1-1-1980

The Information Needs of Business with Special Application to Managerial Decision Making

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THE INFORMATION NEEDS OF BUSINESS WITH SPECIAL APPLICATION TO MANAGERIAL DECISION MAKING

Working Paper 80-112*

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CONTENTS

THE NATURE OF BUSINESS DECISION MAKING

Business managers spend a significant portion of their time making choices among alternatives, that is, making decisions. These decisions always deal with the present and the future of the firm, since the past is known and cannot be changed. Because the future is not certain, the outcomes of each of the alternatives considered in decision making cannot be predicted precisely; that is, each alternative contains some degree of risk. Typically managers seek to maximize return on investment and, at the same time, minimize risk of loss. These are usually conflicting objectives since the outcomes with higher anticipated return usually have higher risk associated with them. Since managers want to reduce risk wherever possible, they seek as much relevant information about the future as possible.

These essential elements of alternatives and uncertainty-induced risk are the rationale for the existence of managers since, if there are no choices to make and no risk involved, there would be no need to hire someone to make decisions. Information provides a way of determining the alternatives available and of assessing the associated risks.

The information needs of business can be divided into three parts:

1. record keeping
2. management of ongoing operations
3. strategic planning.

The record keeping function is basically historical. It involves collecting routine repetitive data such as inventory levels, sales, accounts receivable and payables, credit ratings and the like. Although often involving large expenditures and currently increasing at a rapid rate to cope with the increasing regulation of business, record keeping

is done at the lowest levels of the organization and is not central to the decision process. It does, however, provide a perspective and framework which guides decision makers insofar that they assume that the past will continue into the future.

The management of ongoing operations, usually performed at middle management levels, is concerned with day-to-day phenomena. Here information is needed on the current situation and decision rules, be they rules of thumb or advanced techniques generated from Management Science, are applied routinely and repetitively. The decisions involve such mundane questions as how many inventory items to order and when to order them, routing and scheduling of items through production lines, management of waiting lines, pricing to meet challenges from competition, hiring and firing of personnel, and supervising the record keeping functions.

Strategic planning is the role of top management. Here information is needed that describes current alternatives, future possibilities, the societal and business environment, the competitive and political environment both here and abroad, new technological developments that may pose threats or provide opportunities, as well as the historical and operating information that describes the company and its capabilities. It is strategic planning decisions that determine the future of businesses. In this chapter we will focus on the strategic planning aspects of businesses and the evolving information environments that are changing the way in which strategic planning is being done.

Central to these changes are the revolutions in both computer technology and telecommunications. Our discussion therefore begins with a review of the changes that are taking place in these areas.

FROM DATA BANK TO DECISION SUPPORT SYSTEM

When a new technology is introduced, it tends to look and be used like the technology it replaced. The early automobile, for example, looked like and was used in the same way and over the same roads as the carriage with only the horse replaced. So it was with computers. The initial computer applications were for recording and organizing information. They simply mechanized existing record and filing systems. Examination of what computers are used for in business shows that a large fraction of the usage is for entering information, merging old information with new information, and sorting information into retrievable form. Thus, computers find major application as data banks. These data banks are essentially lists, whether they are customer records or parts lists or the New York Times Index. The data bank approach emphasizes the collection and maintenance of very detailed data about various aspects of a business. It is typically geared to supporting record keeping and specific routine operations (e.g., inventory, ordering, billing, accounting) rather than supporting management decision needs.

The concept of a data base proved to be the step forward needed to make the information in the data bank useful for operational decision making. A data base is an integrated non-redundant collection of stored information.

A simple library catalog analogy will help in understanding the data base. In a conventional library card system, information about a particular book is kept in several places including subject, title, and author indices. Each new entry or change (e.g., replacement by a new edition) requires changes in several locations. In the data base approach, all data on each volume held are kept together on a single

"card" which contains the author, title, call number, publisher, publication date, acquisition date, subject categories, etc. Inquiries made of this data base can be in terms of author (e.g., H. Melville), subject (e.g., whaling), date of publication (e.g., last three years), and, most important, any combinations of these categories. The computer provides a complete listing of all entries that meet the criteria of the inquiry. Thus, a publisher trying to decide whether to reissue Moby Dick can rapidly find out about competing editions as well as other competitive aspects of the market.

It is the integration and the non-redundance that are the key characteristics. No longer does a firm keep separate records for accounting and finance and personnel and marketing and production, with great overlap and duplication. Rather it maintains a central information file that can be used by all parts of the organization for both operations and planning. Data bases have many advantages, two of which are important to us here. First, they assume that changes need to be entered in only one place (e.g., a female employee marries and changes her surname or a selling price is changed) not in several places (e.g., personnel records, payroll, or catalog and billing). Second, a data base can be used to assist various parts of an organization, from routine operations to decision making. In providing information for decision making, the data base is the backbone of a management information system.

A management information system provides an organization of past, present, and projected information about both the internal operations of the firm and its external environment. The purpose of this organization is to condense and filter data in such a way that it becomes information usable in decision making. The management information system typically

is used to generate reports that managers can use to solve problems. Thus, in a good management information system, the focus is on decision-oriented reports rather than routine aggregations of information. However, such systems are rare. Among the reports typically generated by an information system are regularly scheduled documents that record inventory levels, provide project budget status, and summarize sales and orders booked. More important for top management are the exception reports that forewarn of difficulties and crises and the special study reports that are designed to answer specific questions. Table 1 lists the information that may be included in a sophisticated management information system.

Management information systems were developed during the 1960's. By 1967, a reaction had set in. In a famous, provocative paper, Russell Ackoff talked about "Management Misinformation Systems."[1] Ackoff argued that the problem in management information systems was not the conventional wisdom that managers were receiving too little information and that they all would be right if only enough information could be stored. Rather he believed that managers were receiving too much data, which overwhelmed them and actually hindered the decision process. He felt that a good information system did not just provide information, but provided perspective as well, highlighting what is important and eliminating what is trivial. The fetish for having but not using computer printout that develops in some corporations is illustrated by the story, perhaps apocryphal, that in one company the president one day inserted a

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[1]Russell Ackoff, "Management Misinformation Systems," Management Science 14 (December 1967): B147-156.

TABLE 1

CONTENTS OF A MANAGEMENT INFORMATION SYSTEM

INTERNAL INFORMATION	Examples:
Activity Information	Production scheduling, inventory control, credit management
Status Information	Work in process, customer accounts
Resource Information	Personnel, materials, facilities
Resource Allocation Information	Capital budgets, personnel assignments
Planning and control	Plans, budgets, variance reports
EXTERNAL INFORMATION	
Politics and government	Political, legal, legislative developments regulations, monetary and fiscal policies
Society	Demographic, cultural, societal trends
Economy	GNP, economic indicators
Technology	New products and processes
Supplies and Suppliers	Raw materials, labor, subcontractors, energy
Competition	Prices, products, market share

$100 bill in the middle of the printout received by each of his 13 vice presidents daily. By the end of the day, only one of the 13 bills had been discovered.

In institutional terms, the typical management information system has come to be a provider of large amounts of detailed data to middle managers. Such systems do not really resolve the problem of assisting in top level decision making. The decision support system approach

(see, e.g., Keen and Scott-Morton[2] or Alter[3]) adds the idea of providing decision rules and decision models tailored to the specific decision faced by a specific manager. Decision support systems are designed to use the decision maker's understanding of the problem and judgments in an interactive, computer-based process leading up to a decision. This is a much more sophisticated approach in that it implies that merely providing information is not enough; the information must be tailored to the problem and must be coupled to the specific decision and decision maker; that is, it must take the human factor into account.

Decision support systems provide a strategy for making computers useful to top management in firms, where the decisions to be made are rarely routine and where the decision tasks are relatively unstructured. The implementers of decision support systems have come to the realization that the computer and information environment must adjust to the manager, not vice versa. Thus, for example, good decision support systems accept input and translate output to the language of the decision maker. Furthermore, the emphasis is on support. The information and suggested actions are viewed as aids to the evaluation process of reaching a conclusion, not the definitive answers to be accepted blindly. In the view of Keen and Scott Morton the decision support system is a

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[2]Peter G. W. Keen and Michael S. Scott Morton, Decision Support Systems, An Organizational Perspective (Reading, MA: Addison Wesley Publishing Co., 1978).

[3]Steven L. Alter, Decision Support Systems, Current Practice and Continuing Challenges (Reading, MA: Addison Wesley Publishing Co., 1980).

scratchpad for the manager in which the manager is able to create alternative solutions to the problem and use the leverage of the computer to determine the anticipated results of each alternative. Because of the ability to deal with "what if" types of questions, decision support systems require both a strong data base and a computational capability that allows processing the information in the data base.

TELECOMMUNICATIONS AND INFORMATION

The changes in information storage and retrieval for decision purposes has been aided immensely by the advances in telecommunications. These advances have included the use of telephones for data transmission and for computer conferencing (discussed further below) and the introduction of satellite communications in routine business operations. In information terms this growth in telecommunications services has meant that both centralization and decentralization could take place. By sending information over long distances to centralized computers, it became possible to make decisions at headquarters that were previously made in the divisions and field offices of a company. Some argue that we are seeing an erosion of the decisions made by middle managers and that the trend to centralized decision making on routine operating questions will accelerate. Such a trend would have serious implications for the mix of skills required by business.

At the same time that there is a centralization of decision making there is also a trend toward decentralization through "distributed" data processing. In distributed data processing there is decentralization of information and information handling made possible by using a network of computers interconnected by telecommunications. Each organizational unit has its own minicomputer or microcomputer system to handle its own

data needs and can communicate both with the central computer and other computers in the distributed network. From an information standpoint, distributed data networks introduce some redundancy but enable local, autonomous operations and hence improved service.

INTERIOR VERSUS EXTERIOR INFORMATION

Most of the business information referred to thus far has been information generated within the company about itself. Organizations do not exist in a vacuum. They operate in a competitive environment that is impacted by and impacts on society as a whole. Thus, businesses require large amounts of information about the external environment. This information ranges from technical developments to actions and intentions of competitors to present and anticipated government regulations and taxes to local, national, and global political developments, to name just a few. Strategic planning involves consideration of both the abilities of the organization (finances, capital investment, human resources) and the external environment. In those companies where strategic planning is advanced, environmental scanning is practiced regularly and large libraries of information are kept about the world outside the company.

MANAGING CRISES

Information needs become most acute in time of crisis. Crises arise in all organizations from time to time, even the best managed ones. They may be the result of external actions (e.g., an oil embargo) or internal failures (an accident such as Three Mile Island). They almost never repeat; that is, each is seemingly new and involves unique circumstances. At the time that a crisis occurs, decision making and

planning activities are suddenly compressed in time. It is no longer possible to examine a problem from every possible angle or to leisurely gather additional data. Actions have to be taken and they have to be taken now. Here, the organization with an information system in place and with its people trained to cope with crises will, in most cases, does better than the organization that works by the proverbial seat of the pants under such conditions.

The key to successful crisis management is having the information needed to make decisions in a form that relates to the new problem being faced. The time compression implies that most of the information needed for the decisions must already be available. Furthermore, the decision makers have almost no time available for learning. To use the approach of trying to fight the current crisis by what is known from past crises is not likely to work; it is analogous to the general who tries to fight the next war like the last one. History almost never repeats. Therefore, decision makers must have training that enables them to cope with future crises. Contingency planning based on alternative future scenarios is one approach to such training.

The development of scenarios about the future is a developing art. Scenarios are not science fiction. Rather, they are carefully thought out extrapolations of the present into the future. A good scenario has three characteristics:

- it must be possible
- it must be plausible
- it must be consistent.

Possible refers to feasibility. The scenario should not call for conditions which are not technically feasible such as travel faster than the

speed of light or are not economically feasible such as capital expenditures that are ten times the GNP in constant dollars. A possible scenario may still not be plausible; that is, it may not be believable. The user of the scenario must feel that the situation forecast, although far different than the current situation, could take place. Finally, the scenario must be internally consistent. A scenario, for example, should not include both a ban on nuclear power plant construction and a tripling of national nuclear power use.

Scenarios can be written in two forms, tomorrow's newspaper and tomorrow's history. In the newspaper form, the conditions that exist at a particular point, for example on January 1, 2000, are described and it is assumed that the reader either knows or does not care what happened between now and then. In the history form, the scenario describes the sequence of events that "occurred" between now and then as if the events were being chronicled by the historian of the year 2000. In either case, the preparation of scenarios involves knowledge of the past and considerable information about the possible events that can happen in the future.

It can be anticipated that businesses working to survive in an ever more uncertain future will undertake multiple scenario generation and development of contingency plans for them. The INTERAX system, developed at the Center for Futures Research of the University of Southern California, is typical of the management training that can be done to cope with crises. In the next section we describe INTERAX to indicate the range and scope of planning information and training that is beginning to come on the scene and will be much more evident in firms over the coming years.

INTERAX

The INTERAX system[4] generates alternative futures by using analytic models and human analysts in an interactive simulation. Each simulation produces a single possible scenario. The procedure, illustrated in Figure 1, is based on the following underlying assumptions:

1. The future is not predetermined but involves both uncertainty and human will.
2. Existing trends will continue unless natural limits are approached or external changes occur.
3. External changes are uncertain as to their nature, timing, and magnitude of effect.
4. The desirability of social conditions is a value judgment that does not obey fixed criteria.

Trends are physical, social and human processes which describe the state of affairs under investigation. These trends may be quantitative (e.g., gross national product, population) or qualitative (quality of life). Physical changes (e.g., scientific breakthroughs, nuclear accidents) are inherently uncertain and not fully controllable. Social changes are the results of policies taken by various organizations in an attempt to manage evolutionary conditions.

In INTERAX, trends and physical changes are described through computer-based analytic model whereas social changes are based on the

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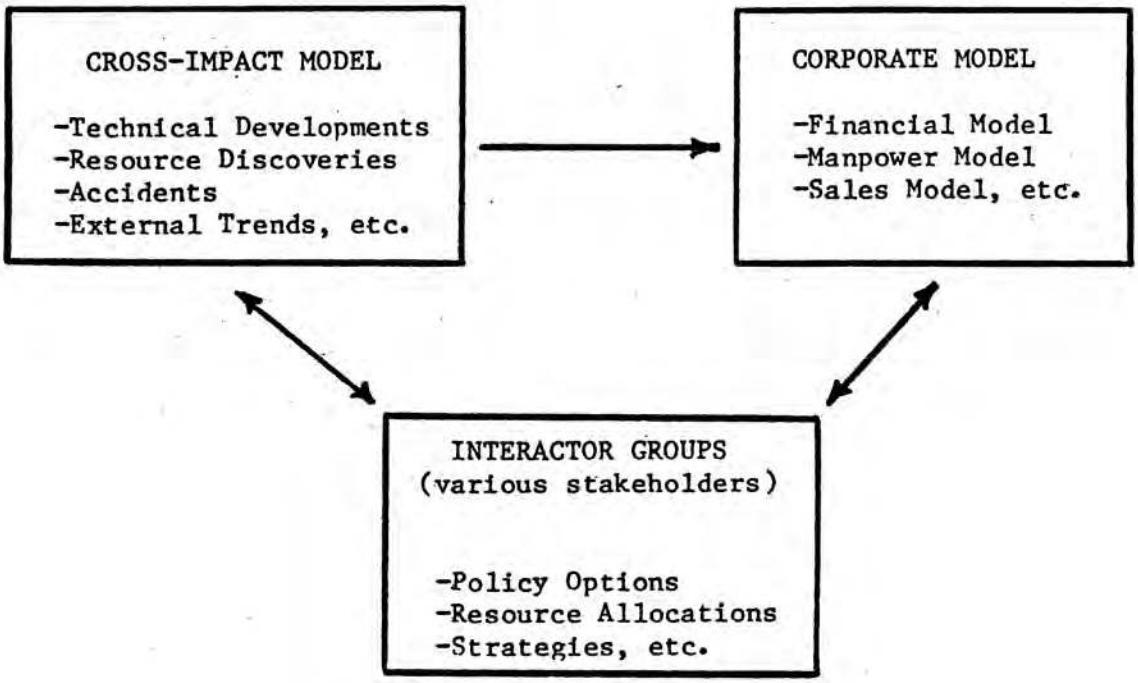
[4]Selwyn Enzer, INTERAX--An Interactive Model for Studying Future Business Environments (Los Angeles: University of Southern California Center for Futures Research, 1980).

Figure 1. Scenario Generator



deliberations and decisions of people simulating interest groups and decision makers.

The corporate model describes the way the company works in terms of variables routinely used in the firm to evaluate performance. The Interactive Financial Planning System, econometric models and other standard forecasting models of the firm are used. The corporate model generates information for fixed time intervals into the future.

The cross-impact model is a simulation model in which random numbers are used to determine whether particular events did or did not occur in a particular time interval. The occurrence and non-occurrence of events (e.g., a depression or commercialization of electric-powered cars on a mass scale) is used (1) to modify the value of trends (e.g., Gross National Product or automobile sales) and (2) to modify the subsequent likelihood of occurrence of other potential events (e.g., commercialization of steam powered cars). The cross-impact model determines the outcomes of events on a period-by-period basis. The simulation is interrupted after each period and all occurrences in that interval are reported. The model updates the likelihood of occurrence (that is, the probability) of each of the remaining events in light of the outcomes in the prior periods and awaits the inputs from the interactors (i.e., managers) before proceeding to the next interval.

An interactive analysis proceeds through the following steps:

1. A long time (e.g., 20 years) is divided into shorter intervals (e.g., 2 year intervals).

2. Current conditions and expectations contained in the corporate and cross-impact model are reviewed by the interactors.

3. The interactors evaluate the data presented to them and decide on what policy changes, if any, should be made.

4. The policy changes are incorporated into the two computer models.

5. The computer models then determine which of the remaining events occur and projects trend values for the next interval. The results of this step become the new current conditions and expectations in Step 2, and the process is repeated for the next interval.

With the completion of all intervals, one possible scenario is described. The scenario describes which events occurred, what values the trends had, and the policy decisions that the managers serving as interactors made. A narrative is usually prepared that describes the rationale behind the policies chosen. If they try another run of INTERAX, different results will be achieved because of the use of the random numbers. For example, a particular scientific breakthrough may occur in one run but not in another; even if it occurs, it may occur at a different time and in a different relation to events and trends.

Attempting to manage an issue under constant uncertainty is similar to the situation faced by managers in the real world. The benefits obtained from trying to solve problems interactively as they unfold are a heightened awareness of the types of situations that may arise to thwart even well-conceived policy choices and an understanding of the follow-up actions that can be taken after the initial choices have been made. By running the model many times with different management groups, it is possible to develop a richer appreciation of the situations likely to be encountered in the future and to determine what responses are

likely to work. As a result, the frequency of surprise is reduced when the transition is made to the real world under crisis conditions.

The use of a model such as INTERAX requires the generation of considerable information about a business and its environment. Typically, the INTERAX model will contain forecasts about several hundred potential events and trends, some dealing with the world in general and others industry or corporate specific. The services of consulting firms that specialize in forecasts can be used to obtain many of the external and some of the industry forecasts; others, however, have to be generated within the individual company.

ADVANCES IN COMPUTING

Other developments in computing in the late 1970's are improving the ability to manage crises and improve long-range planning. We will focus on three developments here:

-the personal computers

-interactive planning systems

-graphic display of information

These developments, when combined with some of the other capabilities in computing and communication referred to earlier, make possible the developments in telecommuting, teleconferencing, and advanced decision rooms to be described later in this chapter.

PERSONAL COMPUTERS

The continual miniaturization of electronics led to the development of minicomputers affordable by small firms and then microcomputers, usually referred to as "personal computers." These units are being sold

in 1980 at prices starting at $500, with the most popular models and accessories running slightly over $1,000 for home and $4,000 for business use. Forecasts of the personal computer market indicate that cumulative sales by 1990 will be 25 million or more units, of which on the order of 5 million will be for business uses. While most of these units will be used for the more routine work of business, many will be used to assist middle and upper level managers in their planning efforts.

"Personal" is the key operative word. Each manager can, at a cost less than a month's salary, have at his or her fingertips the basic planning data that they need for their work. The typical office of the future will see a personal computer on most managers' desks. These machines will contain custom-tailored data bases and decision support algorithms. They will also be interconnected to the company's central computer system and able to gain access to "videotext" and other centralized information systems.

Videotext systems are data retrieval systems that allow individuals to access large data banks. These systems are being developed as network information services for both the home and business market. In a typical system, large data banks are made accessible by phone lines at nominal cost. The provider of the network information service collects information and stores it in a central computer. Phone line inquiry brings the information up on the screen of the user. Videotext services offer the information sources that will be needed as part of the environmental scanning activity.

INTERACTIVE PLANNING SYSTEMS

With the broad dissemination of the personal computer, the problem of overabundance of information pointed out by Ackoff must again be

faced. Managers must be able to put the information in context. The development of interactive planning systems provide one means for doing so.

Interactive planning systems refer to computer software that allows managers to perform planning activities in an on-line, real-time mode. Such systems, to be successful, must be able to use extremely simplified, natural-language instructions. Several such natural-language systems were developed during the 1970's and the trend toward increased use of natural-language programming concepts is well-established.

The Interactive Financial Planning System (IFPS) developed and marketed by EXECUCOMM of Austin, Texas, is typical of such systems. Figure 2 shows an example of a simple 5-year forecast based on current values and assumed growth rates of 10% in market and 7% in selling price. Built-in functions compute net present value (NPVC), the measure of effectiveness for the problem. The important point of Figure 2 is not the specifics of this particular language or program; rather it is the idea that easy-to-use languages in which individuals can be trained in less than two hours are becoming available. Such languages promise to overcome the typical executive's fear of computers. Furthermore, these languages have "what if?" capability; that is, it is possible to examine a whole range of alternatives by asking the computer to change assumptions. In Figure 2, for example, the effect of a change in market share from 25% to 15% is examined. Uncertainty can be taken into account. In extensions under development, optimization routines to find the best answers are being developed.

Figure 2

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MODEL MODEL2  VERSION OF  07/01/80  20 45
10 COLUMNS 1981,1982,1983,1984,1985
20 TOTAL MARKET=100000,PREVIOUS TOTAL MARKET * 1.10
30 MARKET SHARE=.25
40 MARKET=TOTAL MARKET* MARKET SHARE
50 SALES=MARKET*UNIT SELLING PRICE
60 UNIT SELLING PRICE=10.50,PREVIOUS UNIT SELLING PRICE * 1.07
70 CONTRIBUTION TO PROFIT =0.20*SALES
80 INVESTMENT=50000,50000,25000,0,0
90 PRESENT VALUE=NPVC(CONTRIBUTION TO PROFIT,.25,INVESTMENT)
END OF MODEL
     ? SOLVE
MODEL MODEL2  VERSION OF  07/01/80  20 45 -- 5 COLUMNS 8 VARIABLES
ENTER SOLVE OPTIONS
     ? ALL
```

	1981	1982	1983	1984	1985
TOTAL MARKET	100000	110000	121000	133100	146410
MARKET SHARE	.2500	.2500	.2500	.2500	.2500
MARKET	25000	27500	30250	33275	36603
SALES	262500	308963	363649	428015	503773
UNIT SELLING PRICE	10.50	11.24	12.02	12.86	13.76
CONTRIBUTION TO PROFIT	52500	61793	72730	85603	100755
INVESTMENT	50000	50000	25000	0	0
PRESENT VALUE	-8000	-8453	12785	47848	80863

```
ENTER SOLVE OPTIONS
     ? WHAT IF
WHAT IF CASE 1
ENTER STATEMENTS
     ? MARKET SHARE=.15
     ? SOLVE
ENTER SOLVE OPTIONS
     ? SALES,PRESENT VALUE

***** WHAT IF CASE 1 *****
1 WHAT IF STATEMENTS PROCESSED
```

	1981	1982	1983	1984	1985
SALES	157500	185378	218189	256809	302264
PRESENT VALUE	-24800	-41072	-34729	-13691	6118

GRAPHIC DISPLAY OF INFORMATION

In 1975, Henry Mintzberg, writing in Harvard Business Review,[5] observed, "I was struck . . . by the fact that the executives I was observing -- all very competent by any standard -- are fundamentally indistinguishable from their counterparts of a hundred years ago (or a thousand years ago for that matter). The information they need differs but they seek it in the same way -- by word of mouth." The rapid advances being made in computer graphics are beginning to make this observation obsolete.

Computer graphics refers to the technology which converts numbers stored in the computer into pictorial form. One of the barriers to using computer-generated information has been the inability of people to absorb the large amount of data provided. By presenting the data in the form of graphs, managers do not have to sort their way through reams of printout to make sense of information.

The benefits of computer graphics are twofold: they save time and they improve decision making. By presenting information in pictorial form it is possible to find changes, interpret information, and communicate complex sets of findings to others more quickly, all of which reduce the time managers need to process information and permit them to examine a broader range of alternatives.

What computer graphics does is not new, since pictorial information in the form of maps, graphs, charts and drawings are a staple of management briefings. The change that is taking place is the ability to

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[5]Henry Mintzberg, "The Manager's Job: Folklore and Fact," Harvard Business Review (July-August 1975): 49.

examine rapidly the effects of alternatives in a form that is easily grasped and acted upon.

A few examples of the use of graphics in decision making is helpful in understanding what they do. The following are among the applications reported by Takeuchi and Schmidt:[6]

- preparations of maps for reducing the uncertainties associated with oil exploration, thereby affecting decisions on where to drill
- selection of sites for new car dealerships
- determining the areas of best advertising opportunities
- planning of space allocation in shopping malls
- allocating police resources in high crime areas

The technology of graphics is improving rapidly and, at the same time, costs are going down. Two-dimensional and three-dimensional color graphic displays are routinely available on both stand-alone graphics computers and as accessories to both small and large machines. In the years ahead the trend to three-dimensionality can be expected to increase as holographic techniques are developed.

TELECOMMUTING

Historically most organizations have one or more central places of business, often at downtown locations. Each morning and evening, people travel to and from work, creating the traffic jams and other ills associated with urban commuting. In recent years it has become evident that

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[6]H. Takeuchi and A. H. Schmidt, "New Promise of Computer Graphics," Harvard Business Review (January-February 1980): 122-131.

the need to gather people in one place to work is no longer necessary for many corporations, particularly those that are in information-related businesses (e.g., insurance, banks). Examination of what people actually do in offices indicates that there are large armies of clerks who spend most of their time creating information that is stored in the computer or dealing with information generated by the computer. Since, as we have implied by our previous discussion, the computer can be anywhere and the people using the computer can use telecommunications to gain access to the machine, it is no longer necessary to collocate individuals who work for a particular firm. The concept of moving work to where the workers live rather than moving the workers to where the work is goes under the name "telecommuting."

Extensive studies of the substitution of communications for transportation[7] have shown that this form of business organization has economic advantages to both employers and employees, as well as having major implications for conservation of energy. In the basic concept, individuals go to work at a place close to where they work. If they change assignment, they merely change the data base with which they work. Supervision is split into two parts: local supervision of work attendance and work habits and remote supervision of work content through teleconferencing (see next section).

Telecommuting is a significant new possibility that was made feasible by the new information technologies. It carries the concept of

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[7]J. M. Nilles, et al., Telecommunication Substitution for Transportation: Options for Tomorrow (New York, NY: John Wiley & Sons, 1976).

distributed computer networks one step further to the concept of distributing the data gathering and data dissemination functions of business decision making.

TELECONFERENCING

Teleconferencing systems are computer and telecommunications networks that allow video, audio, and data communications among widely separated groups of people. That is, teleconferences are electronic alternatives for groups meeting in person to exchange information and/or make decisions. Teleconferencing is a form of telecommuting. Such systems are available at three levels:

-audio teleconferencing, the extension of the conference telephone call to groups of people located in multiple conference rooms. Although a number of systems are in use, audio teleconferencing is probably a transient phenomenon. The most difficult problems in audio teleconferences are determining the order in which people are to talk and identifying who is talking.

-computer teleconferencing in which messages are exchanged via computer terminals. Computer teleconferences offer the capability for conferences that are extended in both time and space. Each participant in such a conference types messages into a common file and is able to read the messages of others. Because of the storage capabilities of the computer, participants do not all have to be present at the same time. This results in giving participants the ability to give measured, well thought through responses to the statements of others and also provides a permanent record of what is said. Such conferences require a strong chairman to keep them on track. They open new vistas. For example, in one computer

teleconference in which the author participated, effectively all the researchers in the world, including those in Canada, the United States and Europe, working on telecommuting were able to exchange views. Teleconferencing has also proved to be useful in a wide range of applications from the passing of routine administrative information to holding committee meetings to performing consulting without travel (i.e., a form of telecommuting) to crisis management.

-video conferencing in which participants sit in the equivalent of a television studio and can see one another. Such systems have been offered commercially in the United States (Bell Telephone's Picturephone® Meeting Service among 14 cities), England (Confravision), Canada, Australia, and Japan. Typically such systems involve people coming to a public conference room located in the center of a major city, although privately run systems are used by some very large corporations. Video teleconferencing systems are, in a sense, attempts to reproduce conventional meetings for people separated in space.

Of the three systems, audio teleconferences are the least satisfactory. Video conferences have the advantage that they allow large communications substitutions for transportation since more people can participate and travel costs are eliminated (at the expense of rather high communications costs). However, video conferences, while they allow distant participants to be seen as they speak, are still qualitatively different than face-to-face meetings and require participants to adjust to this difference. Computer teleconferencing is perhaps the most innovative but also the one that is strangest to new users. It also seems

better suited to people at staff level than to operating executives who, in present environments, live under high pressure and do not have (or think they have) the time to do the contemplative work necessary for conferences dispersed in space and time.

Teleconferencing systems are in their infancy and can be expected to have extensive development during the remainder of the 20th Century. Being a new communications medium, teleconferences are going through the same sequence as other new technologies; initially attempting to reproduce face-to-face meetings as faithfully as possible. However, teleconferences are really a new way of transmitting ideas and information. As such, we can anticipate that they will change over time and become a unique way of meeting the information needs of business.

THE BOARD ROOM OF THE FUTURE

The various developments discussed in this chapter: advances in computers and computer graphics, advances in telecommunications, telecommuting and teleconferencing, all come together in the executive decision making facilities of the future.

In most business organizations, when members of the Board of Directors or groups of executives meet for making decisions, they gather in a room that is little different than the ones their predecessors met in a hundred or more years ago. Technology is evident only in the electric lights and perhaps a telephone. The only information they have available to them during the meeting other than what is in their heads is contained in a few memoranda or a notebook containing financial and other reports. They may receive verbal briefings with the aid of charts. The information, in short, is static and cannot be changed to consider the implications of new alternatives. Yet, as we have seen in

this chapter, the new set of technologies provide capabilities for enhancing this information environment by:

-providing rapid information retrieval

-rapid evaluation of new alternatives

-visual display of complex information

-participation of individuals located at remote locations.

A few companies have built advanced environments that make use of these capabilities and one or two experimental facilities are being developed at universitites. In these "board rooms of the future," the physical environment is still very comfortable and plush. High resolution graphics terminals are used to display information to be seen by the group as a whole. Video screens project the faces of participants at remote locations. There is complete two-way transmission of information and what is displayed at one site can also be seen at all the other sites. Individuals participating in these meetings may sit around a conference table as in the past or they may have their own table with both workspace and their own personal computer to allow them to obtain the data that they need during the deliberations.

The computing facilities for individuals would be set up to minimize the need for typing. "Touch screens" have been developed where alternative sequences of preset questions set up in menu form can be used to obtain answers to a wide variety of problems.[8]

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[8]The avoidance of typing will be important probably through the mid-1990's while pre-computer-era trained managers are still active and in senior positions. Under any circumstance, the knowledge of computing required will be minimal, with the power of new languages helping to reduce dependence on these skills even further.

In trying to assess how the new information technologies will be used in the advanced environment, we must return to the nature of decision making meetings. Consider the following scenario of a typical planning decision:

The Manufacturing Vice President proposes that a new plant be established overseas for producing semiconductor "chips," the heart of the electronic devices marketed by the company. He comes to the meeting with a set of briefing charts that outline the proposal in terms of its financial and human resource needs and the anticipated benefits to the company. He briefly describes the staff studies that considered various alternatives and presents a recommendation to invest $100 million in Third World Country X.

At once a series of questions are asked: Is this expenditure necessary at all? What happens if the company tries to use its existing facilities? Is the government of Country X stable politically? Is the labor supply in X adequate in numbers and skills? What are the risks of expropriation? Why not build in Country Y which offers a subsidy for new industry? Would the company be better off building two smaller plants, one domestic and one abroad? How sensitive are the projected contributions to profit to the assumed growth in sales? How sensitive is the assumed growth in sales to changes in the national economy and the world economy? Are there technological developments on the horizon which, if they occurred, would make the proposed plant obsolete earlier than planned? The list of serious questions is large. For many, the manufacturing vice president has answers because of the staff work done in advance; however, some bring new consideration into play. It is in

resolving these new issues that the enhanced information capabilities come to the fore.

If the question is one of fact, (e.g., the space capacity available in the company) the company's data base can be consulted. If a particular expertise is needed that is available at another company location (e.g., on competing technologies) the individuals with that expertise can be brought into the meeting by video or other teleconferencing. If new alternatives are to be considered (e.g., the Country Y option), the "what if" capabilities can be tapped and the answers displayed for all to see. The data can, in fact, be presented graphically and comparisons of the alternatives shown directly. If a member of the meeting wants to explore an idea privately, he can turn to his terminal and ask the "what if" question without using up the time of the group or, as is often the case, exposing his ignorance to his colleagues. If the answer is favorable, the results can be displayed to everyone; if it is unfavorable no harm is done.

Eventually, a decision must be taken. Here the electronic environment helps in overcoming the usual problems of committee action. Often the wishes of the chairman or other person of authority or the persuasiveness of a dominant personality sway the outcome. Individuals "go along" rather than following their best judgment. Sometimes the chairman makes the decision in a direction which is universally opposed by his associates. By using anonymous voting, (with the results visible only to the ultimate decision maker, if so desired) consensus can be reached both for the problem as a whole and for many of its constituent parts.

The board room just described did not exist at the beginning of the 1980's; however, many of these constituent parts were available in facilities at various firms. The essential ingredient for achieving the full capability is the marriage of information with the computer and telecommunications into an integrated capability.

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