CRITICAL SUCCESS FACTORS:
AN ANNOTATED BIBLIOGRAPHY

Nancy S. Forster
John F. Rockart

June 1989

CISR WP No. 191
Sloan WP No. 3041-89

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ABSTRACT

Keeping pace with the growing usage of the Critical Success Factor Method is the number of articles that continue to be published on the subject. In this paper we have attempted to make more accessible this wealth of information in the form of an annotated bibliography. To assist in further research we have also included tables of significant articles categorized by the major subject to which each pertains.

1. INTRODUCTION

To a very real extent, the concept of Critical Success Factors has been with us for decades, if not centuries. Writing almost two thousand years ago, Aristotle expressed the idea that leaders should create a few simple goals for their organizations and noted that those organizations that did so fared better than those that did not. Almost two hundred years ago, Baron Von Clausewitz, writing for the German general staff on the principles of war, (On War, 1966) stated nine major principles. One of these was "concentration of forces." Von Clausewitz argued that the "bad" general scattered his forces throughout the battlefields while the "good" general concentrated his forces on the few critical battles that had to be won in order to ensure victory. Peter Drucker, in writing the book The Effective Executive, delivered much the same message thirty years ago. Drucker noted that successful executives focus their time and energy on a very small number of critical problems or opportunities. Other things were either delegated or eliminated.

The concept of first-rate executives concentrating their efforts or "focusing" on the few things that are most important for their organizations is, therefore, not new. In the late 1970s, this concept was moved into the information systems arena. Working from the available literature on managerial "focusing" and the evident need to help corporate executives determine their information requirements, a process was developed at the MIT Sloan School's Center for Information Systems Research (CISR) to help executives determine their business "Critical Success Factors" (CSFs) and the information needed to track progress in these critical areas of the business.

Our original papers, which owe much to Aristotle, Von Clausewitz, Drucker, Pareto, Daniels, and others, were extended by work done here and at other places throughout the 1980s. During the past decade, CSFs as developed by CISR, have gone through three major stages which have evolved largely in response to the concept's three major uses. The earliest use of the concept was to help an individual manager think about his or her information needs. It was not long, however, before it became apparent that a primary use for CSFs was to help a management team think about information systems priorities. Finally, most recently, the CSF process, originally designed to aid in determining information systems priorities, has been utilized by management teams more generally to aid in determining an organization's managerial priorities and the action programs that flow forth from this set of priorities.

What is clear is that the use of CSFs is expanding. The concept appears to strike a very clear managerial nerve and to generate senior management support. Why does the process work? There appear to be a few straightforward reasons. Importantly, the concept is a simple one, easy to understand. It can be carried out in a short time, usually a month or two. Its cost, therefore, is low, and action results. Perhaps most important, however, is that for a management team, a CSF process provides a clear, explicit, and shared understanding of the organization's business environment and the actions which are necessary (be they the development of information systems or other management projects).

During the past decade, in excess of two hundred papers concerning critical success factors have been published in a variety of journals. Both

the concept and the uses of CSFs have been explored and expanded in many ways. Our objective in preparing this annotated bibliography is to make available a summation of this work either for academics interested in further research in the area or for managers wishing to apply the CSF approach to their own organizations.

The following pages represent our best effort at assembling a useful set of annotations. It is necessarily a subjective process. Our apologies to those authors who do not appear herein. And, we extend even greater apologies to those whose work we have perhaps misrepresented in an attempt to summarize it too briefly. For each article, we have not set out to provide an even-handed abstract of the work, but rather to suggest a few key points and insights available. We have tried to highlight those articles that have moved the concept forward as well as to provide some annotations to suggest the range of uses to which CSFs are applied today.

This annotated bibliography has three parts: (1) an alphabetical listing by author of all articles (pp. 4-15); (2) three tables which note the major subject categorization of some of the more significant articles, in our viewpoint (pp. 16-18); and (3) the annotations themselves, in alphabetical order. Not all articles are published or readily available. For those articles that are less available, the reader will find more detail in the annotation (pp. 19-104).

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3. SUBJECT INDEX FOR ANNOTATED BIBLIOGRAPHY

Table 1

MAJOR SUBJECT CATEGORIZATION

	CONCEPT[1]	USES[2]	EXPANDING THE CONCEPT	ASSESSMENT
Anthony, Dearden, Vancil	X			
Bailey	X	X		
Boynton, Zmud		X		X
Brosseau		X		
Bullen, Rockart	X			
Daniel	X			
Davis				X
Day	X			
Dickenson, Ferguson, Sircar	X			
Ferguson, Dickenson		X		
Geller	X	X		
Henderson, Rockart, Sifonis		X	X	
Jenster		X		
Lowery, Thomas	X			
Magel, Houston, Watson	X			
Martin	X			
Mooradian	X			
Munro, Wheeler		X		
Rockart	X	X		
Rockart Crescenzi		X		
Slevin, Pinto		X		
Smith		X		
Vitale, Ives, Beath		X		
Von Clausewitz	X			
Zani	X			

1. See Table 2 for a more detailed view of the CSF Concept

2. See Table 3 for a more detailed view of CSF Uses.

Table 2

CONCEPT

	HISTORICAL ANTECEDENTS	BASIC CONCEPT	METHOD	INDUSTRY CSFs	CSFs ROLE
Anthony, Dearden, Vancil	X				
Bailey			X		
Bullen, Rockart		X	X		
Daniel	X			X	
Day					X
Dickenson, Ferguson, Sircar			X		
Geller				X	
Lowery, Thomas					X
Magal, Houston, Watson					X
Martin					X
Mooradian				X	
Rockart		X	X		X
Von Clausewitz	X				
Zani	X				

Table 3

USES

	MGMT. INFO. NEEDS	INFO. SYSTEMS PLANNING	STRATEGIC PLANNING AND STRATEGY IMPLEMENTATION	EXECUTIVE INFO. SYSTEMS	PROJECT & PROGRAM MGMT.	OTHER
Bailey			X			
Boynton, Zmud		X				
Brosseau			X			
Ferguson, Dickenson						X
Geller				X		
Henderson, Rockart, Sifonis				X		
Jenster			X			
Munro, Wheeler	X	X				
Rockart	X					
Rockart, Crescenzi		X				
Slevin, Pinto					X	
Smith					X	
Vitale, Ives, Beath		X	X			

Table 3

USES

	MGMT. INFO. NEEDS	INFO. SYSTEMS PLANNING	STRATEGIC PLANNING AND STRATEGY IMPLEMENTATION	EXECUTIVE INFO. SYSTEMS	PROJECT & PROGRAM MGMT.	OTHER
Bailey			X			
Boynton, Zmud		X				
Brosseau			X			
Ferguson, Dickenson						X
Geller				X		
Henderson, Rockart, Sifonis				X		
Jenster			X			
Munro, Wheeler	X	X				
Rockart	X					
Rockart, Crescenzi		X				
Slevin, Pinto					X	
Smith					X	
Vitale, Ives, Beath		X	X			

4. ANNOTATED BIBLIOGRAPHY

Anonymous, "Poll Endorses Trio of Planning Characteristics," Computerworld, Vol. 17, No. 14, April 4, 1983.

The Cresap, McCormick, and Paget, Inc. survey on business planning practices found that companies are more successful in information systems planning when their business planning processes include these characteristics: management commitment to planning, wide distribution of a realistic business plan, and use of that plan to monitor performance.

At least 61% of survey respondents whose business planning had these characteristics also achieved the two top goals of information system planning --assurance that business programs will receive needed information systems support, and a wise allocation of scarce information systems resources.

Respondents reported using one or more of the following planning methodologies: CSFs, BSP, internally developed methods, and "others." Except for a slight edge in favor of the CSF methodology, the survey showed marginal differences in planning success related to planning method.

Anonymous, "Critical Success Factors: Improving Management Effectiveness," Indications, Vol. 1, No. 2, Winter 1983, pp. 1-4.

Information technology can improve management effectiveness only after senior executives determine those key business activities they want the system to serve. Assisting them in this determination is the CSF process that links key business activities to management information requirements. In distinguishing between objectives and activities to accomplish those objectives, CSFs help realign the company's MIS with its business strategy and objectives.

The CSF process takes place in several stages. First, an interviewer meets with key managers to identify what each person considers important for the company and for his part of the organization. The critical factors identified are then compiled, and become the basis for discussion when management meets to thrash out different perspectives on what is critical to the success of the business. The primary prupose of this management workshop

is to uncover areas of alignment and nonalignment regarding both business objectives and the CSFs within the management team.

Next, top management assesses how well the information currently available supports the CSFs, discards nonrelated information, and identifies information gaps. As a final step, senior management guides development of an information reporting system to monitor and focus attention on performance of CSF activity. Such a system gives executives a way of measuring effectiveness in critical areas.

Anonymous, "Strategic Planning Amidst Slow Growth," Computer Decisions, Vol. 14, No. 11, November 1982, pp. 28,36.

According to Roy E. Moor, Senior Vice President of the First National Bank of Chicago, addressing the Society for Management Information Systems, a tough period of cost-consciousness lies ahead for organizations which will touch off a new technological explosion. In preparing for this, it is important not to mistake tactical or operational planning for strategic planning, warns John Diebold, a consultant. Bob Benjamin of Xerox agrees, asserting that successful information systems managers must plan strategically. Going even further, General Foods' Ed Schiffer characterizes MIS as a "major force for change" dedicated to enhancing the company's competitive position.

A survey taken at the conference showed the majority of corporate plans look ahead for 3-5 years, while most management information system (MIS) planning is tactical rather than strategic, often initiated to present the MIS idea to top management. Only 40% of MIS/data processing departments have charters or clear statements of mission. Various speakers presented approaches for more effective IS planning, such as the Critical Success Factors method of John Rockart, MIT.

Anonymous, "Kodak's Midss Zooms in on DSS Role," Computerworld, Vol. 19, No. 3, January 21, 1985, pp. 41, 52.

What made Kodak's Market Intelligence DSS (Midss) so successful was painstaking planning, and systems implementation that stressed conceptual rather than numeric goals. Viewed differently than traditional information systems in its input, processing, and output functions, Midss was designed to: assess information needs; measure the marketplace; store, retrieve, and display data; analyze market information; and evaluate impact. In developing Midss, Kodak drew heavily on decision analysis for strategic assumption surfacing and the CSF method to determine what information the DSS should provide.

CSFs were also developed for the DSS project itself:

1982- identify software

      develop application expertise

      obtain management sponsorship

      set up computer-to-computer communications

      select target aplications

1983 - conduct training

      continue developing application expertise

      continue management sponsorship

      identify target users

      position products and services

1984 - develop databases

      develop data stewards

1985 - implement mainframe shared databases

      link micro-based analysis linked to mainframe databases

      implement national networking

      establish database administration and database stewards

      conduct training

1986 - integrate DSS tools and data

      implement worldwide networking

Anonymous, "Society with a Mission," CMA Magazine (Canada), Vol. 59, No. 5, September/October 1985, pp. 36-40.

The Society of Management Accountants of Canada (SMAC) has adopted a phased process for 3-year strategic planning. Early on, goals were defined to position SMAC for future growth and strength. Essential to achieving these goals were the CSFs, identifed as:

1. effective financial management
2. effective human resource management,
3. an effective and efficient decision-making process,
4. employers who value certified management accountants,
5. a strong market position,
6. an effective and robust product development process, and
7. a quality membership base.

In light of these CSFs, 9 strategic areas were defined and the tasks and barriers in each analyzed. In the final phase, consultants collated and filtered the data gathered, and made recommendations to the board of directors. As a result of the process, the SMAC now has a blueprint for moving confidently into the future.

Anthony, R, J. Dearden, and R. Vancil. "Key Economic Variables," Management Control Systems, Homewood, IL: Richard D. Irwin, Inc., 1972, pp. 147-156.

For a management control system to be effective, the system must be tailored to a company's specific objectives, business, and managers. These highly "situational" company characteristics pose a challenge in designing a management control system. Each characteristic must be thoroughly understood along with its implications for systems effectiveness.

The company's control system, moreover, must be tailored to the industry in which the company operates, and to the strategies it has adopted. It must identify the CSFs that should receive careful and continuous management attention if the company is to be successful, and must highlight performance with respect to these key variables in reports to all levels of management.

To develop such a system, the designer must understand the economic factors considered in the decision-making process of the firm. He may benefit from developing an explicit model of the firm, here relying on the experienced executive whose conceptual model of the business, more or less explicit, and more or less detailed, provides insights into the economic implications of his actions on the business as a whole.

Following are the advantages of this decision analysis approach:

(1) The combination of deductive and inductive reasoning about how decisions are made contributes to developing a model of the business.

(2) An understanding of the variables that an individual executive considers leads to a better understanding of his function and its relationship to other parts of the business.

(3) The explicit models that result from this analysis reflect a manager's thinking and can therefore be validated in terms of his own experience.

Understanding why one company outperforms its competitors requires an understanding of management's strategy and decisions to emphasize certain aspects of the business. If performance of those aspects is critical for success, then identifying "CSFs" and developing timely, concise measurements to monitor their performance is an important task for the designer of a management control system.

Bailey, Susan W. "Using the Critical Success Factor Method to Develop a Strategic Managerial Action Plan," Master's Thesis, M.I.T., May 1987.

Although the CSF approach has wide application as an information requirements tool, some companies are using it to discover higher-level management issues without going into the detailed systems development process. This thesis is a case study of a Norton Company Division and the Index Group, hired to assist division management in uniting on a common view of future directions and developing a strategic action plan.

Only two of thirteen CSFs developed by Norton were related to systems, while the others were general action steps. Reponsibility for each CSF was assigned by the divisional Vice President and specific projects related to achieving each CSF were outlined in a detailed action plan, with completion dates established. Thus, the development of action plans replaced that portion of the CSF process concerned with systems development.

The steps in Index's CSF process included:

(1) background scanning to stimulate strategic thinking

(2) kick-off meeting to develop the vision

(3) participant interviews to draw out insights

(4) Index analysis to combine and analyze insights

(5) alignment workshop to get agreement on mission, objectives, CSFs; to identify measures and information needs; to set priorities; and, to assign ownership

(6) analysis and definition of action plan.

Although many of the actions were cut short by an increasingly negative business environment, the CSF process was viewed as a valuable tool for developing strategic action plans. It was getting the managers to think strategically even more than the results that proved useful.

Norton found that the CSF process should include a review either every six months, or as divisional CSFs change in response to changes at higher levels within the firm. With the general and long-range results of their action plans, tracking progress and holding managers accountable for implementation of solutions became an important part of the process.

Band, William, "Develop Your Competitive Strategies for Growth," Sales & Marketing Management in Canada, Vol. 26, No. 10, November 1985, pp. 32-33.

A recent study suggested that leading companies in Canada share several basic characteristics, including:

1. a commitment to value,

2. a sense of mission,

3. a desire for leadership,

4. a focus on CSFs,

5. above-average growth , and

6. commonly held values.

Despite their good intentions, however, most business people today are more concerned with growth, which has been slow in Canada in recent years. Five trends contributing to this slow growth are:

1. changing demographics,

2. mature infrastructure,

3. overcapacity,

4. increased competition from offshore suppliers, and

5. weak gross national product expansion.

Baxter, John D. "Managers: What's Critical to Your Success?", Iron Age, Vol. 226, No. 5, February 16, 1983, pp. 37-39.

The CSF approach, now gaining wide acceptance, has given rise to a new line of questions for many managers. CSFs, often implemented as part of a larger effort to develop manufacturing information and control systems, can also be used alone. It is easy to grasp, quick to implement, and centers on the manager and his job. As useful to small companies as to large, the CSF technique works best with upper-echelon executives. CSFs are not effective, however, at the level of first-line supervisor because their scope of responsibility is just too narrow.

While managers may already know their important job factors, the exercise of consciously pinpointing them is new and enhances communication with both subordinates and superiors. Because of this, the exercise can be helpful with organizational alignment problems.

The CSF process includes two interviews with each manager, a workshop where all managers are brought together, and a hierarchical alignment analysis to resolve manager interface problems.

CSFs most frequently noted by manufacturing managers include excellent supplier relations, productive utilization of capital and equipment, and effective utilization of human resources.

Benjamin, Robert I., "Strategic Planning for Information Systems," presented at the Annual Conference of the Society for Information Management, 1982.

In this discussion of strategic information systems planning, Xerox's Manager of Information Management Strategies, Robert Benjamin, introduces the company and its IS function, demonstrates the importance of strategic planning, and describes some techniques used successfully at Xerox.

Xerox found themselves in need of a framework to integrate the strategic plan elements such that they were understandable to all constituencies and could evolve gradually along with business needs and people skills. CSFs were selected to provide that framework. Twenty senior executives and 10 other people were interviewed, and a 5-6 page summary was produced for each, forming the nucleus of a large book circulated among senior management.

Most significant to the company's chief strategist in this process was the insight he gained about senior-level objectives and missions. Senior management as well, found that the CSF results were a powerful assist to a successful consensus process.

Boynton, Andrew C. and Robert W. Zmud. "An Assessment of Critical Success Factors," Sloan Management Review, Vol. 25, No. 4, Summer 1984, pp. 17-27.

The CSF method has been used successfully to identify key concerns of senior MIS management. Beyond the MIS arena, CSFs can be used in developing strategic plans and identifying critical implementation issues; in helping managers achieve high performance; and, in establishing guidelines for monitoring a corporation's activities.

The CSF method has been cited for three principal weaknesses: difficult to use and therefore not appropriate unless analysts possess the capability to successfully apply the method; validity questionable because of potential analyst/manager bias introduced through the interview process; and applicabilty as a requirements analysis methodology questioned because the resulting information model may not accurately represent the environment.

Despite these criticisms, the CSF method generates user acceptance among senior management using a top-down process that facilitates MIS planning. The CSF method works well at the policy, operational, and strategic levels of information resource planning, forming a bridge between corporate strategic interests and IS strategic planning.

While CSFs are less suited for planning within the I/S function itself, they nonetheless can help identify issues that merit close management attention. Moreover, they are useful for requirements analysis in building conceptual models of an organization or a manager's role. This may not be appropriate, however, where managers have difficulty conceptualizing.

A case study of a financial services firm using the CSF method demonstrated that CSFs were effective in identifying the firm's future information infrastructure, and in providing senior management with information for strategic planning. A second case study supported the assertions that CSFs generate enthusiasm from senior managers, improve user communications, and build managerial support for information technologies. CSFs were particularly successful here, in defining organizational information infrastructures. Yet, both cases indicated that lower-level managers may have difficulty formulating meaningful CSFs and specific information measures.

Based on these experiences, a set of guidelines for using the CSF method were developed:

(1) CSFs are an excellent tool for information resource planning;

(2) When translating CSFs to information needs, the use of prototyping is recommended to help bridge the gap between abstract CSFs and specific management information requirements;

(3) The individual managing the CSF effort should understand the organization thoroughly;

(4) Because it is desirable to access managers throughout the organization, a senior manager should be identified to champion the project;

(5) CSFs should not be associated with information technologies when conducting interviews;

(6) Planning can be enhanced by interviewing multiple levels of the organization.

In conclusion, the weaknesses attributed to CSFs can be overcome through careful application of the method, while CSFs' strength as a structured design process for eliciting both MIS plans and managerial information needs is key to its success.

Boynton, Andrew C., Michael E. Shank, and Robert W. Zmud. "Critical Success Factor Analysis as a Methodology for MIS Planning," MIS Quarterly, June 1985, pp. 121-129.

A CSF study at Financial Institutions Assurance Corporation (FIAC) yielded a list of corporate CSFs. Using this list as a basis for discussion, FIAC conducted a staff retreat to focus on organizational changes brought about by internal growth and environmental change. The participative nature of the CSF process, evident at the retreat, helped make implicit corporate goals explicit, resulting in their inclusion in the planning process. The CSF approach and staff output together provided an excellent structure for the staff's subsequent strategic planning session.

The CSF analysis had major impact in four areas: the information system plan that refocused FIAC from operations-driven to information-driven; the new corporate attitude toward data processing as a driving competitive force; staff productivity increases due to increased information availability; adoption of the CSF methodology in information resource planning, strategic planning, and individual goal setting.

Two factors observed during the CSF project contributed significantly to its success. First, CSFs allowed the MIS planning effort to focus on business strategies and tactics and only later translate them into technology issues. Second, CSFs' intuitively appealing nature and top-down design prompted senior management to buy into the project early.

While CSFs were well received by FIAC, only senior management found the methodology useful. Lower-level managers had difficulty relating to the broad set of corporate CSFs, and defining concrete measures to represent their individual CSFs. These skills, however, are improving over time.

Following is a set of CSF guidelines gleaned from FIAC's experience: (1) CSFs are flexible and may entice users to be too casual; (2) the CSF project

manager should understand the business thoroughly; (3) an executive champion for the project is helpful; (4) staff members should be educated on CSF methods before the interviews; (5) CSFs should not be linked explicitly to information needs, computer applications, or anything concrete, during the initial interviews; and (6) interviews should be conducted on several levels of the target group to validate responses and lead to a broader picture.

Brosseau, Andrew C. "A New Role for Critical Success Factors: A Case Study of a Strategy Implementation Application," Master's Thesis, M.I.T., May 1987.

Understanding environmental factors and choosing appropriate strategic responses is a challenge for today's management. The CSF method, traditionally used in determining management information needs, and information systems planning, can also be used in strategy implementation. Although the CSF process remains the same across these applications, its purpose may differ. In the first two applications, the CSF role is one of project selection. The third application incorporates the additional role of "analytical focus tool" in helping managers discover what areas of the business to analyze and then subsequently, what projects to select. While the CSF process is similar through identification of objectives, CSFs, and action plans for all applications, in the later case the CSF process is used twice—once to determine strategic areas and once to select the projects.

Using two cases to examine the first two applications, respectively, the author investigates the newest application in a case study of Gulfstream Aerospace Corp. In addressing strategic areas of the business, Gulfstream hired United Research Corp. as consultants. While the joint project team focused on specific group problems, it took a top-down approach to coordinate solutions that reflected objectives and challenges for Gulfstream as a whole.

Their two-stage approach involved first, an analytical stage to identify opportunities for improvement in the manufacturing group. Beginning the CSF process with the group's top management, they produced an action plan for analyzing division level CSF activities and projects. Here, the CSF process followed the traditional pattern, deviating only in the type of action plan it

delivered. During the analysis, URC used a number of tools including in-depth interviews, management style analysis, and interface studies. Their conclusions were synthesized into a set of manufacturing project objectives.

URC's second stage, project identification and implementation, also began with the CSF process, conducted during a two-day offsite meeting to assure effective communication of project goals and objectives. Division-level CSFs and manufacturing project objectives were combined to develop manufacturing sub-organization CSFs. Following the kickoff was a series of group department rolldowns and discussions of the division-level mission, objectives and CSFs, and manufacturing project objectives. Departing from the traditional CSF method of developing individual CSFs first then aggregating them, the group CSFs were developed in a discussion among all the managers, then prioritized. For each critical CSFs a set of control variables was identified to monitor their satisfaction (similar to measures).

The action plan focused on neutralizing concerns and fixing problems, much like application action plans. Instead of creating individual CSFs for each manufacturing group, URC, using a team approach, created an integrated set of CSFs across all groups. Thus, the approach coordinated group CSF efforts rather than segmenting CSFs across those groups. Nevertheless, the CSFs at each successive level of the organization flowed logically from those above.

These two stages yielded a number of benefits: the first stage led to improved communications, management focus, and cooperation; the second stage to increased communication and focus as well as help in implementing specific solutions in strategic areas. The analytical stage, with its subjective perspective questioned "what can we do and why?" Here the consulting firm gained knowledge of which areas can change and which can impact client objectives. The more objective project selection stage addressed "what should we do and how?" Analytical applications tend to impact the firm immediately because an increase in management understanding of CSFs leads to successful programs. Similarly, increased understanding of the management team and their CSFs by the consulting firm more likely leads to both successful projects and successful relationships.

Bullen, Christine V. and John F. Rockart. "A Primer on Critical Success Factors," Center for Information Systems Research Working Paper No. 69, 1981.

Elaborating upon the CSF method introduced in the HBR article "Chief Executives Define Their Own Data Needs," this paper offers additional background for those planning to conduct CSF interviews. Most essential to successful CSF interviews are the interviewer's advanced preparation and consulting skill. The CSF method provides the interviewer with a logical way of relating to the manager being interviewed, while providing the manager an opportunity to make explicit what is really important to him.

There is no clear algorithm for finding a CSF, yet only a limited number exist for any manager. The challenge for managers is to select among many alternatives and focus his/her limited time on those few things which make the difference between success and failure. Because these areas receive careful attention, performance in each should be continually measured and the results made accessible for management's use.

CSFs relate to a specific manager's situation and must, therefore, be tailored to the industry, company, suborganization, and the role of that individual. The four hierarchical levels of CSFs emerging here demand specific and diverse situational measures, many of which must be evaluated through soft, subjective information not currently gathered in any formal way.

The five prime sources of CSFs include the industry, competitive strategy and industry position, environmental factors (e.g., economy and national politics), temporal factors (areas critical for a period of time), and managerial position. While their sources provide one dimension for analysis of CSFs, two additional dimensions include (1) internal vs. external—situations within the manager's control versus those less so, and (2) monitoring vs. building/adapting—ongoing situations versus those involving change.

CSFs should be developed from top down. Industry CSFs are determined by the technical and competitive industry structure, and the economic, political, and social environment. As these factors change, the industry CSFs change. Further, company CSFs arise from position in the industry. And, finally, individual CSFs are apart from these others. Where company or sub-

organization CSFs have not been explicitly developed, they can be inferred upward from an analysis of individual manager's CSFs.

Individual manager CSFs are influenced by (1) role-related factors which cut across industries and are an integral part of the job, (2) temporal factors related to current problems and opportunities, (3) strategy, objectives, goals, and CSFs from higher-level organizations and individuals, and (4) corporate environment and industry, to a lesser degree.

Three major uses of the CSF concept are: (1) to help an individual manager determine his information needs, by focusing on business issues then moving to information systems in a series of steps that culminate in the definition of data elements; (2) to aid an organization in strategic and annual planning by using industry CSFs to determine corporate strategy, or, corporate CSFs as input to short-term planning; and (3) to aid an organization in its information system planning.

For use in information systems planning, the CSF procedure incorporates these following steps:

(1) the top 10-20 managers of a corporation or division are interviewed to determine individual CSFs and measures,

(2) the CSFs are scrutinized to determine those that are common and therefore approximate the organization's CSFs, and are then verified with organization management;

(3) organization CSFs are charted, highlighting one or more key "information databases" which should receive priority;

(4) top management's information needs (steps 1-3) are fed into the regular IS planning process and prioritized.

Data processing systems and information databases are identified through this procedure. Unlike transaction databases, information databases play no role in day-to-day paperwork but are repositories of information for recall and analysis. Fed only in part from operational databases, they comprise, more significantly, "soft data." Most are designed with inefficient, yet simple and easily understood file structures.

The success of the CSF method in Information Systems Planning result from it providing:

(1) a technique where none previously existed to define information needs and information databases for top management;

(2) an inexpensive planning tool that demands little manager time;

(3) a deeper understanding of how each senior manager views the world;

(4) a vehicle for top management to think about their information needs;

(5) the definition of databases to support the information needs of <u>all</u> top managers.

In a discussion of interviewer procedures and techniques, the objectives of the interview are defined: to better understand the interviewee's organization, mission, and role ("world view") as well as his goals and objectives; to elicit CSFs and measures, and assist the executive in better comprehending his/her information needs.

Pre-interview preparation begins with (1) studying the articles "Chief Executives Define Their Own Data Needs," and "Executive Information Support Systems," as well as background materials on the industry and company; (2) initiating a letter from top management to interviewees explaining and supporting the undertaking; (3) scheduling interviews from least to most senior management; (4) enlisting a key manager to attend the interviews; (5) anticipating objectives, goals and CSFs of each interviewee, and (6) reviewing interview skills.

The interview itself should be conducted in these steps: (1) introduce the CSF method and how it is used to determine the managerial information needs; (2) ask the interviewee to describe his mission and role; (3) discuss the manager's goals (typically one year); (4) develop the manager's CSFs, seeking clarification where necessary. The last and most significant step should involve straightforward questions first, then introduce the perspective of where failure to perform would hurt the most, and finally, ask what would the executive want to know most about his business. During this discussion, CSFs should be cross checked to ensure that no requisite type is overlooked; and, aggregated to ensure that one CSF is not being addressed in multiple ways. CSFs measurable with soft data must be included along with those more familiarly measurable by hard data. Additional insight may be gained by prioritizing the CSFs. Finally, the interviewer must be careful that his involvement is helpful, not directive.

It is also useful to determine measures and sources of measures for CSFs on the initial interview. Eventually, hard measures must be defined in detail to zero in on the contents of the information databases.

Analysis of the data begins with reviewing CSFs against established classifications and dimensions, then against each other. Aggregating company CSFs highlights the most important databases. Once a decision is made to go ahead with a particular information database, a second phase of interviews begins, emphasizing measures and data needed for the measures.

Crescenzi, Adam D. and Jerry Kocher. "Management Support Systems," Management Accounting, March 1984, pp. 34-37.

As the "chauffeur" of the Management Support System, the controller may see his role within the company evolve to include planning and predicting the consequences of contemplated actions. Because he will be able to provide information to management indicating results of future decisions, the controller will be viewed by the manager as critical in the decision-making process.

The article describes a case in which a controller assumed leadership for obtaining information support and successfully employed the CSF method.

Crescenzi, Adam D. and Robert H. Reck. "Critical Success Factors: Helping IS Managers Pinpoint Information Needs," Infosystems, July 1985, pp. 32, 52-53.

While many information systems managers realize that executives need understandable and action-oriented information, they are not certain how to identify this information and implement systems that provide it in an easy-to-use form. To ensure adequate quality, such information must be significant, relevant, reliable, timely, and comprehensible. By employing the CSF method, executives' data needs can be defined successfully.

The CSF approach has two major phases—definition and implementation. Definition begins by interviewing key managers who identify their mission, objectives, and CSFs. In an analysis of interview results, a skilled business

analyst prepares a composite view of the business to discuss at a CSF working session with the managers. Next, managers determine measures for the CSFs enabling a project team to identify MSS opportunities for the business.

During the implementation phase, the system, using the appropriate technology, starts small and evolves with manager involvement. Prototype systems are developed in successive versions to improve the likelihood for success as the system grows in complexity and sophistication.

The CSF approach is effective because it selects the right problems to be addressed and incorporates a top-down process that focuses on what is important to the business and how it should be measured. To make the CSF process work, the right participants must be involved and the right technology selected. If carried out carefully, the CSF process helps bridge the gap between technology and the information requirements of managers.

Daniel, D.R. "Management Information Crisis," Harvard Business Review, Vol. 39, No. 5, Sept/Oct. 1961, pp. 111-121.

A problem plaguing a number of companies is inadequate management information. The data is inadequate, not in terms of quantity but of relevancy for setting objectives, shaping alternative strategies, making decisions, and measuring results against plans. The origin of the problem is in the gap between a static information system and a changing organizational structure, intensified by a period of accelerated growth, diversification and internal expansion.

Organization structure and information requirements are inextricably linked. In order to translate duties into action, an executive must receive and use information. To build a useful management information system, the executive's information needs must be determined. This requires a clear grasp of the individual's role in the organization, his responsibilities, his authorities, and his relationship with other executives. One must conceive of information for him as it relates to two vital elements of the management process—planning and control. Information required to do planning consists

of environmental, competitive, and internal information, all of which must be included in a comprehensive, integrated planning information system.

In reporting internal data, a company's information system must be discriminating and selective. It should focus on "success factors." In most industries there are three to six factors that determine success and must be done exceedingly well for a company to be successful. The companies achieving the greatest advances in information analysis have consistently been those which have developed selective systems that focus on the company's strengths and weaknesses with respect to its acknowledged success factors.

In response to the awakening interest in business information problems, Daniels predicts accelerated development of techniques for creating and operating total information systems, and new organizational approaches to resolving information problems.

Daniel, D.R., "Reorganizing for Results," Harvard Business Review, Vol. 44, No. 6, Nov-Dec. 1966, pp. 96-104.

Because organizational change has become a way of life in U.S. industry, the ability to plan organizational change wisely, implement it effectively, and realize its benefits promptly is essential to competitive performance. At the same time, the penalties for bungling reorganization are getting higher. The purpose of this article is to show common reasons for these failures, and outline an approach to managing change that has proved successful.

This approach, designed to guard against failure, rests on these basic notions:

- The right organizational structure is determined by the firm's requirements for competitive success, its objectives and plans, the "givens" of the present situation, and tested organizational theory.

- Mutual adjustment of a management philosophy and organizational structure to maintain their consistency is essential to any successful reorganization.

The success requirements, those few things that management must do extremely well to prosper, form the starting point for analysis. In most

cases, not all success requirements of a particular company are obvious. In order to identify and define all of them with precision, the analyst must evaluate products, markets, and marketing requirements; understand the manufacturing process and the role of technology; learn the economics of the business in terms of the behavior of costs, prices, margin levels, capital requirements, and the like; appraise environmental forces including the competitive picture; and, identify the critical decision-making functions.

Considered in this light, the success requirements provide insights into: (a) the soundness of the basic organizational arrangement, (b) the specific activities that must be carried on, and (c) the relative prominence of activities.

Few businesses fail to give due organizational prominence to such basic functions as marketing, manufacturing, and finance. But, without clear definitions of success factors, certain key activities can be overlooked in the organizational structure. Clearly defined success requirements also shed light on the relative prominence of key activities and often reveal that functional emphases, historical in origin and perpetuated by habit, are in conflict with today's realities.

Although their importance seems self-evident, the objectives and plans of the firm have been ignored in many reorganizations. Common sense tells us that a company is organized to do something—to achieve some goal. Structure is a means to this end, and changed ends often call for changed means. But while analysis of success requirements, and plans and objectives permit the ideal structure to be defined, constraints in terms of a range of "givens" must be taken into account as well to determine the right structure. The "givens" can be considered the present structure, present style of leadership, and present manpower resources. Together they define the position from which any changes must begin.

Davis, G.B. "Comments on the Critical Success Factors Method for Obtaining Management Information Requirements in Article by John F. Rockart," MIS Quarterly, Vol. 3, No. 3, September 1979, pp. 57-58.

Addressing the possibilities for failure with the CSF method, Davis questions the ability of executives to articulate CSFs that are correct, complete, and sufficient. The reasons for this can be found in four underlying phenomena:

(1) Human capacity for information processing, limited by short-term memory, can deal with only a few CSFs, but, if supported by a computer-based system could be extended to deal with more.

(2) Bounded rationality restricts factors obtained by inquiry.

(3) Limits on humans as intuitive statisticians, especially in evaluating probabilities of events and, in identifying correlation and causality, may lead to incorrect conclusions about the importance or causality of factors.

(4) Biasing factors such as availability of data exist because recent events are more easily remembered and assume importance over historical events. Thus, CSFs, elicited at one point in time, may not be stable over time.

What is needed is an analytical model of the business that can be used in eliciting executive response and evaluating CSFs for relevance, correctness, and completeness. Within this framework the CSF approach can be useful.

Davis, G.B. "Letter to the Editor," MIS Quarterly, Vol. 4, No. 2, June 1980, pp. 69-70.

Davis withdraws his criticism of the CSF method based on his rationale that human capacity for information processing, limited by short-term memory, can deal with only a few CSFs, but, if supported by a computer-based system, could be extended to deal with more. His concern remains that the CSF method will not always elicit the information executives actually need but rather what they feel they need. Nonetheless, the CSF approach has the merit of

addressing one of the most critical problems for systems development: the strategy design criteria.

In distinguishing between executives' actual and perceived needs, Davis feels that the CSF method is more usefully employed in decision support or monitoring systems where exact data needs are unclear and where a "support now, evolve later" philosophy is desirable.

A process of clarification and validation may be appropriate for systems with more stable requirements. This can take the form of a comprehensive business model.

Day, J.E., "The Planning Department's Plan," Planning Review, Vol. 10, No. 1, January 1982, pp. 32-35.

After developing a framework to describe the function of the planning department, Day identifies the CSFs which influence the department's acceptance and performance. First is an in-depth understanding of the planning process and planning techniques; second is experience in administering the process and applying the techniques; third, fourth, and fifth equally are role, clout, and access.

The plan for the planning department should include mission, objectives, and CSFs. Action programs should be specified corresponding to each selected objective, then further broken down into tasks. The tasks, in turn, are listed under one or more CSFs that will affect their successful completion. The five CSFs are rated to determine whether each is a strength or weakness relative to successful achievement of the tasks associated with that factor.

Analysis of the CSFs pinpoint obstacles in successfully completing a task, such as the need to add experienced people, or re-balance skills.

dePaula, Walter B. and Jacques R.N. Billot. "Critical Success Factors for a New Dimension of Information Systems," presented at the Fifteenth National Congress on Computers, Rio de Janeiro, October 1982.

Facing the pressure of high costs, inadequate controls, and poorly identified users' needs, the Rhodia Group undertook this study. Specific problems identified were inadequate participation of top executives in systems conceptualization; gap in understanding between executives and user personnel; and weak systems designs.

Using the CSF approach to address these problems, Rhodia identified the prime sources of their CSFs: major internal activities; competitive strategies and industry position as related to the company's history, culture, market share, geographic location; environmental factors such as economic fluctuations and political factors; temporal factors related to present circumstances; hierarchical position of the decision maker. This classification helped in the analysis of CSFs.

Several conditions for conducting CSF interviews were established: understand interviewee's organization, position, mission, responsibilities, as well as overall strategy, environment, main issues, and opportunities; isolate objectives, goals; do not think "how," generalize, or problem-solve; avoid MIS language to liberate thinking of the interviewee; question the obvious.

The power of the CSF approach was the broad executive vision that resulted along with an action-oriented direction; more selective and pragmatic information systems; "what" and not "how"; restricted subjectiveness in the decision process; accelerated information process; and, more efficient databases resulting from the consolidation of CSFs of several managers. Above all, it was inadequate management participation in the system conceptualization that posed an obstacle to expanding computer service. And, this the concept of CSFs effectively eliminated.

Dickinson, R.A., C.R. Ferguson, and S. Sircar, "Critical Success Factors and Small Business,"American Journal of Small Business, Vol. 8, No. 3, Winter 1984, pp. 49-57, 64, 40.

Critical Success Factors (CSFs) are those events, circumstances, conditions, or activities that require special attention of management because of their significance. CSFs generally:

1. are unpredictable events with significant risk,

2. involve the performance of a key individual,

3. can have serious effects—good or bad—on the company's ability to meet its goals, and

4. involve essential operations, systems, or facilities that require monitoring or contingency plans.

A comprehensive approach centering on critical issues, CSFs clarify assumptions and provide flexibility to management. While CSFs are neutral to the firm, they are conducive to divergent and creative thought about the firm and its problems.

Major areas for using the CSF approach include starting up a company, making initial "go/no go" decisions, getting appropriate legal and accounting advice at startup, and maintaining the importance of cash management in ongoing operations.

Dickinson, R., C. Ferguson, and S. Sircar, "Setting Priorities with CSFs," Business, Vol. 35, No. 2, April/May/June 1985, pp. 44-47.

The CSF concept, a formal process of establishing and maintaining corporate priorities, is an easy-to-understand tool for high-level decision making. CSFs are internal or external events that can seriously affect the firm—for better or worse—and thus require special attention. They provide an early warning system for management and a way to avoid surprises or missed opportunities.

CSFs differ from other management tools for several reasons: (1) CSFs look at a company as a totality. An executive can view CSFs as one dimension

on a two-dimension matrix with corporate elements (organization, structure, systems, programs, controls, finance, marketing, etc., top management decisions, assignment of responsibilities) as the other dimension. Analysis of this matrix provides a checklist to ensure that all relevant corporate elements have been addressed for each CSF. (2) CSFs require careful consideration of priorities in order to identify what is critical. Those involving new development normally demand higher priority than those monitoring existing situations. (3) CSFs define assumptions that are implied when goals are set and plans drawn. (4) CSFs are constantly evolving, providing greater flexibility in decision making.

Because CSFs can be subtle, substantial search and analysis is often required to detect them. Techniques useful in the search include: the onion technique, which probes an issue with questions such as "what must happen for this to occur?", "What will make this happen?"; the systems approach, which focuses on a web of relationships and indicates how one change in a firm generates other changes; checklists that permit executives to gain from their experiences and those of others.

In setting up a CSF program, the CEO should identify CSFs, assign executives to develop the CSF program, determine follow through on each CSF, check information systems, communicate CSFs, and systemitize the process. To avoid unnecessary implementation problems, CSF actions should be consistent with the firm's management style, limited to a manageable number less than 10, and maintain flexibility in the hierarchy of CSFs.

Because the goal of designating CSFs is often the follow-through, action plans and assignments may be desirable. Such CSF-related assignments often cross traditional organizational bounds.

Diesem, J., "Methods for the '80s," Computer Decisions, Vol. 18, No. 21, September 30, 1986, pp. 44, 46.

By combining classic planning methodologies with up-to-date competitive information, managers can effectively plan strategic systems. Such efforts begin by viewing the business as a series of steps, and assessing the value of

the information content of each step. In this way a foundation for using information technology competitively is established. The planning method that helps MIS planners accomplish this best is the one that best fits his/her organization. Following are the choices available:

(1) IBM's BSP is useful in designing overall corporate databases, and identifying business processes and data classes. Because BSP focuses on information rather than systems, however, linking critical business factors to data and process is difficult.

(2) Norton's stages of growth provides a template for assessing applications, personnel specialization, management techniques, and user awareness. It itemizes environments, events, organizational structures, and levels of expenditures for each stage.

(3) Process-driven planning generally contains a precedence network or tasks, responsibilities, work steps, and documentation standards. This type of methodology tries to consolidate the corporation's information architecture, training, and implementation plans.

(4) The CSF approach is useful in corporations where much information is shared by many departments, or when data from existing systems is brought together into a management reporting system.

Cornelius Sullivan has offered a framework to help planners choose a methodology to best suit them (Sloan Management Review, Winter 1985). The basic elements of that framework are systems infusion—the impact of information technology, and system diffusion—the extent that information technology has been disseminated through the business.

Ferguson, C.R. and R. Dickinson, "Critical Success Factors for Directors in the Eighties," Business Horizons, Vol. 25, No. 3, May/June 1982, pp. 14-18.

The board of directors is at least partly to blame for the condition of U.S. companies. There are two major views of the role of the board of directors. One says that the board is primarily responsible for putting the best possible manager at the head of the company, while the other view holds that the directors should do whatever is necessary to make sure that the CEO's

initiatives are sound and major risks avoided. Yet, in either case the dilemma remains as to how the board should do this. It is suggested that the successful functioning of a board depends on identifying CSFs and dealing with them from the perspective of the outside director.

CSFs are factors inside and outside the company that support or threaten the achievement of company goals. Four particularly critical areas for the 1980s include coping with inflation, ensuring the adequacy of financial and management resources, establishing a competitive position, and maintaining an adequate strategy for development.

With their detached perspective, board members can ask the CEO questions that lead to his identifying CSFs and subsequently to developing strategies for dealing with them. In this way, the board directs, at least partially, the activities of the CEO, while gaining awareness of the firm at various levels.

CSFs identified by the board have different emphasis that those identified by top management. The board is most concerned with the firm's state of development and ability to withstand risks, while the CEO emphasizes plans, responsibilities, and the firm's ability to execute plans.

Boards with a conservative view of their responsibilities will deal with CSFs by discussing them with the CEO and offering informal opinions and suggestions. For those more active, the CSFs offer an opportunity to influence direction and development without interfering in operations.

Freund, York P. "The Hows and Whys of Critical Success Factors," The CPA Journal, Vol. LVII, No. 5, May 1987, pp. 30-31.

CSFs, while simple to define, are difficult to implement because they (1) are often confused with performance indicators; (2) may attempt to map goals that are too generic and difficult to measure; (3) do not ensure competitive advantage even if successfully achieved since other companies can set and achieve similar CSFs.

CSF analysis is most effective when (1) conducted top-down; (2) measurement tools and standards of measurement are defined; (3) the format for

presenting indicators highlights trends or exceptions; (4) multiple performance indicators for each CSF or strategy are identified; and (5) automated or manual procedures to report performance in a timely fashion are established.

Garner, Les, "Critical Success Factors in Social Services Management," New England Journal of Human Services, Vol. 6, No. 1, 1986, pp. 27-30.

Control is difficult in public agencies where, in spite of mountains of reports, information on the effectiveness of service delivery is often lacking. How then can social services executives get a handle on the systems they are supposed to manage? While the CSF approach is intriguing for a system as complex and diffuse as a child welfare system, it does not help social services managers organize their analysis because CSF identification relies partly on investigating the major sources of CSFs—industry structure, competitive strategy, environmental factors, and temporal factors. Of these, none are relevant to social services.

What is needed is a way to identify CSFs for social services. The approach suggested here uses the standard concept of process analysis in government operations to identify CSFs and guide their use in setting management priorities. The executive must identify factors that hold at each step of the process to produce the desired outcome; and then determine what key functions his agency must perform if these outcomes are to occur; and what, if not done, will prevent the outcome from occurring.

Because the agency executive does not supervise workers directly or review case records regularly, his levers over agency personnel are limited by politics, time, geography, and tradition. Typically, the executive can most directly influence—although not fully control—the allocation of resources, development of policy, flow of information, and number and quality of external alliances. He therefore will focus on these in making sure that CSFs are observed and met.

Once the factors are identified, the executive's first task is to measure whether the system is meeting the objectives they imply. After designing the

requisite monitoring system, the executive should then ask how external alliances, information flow, and formal policy and resource allocation decisions can be made to strengthen the agency's ability to meet its CSFs. The answer to this question provides a management agenda.

Geller, Neal A. "Executive Information Needs in Hotel Companies," Peat Marwick, Mitchell and Co., 1984.

This study has two major purposes: to present findings on the current state of information gathering and use in hotel companies, and to present plans for use by hotel companies and others to improve their executive information systems. Over 40 hotel companies were studied, and 74 executives interviewed to ascertain information needs and measure EIS effectiveness.

The goals of the hotel companies—almost textbook business goals that could be found in any industry—nonetheless provided an industry perspective and basis for identifying CSFs. Once captured, the CSFs, generic to all hotel companies, had surprising implications, especially for information systems. Of the nine industry CSFs reported, two led the others significantly, and the top three were universal. Yet, information systems were weakest in the two most critical areas and adequate and accurate measures were difficult to pinpoint.

While many factors affect company CSFs, three in particular fit the hotel industry: temporary circumstances that companies encounter; management style and policies such as centralization or decentralization; and, stage of life of the company—startup, growth, maturity, or decline.

In planning a CSF analysis, a company should use industry CSFs as a training tool and starting point for their own study while recognizing that all industry CSFs are not critical for every company. After defining industry CSFs, the first level of CSF hierarchy, the next level, company CSFs, are developed by a trial-and-error process which is instructive in identifying redundancies, refining existing EIS, and matching required measures to MIS capabilities.

Last in the hierarchy are job-specific CSFs which change as functions within the company change. As one looks down the company ladder, critical areas become narrower. Conversely, as one looks up toward top management, the critical issues become broader.

Since measures are an important link from information needs to actual data processing, executives interviewed for the study were asked to list measures useful in monitoring specific CSFs. Of these, the six most frequently cited dealt primarily with the two leading CSFs. In contrast, commonly used industry indicators sometimes had little business value as was evidenced by the fact that when ranked by usefulness and popularity with the same executives, the common indicators were remarkably (although not entirely) different from the useful measures just identified. While the top five indicators were viewed as extremely useful, the two highest priority indicators, venerable old standbys included largely out of habit, had only weak and indirect links to the two most critical CSFs.

It becomes clear that companies wishing to optimize their executive information systems need to identify and report measures that directly monitor areas critical to top management. There is nothing wrong with reporting measures for "peace of mind," as long as they do not displace important direct link measures.

In assessing their currently installed EIS systems, interviewees were concerned with the lack of marketing and competitive data, especially predictive data, the overload of useless information, and lack of timeliness. Budgeting and historical information were considered adequate.

Having established the need for improvement in hotel industry EIS systems, the author presents a step-by-step plan, including schematic diagrams to aid companies in gaining these improvements. While most pertinent to hotel companies, the plan is nonetheless of great general interest. It included the following steps:

(1) establishing a project team and steering committee;

(2) documenting business plans and goals;

(3) defining business unit CSFs;

(4) analyzing information needs;

(5) evaluating the current EIS;

(6) defining the required EIS enhancements;

(7) implementing EIS enhancements;

(8) monitoring CSF performance, and updating plans and goals.

Special attention is given to the development of marketing and personnel systems, including generic information flows, as well as discussions of ways to filter out or pyramid information as it flows up the company ladder.

NOTE: This study is summarized in the article, "Tracking the Critical Success Factors for Hotel Companies," Cornell Hotel and Restaurant Administration Quarterly, Vol. 25, No. 4, February 1985, pp. 76-81.

Gellman, H.S., "Why Should Senior Executives Pay Attention to Information Technology?", CMA Magazine (Canada), Vol. 60, No. 6, Nov/Dec. 1986, p. 62.

After years in a support role, information processing today is creating new revenues and contributing to the profits of many businesses. Information technology now affects almost every function of business and can both improve a company's internal effectiveness and strengthen its competitive position. Good information systems help an organization reach its strategic objectives, and many senior executives are providing leadership to ensure that information technology resources are being used for the right things.

The method of accomplishing this is CSFs. This and other techniques enable executives to send consistent signals throughout the organization about their important objectives and strategies. Information technology makes for a more complex world, but companies successful with it will be the market and business leaders.

Gerrity, Dr. Thomas P. and Adam D. Crescenzi. "Designing Information Systems That Work," <u>Newsweek</u>, April 9, 1984, special advertising section.

The CSF process, used successfully by Index Systems at Southwestern Ohio Steel, included the following steps:

(1) Identify CSFs through executive interviews,

(2) Align individual CSFs with the strategic objectives of the organization utilizing a "strawman" CSF statement,

(3) Review information to determine if and how it supports the CSFs,

(4) Identify key measures,

(5) Communicate CSFs throughout the company. Use CSFs to measure the value of current information. Overhaul existing reports and design new information reporting systems.

(6) Develop prototypes enabling the system to start small and evolve.

Gillin, P., "Critical Success Factors Seen Key in MIS Planning: Executive Guidelines Outlined for CSF," <u>Computerworld</u>, Vol. 17, No. 16, April 18, 1983.

According to Edward McCarthy, V.P. of MIS at American Television and Communications Corp., top management must drive MIS implementation and they can do this with the CSF method of information planning. By their involvement in the first half of the planning process, top management ensures that priorities are established before MIS strategies are formulated. McCarthy says that management actions taken since initiation of the CSF process are its greatest reward.

Some key success variables for using the CSF method are: (1) proper timing, (2) a sponsor to sell the program, (3) executive commitment, (4) a skilled consultant, and (5) publication of a final document describing the CSFs, what MIS will do about them, and when.

Gulden, G. and R. Reck, "CSF Technique Can Apply to Team Management, Too," Computerworld, Vol. 18, No. 26, June 25, 1984, pp. 51, 60.

The CSF process, traditionally used to create management support systems or decision support systems has been expanded by Index Systems, to include four new uses:

1. focusing the information presented in an organization's current management report portfolio,

2. identifying, analyzing, and supporting the definition of new business functions,

3. overhauling the methods and procedures of a business or organization, and

4. supporting strategic and tactical business planning.

Taken together, these new applications of the CSF process, along with the conventional uses, offer a basis for improving the effectiveness of managers. The CSF process, used in an energy resources company to develop management support systems, resulted in immediate productivity improvement and cost savings.

Gunner, H. and G.K. Gulden, "Partnerships Between Executives and Information Professionals Speed Business Strategy Execution," Information Management Review, Vol. 1, No. 4, Spring 1986, pp. 11-23.

Executives often do not have the information they need to execute strategy effectively. To address this issue, information professionals need to form a partnership with senior managers, capturing their interest and encouraging their participation. Together they can replace the traditional management information systems (MIS) which were designed primarily to support day-to-day operations, and produce reports too detailed and lacking in critical information. The new systems can provide executives with information tailored to support their decision making.

Overcoming three barriers to strategy execution--team mis-alignment, inadequate information, and out-of-step management processes—are three techniques including the CSF process, MSS prototyping, and management process redesign. Use of these techniques provides benefits beyond those gained from the information and decision support tools themselves.

Hall, Roger and Malcolm Munro, "Corporate Systems Modeling as an Aid to Defining Critical Success Factors," submitted to Communications of the ACM (with Roger Hall), The University of Calgary, Working Paper #18-85, May 1986.

Applied to a broad range of organizational contexts for information planning, the CSF method relies on the identification by senior management of corporate activities critical to the success of the organization. Research in human information processing, however, indicates that senior managers commonly base decisions on simplistic mental maps of their organization. Complex interacting systems of cause and effect are often poorly understood and can contain counter-intuitive effects that go largely unnoticed. In such circumstances, managers may not know exactly what factors are critical to success, or worse yet, may heed the wrong factors.

Corporate system modeling is useful in overcoming such problems. Specifically, System Dynamics and its complementary computer system simulation language, has been designed to aid the modeling and simulation of complex dynamic feedback systems. The authors detail the stages in building a corporate system model, then provide examples of models.

Whereas the methods for constructing models are relatively simple, gathering information may be tedious and difficult. The map obtained may be biased by subjective resolution of complexity, devoid of feedback loops, completely balanced, and based on false assumptions. If the map is too detailed it becomes difficult to unravel, but if too simple it no longer represents the major determinants of behavior. Once the map has been constructed and causal assertions verified, analysis still presents problems, as often the feedback loops from policy decision to goals become so numerous that the task of policy making seems complicated by map-building. The issue

becomes whether an executive prefers to base policy decisions on an explicit albeit complex map, derived from the best estimates of how the system works, or on a much simplified intuitive map designed to resolve complexity but subject to the deficiencies mentioned. Obviously it is easier to make decisions using the latter intuitive map.

From the authors' experience, the model built at the right level of abstraction enables one to investigate every path and identify the crucial ones, quickly clarify issues, and find stimulation in the search for more creative policies.

A model of the business used in developing CSFs would overcome human information processing limitations and permit the analyst to evaluate CSFs for relevance, correctness, and completeness or to uncover new CSFs. Moreover, corporate systems models can be rich in conceptual ideas concerning difficult policy issues, and can lead naturally to the factors critical to survival, adaptation, and success of the organization that might otherwise lie undiscovered.

Hardaker, Maurice and Bryan K. Ward, "How to Make a Team Work," Harvard Business Review, Vol. 65, No. 6, November-December 1987, pp. 112-119.

IBM has developed a method that helps managers get the whole team on board to ensure that everyone knows where the enterprise is heading and agrees on what it will take to succeed. This method, Process Quality Management, has been the starting point for strategy formulation, funding, human resource management, marketing, and resource allocation for complex projects. Like other planning processes, PQM includes identification of goals and activities central to their attainment, and ways to measure success. But PQM demands an intensive one or two-day session at which all key managers agree on what must be done and accept specific responsibility.

PQM begins with the leader of the management team who involves everyone in the immediate team—maximum 12 people. A neutral outsider should lead the discussions, best held off premises. The group first develops an explicit understanding of the team's collective mission clear enough to communicate

when people have succeeded and are entitled to a reward. Next, they could begin definition of CFSs or, if not relaxed enough, try a 10-minute brainstorming session in which team members list one-word descriptions of everything they believe could have an impact on achieving their mission. Typically, a team's list will contain 30-50 diverse items ranging from things like costs and supplier capabilities to jogging and the weather. Now, the team should be ready to identify CSFs, that is what the team must accomplish to achieve its mission. Consensus on these aims is vital. Like the mission, CSFs are not the how-to of an enterprise, and are not directly manageable. Often they are statements of hope or fear. In a sense, every CSF should begin with "we need...," or "we must...." to express buy-in and agreed-on criticality.

In naming its CSFs a team should be guided by the necessary and sufficient rule. That is, the group must agree that each CSF listed is necessary to the mission and that together they are sufficient to achieve the mission. The CSF list must reflect the absolute minimum number of subgoals that have to be achieved for the team to accomplish its mission, maximum eight. It should be a mix of tactical and strategic factors. Reaching agreement on CSFs usually takes from 1 to 3 hours.

The next sep in PQM is to identify what has to be done so that a company can meet its CSFs. As with the CSFs' relation to the mission, each process necessary for a given CSF must be indicated, and together all those processes must be sufficient to accomplish it. Other useful rules in identifying processes are (1) each business process description should follow a verb-plus-object sequence; (2) every business process should have an owner, the person responsible for carrying out the process; (3) the owner should be a member of the management team that agreed to the CSFs; (4) no owner should have more than three or four business processes to manage. Once the list of important business processes is complete, it is ranked to identify the most critical processes whose performance or quality will have the biggest impact on the mission. To do this, the processes and CSFs in random order are placed on a matrix. The first success factor is scrutinized to determine which processes must be performed especially well to achieve this CSF. The object is to single out the processes that have a primary impact on this CSF. The facilitator fills in a box on the chart for each critical process, identified

for this CSF. Then the list must pass the sufficiency test. The number of CSFs that each process affects is totaled and placed in the count column.

Next, those activities that warrant the most attention must be pinpointed. To rank a process, we need to know how well it is being performed. Using a subjective processs, an A for Excellent through an E for embryonic or no performance is assigned. The quality of each process is plotted horizontally and number of CSFs the process impacts is plotted vertically. Then the team divides the graph into zones to create groups of processes, with the highest risk or opportunity processes found in zone 1. These activities need the team's closest attention if the company is to improve.

That's the PQM process—a never-ending journey to zero defects. PQM, nevertheless requires follow-through. Decide the nature of the improvement needed, and establish relevant process measurements. They apply the needed resources for the appropriate improvements. Revisit the CSF list once a year or whenever a significant change has taken place.

Henderson, John C., John F. Rockart, and John G. Sifonis. "A Planning Methodology for Integrating Management Support Systems," Center for Information Systems Research Working Paper No. 116, September 1984.

(This paper is reprinted in "The Rise of Managerial Computing: The Best of the Center for Information Systems Research," J.F. Rockart and C.V. Bullen (eds.), Homewood, IL: Dow Jones-Irwin, 1986.)

As the role of technology in establishing competitive advantage is emerging, the importance of strategic systems planning and its link the to the strategic business plan becomes even more compelling. A strategic planning methodology must achieve the following goals:

1. link the business plan and information systems plan;

2. provide a means to coordinate the investment in management support systems that are responsive to management needs; and

3. provide a basis for understanding data as a corporate resource through the construct of a strategic data model.

The CSF methodology has been used to identify management's information needs and DSS prototyping opportunities, and is extended in this paper to address needs for executive support and for input to strategic data models. This extension enables validation of proposed CSFs and provides an "early warning" mechanism to alert management to change what is critical.

The expanded method creates a planning context for definition of three products: Critical Information Set, Critical Decision Set, and the Critical Assumption Set, as follows: (see attached). Beyond the Critical Information Set, the product of CSF analyses, there is a need to analyze the critical assumptions underlying the CSFs, and the decision processes critical to achieving these CSFs. Each of the set definitions becomes the basis for a functional analysis of MIS, DSS, and ESS, respectively, and provides insight into a strategic data model that links internal and external data sources.

A test of the extended CSF method was conducted providing a basis for several conclusions:

1. The capability to generate the critical assumption set and critical decision set proved valuable. Yet the executives were less enthusiastic about the critical decision set, perhaps because its related activities are ones they often delegate, while the assumption set is clearly their own domain. Nonetheless, generation and prioritization of the decision set provided a direction for the MIS manager and a means to ensure that investments in DSS would have strategic impact.

2. The methodology provided for integrating ESS, DSS, and MIS through its comprehensive framework for building a strategic data model. The model linked the strategic data needs of top management and the operational and technical needs of the IS organization.

3. The group process techniques used to generate and evaluate the CAS and CDS proved quite effective in challenging and verifying or changing the CSFs.

Horton, F.W., Jr., "Whose Critical Success Factors?", Information Management, Vol. 18, No. 7, July 1984, pp. 26, 29.

Two highly touted approaches to linking corporate strategic planning and information needs assessment are BSP and CSFs. But, while useful, these techniques should not be stretched to do more than they were designed to do. The strength of these methods lies in their stance that information systems should not be planned in a top management vacuum. Thus, using CSFs, broad strategic considerations are progressively messaged by different levels of management, until there emerges a classification scheme for information that the organization needs. The classes of information vary from organization to organization, and from time to time, depending on whether the organization's missions and goals shift. But generally, classes of information and therefore the construction of major information systems remain stable.

Through the development of various matrices that link core business processes with information classes, BSP provides systems developers the wherewithal to translate relatively amorphous and intangible information wants and needs into specific operational information systems. Moreover, such matrices are helpful in moving toward a more rational overall information architecture essential in avoiding proliferation of incompatible, overlapping, and redundant information sources, services, and systems.

One problem with the CSF/BSP doctrine, however, is that the CSFs and related information needs for individual managers can be quite different at different levels in the organization. At some point toward the middle of the organization, when the needs of top management collide with those of the bottom, the need to shoehorn the two arises. And, it is at the bottom of the pyramid that the individuals suffer most as their information needs will have been in a larger or smaller amount predetermined by those above. Information managers must avoid this course and employ Information Resources Management approaches that assume unique information requirements for each person that shift from one decision context to another. The entrepreneurial information manager should try a wide variety of approaches until he/she finds the right mix and match combination.

Jenster, Per V. "Using Critical Success Factors in Planning," <u>Long Range Planning</u>, Vol. 20, No. 4, August 1987, pp. 102-109.

As a means to more tightly integrate the strategy planning and control process with informations systems, recent research has expanded the CSF concept, suggesting that the definition and monitoring of CSFs differs for various strategy types. A study of 128 manufacturing firms indicated that those with higher return on equity: (1) formally identified their CSFs; (2) use these factors to monitor progress in implementing strategic changes; (3) benefited from formally integrated reporting and information systems.

Other firms have found that CSFs, when formally identified, implicitly communicate top management priorities and thereby direct organizational efforts. Provided with a framework to interpret priorities, assumptions, and environmental conditions, employees are better able to execute long-range plans. Explicit recognition and use of CSFs provide, therefore, a planning process/system through which strategy can be formulated and controlled within the firm.

Incorporated in this process are nine steps:
1. provide a structure for the design process;
2. determine elements which influence success;
3. develop a strategic plan or modify current plan;
4. identify CSFs which reflect success of the defined strategy, motivate and align the managers, and are specific and/or measurable;
5. determine responsibilities;
6. select strategic performance indicators which are operational, indicate desired performance, are acceptable to subordinates, and are reliable, timely, and simple;
7. develop reporting procedures;
8. initiate use of procedures by management;
9. establish evaluation procedure.

Reflected in the design philosophy here is the interrelation of strategy formulation and plan execution issues. During strategy execution, planning assumptions are likely to change as time passes. Therefore, getting the right information on developments in critical issues and strategic progress is

essential to management. Furthermore, this specifically identified information is used in communicating and monitoring strategic progress, and measuring key personnel on vital aspects of the firm's strategy and providing powerful motivation for the firm as a whole.

Jenster, Per V., "Firm Performance and Monitoring of Critical Success Factors in Different Strategic Contexts," Journal of Management Information Systems, Vol. 3, No. 3, Winter 1987-87, pp. 17-33.

Planning for management information systems and managing the information systems function must be rooted in the firm's objectives and strategies. One design approach that attempts to align the strategic-MIS linkage is the CSF methodology. In addressing the validity of underlying assumptions about the relationship between business strategy and information systems, this study investigates executive monitoring of CSFs and its relationship to organizational performance across different strategic contexts.

One way of examining the fit between a business strategy and the firm's information systems is by examining the extent of executive monitoring of CSFs and how it relates to strategy types and organizational performance. Specifically, the hypotheses of this study substantiated by the author's research state (1) there are differences across strategy types in the extent to which executives monitor CSFs; (2) there is a relationship between executive monitoring of CSF and organizational performance which differs across strategy types.

Senior executives were asked to assess the extent of their monitoring activity, assuming that the degree of monitoring reflects value. The findings suggest variations in CSF monitoring are concentrated in such functional areas such as general administration, R&D, and human resources, whereas, others, the financial domain, for instance, appear to be monitored uniformly. Because R&D and human resources management are more important to certain strategies, it is not surprising that monitoring of these areas varies across strategy types. Defender strategists more extensively monitor administrative domains. Defenders and Analyzers, like the Prospectors, monitor human resources more than Reactors do.

The analyses of the relationship between monitoring and firm performance revealed the association between executive monitoring and quality and innovation which suggests that our information systems may have a wider impact than usually assumed.

The fact that the relationship between executive monitoring patterns and firm organization varies from strategy to strategy underscores the importance of considering the strategic context in MIS research and practice.

These findings suggest the following propositions for strategy types: Prospector organizations seem to design their MIS systems more horizontally to scan for specific developments in industrial and economic trends and for competitive moves, as well as to control product R&D, product effectiveness and efficiency, human resource developments, and financial position. Defenders, on the other hand, may design their MIS along more vertical lines and emphasize domains. For such organizations, information monitoring appears to support process R&D, production effiency, competitive situations, capital costs, labor relations, and personnel availability. Managers of Analyzer firms are likely to benefit from using vertically and horizontally integrated systems in order to be efficient in a narrowly defined domain. Their extensive monitoring in many areas suggests that their information is a strategic resource used to gain competitive advantage.

In general, Reactor organizations did not emphasize excessive monitoring, but focused on efficiency information. The fairly inconsistent monitoring patterns may explain the generally poor performance shown by Reactors. Both a strategic shift and altered monitoring are likely in a turn-around situation.

Jones, C.M., "GTE's Strategic Tracking System," Planning Review, Vol. 14, No. 5, September 1986, pp. 27-30.

In 1984, GTE management established a formal strategic tracking system to determine whether plans were keeping up with changes as they occurred. The initial assumption was that existing strategic plans were acceptable, that a finite number of things had to be done well to carry out those plans, and that if they were done well the business would meet its goals. The tasks that had

to be done well were called CSFs and were specific and action oriented, and included performance measures.

The purpose of the Strategic Tracking system, reviewed by the president, was used to monitor and track progress against plans. As such, it was designed to:

o   ensure that critical factors tied to the plan,

o   determine if action was being taken, milestones met, and targets achieved,

o   adjust operations reviews to a forward look,

o   complement the financial reports.

Since implementing STS, monthly reports have improved. In addition, STS has sharpened recognition of the critical issues GTE confronts.

Kanter, M., "Information Systems Planning—Use Critical Success Factor Approach," Healthcare Financial Management, Vol. 37, No. 2, February 1983, pp. 43-44.

Hospitals must have timely and adequate information for operational control and long-range planning. The CSF technique constitutes a viable approach for defining information needs that relate to the hospital's operating environment and competitive strategy. CSFs are those areas that must be managed properly for any organization or manager to succeed. They are used as a basis for identifying key information systems that must be designed to monitor the CSFs properly and thereby help in managing the organization better. And, CSFs focus on management, and the essence of hospital direction setting. Once CSFs have been defined and performance measures devised, information systems management must assess information resources available to support CSFs and then design relevant systems for those involved with management of the CSFs.

Kerzner, Dr. Harold. "In Search of Excellence in Project Management," Journal of Systems Management, Vol. 38, No. 2, February 1987, pp. 30-39.

The purpose of this article is to identify those critical success factors present in companies that have a continuous stream of successful projects. The CSF approach may be applied to the project itself, to project management, to the project's organization and environment, and to senior management. Environmental factors in any of these areas can severely impact project outcome. The CSFs in companies with successful projects include: (1) corporate understanding of project management, (2) executive commitment to project management, (3) organizational adaptability, (4) project manager selection criteria, (5) project manager's leadership style, (6) commitment to planning and control.

Leidecker, J.K. and A.V. Bruno, "Identifying and Using Critical Success Factors," Long Range Planning (UK), Vol. 17, No. 1, February 1984, pp. 23-32.

This article addresses the use of CSFs in strategic planning for environmental analysis, resource analysis, and strategy evaluation. Identification of CSFs provides a means for a firm to assess its strengths and weaknesses as well as the threats and opportunities in its environment. These elements are cornerstones of the strategic planning process.

A CSF can be a characteristic or condition, and can be analyzed at three levels, firm, industry, and socio-political. The more macro analyses are less important when designing management information systems or control systems than they are for planning systems that demand perpetual scanning of the environment (economic, socio-political).

Techniques for identifying CSFs include analyses of the environment, industry structure, competition, reviews of industry/business experts, dominant firms in the industry, company assessments, temporal/intuitive factors, and PIMS results. CSF examples are included along with a scheme for assessing the relative importance of CSFs. The profit impact and importance

of an activity are significant factors in CSF identification. Profit impact analysis focuses on major activities of the business, dollars, and changes in performance.

Lowery, Julie and J. Williams Thomas. "Determining the Information Needs of Hospital Managers: The Critical Success Factor Approach," presented at the International Conference on System Science in Health Care, Montreal, Canada, July 14-17, 1980.

Hospital management responsibilities are examined as a basis for identifying their information needs. Techniques commonly used to determine information needs, including unstructured interviews and decision analysis, are reviewed and discarded because of methodological limitations. Overcoming their shortcomings is the CSF method which incorporates a framework for structuring managers' thoughts about information needs.

With this technique, individual interviews follow a questioning protocol based on the manager's monitoring and control responsibilities. The interviewer asks the manager to define the principal functions of the organizational unit; define CSFs associated with each; specify indicators for assessing the status of each CSF; and, specify performance indicators for each function defined.

The manager's information needs, then, consist of the indicators identified, and derive from the manager's "mental model" of the business. CSF's structure assures that information requirements are complete while irrelevant information is excluded. Although the CSFs focuses on management control, planning information is included.

In an effort to improve the Veterans Administration's hospital management information system, an in-depth analysis of management information requirements was conducted and is discussed in this paper as an application of the CSF method. Of 42 interviews conducted, only four managers considered CSF results unsatisfactory. Two were in staff positions and devoted little time to control activities, and the other two were not inclined to use quantitative measures for monitoring performance. The great majority felt that the CSF framework facilitated systematic thinking about information needs, and the

process helped them recognize important service interdependencies and areas for managerial concern.

While the CSF procedure is oriented toward defining report content, it also provides a framework, including data needs, specifications, and hierarchies for structuring an organization's database.

Definition of management information needs is an ongoing activity, and systems developed to provide management information must be sufficiently flexible to accommodate continually changing requirements.

These CSFs provide a framework for communications by concentrating top management attention on what really matters in MIS, and enabling them to evaluate MIS performance in those areas; and, providing the MIS Director a means to validate his own CSFs, and seek keys to success for each.

Magal, Simha R. and Houston H. Carr, "An Investigation of the Effects of Age, Size, and Hardware Options on the Critical Success Factors Applicable to Information Centers," Journal of Management Information Systems, Vol. 4, No. 4, Spring 1988, pp. 61-76.

The use of the critical success factor method has been suggested by several sources as a means of ensuring the success of an organization. In this article, Magal and Carr investigate the existence and nature of CSFs for information centers. Twenty-six CSFs were identified from various sources. The importance of each was rated in a survey of IC managers, and a principal-components analysis was performed to indicate the underlying structure. This paper reports the effect on the composite CSFs of the IC variables' age, size, and hardware options supported.

Magal, Simha R., Houston H. Carr, and Hugh J. Watson, "Critical Success Factors for Information Center Managers," MIS Quarterly, Vol. 12, No. 3, pp. 413-425, September 1988.

This article explores the critical success factors of an information center, and how they evolve over a period of time. The data for the study comes from 311 questionnaires completed by information center managers.

The information center, a facility to support the needs of end users, evolves through four stages that are described in detail. The stages then serve as a framework for analysis of IC critical success factors. Twenty-six critical success factors, previously identified for ICs, are investigated and grouped into five composite CSFs. These include: (1) commitment to the IC concept; (2) quality of IC support services; (3) facilitation of end-user computing; (4) role clarity; and (5) coordination of end-user computing.

The relative importance of the CSFs did not change over the four stages—initiation, expansion, formalization, and maturity—thus suggesting that IC managers need not change CSFs over time. The only exception was that clarity of the role of the IC organization was shown to be more important in stage 3 than in stage 1.

Martin, E.W. "Critical Success Factors of Chief MIS/DP Executives," MIS Quarterly, Vol. 6, No. 2, June 1982, pp. 1-9.

To gain insight into the management of MIS, Martin explores the CSFs of MIS executives in successful organizations. Knowledge of these CSFs is useful both to top management in understanding how to cope with and evaluate the MIS organization as well as to MIS managers in improving their own performance, communicating with their superiors and subordinates, and defining their personal information needs.

In response to a questionnaire, 15 MIS executives identified their CSFs. The number of CSFs averaged 5.9, and ranged from broad and general to narrow

and specific. A common set of CSFs, developed by trial and error from these responses, included 6 factors which characterize most MIS/DP organizations and a 7th important to many:

1) <u>System Development</u>: project management has been inadequate, characterized by large cost and time overruns. Specific concerns include project selection and management, ability to respond in a reasonable timeframe, and development of reliable, timely, and cost effective application systems.

2) <u>Data Processing Operations</u>: concerns here are the continual errors, late reports, availability and response time of on-line systems, and security.

3) <u>Human Resource Development</u>: recruitment, career development, and retention of the technical and managerial personnel in the face of a shortage of qualified people and high turnover poses problems.

4) <u>Management Control of the MIS Organization</u>: specific concerns cited were planning, adherence to budgetary controls, standardization of policies and procedures, and cost control.

5) <u>Relationship with Management of the Parent Organization</u>: this extends to user management primarily and top management secondarily.

6) <u>Support of the Objectives and Priorities of the Parent Organization</u>: aligning MIS priorities with those of the parent and users requires mechanisms for determining and expressing objectives and priorities.

7) <u>Management of Change</u>: involved here is long-range technological planning to support technological change in a non-disruptive manner.

Additional CSFs identified included (1) data as a corporate resource; (2) increased use of common systems; (3) sensitivity to peoples' needs.

Martin, E.W. "Critical Success Factors of Chief MIS/DP Executives—An Addendum," <u>MIS Quarterly</u>, Vol. 6, No. 4, December 1982, pp. 79-81.

Which CSFs are generic to the MIS organization, and which are subject to environmental differences found in different countries? In exploring this issue, Martin compares the set of CSFs of nine MIS executives in the UK with those of 15 American counterparts previously studied. The following five CSFs were common to both groups, and half of each group reported the sixth:

1)   system development,

2)   data processing operations,

3)   human resource development,

4)   management control of the MIS organization,

5)   relationships with management of the parent organization,

6)   management of change.

While there was an impressive degree of commonality between the CSFs of DP executives in the U.S. and U.K., two CSFs revealed differences in the two environments. Industrial relations, important in the U.K. where many DP organizations are unionized, was not an issue to the American managers.
This is explained by the fact that in labor disputes in the U.S., unions strike and try to close down the entire organization, but in the U.K. a common tactic is to selectively disrupt company operations, thus rendering DP particularly vulnerable.

The DP executives in the U.S., unlike those in the U.K., felt that support of the objectives and priorities of the parent organization was extremely important. It was not immediately obvious why this CSF should appear in one country and not the other, but could be the result of an already well-aligned set of priorities in the U.K., or of differences in reward systems and attitudes that are less pressured and competitive in the U.K..

Given the pervasive similarities between cultures in the U.S. and U.K., one might anticipate more significant differences with DP counterparts in other environments.

Mason, Richard O., "Information Systems Strategy and Corporate Strategy," presented at the Colloquium on Information Systems, July 10-12, 1983.

In many contemporary corporations information activities have sufficient power to determine business strategy. The increasing interdependence of business strategy, organizational structure, and information systems is accounted for by three historical processes: rapid innovations in information technologies; widespread new concepts about information; and, extensive development of information-intensive organizational forms.

The information an organization possesses, its concepts for interpreting and relating information, and its manner of deploying information provide economic value just as its use of capital and labor do. Consequently, information systems planning is becoming an integral part of corporate strategic planning and vice versa. To successfully merge information systems planning with strategic planning, executives need ideas, methods, and analytical tools to think integratively about information and strategy.

To meet this need, a variety of new methods have been developed, and are reviewed by the author in two sections—(1) Information systems as the vanguard of strategy, and (2) Strategy as the determinant of information systems. The second section addresses stakeholder approaches, and business analysis approaches, including CSFs. Advantages of the CSF approach are that it focuses on high payoff, critical factors, is fast and inexpensive to administer, and frequently reveals new insights to the executives involved. On the other hand, it is not comprehensive, and results in a snapshot of the business which can be readily obsoleted by major change.

McCartney, L., "Helping Executives Get the Computer Data They Need," Dun's Business Month, Vol. 127, No. 5, May 1986, pp. 87-88.

While the computer is far from being as useful to top management as it could be, help is at hand. Several approaches, developed to meet the information needs of top management, include:

(1) The key indicator system allows management to agree on a set of financial indicators, and use exception reports to focus selectively on areas where performance does not meet expectation.

(2) The total system process, developed by IBM, attempts to define a company's overall information requirements, largely through extensive "top down" interviews with senior to middle level managers.

(3) CSFs, generating the most excitement currently, focuses on the criteria a company needs to consider in order to obtain the desired results.

The mounting interest in CSF has already spawned software products that enable users to store current CSF data in their corporate databases and track it electronically. Collectively known as executive information systems, these products can be produced by Comshare, Pilot, and others. While CSFs could have a major impact on the ways in which senior managers receive and use data, first the reluctance of corporate data processing departments to implement a system of such high visibility must be overcome.

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McIntosh, H.E., "The Executive Information System: A New Dimension in Effective Decision Making," Public Utilities Fortnightly, Vol. 109, No. 3, February 4, 1982, pp. 63-66, 68.

The executive information system puts a large database of variables that affect utility management within direct and easy reach of the executive. The CSFs approach is being used in developing such systems by helping each executive to define his data needs. Information from operational systems is collected, summarized, and entered into the EIS database which also contains planning information collected from outside sources. The EIS provides better time management for executives, direct access to information eliminating the dependency upon staff presentation, and, faster answers to questions.

McLaughlin, D.B., F.L. Shapiro, and A.J. Umen, "Designing Information Systems for Health Care Executives," Health Care Management Review, Vol. 5, No. 2, Spring 1980, pp. 49-57.

The quantity of data generated within health care organizations has risen dramatically due to the increasing complexity of today's health care delivery systems. Some data is useful to decision makers, but often there is too much information for the manager to handle. A new methodology designed to provide only the information necessary is used for the Regional Kidney Disease Program (RKDP) at Hennepin County Medical Center, a multi-institutional provider of end-stage renal disease patient care services. RKDP employs over 250 personnel

itself and provides 46 percent of the dialysis care to the upper Midwest. The administrator and medical director have devoted much of their time toward the achievement of four critical success factors:

1. encouraging patient referrals,

2. maintaining or increasing quality of patient care,

3. keeping tight control on the unit cost of dialysis, and

4. maintaining an appropriate mix of patients in all modalities of care.

Although the four CSFs described above are currently important to the RKDP, they have been different in the past and must be evaluated continually. For example, cash flow was a difficulty four years earlier and a special data system was developed to monitor it. Because this problem has been resolved, the system has been modified, summarized, and finally, put on the "back burner." It is important to know when a system is at the end of its useful life, and turn it off.

McNair, C.J. and William Mosconi. "Measuring Performance in an Advanced Manufacturing Environment," Management Accounting, Vol. 69, No. 1, July 1987, pp. 28-31.

To achieve manufacturing excellence and remain competitive in the world marketplace, U.S. companies must incorporate advanced manufacturing techniques and performance measurement systems into their strategic plans. Such performance measurement systems should capture key elements in the manufacturing strategy, expose non-value-added costs, provide accurate and timely data on cost drivers, as well as accurate records for product costing decisions. In sum, they should ensure attainment of company goals.

People, quality, delivery, and cost are the four critical success factors that need to be measured at every level of activity. Unfortunately, accountants traditionally have focused solely on cost, ignoring the "nonfinancial" CSFs. Proactive management, however, suggests that changing measurements and incentives are critical for successful technology adoption.

Millar, Victor E., "Decision-Oriented Information," Datamation, Vol. 30, No. 1, January 1984, pp. 159-162.

The unblemished reputation of strategic planning will not survive the 1980s unless more enterprises become effective in strategy execution. Vital to strategy execution is a change agent that can motivate an organization to move in the strategic direction chosen by the CEO. Strategic information can serve as that agent by describing the expectations of corporate leadership, performance desired, and measurements of progress toward specific goals. As part of the strategic planning process, these concepts should be defined in terms of strategic success factors.

Millar, Victor E. "Strategy Execution: The Information-for-Motivation Approach," Information Strategy: The Executive's Journal, Spring 1985, pp. 29-32.

Although business leaders hold planning in high regard, their experience with strategy execution has left them dissatisfied. To address strategy execution effectively, the CEO needs strategic information as a change agent to motivate the organization to move in a desired direction. Because strategic success factors can be used to measure successful performance in relation to the planning horizon, they provide the strategic information on which strategy execution should be based.

The benefits of information-for-motivation are that it communicates goals and strategies top down; supplies only relevant information; ensures that information to monitor progress is consistent throughout the organization; focuses on individuals whose performance is critical to success; motivates managers by providing feedback on accomplishments; provides information to measure and analyze managerial productivity regularly; fits management's style by providing a customized system; uses state-of-the-art technology to help executives.

The information-for-motivation approach includes the following steps:

1) determine success factors,

2) review strategic plan,

3) select CSFs which are controllable, simple, and measurable,

4) determine which individuals will be monitored based on their responsible for achieving the CSFs, including as well, some lower-level managers designated to undertake specific CSF-related tasks,

5) select key performance indicators approved by senior management,

6) develop an information system for strategy execution,

7) make prominent use of information.

Munro, M.C., "An Opinion on Critical Success Factors Work," MIS Quarterly, Vol. 7, No. 3, September 1983.

At the Third International Conference on Information Systems, December 1982, the CSF method was criticized as unscientific in that results obtained might be more a function of interviewer perception than an accurate representation of reality. Jack Rockart responded to this challenge saying that the CSF method was a form of descriptive research, necessary and unavoidable in developing theory.

Exploring further the potential for interviewer bias, the author compared the results of Rockart's CSF study of IS managers, with Martin's CSF study of IS managers and concluded that the results were quite similar. While slightly different labels were adopted for each CSF, detailed descriptions were clearly comparable.

An inconsistency did arise between the two CSF studies in the level of concern with control issues expressed by IS managers, but this could have been due to differences in the stages of the companies studied. This comparative exercise indicated that the CSF approach provides reasonably reliable results, yet is not wholly free from an interviewer's bias.

Munro, Malcolm C. and Basil R. Wheeler. "Planning Critical Success Factors and Management's Information Requirements," MIS Quarterly, June 1982, pp. 27-38.

Focusing on critical success factors has been advocated as an approach to defining senior and middle managers' information requirements. This article describes a study of the planning processes in a corporation used for identifying goals, CSFs, and performance measures and standards—the information requirements for managerial control.

In that an effective information system must be designed from the top down, the CSF approach ensures a clear connection between the organization's objectives and managers' information. With information tailored to meet his needs, the manager is more effective and efficient. Moreover, engaging in CSF analysis with the information analyst aids him in understanding his role and that of the business unit in achieving corporate objectives. This, in turn, should lead to better performance by the manager and better direction for his subordinates. CSFs can also provide structure to some managerial jobs previously considered "free form". But, while more structure may be welcomed by some managers, it is viewed negatively by others such as those highly entrepreneurial executives whose success is based on heuristic talents.

For the analyst CSFs make the challenge of determining manager's information needs more manageable. Inherent in the process are natural guidelines as to relevance, accuracy, and timeliness that result from operating within the planning context. Use of the planning process also provides structure for the analyst's interviews, and ensures that critical soft information is not overlooked. Even more significant, the structure prevents managers from overlooking CSFs, because the CSFs are generated in response to stimuli, i.e., goals and objectives, as opposed to relying solely on an individual's limited information processing capabilities (cf. Gordon Davis).

The difficulty of measuring performance in "soft areas" is only partially alleviated by the use of surrogate measures that infer performance. Moreover, an approach to determining information requirements dependent on a commitment to planning is difficult if no such commitment exists.

Finally, as the organization and its environment change, so too will its goals, objectives, and CSF changes. And, the CSF process ensures that CSFs, performance measures, performance standards, and related information are regularly updated.

For these reasons, the CSF method answers the criticism that management information systems activities can be of little assistance to senior executives.

Munro, Malcolm C. and Basil R. Wheeler. "Planning Critical Success Factors and Management's Information Requirements," MIS Quarterly, June 1982, pp. 27-38.

Systems designers, traditionally least successful in developing information systems for senior and middle level managers, can now utilize the corporate planning process to aid in identifying CSFs and performance measures. In this paper, further structuring of activities directed toward defining information needs of managers is based on a study of the planning activities of senior managers in a large resource-based company.

Management control, aimed at ensuring that resources are used to attain corporate goals can become ineffective when those goals are not quantified. Consequently, more detailed intermediate targets are required that translate goals into operationally useful performance measures. These targets or performance measures are generated by the manager's planning activities.

The process of determining information requirements for control purposes consists of 5 activities.

1) Understanding business unit objective: The information analyst and manager study the corporate plan, including its goals and objectives in relation to objectives of the manager's business unit. The currency and explicitness of the corporate plan greatly impacts the straightforwardness of this activity.

2) Identifying critical success factors: For each objective, the manager and analyst identify the CSFs (using brief labels) during one or two discussions.

3) <u>Identifying performance measures</u>: Preferably quantitative, the measures typically address quantity, quality, cost, and time. When quantification is difficult, indirect surrogate measures which infer progress toward an objective may be considered. Once performance measures are identified, standards can be derived from the business plan, consultations with superiors/subordinates, or past performance figures.

4) <u>Identifying data required to measure performance</u>.

5) <u>Identifying decisions and information for each CSF that is required to implement the plan</u>: Modeling the decision process techniques and flowcharting relationships between major decisions in an organization are useful in establishing the connection between information and its direct use for comparing performance against standards.

By utilizing the corporate planning process, the system is designed top down, and the information most critical to decision making is identified. Moreover, with only relevant information provided, the total volume of information and time spent analyzing the information is reduced.

Engaging in this process yields deeper understanding of the manager's role, business unit, and corporate objectives, and therefore, to better performance. It may also provide structure to previously "free form" managerial jobs. Yet, imposing a structure on a manager with a highly entrepreneurial, heuristic cognitive style may be dysfunctional. By operating within the planning context, this information requirements process provides the analysts natural guidelines as to relevance, accuracy, and timeliness. Moreover, pressure on the manager to meet objectives ensures his serious participation in a related activity. Its basis in the planning process also enables the manager to express needs for elusive "soft" information as well as easier to articulate "hard" information; to ensure that no CSFs are overlooked; and, to overcome the problem of "bounded rationality" addressed by some analytical models.

A problem remains, however, in generating performance measures for "soft" areas because surrogate measures lack the direct connection of performance and result. Another problem, where the corporate plan does not yield clear strategies, goals, and objectives requires that the manager well understand his organizational mandate.

On the other hand, as the organization and its CSFs change, this approach will ensure, through the mechanism of the planning cycle, that each of its five steps are reviewed and updated.

Napier, H. Albert, "Critical Success Factors in Implementing Computer Networks for Competitive Advantage," unpublished paper.

In recent years, many organizations have used information systems in a computer networking environment to gain a competitive edge. Scrutinizing several organizations to determine the CSFs for implementing such systems, the author hones in on four:

1. Top Management must recognize the importance of information technology to the organization and be aware of how computing contributes to gaining a competitive edge. Managers and users must be the real driving force.

2. The IS Organization must be "user friendly," service-oriented, and able to communicate effectively with top managers and users. IS personnel and users must constantly search for new hardware and software technology.

3. From a Technical Perspective, the computer hardware and software must work properly. Communications faults are particularly frustrating as is inadequate response time. "Trusted" vendors and standard proven software are important.

4. General Organizational success factors include user training on specific hardware and software; and adequate documentation and support personnel.

Peirce, Holly B., Robert H. Siegler, and Stephen J. Sundquist. "Systems Life Cycle vs. Critical Success Factors: A Meaningful Comparison?", The Chicago MBA, Vol. 5, Summer 1981, pp. 64-79.

The system life cycle (SLC) and critical success factors (CSF) approaches were developed to aid in meeting management information needs. This author defines the approaches, develops hypotheses regarding their application and relationship, and examines them in six cases.

SLC looks at system development in stages: 1. system project selection; 2. feasibility study; 3. definition; 4. design; 5. implementation; 6. evaluation.

The initial stage yields a range of systems opportunities and selection of the project best addressing the business needs. SLC provides a high degree of control and management impact on the development process, and reduces the possibility of management committing resources to unworthy projects.

While SLC's emphasis is on what needs to be done, the CSF emphasis is how to identify information needs and provide the information. Thus, the two may be integrated into a single systems development methodology. CSFs originate from four main sources: industry structure; competitive strategy, industry position; and geographic location, environmental factors; and temporal factors. The CSF method focuses on quantitative and subjective information needs; accounts for the variance of needs between managers and across time; is useful at each level of general management; and eliminates useless information.

The CSF process includes 2-3 interviews each with the top 10-20 managers. This helps the manager determine key factors and provides hierarchical communication (best accomplished by interviewing from the bottom up).

A problem with CSFs is that the average systems analyst cannot readily interview and guide top managers. However, successful application of CSFs in approximately 20 organizations suggests that top management's CSFs can be defined, and information support databases can be distinguished.

The CSF method can be used for information systems planning, and, as a front end for the systems life-cycle methodology, depending on the system orientation/structure. For data recovery/transaction processing systems, SSLC can be used exclusively. For DSS, CSF should be used as well.

Six cases, selected from current literature and described in terms of attributes and system development methodology, are analyzed for how the attributes affect the systems approach, and whether similarities between cases key to similar methodologies.

Pinto, J.K. and D.P. Slevin, "Critical Factors in Successful Project Implementation," IEEE Transactions on Engineering Management, Vol. EM-34, No. 1, February 1987, pp. 22-27.

In an investigation of CSFs that are predictive of successful project management, full-time managers, experienced with projects, generated success factors they considered to be critical to successful project implementation. Ten factors were found and related well to previous theoretical formulations in the literature:

1. project mission,

2. top management support,

3. project schedule/plan,

4. client consultation,

5. personnel issues, including recruitment, selection, and training,

6. adequate technology to support the project,

7. client acceptance,

8. monitoring and feedback,

9. adequate channels of communication, and

10. adequate trouble-shooting expertise.

The 10 factors are linked together in an interdependent quasi-sequential framework that provides a diagnostic tool useful in assessing the status of any project.

Pliniussen, J.K., "Information Systems Management—The Critical Success Factors," Cost & Management (Canada), Vol. 58, No. 4, July/August 1984, pp. 57-59.

In response to questions about CSFs for the effective management of information systems, there are two elements which need to be developed—the concept of CSFs, and the uses of CSFs.

The variables which most strongly affect progress toward a manager's goals are termed the CSFs. Research indicates that there are from 3-8 CSFs per manager. The CSFs concept has its origin in 6 major sources: the industry, competitive strategy and industry position, environmental factors, temporal factors, managerial roles, and managerial "view of the world."

CSFs can be used within the information system framework in 3 general areas:

1. clarifying management's perspective,
2. identifying management's information needs, and
3. establishing information systems priorities.

Poppel, Harvey, "The Strategic Managmeent of Information Technology," Booz-Allen and Hamilton Inc., pp. 6-9.

Aggressive business leaders have learned to wield technology for competitive advantage. For most organizations, the strategic deployment of technology relates to two CSFs: product differentiation in relevant marketplaces which leads to greater price recovery and profits; least-cost production through ongoing productivity gains yielding wider margins and/or greater pricing flexibility.

The relative importance of these CSFs is derived from the strategic positioning of the business, often related to where its principal products are in their life cycle. Once derived, CSFs generate the strategic technology imperatives. A newly emerging technology, embedded processing, provides flexibility in using information technologies to meet strategic business requirements by enabling individuals to access computers wherever they may be.

In identifying those information technology projects with greatest strategic leverage that require resource commitments, a strategic prioritization grid analysis could be useful. The axes of the grid are the two CSFs—the degree to which productivity can be improved and the degree to which a product can be differentiated in its marketplace. Within the grid, each project is plotted relative to its potential contribution to both CSFs. The size of the plot point relates to the amount of information resources required and its shading denotes the degree of risk inherent in the project.

Pratt, Vivian. "CSFs: A Strategic Planning Technique," unpublished paper, Sloan School of Management, M.I.T., December 1980.

Pratt defines a company, for strategic planning purposes, in terms of:

1) strengths and weaknesses, and choices between courses of action;

2) organizational processes and outputs;

3) organizational politics, conflicts, and compromises.

CSFs are then used to analyze the company and re-evaluate its strategy.

The history of the CSF concept within the context of strategic planning is traced from Daniel to Hofer and Schendel, then Linneman and Kennell, and recently to Jack Rockart who first applied CSFs to information systems planning. Rockart's technique addresses managers' perceptions which may have underlying basis in rational, political, or organizational factors and which define current organizational behavior.

These perceptions of key areas of concern are captured initially in interviews which themselves assist the manager in assessing and explicitly stating his key concerns. A compilation of the interviews of the principal management of the firm provides a broad description of that firm, and a basis for analysis. By comparing CSFs with stated mission, objectives, and strategies, potential problems are pinpointed which CSFs do not cover or where CSFs exist without a strategy.

A case illustrating the role of CSFs in strategic planning showed how the CSF method yielded benefits in analyzing the internal environment, and, controlling the real direction of the company by monitoring individual managers' progress toward stated goals.

Raphael, D.E., "Betting the Bank on Technology—Technology Strategic Planning at Bank of America," Long Range Planning, Vol. 19, No. 2, April 1986, pp. 23-30.

The banking industry, market- and technology-oriented, and is being reshaped by changes in technology. To cope with the new environment, banks must develop strategic management processes as Bank of America has done in the technology planning area, comprised of 8 steps:

1. Identify the major economic, social, competitive, and technological forces of change.
2. Segment strategic business areas.
3. Assess Bank of America's performance in each business area relatiave to that of a successful competitor.
4. Perform strategic issue management by using environmental scanning.
5. Build a competitive advantage by using the overall CSFs related to the customer, to management, and to technology.
6. Develop a strategic profile of present and future business needs that can be translated into technology requirements.
7. Make strategic alternative decisions, which are developed by using scenarios.
8. Assess the strategic resources needed to guide strategy.

Reck, R.H. and J.R. Hall, "Executive Information Systems: An Overview of Development," Journal of Information Systems Management, Vol. 3, No. 4, Fall 1986, pp. 25-30.

Representing a total break from traditional design concepts, EISs deliver information critical in achieving business goals and objectives. As such, they are user or problem driven. The MIS manager must understand the requirements of this new set of users and how to design systems to meet those requirements. The EIS filters voluminous data and can be tailored to the needs and style of senior executives. Its three functions include (1) data access, (2) data manipulation for analysis, and (3) structured data manipulation for modeling and simulation.

What executives should focus on in defining their EIS depends on their view of critical business factors and type of information needed to monitor those factors. The CSF methodology is useful in translating business objectives into such factors critical to the success of the organization. A case study involving EIS and the CSF method is discussed.

Rinaldi, D. and T. Jastrzembski, "Executive Information Systems: Put Strategic Data at Your CEO's Fingertips," Computerworld, Vol. 20, No. 43, October 27, 1986, pp. 37-46.

Used primarily to track corporate business strategy, Executive Information Systems (EIS) are easy to operate, consist of custom-designed applications, and provide executive access to external and internal data sources. By building an EIS that highlights and simply presents corporate CSFs to senior management, MIS can become a vital player in running the corporation.

While the technical issues concerning response time are many, the greatest challenge to EIS developers is making the system easy to use, yet specific. Developers must understand the characteristics of the executive decisions within their companies as approaches to problem solving differ. Moreover, they must consider organizational structure and culture and realistically allocate resources, including hardware, data, software, money, and staff time.

According to EIS pioneers, Rockart and DeLong of MIT, a "committed and informed executive sponsor is one of the EIS project's CSFs." The executive sponsor needs a realistic understanding of the implementation process and a good relationship with the information systems department as they educate each other in the human, financial, and technical requirements for feeding and maintaining the EIS. An operational sponsor must also be designated; and, organizational impacts and political resistance be anticipated and managed.

Rockart, John F. "A New Approach to Defining the Chief Executive's Information Needs," Center for Information Systems Research Working Paper No. 37, September 1978.

This article provides the basis for a subsequent article published in the Harvard Business Review, and summarized as it appeared there, entitled, "Chief Executives Define Their Own Data Needs."

Rockart, John F. "Chief Executives Define Their Own Data Needs," Harvard Business Review, Vol. 57, No. 2, March/April 1979, pp. 81-93. Also reprinted in The Rise of Managerial Computing: The Best of the Center for Information Systems Research, J.F. Rockart and C.V. Bullen, eds., Dow Jones-Irwin, Homewood, Illinois, 1986.

Chief executives are often overwhelmed with a massive information flow, much of which is irrelevant to performance of their jobs. In exploring this problem, Rockart identifies four current approaches to defining executive information needs:

1. By-product technique makes available to interested executives the information by-products of routine paperwork systems.

2. Null approach assumes that existing reports cannot be useful to the chief executive because his activities are ever-changing. Rather, he should gather data through oral communication as new situations arise in order to best capture the predominantly soft information needed.

3) Key indicator system focuses on indicators of financial health and presents them in exception reports.

4) Total study process queries a wide sample of managers to identify their total information needs, and adds to the existing systems those subsystems required to provide the missing information. IBM's BSP is an example of this methodology.

A new approach to assessing information needs has been developed by a research team at M.I.T. Called the CSF approach, it is effective in helping executives define information needs, efficient in its use of their time, and, is well received. Interviews are conducted during which goals are recorded, CSFs underlying goals are discussed, interrelationships clarified, and measures identified. Results of a preliminary interview are reviewed and "sharpened up," and measures and reports are discussed in depth at a second session. A third session may be needed to achieve final agreement on CSF measures and reporting sequences.

CSFs focus on individual managers and current information needs, both hard and soft. They are the few key areas where "things must go right" to ensure successful competitive performance, and therefore deserve constant attention. Prime sources of CSFs are industry structure, competitive strategy, industry position, and geographic location, environmental factors, and temporal factors.

Useful at each level of general management, the CSF process yields significant benefits:

1) Helps managers determine key factors and ensures that those receive scrutiny;

2) Forces managers to develop good measures and get reports on those measures;

3) Limits collection of data to what is necessary;

4) Focuses attention on data significant to a manager that might not otherwise be collected;

5) Acknowledges that some factors are temporal and that CSFs are manager specific so that changes are viewed as inevitable and productive;

6) Is useful in the planning process as well as in information systems design.

These benefits, as well as illustrative CSFs, measures, reports, and subsystems are developed in a series of case studies. Also drawn from those cases are additional attributes of information for executives.

1) Traditional accounting systems rarely provide data to monitor CSFs.

2) Many CSFs require external information about market structure, customer perceptions, or feature trends.

3) Many CSFs require coordinating information from multiple widely dispersed data sets throughout the company.

4) About a fifth of the status measures require subjective assessment, i.e., are soft but useful.

5) CSFs can be categorized as either "monitoring" or "building." With more competitive pressure, CSFs tend toward monitoring current results. The more insulated from economic pressures or decentralized the firm, the more CSFs were oriented toward building for the future through major change programs.

Because a great deal of information needed is relatively short-term "project status" information, periodic review of CSFs will bring to light the need to discontinue some reports and initiate others.

Rockart, John F. "The Changing Role of the Information Executive: A Critical Success Factors Perspective," Sloan Management Review, Vol. 24, No. 1, Fall 1982, pp. 3-13.

The "technically oriented" information system executive of the 1960s and 1970s is being replaced by a "managerially oriented" executive of the 1980s. His domain has grown to include a broad spectrum of applications in most parts of the organization, widespread computer hardware supported by geographically diverse I/S personnel, and a clientele rapidly extending to almost everyone in the organization.

The study discussed in this article focuses on the CSFs of 9 top I/S managers as a means to identify the fundamental issues for the 1980s, and to develop a "model" for the I/S executive. Three major findings appeared most relevant:

1) The CSFs differ from company to company but can be summarized as a set of 4 distinct factors;

2) Each I/S executive has a set of management tools aimed at facilitating good performance in critical areas;

3) Management viewpoints are strikingly similar and form a profile of the model I/S executive of the early 1980s.

The four generic CSFs for I/S executives are: (1) Service, including perceived as well as actual operational performance. (2) Communication, both to users and executives, on the impact of IS, and from them on their needs and priorities. 3) IS human resources that are technically literate, managerially competent, and are incented effectively. (4) Repositioning the IS function with technical, organizational, psychological, and IS managerial shifts from "back office" into all aspects of the business.

Although this generic set of CSFs is readily apparent, specific CSFs differ from one I/S executive to another while some generic ones may be absent altogether. The reasons for this are: (1) stage of development of the I/S organization, (Gibson, Nolan four stages of growth from inception to maturity); (2) recent organizational history, e.g., if service has been a problem, service-oriented CSFs predominate; (3) human, organization, and financial makeup of the company, e.g., CSFs differ in organizations where top management understands technology and its implications from those where they do not; (4) the I/S executive's "world view" and role in the company.

Of the companies studied, techniques and processes ensuring that attention is devoted to critical areas include: (1) for the service CSF—measuring user perception of delivery; (2) the communication CSF—strategic planning, positioning the I/S executive high in his organizational pyramid, establishing steering committees, aligning development groups with customer units; (3) the human resources CSF—creating a career development process to support and incent I/S personnel, interchange people among I/S and other functions, and develop a managerial focus; (4) the repositioning CSF—managing data as a corporate resource, developing DSS for managers, shrinking corporate I/S to a staff function and reassigning development personnel and hardware to functional departments as a means to facilitate corporate-wide dissemination of computer technology.

The profile of the excellent I/S manager is one who sees himself as a corporate officer in the role of general business manager, and, as a candidate for a top management line job. He views the I/S function as significant to the success of the company and has a strong sense of the steps to implement the desired I/S strategies as well as his personal ones. He is a thinker, planner, and coordinator rather than a direct implementer and doer.

Rockart, John F. and Adam Crescenzi. "Engaging Top Management in Information Technology," Sloan Management Review, Vol. 25, No. 4, Summer 1984, pp. 3-16.

Today information technology gives managers an opportunity to improve delivery of products and services, increase effectiveness and productivity in managing the business, and significantly impact business strategy. Through a case study of Southwestern Ohio Steel, Rockard and Crescenzi present a three-phase process instrumental in engaging top executives in information technology. The process embraces these concepts: (1) CSFs to engage management attention and ensure that systems meet critical business needs; (2) Decision scenarios to demonstrate how systems aid decision making; (3) Prototyping to provide results quickly at minimum initial cost.

The process, described in Figure 1, begins with an introductory workshop which yielded several benefits to SOS: (1) a management perspective for systems development that links system and business priorities; (2) a step toward establishing business priorities by defining corporate goals;
(3) active involvement of key executives; (4) a clear explanation of techniques to be utilized.

Following the workshop, interviews with SOS executives help clarify their understanding of the business, of individual roles and organizational culture. During the next step, a focusing workshop, the consultants present a "strawman" of corporate mission, objectives and CSFs constructed from earlier workshop and interview results. This stimulates discussion and uncovers varying perceptions and disagreements among the management team. Because this step is both significant and difficult, executive leadership in focusing on core business elements is essential to achieving agreement on corporate mission and goals.

The second phase, dedicated to developing systems priorities, begins with another workshop to define hard and soft measures for monitoring CSF performance. Transitioning from a business focus on CSFs to a technical one on systems definition is not straightforward, but relies heavily on the design team's technical expertise, systems knowledge, and all-around expertise.

During this phase, key managers are observed, recurring decisions and associated questions are identified, and a set of decision scenarios, each concerned with a particular managerial event, are developed. By working through a series of scenarios, managers gain familiarity with the proposed system.

Phase Three includes creation of a prototype design, and systems development. Three kinds of prototype emerge: (1) an information database, (2) a pilot system, and (3) a "classical" prototype.

Key to the success of this process at SOS was an approach to information systems based on managing the business; a sharper focus on the few important things; an increased understanding of the interdependencies within the business, and ability to capitalize on this knowledge; the transfer of knowledge from a retiring chairman to a younger management team; and terminal access by management to status data.

While this process has proven effective in large as well as medium-sized companies, timing is critical. Management must be ready to become involved and to re-think computer priorities for any of a number of reasons.

Rockart, John F. and A.D. Crescenzi. "Engaging Top Management in Information Systems Planning and Development: A Case Study," Center for Information Systems Research Working Paper, No. 115, July 1984.

This paper also appears in the <u>Sloan Management Review</u>, Vol. 25, No. 4, Summer 1984, under the title, "Engaging Top Management in Information Technology."

Rockart J.F. and M.S. Scott Morton, "Implications of Changes in Information Technology for Corporate Strategy," <u>Interfaces</u>, Vol. 14, No. 1, January-February 1984, pp. 84-95.

That information technology should support a firm's existing business strategy within its current organizational structure is too limited a view of the role of IT. Historically, computer usage has evolved through three distinct "eras"; the first two were concerned with computerizing paperwork processes, and the third with providing information to middle and top management for data analysis and communication. Third era firms can use information technology proactively, to <u>create</u> new opportunities.

The critical metamorphosis from data processing to information technology has been brought about by significant changes in computer hardware, communications, software, and data availability. Applications made feasible by these changes include robotics, decision support systems, information databases, executive databases, electronic mail, and communications networks. No doubt the most dramatic Third era advance is that the technology now affects management and its actions, as well as products and their markets; and, has major implications for strategic positioning of the organization. Targeting the technology at what is important to the firm's strategy can so alter the structure of the firm as to put it in a whole new competitive position.

A conceptual model of the impact of technology is used to illustrate the balance of all elements of corporate functioning—technology, strategy, organization structure and culture, managerial processes, and individuals and their roles. Two driving forces external to the firm—the socioeconomic

environment and the technology—set into motion the internal elements of an organization, its technology, strategy, processes, personnel, and structure. The resulting changes in one internal element requires equilibrating changes in others to maintain the balance required for a firm to be effective.

Rockart, J.F. and M.E. Treacy, "Executive Information Support Systems," Center for Information Systems Research Working Paper No. 65, November 1980 (Revised: April 1981).

Recognizing the growing trend of computer usage by upper echelons of corporate management, Rockart and Treacy undertook a study of Executive Information Support. Six conclusions resulted from that study:

1. A growing number of senior managers want to make use of computer-based information retrieval and analysis to improve performance in planning and control;

2. Existing concepts for managerial use of computer data are incomplete;

3. A few companies have successfully provided top management with computer-based information;

4. EIS can be conceptualized meaningfully;

5. EIS is a product of a new era requiring a new managerial perspective; and

6. Significant implications for executive action arise from this trend.

Evident in the second conclusion is the need for a framework for developing executive systems. The concept of decision support, useful for semi-structured decisions with specific data and formatting needs, is a middle management concept. Executive decisions, in contrast, are non-repetitive, ever-changing and moment-to-moment.

Another view of managerial information needs is CSFs. Designed to assist managers in determing the information they need to monitor performance, the method focuses on selecting the few significant areas deemed to underlie organizational success or failure, and making available progress information in each area. The CSF method stops at determining information priorities and does not address organizing and accessing the data, or selecting appropriate technology.

Given the incompleteness of these approaches, the authors formulated a more robust conceptualization of EIS support based on their analysis of relevant systems. A pattern of factors emerged in successful EIS installations: an "information support database"; user-tailored access methods; organizational support; the user as designer; and system evolution.

An EIS, therefore, cannot be oriented toward individual decisions but rather, toward relevant planning and control data in an information database.

Rule, Erik G. "What's Happening to Strategic Planning in Canadian Business?", Business Quarterly, Vol. 51, No. 4, March 1987, pp. 43-47.

Investigating the state of strategic planning in Canadian organizations, the Coopers & Lybrand Consulting Group surveyed 109 senior executives. From survey results, they identified the greatest contributions to planning effectiveness: CEO involvement and leadership; senior executive acceptance of the purpose of planning, and top manager involvement in the process. The greatest weaknesses in strategic planning resulted from managers' lack of conceptual ability in understanding and using analytical tools; middle managers' lack of involvement; poor fit between reward system and goals; and inadequate market data for strategy development.

Planning effectiveness was also assessed by determining its impact on the organization. The greatest impact was felt in a clear definition of what business the company is in, and, a clear understanding of the CSFs relevant to those businesses. On the other hand, strategic planning had little impact in developing general management skills; anticipating competitor moves; and anticipating external environmental events.

Having raised the question of whether strategic planning contributes to improved profitability, these researchers found a strong correlation between planning effectiveness and return on equity.

Scott, K.L., "Critical Success Factors in Architectural-Engineering Firms," <u>Today's Executive</u>, Vol. 6, No. 3, Autumn 1983, pp. 8-13.

Every organization, be it big or small, has four or five key things that make it successful or unsuccessful. The key to profitability in a professional services organization is to identify the items critical to the organization's success and then monitor those items on a regular basis. Four CSFs relevant to these firms are (1) backlog, (2) labor utilization, (3) labor burden, and (4) cash flow.

These CSFs can, in most cases, be simulated in an economic model—allowing management to perform "what if" analysis of their firm's financial future. This forecasting gives A-E management an advantage over firms not using forecasting because it enables them to project the results of decisions. If A-E managers give as much attention to these business needs as they do to the scientific and technical needs of their clients, their firms can operate profitably and efficiently.

Sinclair, S.W., "The Three Domains of Information Systems Planning," <u>Journal of Information Systems Management</u>, Vol. 3, No. 2, Spring 1986, pp. 8-16.

Strategic planning for information systems is more difficult than corporate strategic planning because the technology is constantly changing, and planning techniques have received little attention. However, an appropriate way to begin is by considering the related issues of (1) what the organization wants from IS in its three domains—efficiency, effectiveness, and competitiveness; (2) how the organization can better achieve its goals; and (3) what the tradeoffs are in pursuing different IS objectives.

Tools currently applied to IS planning include BSP, the most widely known, which produces a bottom-up, disaggregated view of information in an organization and yields a database-driven rather than applications-driven approach to IS. The strength of the BSP approach is in the knowledge gained from a detailed examination of the way the firm works, and how the data flows

throughout the firm. It falls short, however, by describing what exists instead of what should exist in light of new priorities. Overall, BSP helps companies focus on efficiency and effectiveness.

The portfolio approaches to IS provide for plotting business unit performance in terms of market share, industry growth, control, and slack in order to see the relevance of IS to strategic issues and evaluate the contribution of IS under various conditions.

CSFs is a technique used in high-level strategy development to focus on the most important ingredients of a firm's success and ensure that information systems are in place to support them. By identifying tasks that must be performed correctly if strategic objectives are to be realized, CSFs point the firm toward long-range, external issues that other IS planning techniques tend to examine last rather than first. If the CSF method has a weakness, it is that perceptive interviewers are required to identify the information needs of top management.

The applications portfolio approach incorporates a graphic representation of information systems by function and authority level. All applications of the firm are arranged in a three-tier hierarchy with transactions at the bottom, middle management operations in the center, and strategic concerns at the top. The central concern addressed by this approach is effectiveness.

Finally, use of the stages approach helps managers interpret how IS growth processes affect the services it provides. Measured on a series of S-shaped curves are patterns of change such as IS spending. As the stages grow in complexity, they embrace additional aspects of IS growth—the role of users, the spread of automation, changes in the DP organization, and type of planning controls instituted. Its empirical basis is now less important than the incisive planning questions it forces companies to ask themselves.

Cases drawn from seven firms illustrate how these techniques are used and indicate that they generally address only one of the three domains of IS planning satisfactorily. Therefore, they must be carefully selected. However, the cases suggest that companies devote too little thought to IS planning objectives and that less structured approaches depend greatly on the skill of the consultant's questioning. Although IS planning can yield a tremendous return, too often it is carried out without enough attention to clarifying IS objectives, agreeing upon planning tools, monitoring and evaluating programs toward the new state.

Slevin, Dennis P. and Jeffrey K. Pinto. "The Project Implementation Profile: New Tool for Project Managers," Project Management Journal, Vol. 7, No. 4, September 1986, pp. 57-70.

The project manager needs to know what factors are critical to successful project implementation. These factors should be sufficiently broad to encompass important aspects of organizational and management behavior and sufficiently precise to provide real guidance. Moreover, they should provide a basis for the monitoring, anticipating, and resource allocating functions faced by the project manager.

Ten CSFs that represent a framework for effective project monitoring include:

1. initial clarity of project mission,
2. willingness of top management to provide necessary resources and authority,
3. detailed specification of action steps required for implementation,
4. communication with all impacted parties,
5. recruitment and training of necessary personnel,
6. availability of required technology to accomplish specific technical steps,
7. "selling" the project to its intended users,
8. timely monitoring and feedback at each step,
9. provision of appropriate network and data to all key actors in project implementation,
10. ability to troubleshoot deviations from plan.

Smith, D.R., "Information Systems for the Entrepreneur Enterprise," Today's Executive, Vol. 9, No. 3, Summer/Autumn 1986, pp. 11-17.

Use of a 4-step process can help determine how to use microcomputers in an entrepreneurial enterprise. First, enterprise CSFs such as the ability to develop products or services in a timely way, should be identified. Next, the company's information needs must be understood at different levels. The

levels relate to the efficiency and quality of the system, the control of operations and records, the triggering of a decision or action, and managing the operation directly, including planning and evaluation. The third step involves developing an overall information system strategy and database plan that focuses on how information can support the firm's CSFs. During the final step, the information systems strategy is implemented. Effective planning helps make this a smooth process.

Smith, W., "Critical Success Factors of Quality Programs," Computerworld, Vol. 18, No. 11, March 12, 1984, pp. 53,58.

The CSF approach provides insight into how to go about establishing a "quality program" in your organization. Such a program incorporates management techniques, organizational approaches, technical methodologies, and administrative procedures that can improve the quality, timeliness, cost, and user satisfation of development and maintenance efforts.

CSFs, in the context of quality programs, are the following characteristics that are both necessary and sufficient for the program's success. First, commitment is required at three levels in the organization—senior management, information services management, and information service staff—to ensure allocation of money, time, and staff. Second, the organization must embrace the quality program as a separate function headed by a respected manager reporting to the head of information services. Finally, the discipline, used by information services to deliver their products, must be adopted to provide an infrastructure of methodologies, techniques, and procedures such that constituent methods operate efficiently, and not in a hodgepodge.

Spalding, R. "Conferences and Exhibitions: Prepare to Travel, Prepare for Profit," Director (UK), Vol. 39, o. 8, March 1986, pp. 64-77.

Exhibitions are the most underrated form of sales and promotion in many firms' marketing plans, yet their greatest benefit is the widening of customer and contact lists. Two essentials must be followed: (1) no business takes place at an exhibition; (2) never assume there will be buyers in attendance. CSFs for utilizing exhibitions include stand location, stand design, and stand staff.

Sullivan, C.H., Jr. "Systems Planning in the Information Age," Sloan Management Review, Vol. 26, No. 2, Winter 1985, pp. 3-12.

The author traces the evolution of systems planning practices, and introduces information architecture planning. Twenty years ago, the leading approach to systems planning, Stages of Growth, offered a means to benefit from the experience of others by promoting management controls during a period of transition from expansion to consolidation. As the emphasis on information systems shifted from applications processing to information resource management, new planning requirements emerged.

The planning response to this new environment was IBM's Business Systems Planning, which focused less on organizational structures and computer room disciplines than on the corporate data resource. BSP was business-oriented and enabled recommendations to be derived from construction of an empirical model of an enterprise and its information resource. Because it assumed that building a corporate database was a one-time effort, however, BSP did not provide for the typically more gradual development process. BSP was further limited in that it was designed for centralized environments, yet a trend toward decentralization was underway by the late 1970s.

Appropriate in the 1980s, CSF planning assists managers in identifying requirements for information systems by boiling down a list of crucial information and analyses, not currently at hand, which subsequent systems could produce. In this sense, CSFs are oriented toward communications rather

than processing or data, and assume a networking perspective. Although extremely useful, CSFs are not a complete planning methodology because they require a good deal of awareness about information systems on the part of the user, and are more helpful in designing support systems for individual senior executives than in resolving company-wide systems integration issues.

In the quest for an effective planning methodology, the author reviewed information systems planning efforts at 37 major U.S. companies and identified two factors that correlated to planning effectiveness. Those are infusion—the degree to which information technology has penetrated a company in its importance, impact, or significance; and diffusion—the degree to which technology has been disseminated througout the company. In 22 companies where their current planning methodology was viewed as moderately effective, no significant correlation with kind of planning process used was identified. However, connections between planning process and extent of infusion and diffusion in the 15 firms with highly effective planning are clear and can be seen in Figure 1.

CSF planning is best suited to an environment with distributed technology —high diffusion, but low infusion. In a federation of loosely coupled entities, the central issue is deciding what information to share and allowing access to remote data and programs. A shared communications utility frequently emerges here to coordinate otherwise independent processing and data resources.

As more companies enter the complex environment of the fourth quadrant, they are discovering that there is as yet no suitable planning methodology and that they are developing eclectic approaches tailored to specific needs.

Vitale, M.R., B. Ives, and C. Beath, "Linking Information Technology and Corporate Strategy: An Organizational View," presented at the Seventh International Conference on Information Systems, San Diego, Califoria, December 15-17, 1986, pp. 265-276 of Conference Proceedings.

Considerable attention is currently focused on using information technology to obtain competitive advantage. Numerous mini-cases illustrate the use of such systems and various conceptual frameworks aid in their

identification. Much of this research, grounded in the single concept of "top down" strategy formulation, assumes that involvement of IS-aware people more likely results in applications that bring sustainable competitive advantage. In contrast, after-the-fact support for strategies developed without regard for information opportunities rarely result in competitive applications. In general, however, IS managers have not successfully interjected themselves into their firm's strategic planning processes. The BSP and CSF methodologies circumvent the problem by using structured interviews with top management to gain the necessary information on goals and strategies.

A survey of 17 IS executives, 7 of whom had used CSFs, reveals the potential problems of relying on a top-down approach. Many organizations have no well-defined strategy, thus precluding either mapping IS plans to long-range organizational plans or impacting organizational plans with IS. Moreover, without sufficient knowledge about IS possibilities and capabilities, organizational strategists have difficulty making effective decisions about the application of IS technology. Finally, turbulence in the environment affecting products, customers, competitors, suppliers, or production methods may reduce the appropriateness of strategies formulated top-down.

A second "adaptive" approach for identifying competitive applications, is better suited to organizations facing environmental turbulence or those whre senior strategists are uninformed about IS. Using this approach, resources are developed, then tactics and strategies are identified. Thus, the firm experiments with technologies, gains experience with their capabilities and constraints, and a broadly based knowledge results. The company dealing with turbulence should encourage relatively low-level managers to seek continuous improvement and react quickly. Whereas the top-down model is often implemented as a process, this approach is implemented through changes in organization to facilitate developing technical means and innovative applications of those means. The current focus on process issues risks ignoring distinctive information-related competences of the firm, thus potentially overlooking opportunities that might result in sustainable competitive advantage. Development of an organizational structure conducive to the identification and implementation of strategic applications may, in the long run, prove to be sustainable competitive advantage in its own right, that is, an organizational structure that assures leadership in the strategic use of technology. The authors define five permanent organizational roles to help support the adaptive approach.

Wahi, Pran N., Kenneth A. Popp, and Susan M. Stier. "Planning at Weyerhaeuser," Journal of Systems Management, March 1983, pp. 13-21.

In 1981 Weyerhaeuser introduced a new information systems planning methodology incorporating CSFs and information flows. The CSF process relates the systems plan to organizational operations and strategies by identifying the information needs, problems, and strategies of managers. The information flow process documents current and target flows between functions and thus highlights system and organizational interfaces. The resulting plan addresses the current year, following year, and 5-year horizons.

In their planning pilot, Weyerhaeuser found that the most important ingredients for success of the systems plan were: management commitment and involvement; the planning team's business knowledge; management acceptance of the team leader; frequent management reviews; technical reviews with IS personnel where appropriate; visibility of products on display wall.

The objectives of IS planning are to develop a company-wide view of what information systems are needed and align systems staff, equipment, and facilities consistent with that view. The four-phase planning process utilizes CSFs in the first phase as the basis for identification of requirements. The IS team determines what personnel to interview, then drafts CSFs for each using position descriptions and management by objectives material. Those familiar with the applications unit conduct the interviews. Interview results are analyzed and consolidated to develop a list of general information problems, information needs, and proposed information strategies and objectives.

Weber, Thomas E., Daniel Kashporenko, and Stephen Smith. "An Information for Decision-Makers System (IDMS), unpublished draft for Harvard Business Review, February 1982.

When management information does not support the organization's goals, the condition known as "information thrashing" arises. That condition confronted the U.S. Army when their traditional systems required "tieing in." Their

challenge was to extract data from their systems without disrupting its proponents, while manipulating the data at a higher level suitable to management decision making.

CSFs were used to help management define their information needs. Initially, however, problems were encountered due to a scarcity of management time, and inability of general officers to identify CSFs (perhaps because of emphasis on operational rather than planning responses, or reliance on subjective judgment and informal communication as opposed to structured information techniques). These problems were addressed in a study of the nature of information systems for complex organizations which defined systems in levels of hardware/software, data, information structures, perceptions, and goals.

Decision makers, previously constrained by any information capability that depended on the computer, structure of programs, available data, and thoughts of the systems analyst, needed help to think clearly and focus on critical factors. Quick comprehension of issues and the ability to expand or change perceptions was vital.

While the only levels of information system development appropriate for senior executive involvement are the perception and goal levels, an iterative process was needed to facilitate involvement in these phases. Using models and other logical structures to stimulate executive thinking, the U.S. Army developed the Information for Decision Makers System (IDMS), a methodology requiring a new way of thinking and new analytical language.

Winkler, C. "A Big Payoff at SOS from Just-In-Time," The Business Week Newsletter for Information Executives, Vol. 1, No. 1, October 1, 1987, p.5.

Facing a recession in the early 1980s, soaring interest rates, troubled customers, and a retiring chief executive, Southwestern Ohio Steel found themselves at a crossroads. Their response was to develop a just-in-time system that linked customers electronially to SOS's three sites and enabled customer needs to be constantly monitored. With this competitive advantage, SOS sales soared as they moved from No. 3 to No. 1 in market share.

To achieve this, SOS called in Index Group which brought to the steel service center the CSF method based on the work of Jack Rockart at MIT. Applying the method, Index and SOS came up with a list of about 100 factors, boiled them down to five, and developed three core information systems to enable SOS to deal with those five.

Winski, Donald T., "In Search of Excellence," A Systems Strategy.

Properly executed, a systems strategy provides an organizational and technological framework to help the business achieve its goals through information technology. A successful strategy process, evolving in a number of leading-edge corporations, centers around three concepts: (1) the SBU's CSFs set the direction for application systems development; (2) this development must integrate technology with the organization; (3) the resulting systems must work in a broad range of business contexts.

Top management support is critical, as in the broader business strategy process. CSFs provide the common ground of communication between top line management, user, and systems management. The CSFs of the SBUs, once analyzed, fall into three categories: corporate issues, common issues to several SBUs, and issues unique to an SBU. Some CSFs require manual procedures while others need automated systems. Although the major emphasis of the systems strategy is on automated systems, revised policies and procedures can often provide major benefits.

CSFs provide information for formulating systems strategy. First, CSFs indicate the business cultures and priorities of each SBU, thus providing guidance in placing systems responsibilities. Second, the CSF measures can be translated into information requirements for monitoring business success. Third, the systems required to support the CSFs provide a macro-level lead-in to developing an application portfolio. When common CSF issues are significant, a systems approach common to multiple SBUs may be appropriate. Conversely, when CSFs predominate, decentralized systems portfolios may be best..

The applications portfolio is the investment portfolio for information systems that will make the CSFs happen. As such, it is a blend of low- and high-risk ventures with various benefits. In addition, it describes the relationships and planned implementation sequences of the various applications systems.

Winski, D.T., "A Businessman's View Toward Strategic Systems Planning," ICP Business Software Review, Vol. 3, No. 1, Feb/Mar 1984/ pp. 28-29.

The key objectives of a business-oriented systems strategy are:
1. ensuring that the systems being funded support critical business objectives,
2. securing people and technology resources that are justifiable and affordable, and
3. using the resources efficiently.

The first step in achieving these objectives is to identify the major business activities that need their own self-contained systems plans. Next, define each strategic business unit's CSFs, which dictate the management information required, the best choice of applications, and the priorities and business culture of ech SBU. This step is followed by: estimating the funding required for existing and new systems; defining the business context in which these systems must operate; and distributing the 3 systems responsibilities, including management control systems development, and systems operation, between the users and systems staff.

Yudelson, J., "Critical Success Factors: Just What the Doctor Ordered for Today's Retail Management Headaches," Retail Control, Vol. 55, No. 5, June/July 1987, pp. 41-53.

Retail management may use CSFs to guide them in decision making and monitoring their companies' strategic objectives. CSFs stress an integrated perspective of business by raising penetrating questions for management to ask about the causes behind problems. Additional reasons for using CSFs include:

1. the rise of strategic planning in retailing,

2. data overload due to computers generating more information than management can absorb, and

3. the rise of both intra- and inter-type competition.

The CSF approach provides management with a structure that allows them to determine the facts that make a difference and incorporate them into a regular management information system. Through monitoring, appropriate action may be determined to achieve organizational goals. CSFs should reflect the company's strategic goals, and often are specific to a type of retailer. In developing measurements, management should be aware that some CSFs are operational variables and easy to measure, while others are more difficult to assess in quantifiable terms.

Zahedi, Fatemeh. "Reliability of Information Systems Based on the Critical Success Factors Formulation," MIS Quarterly, Vol. 11, No. 2, June 1987, pp. 187-203.

This article presents a model for measuring the reliability of information systems based on a synthesis of CSFs and system reliability concepts. To compute the reliability of an IS from its CSFs, the author establishes the interconnections among critical factors, then constructs a hierarchy of CSFs using as his example Rockart's data on CSFs of IS executives. The applicability of this model is verified against Martin's data, also addressing the CSFs of IS executives.

Reliability is a quantifiable measure useful in the control and management of IS. It provides an early warning about the quality of the IS and identifies trouble areas. Reliability can be a factor in comparing information systems and, as such, is useful for cost/benefit analysis of competing IS investment projects.

Zani, William M., "Blueprint for MIS," Harvard Business Review, Vol. 48, No. 6, December 1970, pp. 95-100.

The key to good MIS design is a thorough understanding of the major management decisions made at various levels of the company. These decisions define the information required, and hence the basic design parameters of the system itself. When management information systems are spun off as by-products of automating or improving existing systems, it is fortuitous whether the information provided is the sort needed for manager's decision making. In contrast to this "bottom up" development, an effective system requires a carefully planned top-down design that provides the information the manager needs to perform the critical tasks and make critical decisions within an organization.

In this article the author presents an approach to MIS design oriented to decision making. The major determinants of design are: opportunities and risks; company strategy; company structure; management and decision-making processes; available technology; and available information sources. By exhibiting the relationships between these factors, the framework helps establish goals and priorities for MIS development. The resulting system is likely to support the critical areas of decision making. To ensure that the framework will be used, top management must take a more prominent role in the design process and, in fact, start the design process by delineating strategy structure and decision processes for the design specialists in the group. The framework is offered not as a step-by-step procedure for the design process, but as a concept of how top management should think about management information systems.

The implication of corporate strategy for MIS design is critical—strategy should dictate explicit objectives for system design. Opportunities, risks, competences, and resources, plus the strategy derived from them yield organizational structure. The structure subdivides essential tasks. The tasks and structure determine the information needs of the company. Internal resources, external forces, strategy and structure define the key success variables—the activities on which the company must score high to succeed. The key success variables name the key tasks of the company and thus help identify priorities for IS development.

The only way to isolate specific information requirements of individual managers is to isolate the nature, frequency, and interrelationships of the major decisions in a company. The key success variables help identify major decision areas for detailed analysis. The decision-analysis section of the framework is divided into strategic planning decisions, management control, and operational control.

Thus, the framework makes explicit objectives dictated by strategy, specific tasks and their interrelationships displayed via organizational structure, and key success variables. Using these elements as a base, an analysis of decision-making patterns in strategy, management control, and operational control draws out the specific information requirements for the critical areas of the company operations. It is by identifying these factors and guiding their analysis that managers make their contribution to MIS development.

Using the framework encourages understanding of the critical areas of operations, identification of specific information requirements, and recognition of the technological, economic, and personnel constraints within which an MIS develop. Only management's understanding can delineate the organization's CSFs for the information specialist.

ACKNOWLEDGEMENTS