

WHAT INFORMATION DO MANAGERS NEED?

We are seeing increasing evidence that, during the early 1980s, computer systems will be used to serve the specific information needs of managers. As an introduction to this subject, last month we discussed the information handling and decision-making roles of managers. In this report, we address the question of improving the quality of information that managers receive. The question that we investigate is, "How does one discover what information managers need?" In our research, we uncovered two interesting analysis techniques—critical success factors (CSF) and business systems planning (BSP). We begin with a discussion of the experiences of two companies that have used these information analysis methods.

M/A-COM, Inc. is a manufacturer of various types of high technology communication components and equipment for both industrial and governmental use. It has headquarters in Burlington, Massachusetts, and employs 3500 people in its 30-odd business units. Over the past few years the company has been experiencing rapid growth (25 to 30% a year), due primarily to acquisitions. It now has gross sales of over \$100 million a year.

Data processing at M/A-COM has followed the classical route, beginning in finance and then moving into the manufacturing mainstream of the business. M/A-COM has been able to use some of its existing EDP systems in its newer divisions, but the problem of integrating and controlling these various businesses has remained. So in 1977 the people at M/A-COM asked, "What would be an appropriate management information system for us, for control-

ling our diverse business units? Are we gathering the information that our managers really need?"

To help them study their information requirements, M/A-COM became a sponsor of MIT's Center for Information System Research (CISR); we described some of CISR's current projects in our April issue. As a result, several CISR students were assigned to work at M/A-COM, under CISR faculty direction, as part of their study toward masters degrees. They worked on projects aimed at identifying information needed to manage the various business units. This consulting work prompted the president of the company to ask, "What can you do for me? What information can you provide me with so that I can better run this company?"

The president had two concerns. First, since M/A-COM had grown so rapidly, he realized that the information he had used to run a \$10 mil-

lion company was not adequate for running a \$100 million company. Secondly, he knew that others were supplying him with information *they thought* he needed. But, in many cases, this information was not what he wanted at all. He was looking for a logical method to identify the types of information he really did need.

As the study got underway, the president was informed about one technique that the research team proposed to use—the ‘critical success factors’ (CSF) approach developed by Professor John Rockart, director of CISR. The technique helps each manager discover the six or so key areas of the organizational unit that he or she manages that are critical to the success of that unit. For instance, in an automobile company, the top-level key areas might be styling, an efficient dealer organization, tight control of manufacturing costs, and compliance with energy regulations. Having identified these factors, the next step is to determine measures for tracking each factor. Then methods for reporting these measures are created.

The technique sounded reasonable to the president, so he decided to start the study by using it to identify his own information needs. The student/faculty team spent a couple of afternoons with the president, identifying his critical success factors and how they could be measured. The president found that the team’s familiarity with both the business and the industry helped him better determine which factors were really critical to M/A-COM’s success.

Initially, nine critical success factors were identified, but by the second meeting this number was trimmed to seven. For each of these factors, two to three prime measures were identified, for tracking performance. The president was then able to take steps to obtain as much of this measurement data as was then feasible.

The president was pleased with the approach and recommended it for other M/A-COM executives. So during 1978 CISR faculty and students presented several in-house seminars on CSF to the second and third level executives, followed by a CSF analysis with each executive.

Use of CSF has indeed helped M/A-COM identify its management information needs, we were told. And, in turn, it has improved its

data processing planning process. In 1978 a new position was created—manager of data processing planning and control. This person reports directly to the president and is responsible for seeing that the planning emphasizes data processing support of the business’ goals. This manager is responsible for extending the CSF analyses to lower levels of management and for holding yearly CSF reviews for all corporate management. Another responsibility of this new position is to implement (or change) systems to support the CSF analyses.

As an example of an early improvement made because of the CSF analysis, it was found that while an ‘estimated profit margin’ figure was calculated for contracted projects, this figure was not reported in two other desirable ways—by market segment and by product. The studies had found that these figures were measures for critical success factors for several executives. So additions to an existing system were made to provide these figures.

The CSF analysis is quick and easy to perform; it takes fewer than eight hours for each executive, the president told us. Implementing the reporting systems to get the right information to executives is much more difficult, he added. But M/A-COM thinks that the CSF analysis technique has put them on the right track for determining their management information needs.

Twentieth Century-Fox Film Corporation

Twentieth Century-Fox Film Corporation is one of the major film companies in the United States. The company each year produces and markets some 15 films and a number of television programs and has gross annual revenues of some \$625 million. Their headquarters are in Beverly Hills, California, and they have over 5000 employees.

In late 1976 top management decided that a long range information systems plan for the corporation was needed. So they created a new position—corporate information planning director—and filled it with someone familiar with IBM’s ‘business systems planning’ method (BSP). They also decided that their largest division, the feature film division, would be the first to

undertake the creation of its own strategic information system plan, using the BSP approach.

BSP is a methodology developed by IBM for creating a strategic information system plan to support an organization's goals. The approach treats information as a corporate resource that must be managed in order to be useful for decision-making. So discovering what information executives think they need is an integral part of BSP.

To get the project underway, a team was formed of executives from the feature film division and the corporate office. It was headed by the division vice president of finance and administration. Also on the team were the western division sales manager, the marketing services director, the vice president of production administration, the data processing director, and the new information planning director. Over a four month period, these executives devoted about 40% of their time to the project, at afternoon sessions lasting three to four hours each.

Fox organized its BSP study into six steps. For the first step, the team began by looking outside of Fox, at the business environment. It speculated on the future of the film industry, and then determined the information implications of those predictions.

In the second step the team turned its attention inward, studying the film division in some depth. It identified and defined forty-six major activities, or business processes, that take place within the division, as well as which departments perform which activities. And it identified the 'data classes' required by each activity; twenty-four of these were found. Fox discovered that this step provided a good general education for team members, most of whom knew a lot about their own areas of responsibility but little about the rest of the division.

In the third step, the team grouped logically related processes and data classes. From this grouping, an information systems architecture was designed. It shows which information systems use which data classes to support certain business processes.

With the information system architecture in hand, the team moved on to identifying problem areas and delineating information system development priorities. To identify problem

areas, the team interviewed the top fifteen executives in the division. Each interview was structured to cover six points: (1) What are your business objectives? (2) What problems hinder you from meeting those objectives? (3) What information do you need to accomplish the objectives? (4) What benefits would the company receive if you had this information? (5) What business changes do you expect over the next five years? and (6) What do you think of the automated information system support you are currently getting? The team's definitions of the data classes, business processes and organization structure were also reviewed with each executive in order to refine their accuracy.

These discussions uncovered four areas where crucial decision-making information was either lacking, untimely or difficult to use. One was the inability to easily analyze and compare box office gross sales data. Many decisions at all management levels within a film company are based on these figures. Two, there were information gaps in several areas, such as advertising effectiveness and theater engagement profitability. Three, accounts receivable information was not available when needed. And four, there were gaps in foreign sales and expense information.

The team then estimated the cost of fixing each of these information problem areas. And they established a priority schedule for these projects.

In the fifth phase of the study, the team turned its attention to assessing the current data processing situation at Fox—the policies governing the selection and development of new systems, the characteristics of existing systems, past cost trends, user satisfaction, etc. From this study they made a number of suggestions for improvements.

Finally, in the sixth step, the team laid out a timetable for making the information system improvements and implementing the new projects. A new position—manager of special projects—was created in the feature film division to manage the implementation of the recommendations.

Looking back at the study, three things stand out, we were told. One, the study pointed out major shortfalls in the data

processing department. The team recommended that these be corrected before any new projects were started. Two, information deficiencies in the film distribution area became apparent. So priorities were switched from the production area, where an adequate system existed but where an expensive on-line system was being considered. And three, recommendations were made for improving a number of manual systems and procedures.

During 1978, two other parts of Fox—the television division and the corporate office—used BSP to create their own strategic information systems plans.

The company is pleased that they have taken this top-down approach to information planning. And they think that the information systems they develop in the future will better serve management's information needs, as well as be useful longer and easier to operate and maintain.

Lessons from the past

In the 1960s there was much talk about all-encompassing management information systems. These were to be systems that would have access to essentially all operational and financial data and massage it into information useful for management's purposes. As we all know, such systems have not materialized. In our research for this issue, we found a number of interesting theories about why this dream has not come true. We will cite a few of these theories, since they help to better understand the failure and to provide some guidance for developing future systems for management use.

Herbert Simon (Reference 1) theorizes that in the 1960s people were asking, "What else can we do with this information that we have already collected?" By following this approach, information for management proliferated unbearably, in the form of voluminous reports of company operating data. Yet this information, which system designers thought would be useful to management, was mainly ignored.

Why wasn't top management satisfied? Well, says Simon, the system analysts started at the wrong end. They should have asked, "What decisions are being made and what information would be helpful in making these decisions?" In an information-rich society, such

as we now have, the major task of an effective information system is to *filter* information, not proliferate it. So Simon recommends analyzing decisions to uncover the needed information. He goes on to talk about types of decisions, programmed and unprogrammed. These ideas have been expanded by Keen and Morton in their work on decision support systems, which we discussed last month.

In 1965 Robert Anthony (Reference 2) divided planning and control into three levels: strategic planning, management control, and operational control. He also divided management into three levels: general, functional, and operational management. We found that Anthony's ideas are well accepted today as reflecting corporate reality, so we will briefly discuss them.

Anthony's highest planning and control level is *strategic planning*, done by top (or general) management. This planning addresses long-range problems, which generally have a unique occurrence and are unstructured. The decisions require analysis of data collected for the specific problems. An example of an activity at this level might be a merger or an acquisition.

The next lower level is *management control*. It addresses resource allocation problems. These are continuing and cyclical, says Anthony. The decisions tend to be more structured and require summary data gathered on a systematic basis. Both general management and functional (or line) management make management control decisions. An example of an activity at this level might be deciding on plant rearrangement after the decision has been made to acquire a new division.

At the lowest level is *operational control*. It seeks to assure that specific tasks are carried out effectively and efficiently. It is transaction oriented, addressing problems which are repetitive and usually well-structured and well-defined. These decisions are made by functional and operational management. An example of an activity at this level would be scheduling production that incorporates the facilities of the new division.

Anthony points out that computers have historically been used to solve operational control problems, because the data is related to individual events. It is exact data and there are ex-

PLICIT decision rules that can be programmed to perform the control analyses. Only exceptions to these rules need to be handled by humans. These systems can be, and have been, designed for limited areas of application. The problem has been that these various systems usually are incompatible. The systems have been built one at a time, over a period of years, with the result that their data definitions are often inconsistent. So information cannot be easily pulled out of them, compared, and passed on to a management control system.

Management control systems require common data definitions. So, the systems that do exist most often have an underlying financial structure; plans and results are expressed in monetary units. Standard financial data definitions allow a comparison of data across organizational units and over time.

Strategic planning relies heavily on information about the environment outside the company—technological developments, governmental regulations, industry trends, estimates about the future, etc. Internal data (generally historical in nature), if used, often must be recast to fit the problem at hand, says Anthony.

Based on these analyses, Anthony theorizes that companies have been starting at the wrong place to build their management information systems. He believes that the starting point should have been at the *management* control level where an underlying framework of consistent data definitions is necessary. So Anthony bases the failure of management information systems on the absence of an overall framework for information systems, which should have been developed at the outset.

Building on Anthony's and Simon's work, G. Anthony Gorry and Michael Scott Morton (Reference 3) question the wisdom of trying to serve all three planning and control functions with one system. Using the output from operational control systems to be the input to management control and strategic planning systems has two problems, the authors say. One is the question of timing. The operational control system must be 'completed' before the other two can be implemented. But information system development is on-going; operational control systems are never really 'complete,' so the

output from operational control systems is continually changing.

Also, say the authors, this approach does not properly represent management's information needs. Aggregated operational control data is not necessarily the type of information that managers require. The differences among the three types of planning and control are not simply aggregation. There are fundamental differences in the characteristics of the data, the authors point out. Functional managers get most of their information through inter-personal contacts, including much 'soft' (opinion) information; they do not seek only hard, aggregative, or analytical data.

Another distinction that Gorry and Morton see is between the information needs of structured and unstructured decisions. Structured decisions have precisely stated problems and clear criteria by which the solutions are to be judged. These problems, such as the most economic reorder quantity for staple inventory items, have decision rules that are universal. The essential aspects tend to be the same for many organizations, although the details may vary. The typical data processing system today handles these structured decisions well.

Unstructured decisions, on the other hand, are very organization-dependent, say Gorry and Morton. The definition of the problem is ambiguous, and there is confusion about the proper evaluation criteria. To improve these types of decisions, the managers need an improved decision process or better information, or both.

Michael Driver and Alan Rowe (Reference 4) see the problems of building a ubiquitous MIS from yet another view—through the eyes of the manager users. Assuming that a system for providing management information has been developed, and that the managers have easy and convenient access to it, will they actually use it? Driver and Rowe reply, "Maybe not, because different managers use different decision styles, some of which depend on very little information input."

Based on studies and field tests performed by themselves and numerous other researchers over the past ten years, Driver and Rowe theorize that there are four decision styles. The style that a manager uses most of the time for

reaching a decision has inherent, learned, information-using characteristics. These, in turn, indicate a preference for certain types and formats of data, and indicate whether he or she would use a management information system at all, if it were available.

A manager with a *decisive style* makes very quick decisions after considering only a very few alternatives. He or she wants to see only enough summary data to make a 'good enough' decision. Once that decision is made, it is final; the decision maker does not want to hear about other alternatives. 'The buck stops here' expresses this philosophy. Managers using this style are very effective in situations with tight time pressures—yet they make relatively little use of information. Driver and Rowe speculate that if a decisive style manager were given a 'what if' capability in an interactive system, it would not be used.

A manager preferring a *flexible style* of decision making also uses only a small amount of information; but, in addition, this manager may continually absorb new information and may generate newer solutions as the situation changes. Thus the first decision may not be final. This decision maker is more adaptable and is exemplified by the manager who 'rolls with the punches.' The flexible style relies heavily on intuition and affability with others. So Driver and Rowe speculate that a flexible-style manager would probably use an information system only for obtaining summary data, not for studying alternative solutions.

A manager with a *hierarchic style* uses lots and lots of data, to obtain one 'best' solution, in addition to consulting with others. Then the selected solution is implemented with an elaborate contingency plan, so as to control the outcome as much as possible. An example of use might be the development of long range plans. Hierarchic style managers do use a lot of information—all the information they can get to back up their solutions, in fact—so they would use a management information system. But they probably would not use its 'what if' features, say the authors.

Managers with an *integrative style* not only look at large amounts of information, but they also consider a large number of alternatives. They rely more on creative thinking than on

logic to reach a decision, so they often develop highly inventive solutions by combining aspects of several alternatives. Their decision process involves lengthy discussions with others. They are the ones most likely to use an interactive information system, say the authors.

Driver and Rowe point out that no one style is better than another; each is best in certain situations. Most system designers use the integrative style in their own work, so they tend to create systems to support the 'much information, many alternatives' approach. But this type of system creates an over-load of information for decisive and flexible style managers. Thus, say the authors, a system should provide only the type and amount of information that the manager will use. Systems in the past have not taken this aspect into account, hence they have not been properly used, Driver and Rowe speculate.

You may wonder why we have devoted so much space to recounting theories about management information analysis. We have one main purpose in mind. We think that knowledge of this past and on-going research is an important backdrop for our discussion of the two information analysis techniques we are concentrating on in this report. Both of the analysis techniques draw upon some of these theories. So we see the fruits of the various research projects now beginning to become available in practical analysis methods. And these methods appear to be quite an improvement over how most companies typically have been identifying their management information needs. Let us begin by discussing CSF.

The philosophy of CSF

Rockart (Reference 5) identifies shortcomings of several approaches used in the past. One criticism of these is that they do not provide the full gamut of information that functional and top management need. They most often provide only financial data or aggregated paperwork processing data, and rarely deal with external comparative data or 'soft' verbal information, he says. Secondly, these analysis methods do not concentrate on an individual manager's needs. They aim more at organizational functions or positions rather than the individuals that occupy the positions. This dis-

inction is important, says Rockart. What may be useful to one person may not be used at all by another. Ignoring this individuality is folly, he thinks.

So in 1977 Rockart and his colleagues at MIT's CISR began developing a method for defining executive information needs that would overcome these two prime shortcomings. The result of their work is the 'critical success factors' method (CSF). It focuses on individual managers and their current information needs, be it factual or opinion information.

For each executive, critical success factors are the few key areas of the business where things must go right in order for his or her organization to flourish. There are usually fewer than ten of these factors that any one executive should monitor. Further, they are very time dependent, so they should be re-examined as often as necessary to keep abreast of the current business climate. These key areas should receive constant attention from executives—yet most managers have not even explicitly identified these crucial factors, he says.

Rockart finds that there are four sources for these factors. One source is the *industry* that the business is in. Each industry has CSFs that are relevant to any company in it.

A second source is the *company itself*, and its situation in the industry. Actions by a few large, dominant companies in an industry will most likely provide one or more CSFs for small companies in that industry. Further, several companies may have the same CSFs but, at the same time, have different priorities for those factors.

A third source of CSFs is the *environment*, such as consumer trends, the economy, political factors of the country (or countries) that the company operates in, etc. A prime example used by Rockart is that, prior to 1973, virtually no chief executive in the United States would have listed 'energy supply availability' as a CSF. Following the oil embargo, however, many executives began monitoring this factor very closely.

The fourth source is *temporal* organizational factors—areas of company activity that normally do not warrant concern, but which are currently unacceptable and need attention. A

case of far too much or far too little inventory might classify as a CSF for a short time.

Rockart sees CSFs varying from organization to organization, from time period to time period, and from manager to manager.

In addition to these four sources, Rockart has found two types of CSFs. One he calls *monitoring*—that is, keeping abreast of on-going operations. The second he calls *building*—tracking progress of 'programs for change' initiated by the executive. The higher an executive is in the organization, the more 'building' CSFs are usually on his or her list.

One way to use CSF is to list the corporate objectives and goals for the year. These are then used to determine which factors are critical for accomplishing the objectives. Then two or three prime measures for each factor are determined. Discovering the measures is the most time consuming portion of this stage, we are told. Some measures use hard, factual data; these are the ones most quickly identified. Others use 'softer' measures, such as opinions, perceptions, and hunches; these take more analysis to uncover their appropriate sources.

Following these discussions the analyst designs 'report' formats. This step requires studying the existing information systems and data definitions in the company. Other information may be identified, such as that which is not collected or which is difficult to collect. And for softer measures, forms with rating scales on them are created, for recording estimates.

Interestingly, the CSF approach, when used for managers at all levels in a company, improves their communication and understanding of the company. Often, they see for the first time what is really important to their superiors, and adjust their priorities accordingly. Rockart recommends beginning the CSF analysis process at the top of the organization, for this reason. It develops a CSF framework that tends to unify the various management information needs. At least this has proven true in the cases studied thus far, he says.

The philosophy of BSP

The basic philosophy of 'business system planning' is that data is a corporate resource. And, as such, it must be managed from an overall organization viewpoint. Only then can

it best serve the organization's objectives and support its decision-making activities.

The goal of BSP is to discover a stable information architecture that supports all of the processes of the business. Once the basic data needs of a business process (such as purchasing) have been identified, and as long as that process remains basically the same, then the information framework will be stable, say the BSP people. BSP uses this information framework as a basis for future information system planning.

The BSP handbook (Reference 6) describes fourteen steps in the method, two of which are preparatory to the actual study, and one other which involves possible follow-on activities. We shall briefly describe the fourteen steps.

1. Gaining commitment. BSP begins by requiring a commitment from management—either corporate or division management, depending on the breadth of the study. The top executive of the organization is normally the study sponsor. All final study recommendations are presented to the sponsor, for review and approval to proceed. A commitment of one top executive to serve as team leader is also needed. He or she contacts other executives to join the team and then directs the team's activities. It will be the team's responsibility to determine the information needs of the organization and recommend future information system actions. So choice of appropriate high level team members is crucial.

2. Preparing for the study. Preparations for the BSP study are usually handled by the team leader (with outside help, if necessary). These preparations involve creating the study schedule, making out the list of executives to be interviewed, gathering reference materials, locating and equipping a meeting room, etc.

3. Conducting the kickoff meeting. At the initial meeting of the team, the objectives of the study are presented by the sponsor. The team leader reviews any preparations already made, as well as the study schedule. And an overview of the company's information systems is presented by the information systems executive.

4. Defining business processes. In this step the team sets about identifying and describing all

of the activities of the business, such as product development, marketing, purchasing, receiving, etc. BSP calls these activities 'processes.' They are identified independently of the current organizational units responsible for them, so that future organizational changes will not affect the list of processes. Also in this step, the processes that are key to the success of the business are identified.

5. Defining data classes. Next the team groups all of the data used in the company into logical categories; BSP calls these 'data classes.' A data class is information about anything that needs to be tracked, such as customers, vendors, parts, machines, work orders, contracts, etc. A company generally has 30 to 60 data classes; the BSP manual describes several approaches for classifying these.

6. Analyzing business/systems relationships. Now that the team members have studied the business, its activities, and its data, they turn their attention to the company information systems—both current and planned. From this study the team can discover which processes receive no formal information system support, which receive some support, where possible redundant systems exist, and where shared information systems are possible.

7. Determining the executive perspective. Next the team interviews 10 to 20 executives within the top three levels of the organization being studied. The purposes of these interviews are: (1) to verify the organizational assumptions made and the processes/data classes developed thus far, (2) to determine the information needed by these executives, and (3) to uncover their problems and priorities. Each interview lasts from two to four hours.

8. Assessing business problems and benefits. By this stage, the study team has amassed a huge amount of material: research and organizational information, interview summaries, relationships of processes, data classes, organizational structure, and systems, etc. These must all be organized and summarized in order to be useful for determining the corporate information architecture.

To do this, first the team assesses the business problems and opportunities discovered in

the interviews. For each problem stated by the executives, the team considers the importance attached to that problem, the processes causing the problem, other processes that are affected, and possible solutions. The root causes and end effects of these problems are listed.

Using this list the team determines if a problem lies in an existing information system, is caused because no information system exists, or is not an information system problem at all. Some problems can have both organizational and system solutions. The need for better market information, for example, could require establishment of a market research group as well as creation of a supporting information system. The team's charter, however, is to deal only with information system problems (a point that some single out for criticism).

9. Defining information architecture. The objective of this step is to define the information architecture of the organization. The architecture shows the relationship between data classes, processes, and information systems. BSP delineates a procedure for defining information systems in terms of the data they manage to support related business processes. The main criterion is: Which processes *create* which data? The creation of data is important, not just the use of data, because the creator of the data should also maintain it. Data created in one system and used in another is identified. Then sub-systems are identified, either as 'create' sub-systems or 'usage' sub-systems. The team analyzes these sub-systems to see which must be in place before others can be implemented.

10. Determining architecture priorities. In this step the team decides the order in which sub-systems are to be developed. This is based primarily on what would be most useful to the executives, and secondly on classical evaluation criteria, (such as cost, development time, etc.) The recommended first system or sub-systems are then described in considerable detail for evaluation by the study sponsor.

11. Reviewing information systems management. Having analyzed the business processes and the data used to perform them, in this step the team studies the company's information system management policies, in order to iden-

tify the changes implied by the study recommendations. BSP recommends quite an in-depth study of the planning and control aspects of the information system function, taking the point of view of the manager of that function. The study includes looking at the function's objectives, personnel, finances, facilities, applications, data, and users. Implementation of the study team's recommendations may require some fundamental changes in information system management practices. For example, a move to distributed processing could require new funding, cost charge-back, control, and training policies, to name a few. The team lists such implied changes as they study the department.

12. Developing recommendations and action plan. The recommendations from the BSP study fall into three areas: (1) information resource architecture, including the sub-systems that make it up, (2) information system management, specifically the management, planning and control of data, and (3) the sequence in which the systems are to be developed. The action plan describes the costs, potential benefits and schedules for the recommended projects. Generally, several concurrent projects are recommended.

13. Reporting results. In reporting the results of its study, the team hopes to gain approval from the study sponsor to proceed with its recommendations and action plan. The presentation is in both verbal and written form, with the verbal overview for top executives lasting no more than one hour.

14. Overview of follow-on activities. The BSP manual stresses the importance of various people, including users, assuming responsibility for implementing the team's recommendations. And the manual recommends that a steering committee be formed to oversee the information resource architecture. The manual also describes various aspects of the follow-on activities: implementing changes, maintaining and refining the architecture, and developing the first system.

Which way to proceed?

Going back to our original question, ("What information do managers need?"), it appears

that both CSF and BSP will uncover the types of information that managers think they need. But the two approaches are very different—in scope, philosophy, study time, and cost. Are they really comparable? Which will prove to be the wisest choice in the long run? And can they be combined?

These are difficult questions to answer. We do not know the answers, nor have we talked to anyone who does. So let us explore the philosophies of these two representative analysis methods a bit to see where the debate centers. This discussion is not intended to point out deficiencies in either approach, but rather to show that there are unresolved differences that users should consider when evaluating analysis techniques.

It appears that a major disagreement exists in answering the questions: "Should an architecture of the corporate information resource be developed first? Is this a necessary prerequisite to managing information?" As we see it, it does not appear to be a prerequisite for *identifying* management information needs. But then, identification is the easiest step, given a logical and thorough procedure. Supplying that information is much harder. And it is here, in the supply end, that BSP adherents claim that an information architecture is necessary. It is the architecture that assures data consistency, which is a prerequisite, they say, to management control systems. Once the business activities and data have been put together in a framework, then management information can be more easily and quickly obtained. So the BSP adherents say, "Pay now for building an architecture, and you will not have to pay later for trying to integrate incompatible systems."

Rockart, on the other hand, is not too sure that the resulting architecture will encompass *all* of the information that managers will need. He points out that much management information comes from outside the company, whereas the total study approach typically concentrates on improving systems that manipulate internal company information. It often ignores subjective and external information, he says.

CSF, on the other hand, does not necessarily work toward creating computerized systems. It aims at identifying all types of needed information, and then supplying that information in a

reasonable manner—such as by subscribing to a new service, or having a subordinate prepare figures, or supplying the manager with a form on which he can record his perceptions. The ultimate source of information is not preconceived to be a computer system. This is a distinction that allows identification of more types of information—types of more interest to managers—says Rockart.

The people at IBM say that the BSP study is aimed at improving computer support for management, but this does not limit the types of information discussed in the executive interviews. If the executives complain that certain types of external information are lacking, then these will be considered. The ideal of the BSP study is to consider *all* types of information. However, interest in computer systems may influence the team to stress internal and hard data over external and subjective data, since the latter may be viewed as inappropriate for information system applications.

A second point of debate is whether an information architecture would indeed be stable over, say, the next five years. BSP says that as long as a company stays in the same business, the functions that are performed (business processes) and what those functions manage (data classes) will remain relatively constant. And the relationships between these (the architecture) will remain stable. So this architecture serves as a base line for evaluating and adjusting to those aspects of the organization that may change, such as corporate structure, priorities, strategy, external environment, and so on.

Rockart also expects information *needs* to be changing continually. But he sees the *data types* changing, particularly external data which the organization cannot control. This external information most likely will not be stable. And an architecture of internal information will not supply most of the kinds of information executives need.

A third apparent difference between the two approaches is in their viewpoints. BSP sees data from the corporate viewpoint. CSF looks at it from the individual manager's point of view. We suspect both views are needed, but this is a new field, and this question needs more study. It may very well be that companies will find they need some method for co-ordinating

the various 'reporting systems' developed through CSF. This could be an architecture such as BSP recommends.

One of the prime benefits of CSF is that the individual manager's information needs are made known—to himself, to subordinates, and to the data processing department. The BSP people say that their approach will serve individual managers also, once the detailed system analysis is completed. They say that creating a new 'report' will be like supplying parts from inventory. Only the retrieval and formatting programs need to be created once the data is on hand in data bases. This is quite different, they stress, from the made-to-order approach typically taken today, where the response to a new user need is to create a custom-made program and perhaps even create new data definitions and new data files. The people at IBM point out that companies usually see the need for the data-driven approach of BSP after data processing has been unable to fulfill management's requests for data relating several operational control systems or after the cost of integrating several systems becomes exorbitant.

Rockart tells us that CSF can be and is being used to identify information needs of organizational functions as well as those of individual managers. This level of use helps the data processing department better support the various corporate functions.

So we see these approaches having notable differences. But we also see several similarities. For one thing, both techniques take a top-down analysis approach. Then both techniques suggest using a bottom-up procedure for building 'systems' to supply the needed information.

Similarly, we think it is interesting that both of the companies we talked with found it necessary to create new management positions following their use of the techniques. These new information planning executives have the job of aligning the company's information systems with the management information needs, putting the two in better step with each other. And in both cases the position was set up outside of the data processing department, either just above it or along side of it organizationally. It appears that once a company begins to look at management information needs, a person is needed to be responsible for implement-

ing recommendations. Both user companies stressed that they see this type of position as the wave of the future.

So, there are numerous questions to ask about any analysis technique for studying the information needs of managers. The techniques take different viewpoints, but they have the same objective: to better understand these information needs. We expect to see more discussion of this subject during the next few years.

In this report we have dealt with the very narrow subject of *analyzing* management information needs. And, as the users we talked with pointed out, that is really the easiest phase. The collection of pertinent data and the creation of useful systems are much harder. For one thing, there are many obstacles today to implementing management information systems. Let's take a look at some of them.

What are the obstacles?

In five reports within the past 12 months we have stated that a new generation of information systems will begin to offer work-stations for management use, which in turn will be tied to in-house computers, to communications networks, to outside services, and such. Let us assume that the information analysis phase points out the benefits of acquiring such work-stations. Then the question must be asked: What problems lie ahead for providing computer support for managers? Here are just a few obstacles that we think must be faced.

Management resistance to new methods. Management is charged with keeping the enterprise running. So resistance to the adoption of new management methods is understandable. The verbal communications and paper media methods may have their shortcomings, but managers may be unwilling to give them up for strange, new, computerized systems.

Overselling. What has happened in the past is likely to be repeated here. Benefits will be promised that do not materialize (or at least not during the 'probationary' period). The systems will turn out to be more complex to operate than expected. And some 'overlooked' problems will turn out to be real challenges—such as security of the managers' information

files. We will discuss this important subject next month.

Complex user procedures. There are many characteristics of today's interactive computer systems that do not endear them to the casual user (which most managers are likely to be). These include log-in procedures, not only for the operating system but also perhaps for the communication network and various services. A lot of today's systems require cryptic input commands from the user (such as "pdp: database;") and in turn delivers their own cryptic outputs.

'Unfriendly' hardware. The most typical user terminals have typewriter-like keyboards. And many managers simply do not want to type, for a variety of reasons. Others terminals offer function keys, but these may perplex the casual user. Terminals must be 'friendly' if they are to be widely used by managers.

Clearing the hurdles

So what can an organization do to gain acceptance of these new systems, in the face of such obstacles? Once top management is convinced that the new methods are worth a try, here are some suggestions on how to proceed (which are discussed in more detail in our October 1978 issue).

Do not try to introduce these methods to individual managers who show an interest in them. Instead, look for a 'community of users' that meets several criteria. The members of this community should have a lot of regular inter-communication among themselves. They should be aware of and annoyed with the shortcomings of present methods. They should be willing to try new procedures and devices. And the project should be headed by a highly regarded member of senior management.

Then, as one experienced user told us, "Take it easy. Introduce the new methods on an experimental basis." Getting managers to use computer systems will be much harder than getting secretaries to switch to word processing.

The information analysis techniques that we discussed this month will surely prompt data processing management to consider newer, more sophisticated systems for their corporate executives. Even a brief look at the possible obstacles indicates that introduction of computerized systems be taken very slowly and carefully. However, the information analysis phase, by itself, will do much to put information system support better in step with management's information needs.

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Following publication of our March issue on program design techniques, Michael Jackson pointed out to us that the Michael Jackson seminars on structured programming are offered *only* by Michael Jackson Systems Limited, 101 Hamilton Terrace, London NW8 9QX, U.K. We are sorry for any inconvenience our other reference may have caused. (In addition, MJSL offers a COBOL pre-compiler for the method; also, three video-based courses on the Jackson method, featuring Michael Jackson, are offered by DELTAK, Inc., 1220 Kensington Road, Oak Brook, Illinois 60521.)

Prepared by: Barbara C. McNurlin
Associate Editor

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