "The terminal on my desk is a message to the organization."

Personal analysis: In this alternative approach, the executive uses the computer not only for status access, but also as an analytical tool. At Northwest Industries, Wausau, and Thermo Electron this is the case. Senior executives in these three organizations and several others have chosen to dictate the contents of the data bases they desire, to learn the relevant access language, and to do some programming themselves. Instead of merely having access to the data, these managers also actively work with the data to assist their analytical processes.

The type of analysis performed differs from manager to manager. Some executives perform fairly simple analyses, such as creating new ratios or extrapolating current trends into the future. Some graph trends of particular interest to gain the visual perspectives available from often multi-colored comparisons. A few work with simulation models of parts of the business to determine where capital investments will be most productive. In all cases, however, the executive using this approach has an increased ability to look at, change, extend, and manipulate data in a host of different ways which are personally meaningful.

To espouse the personal analysis approach requires a significant commitment from an executive. He must believe that he can significantly improve the existing analytical processes in his company through his own on-line interactive manipulation of computer-based data. He must also be willing to invest much of his own time and energy into defining the data he needs and learning to use the available techniques to access and manipulate the data. If both these conditions hold, then the personal analysis mode can provide benefits.

Two Principal Types Of User

Just as EIS systems appear to divide sharply according to the type of use that is made of the stored data, so do they differ with regard to the principal user of each system. Some systems are designed primarily for use by corporate functional staff groups, others primarily for executive office personnel.

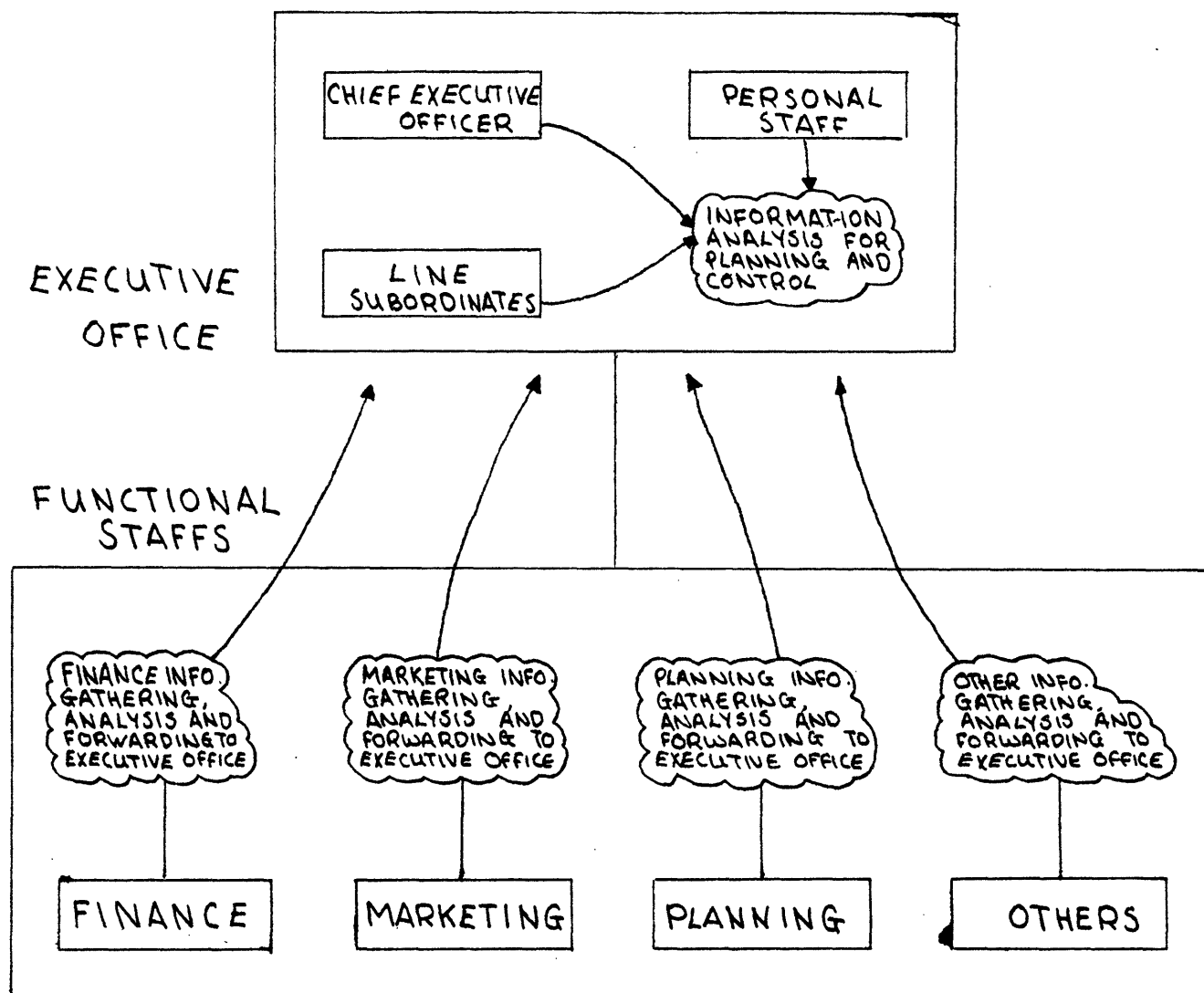
To understand these two different approaches one must recognize that a CEO has two separate, and quite different, sets of people on whom he can rely for the monitoring and analysis activities which are part of planning and control. The top executive can depend on his corporate functional staff groups, such as accounting, marketing, and finance. These staff groups are the traditional monitors and the usual developers of key status and trend reports with diagnostic commentary. Alternatively, the CEO can turn for a significant amount of information analysis to the occupants of the executive office: himself, his subordinates, and his personal staff. In general, both of these

facilities are used. Executive office and staff personnel are a two level "information analysis team." Each of the participants has many other responsibilities but a joint shared activity is that of information gathering and interpretation (Exhibit 7).

This two level distribution of information analysis responsibility means that computer-based assistance can be developed with a primary user at either the staff level or the executive level. The systems we observed have primarily been designed for use at one level or the other.

The choice of principal system user is essentially dependent upon executive style. Until recently, data gathering and analysis were time consuming and tiresome tasks. Thus, they were largely relegated to the functional staffs. However, as noted earlier, advances in the technology have initiated a significant change in this situation. Thus, the locus of an increasing amount of information monitoring and analysis is shifting from the bottom segment of Exhibit 7 (the functional staffs) to the top (the executive office). Let us look briefly at the differences in these two approaches:

Functional staff centered: In some systems, although the CEO may have a terminal on his desk, he is only able to inquire into or analyze data from information data bases developed by and, primarily devoted to, the work of one or more functional staffs, such as finance or market research. Here, the executive's access to data is limited to working with only parts of the common core of data. The focus of the system is



THE EXECUTIVE INFORMATION ANALYSIS ORGANIZATION

EXHIBIT 7

the staff and its interests. Executive access is an afterthought, although each information data base contains much of interest to the CEO.

Executive office centered: For an increasing number of senior executives, however, access to one or more functional staff centered information data bases is not enough. It is their belief that it is desirable today to have direct access to a specifically designed executive data base including relevant data from all aspects of the business. This is the case at Northwest Industries, Merrill Lynch and at by far the majority of the companies in our sample.

The composition of these executive data bases is necessarily much broader than that of staff centered data bases. Top line officers are responsible for all areas of the business. They must integrate diverse aspects of the organization and its activities in their planning and control process. Therefore, they need data drawn from multiple areas of staff responsibility. Thus, executive office centered systems are developed to provide the full common core of data including financial, marketing, planning, competitive, and other data needed either for status access or analytic purposes.

Support Organization

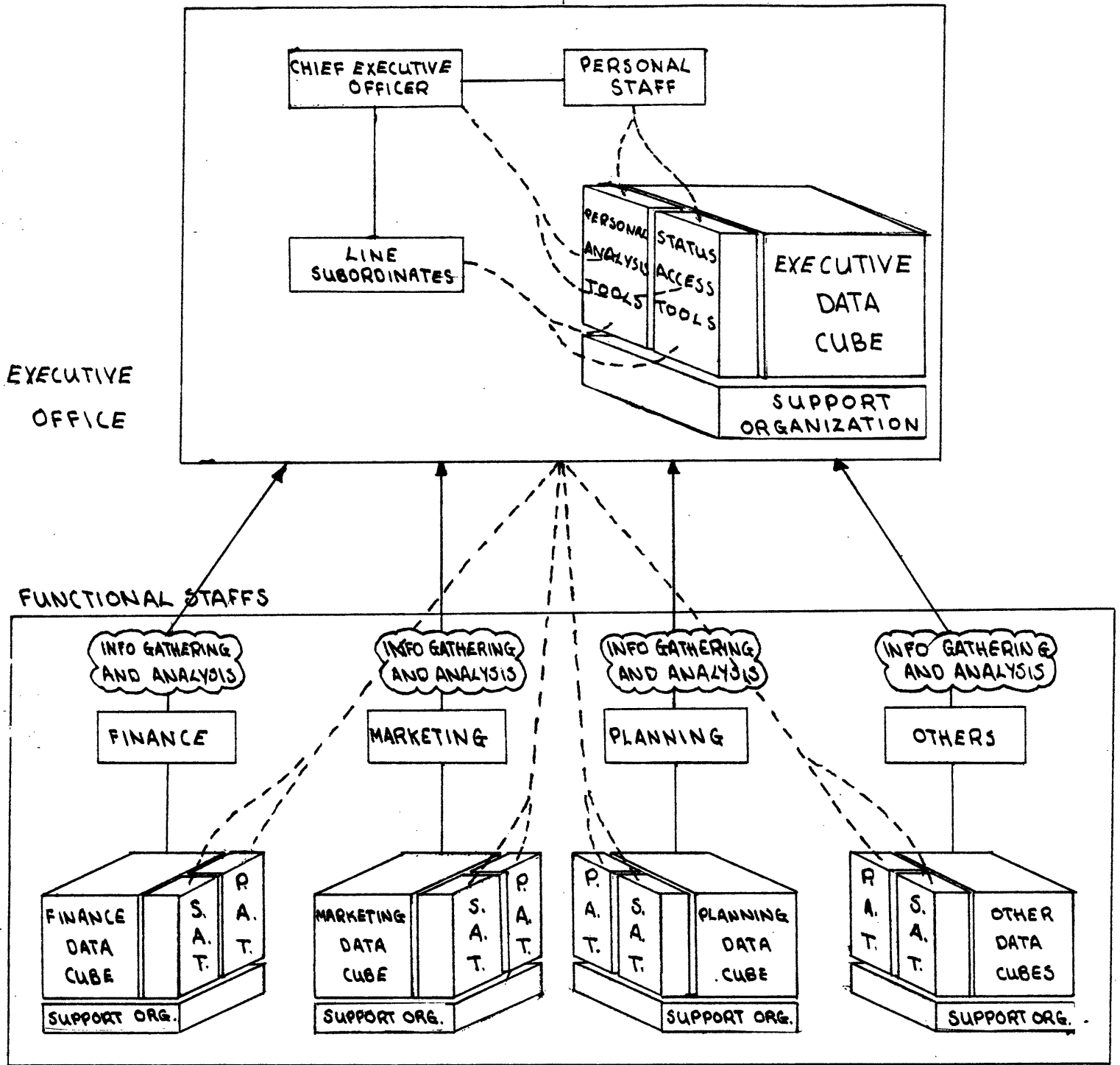
The final significant common feature of the systems we have observed is a group of people dedicated to providing a high level of personal support to the executive users. This is a factor which is in the

background and often unnoticed, yet it is essential. At a minimum, the access languages used by all EIS systems are tools which require some initial training and ongoing assistance in their use. However, in most instances organizational support goes far beyond mere training in the access languages. The EIS support "coach" provides education, helps establish and change the data base, and provides assistance to the users in conceptualizing, designing, and improving both their systems and their analyses. These coaches have a consulting oriented "helping" rather than "doing" approach to their role. Many, in fact, as at Northwest Industries, are former consultants.

To allow continuing, uninterrupted assistance to EIS system users, the organizations we observed have separated out this support group from the regular data processing organization. This appears to be a healthy move, both because EIS consultants are a different breed from most conventional data processing systems analysts, and because they need to be shielded from involvement in the emergency development of an overdue conventional system.

A Conceptual Model of Executive Information Support

Exhibit 8 summarizes all of the foregoing into a single model of all key elements of computer-based executive information support. The two user levels at which systems can be located, just noted in Exhibit 7, are repeated here. As shown, data bases can be developed primarily to assist staffs in developing and formulating information. Each of these contains only the part of the common core relevant to the particular



A CONCEPTUAL MODEL OF EXECUTIVE INFORMATION SUPPORT

EXHIBIT 8

functional staff. Alternatively, systems can be developed at the executive level where the full common core is brought together and enhanced.

In addition, the two possible types of use of each data base, status access and personal analysis, are noted as entry "tools" to get to the data base at either level. Finally, the necessary presence of a support group of coaches is indicated as a key ingredient underlying each system if executive use is to be successful.

Exhibit 8 also notes (through its dashed arrows) that no matter where the system is located, executive access is possible. In addition, it indicates that even though the primary use of the systems is either simple status access or personal analysis, the availability of the other set of entry tools to any data base can permit the other form of use by different executives. For example, although the Merrill Lynch system is principally an executive level, status access system, Greg Fitzgerald, the Corporate Chief Financial Officer, often uses it for personal analysis, writing many of his own programs to create new analyses.

In effect, executives have four major choices, as noted in Exhibit 8, for EIS system use: status access to either functional staff or executive data bases, and personal analytical use of either. Exhibit 9 diagrams these choices. The selection of the appropriate method or methods depends heavily on the managerial style and analytical propensity of the particular top executive.

PRIMARY MODE OF USE

STATUS ACCESS

PERSONAL ANALYSIS

EXECUTIVE
OFFICE

PRIMARY

USER

FUNCTIONAL
STAFF

FOUR CHOICES FOR
EXECUTIVE INFORMATION SUPPORT

EXHIBIT 9

Northwest Industries: An Example

Perhaps the most striking example of an EIS system, both in design and use is that at Northwest Industries. The development of this system began in 1976. At that time, Ben W. Heineman, President and CEO of Northwest Industries (1980 sales: \$2.9 billion), decided that he needed an executive data base to aid him in monitoring, projecting, and planning the progress of his nine operating companies. In his own words, Heineman feels that he is "employed by the directors of Northwest Industries to do three things: plan, forecast and think." [5] Heineman is a great believer in the advantages of "not being the captive of any particular source of information". He felt a great need to analyze various aspects of the business himself, but saw little opportunity for this without a computer-based system that would reduce data handling chores.

An experimental system was at first designed to allow executives to retrieve more than 70 predefined reports and to perform limited analyses such as compound growth calculations, variance analysis and trend projections. In January of 1977, the six top executives were given this system. By February, Mr. Heineman had stretched the limits of its analytic capabilities and was demanding more.

The additional capabilities came in the form of a new access and analysis language. It included not only simple file handling and data

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[5] Thomas H. Naylor, "Management is Drowning in Numbers," Business Week, April 6, 1981.

aggregation facilities but also capabilities which facilitate extensive modelling and statistical analyses of data series. To complement these analytical tools, Northwest Industries has continually expanded its executive data base to include:

- . 350 financial and operational data items of planned, budgeted, forecasted, and actual monthly results for each operating company for the past eight and the next four years.
- . 45 economic and key ratio time series
- . several externally subscribed data bases, including Standard and Poors' Compustat and DRI services.

Northwest Industries' system is truly a corporate level EIS system. It is now used by almost all managers and executives in the corporate headquarters to perform their monitoring and analytical functions. The data base is more all-inclusive and extensive than any other we have seen to date. It is constantly growing as new data items and series are added as they are found to be of use.

The driving force behind the system, and its most significant user, is Heineman. Use of the system is an everyday thing for him, a natural part of the job. He believes that the knowledge he can bring to the analytic process from his viewpoint makes personal analysis preferable, in many situations, to handing assignments to staff personnel. He writes many of his own programs. "There is a huge advantage to the CEO to get his 'hands dirty' in the data," he says. "The answers to many significant questions are found in the detail." What is more, instant access to the data base, to try out a thought he might have, is very useful. For this reason, terminals are present at his home and available to him during vacations.

"The terminal allows added insight," says Heineman. "One of a CEO's primary tasks is to motivate people in the right directions. The system provides me with an improved ability to ask the right questions and to know the wrong answers."

Supporting Heineman and others in their development and use of the data base is a small group of information systems personnel who function as coaches to the various managers at the corporate level. They rarely design or program any reporting system. Their primary function is to train and assist users. They aid in helping a user determine whether the data he needs is already available, and whether any additional necessary data can be obtained. They further assist by getting the data into the data base, coaching the users in access methods, and helping the users to understand what sort of analytic routines are best fitted to the particular types of analyses which they desire. Only for major modelling applications do they take part in the system design and programming process.

Why Are These Systems Being Built?

It is important to note that Exhibits 8 and 9 do not contain what is still the most popular choice for executive information support - no terminal based access whatsoever. Despite the thrust of this article, it should be clear that not all senior executives are going to use terminal based systems. For many, given their managerial styles and their view of their roles, the formulation of verbal information requests to computer assisted staff groups will be the closest they

venture to the analytic potential offered by the computer. This is a highly acceptable managerial style, proven through the years.

Why, then, are those who are initiating or making use of executive information support systems doing so? It is not for traditional cost/benefit reasons. We know of no system which has been justified in traditional labor saving terms. Rather, for each executive, the benefits are an improved ability to understand his company's environment and to more confidently take the requisite actions for the future. Perhaps the best sense of the reasons why these systems are built and used are contained in the following quotations from our executive interview notes:

"The system has been of infinite help in allowing me to improve my 'mental model' of the company and the industry we're in. I feel much more confident that I am 'on top' of the operations of our company and its future path."

"Your staff really can't help you think. The problem with giving a question to the staff is that they provide you with the answer. You learn the nature of the real question you should have asked when you muck around in the data."

"It saves a great deal of my time spent in communicating with functional staff personnel. Today, for an increasing number of problems, I can locate the data I want, and I can develop it in the form I want, faster than I could describe my needs to the appropriate

staffer."

"Some of my best ideas come at fallow times between five in the evening and seven the next morning. Access to the relevant data to check out something right then is very important. My home terminal lets me perform the analysis while it's at the forefront of my mind."

"Comparing various aspects of our company with the competition is a very fast way of defining the areas in which I should place most of my attention. The system allows me to do exactly that."

"I think graphically. It's so nice to be able to easily graph out the data in which I'm interested . . . and it's especially nice to be able to adjust the display to see the data in the exact perspective which best tells the story."

"I've always felt that the answers were in the detail. Now, at last, I can pour through some of that detail. That's my style. It used to mean long nights and plenty of staff and lots of frustration. Now, it's somewhat easier. And frankly, it also saves a great deal of my staff time which was formerly spent on routine charting and graphing."

"I bring a lot of knowledge to the party. Just scanning the current status of our operations enables me to see some things that those with less years in the company would not see as important. Although the resulting telephone calls undoubtedly shake up some of my subordinates, I think in the long run this is helpful to them too."

"The system provides me with a somewhat independent source for personally checking on the analyses and opinions presented both by my line subordinates and by my functional staffs. There is a great deal of comfort in being relatively independent of the analyses done by others."

"By being able to work with the data I originally thought I needed, I've been able to zero in more accurately on the data I actually need. We've expanded our data base significantly, but each step has led to better understanding of our company and its environment."

"Frankly a secondary, but very real, advantage of the use of the system by me is the signal it gives to the rest of the company that I desire more quantitatively-oriented management of the organization. I want my subordinates to think more analytically, and they are. I feel we're on the way to becoming a significantly better managed company."

As the comments suggest, what emerges from all of our interviews is that the principal thrust of EIS systems is to assist top executives in their search for a deeper understanding of their companies and their industries. We do not yet fully understand how broadly, or in how many different ways, this class of systems will ultimately be used. What does appear to be fairly certain, however, is that the several trends noted at the start of this paper favor the increasing use of these systems by analytically-oriented executives. This segment of the top executive ranks is today increasingly discovering that there is a new tool available which facilitates a more data-intensive approach to management.