
CORPORATE INFORMATION SYSTEMS MANAGEMENT

Text and Cases

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Case material of the Harvard Graduate School of Business Administration is made possible by the cooperation of business firms and other organizations which may wish to remain anonymous by having names, quantities, and other identifying details disguised while maintaining basic relationships. Cases are prepared as the basis for class discussion rather than to illustrate either effective or ineffective handling of administrative situations.

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To Clemmie, Karen, and Mary

Preface

This book is aimed at students and managers interested in contemporary information services (IS) management. It is intended to communicate the relevant issues in effectively managing the information services activity. No assumptions are made in the book concerning the prior background of the readers with regard to the details of IS technology. It is, however, assumed that the reader has a basic background of either administrative experience or management training.

Our purpose is to provide perspective and advice for coping with the information explosion. This expansion is best characterized by the doubling of the Library of Congress from 1933 to 1966 and the doubling again from 1967 to 1979; and it is expected to double a third time before 1987. At the same time, the acceleration in the growth of knowledge in science is stimulating a dramatic increase in the number of new products based on new technology. This growth, coupled with the increasing international nature of many businesses, puts an enormous burden on the individual to keep abreast of events. It is a sound scientific conjecture that a human can retain 25 billion characters of information.¹ However, it has proven impossible to retrieve and use everything one knows, let alone keep our knowledge up to date. As Keen and Scott-Morton² have suggested, man-machine systems can function to assist the individual in coping with this information overload. We feel the broader issue is to help organizations adapt the new technology to better compete in their industry segments. This book is designed to help present and future managers prepare their organizations to better deal with information services management.

The book is organized around the authors' concept relating to a management audit of the information services activity. We have combined text and cases to convey and illustrate key conceptual frameworks. Chapter 1 begins with an overview of the key questions to resolve in assessing the health of an IS activity. Chapter 2 then presents a series of frameworks which the authors have found useful in analyzing and structuring the problems in this field. The

¹ Carl Sagan, *The Dragons in Eden* (New York: Random House, 1977).

² Peter F. Keen and Michael S. Scott-Morton, *Decision Support Systems* (Reading, Mass.: Addison-Wesley Publishing, 1978).

subsequent chapters address issues relating to how the activity can best be organized, planned, and controlled.

The material in this book is the outgrowth of a series of research projects conducted by the authors at the Harvard Business School over the past several years. We are indebted to both former Dean Lawrence E. Fouraker and Dean John H. McArthur for making the time available for this work.

We are particularly indebted to the many firms and government organizations which provided us with so much time and insight during the course of our research. All the cases and concepts in this book are based on observation of real practice. Without the aforementioned, it would have been impossible to prepare this manuscript.

We are especially grateful for the many valued suggestions and insights provided us by our colleagues Gregory Parsons, Leslie Porter, Michael Vitale, and Shoshanah Zuboff. In addition we acknowledge the valuable work done by Phillip Pyburn and Kathleen Curley during their time as doctoral students. Lynn Salerno, in her editorial capacity at the *Harvard Business Review*, provided valuable assistance. We would also like to express our appreciation to our office staff, Lillian Braudis, Louise Girard, and Alys Reid, who typed and edited numerous versions of the work.

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THE CHALLENGE OF IS TECHNOLOGY

Over the past 30 years, the rapid evolution and spread of information systems (IS) technology (in this book, IS will include the technologies of computers, telecommunications, and office automation) has created a major new set of managerial changes. Attempting to resolve these challenges has resulted in creation of new departments, massive recruiting of staff, major investments in computer hardware and software, and installation of systems which have profoundly impacted both how the firm operates and how it chooses to compete. The impact of this technology has not been confined to the large corporations but, in its current form, is impacting the very small (i.e., \$1 million sales) firms as well. Further, in the large corporations, its impact is now very pervasive, reaching into both the smallest departments of the company and into managerial decision-making processes in a way which could not have been visualized even 10 years ago.

Facing these challenges is complex because many members of senior management received both their education and early work experience in a time prior to the wide-scale introduction of computer technology. Consequently, many feel somewhat uneasy about the subject and lack confidence that they have the appropriate handles to provide managerial oversight. Many IS managers face similar problems, since their firsthand technical experience was with technologies so different from those of the 1980s as to pose unrecognizable problems. Understanding the programming challenges of the rotational delay of the drum of an IBM 650 (a popular machine in the late 1950s) provides no value in dealing with the challenges posed by today's sophisticated computer operating systems. Further, understanding of what makes acceptable management practice in this field has changed dramatically since 1971. Virtually all major, currently accepted conceptual frameworks for thinking about how to manage in this field have been de-

veloped since 1971. Consequently, a special burden has been placed on IS management, not just to meet day-to-day operating problems and new technologies, but to assimilate and implement quite different ways of managing the activity. If they are not committed to a process of self-renewal, very quickly they become obsolete.

This book is aimed at two quite different audiences in a firm. The first is the general management which is responsible collectively for providing general guidance for the IS activity. For these readers, this book identifies a set of frameworks for looking at the IS activity in their firm, crystallizes the policies they are responsible for executing, and provides insights on how they can be executed. Also for this group, the attempt is to move from a world view down to an overall perspective of the IS forest and its management challenge.

The second audience is senior IS management. For these readers, we have attempted to develop an integrated view of the totality of IS management for the 1980s. We have tried to identify the key patterns which organize and make sense out of a bewildering cluster of operational detail. The attempt for these senior managers is to move from analysis of bark composition on individual trees to an overall perspective of the IS forest and its management challenge. The book thus tries to integrate the needs of two quite different audiences (who are very operationally interdependent) and provide them with a common set of perspectives and a language system for communicating with each other.

It would be a serious mistake, of course, to consider the problems of IS management as being totally unique and separate from those of general management. While the authors freely admit to having spent most of their professional lives dealing with IS technical and managerial issues, much of their thinking has been shaped by literature dealing with general business. The issues of IS organization, for example, are best thought of as special applications of the work on integration and differentiation first started by the behaviorists Paul Lawrence and Jay Lorsch. Issues of IS planning and strategy are influenced, on the one hand, by the work of Michael Porter and Alfred Chandler in business policy and, on the other hand, by Kirby Warren and Richard Vancil in the area of planning. Notions of budgeting, zero-based budgeting, transfer pricing, profit centers, and so forth, from the general field of management control, are relevant here. The work of Wickham Skinner and Richard Rosenbloom, in the area of factory management and transfer of technology, has shed light on how the computer operations function can be better managed. Many individual aspects of the IS management problems thus are not unique. What is unique is the peculiar confluence of these notions in running an efficient and evolving IS function. In thinking about this, some authors have found it useful to regard IS as a business within a business. Integrating the IS business into the rest of a firm may be conceived of as having special organizational, strategy-formulating challenges.

This book is organized around four concepts of how this kind of business can be better managed.

Strategic Relevance—The strategic relevance to the firm of an efficiently and effectively managed IS activity is not a constant but varies both between firms and over time for an individual firm. It is also of more significance to some operating units and functions of a company than to others. This notion of different strategic relevance is critical in understanding the wide diversity of potential organizational, planning, control, and other practices for managing and integrating this function.

Corporate Culture—"Within a business" is a very important phrase in understanding how the IS business itself should be managed. The values of senior management, approaches to corporate planning, corporate philosophy of control, speed of technological change in the company as a whole are one set of determinants. The other is the dynamics of its external marketplaces. Both have a major influence on what is appropriate management practice in both managing IS internally and integrating it with the rest of the firm. What works in one corporate environment may fail abysmally in another one.

Contingency—IS management in the 1980s is much more influenced by contingent notions than it was in the 1970s. In the 1970s, as IS management systems were being implemented where chaos existed before, simplistic and mechanistic approaches to management control, planning, and so forth were a great improvement over what was there before. As these systems were assimilated into the firm, the initial surge of value from their introduction, has given way to frustration in many cases because of their apparent rigidity. They answered some challenges well and others not at all. Dealing with this problem has required introduction of more complexity and flexibility in the approaches used to adapt them to the changing environment.

Technology Transfer—The diffusion of IS technology can and must be managed. If poorly managed, it will not evolve into a well-functioning support system but more likely a collection of disjointed islands of technology. We draw upon the general work in technology transfer in our thinking but have expanded that experience because of unique aspects of a technology which must deal with information. What makes the introduction and evolution of IS technology so challenging is that in many of its applications, success comes only when people have changed their thinking processes. Hence, we will refer to it as an "intellectual technology." In the field, too frequently, we have a technical success but an administrative failure.

COMPLEXITY OF THE IS MANAGEMENT TASK

There are a number of factors which have made the assimilation of IS technology a particularly challenging task. An understanding of these factors

is essential if a sensible IS management strategy is to be developed. The more important of these factors are enumerated below.

1. IS technology, at least in its modern form (with high-speed computers), has had a very short life. Its earliest commercial application occurred in 1952. Thirty years is a very short time for the distilled outline of a new management profession to develop. Fields like marketing, accounting, finance, and production had a thriving body of literature and know-how in place in 1920. An incredible amount of knowledge and changes in thinking have occurred in these fields in this century, but it has been able to be assimilated within an organized field of thought. Evolution, not revolution, has been the challenge in these fields. The challenge in IS has been to develop from a zero base during a period of time where applications grew from being very narrow and specialized to being quite broad and integrated, with budgets and staffs exploding in size. In this environment, not surprisingly, the half-life of administrative knowledge has been quite short. Not a framework or avenue of thinking in this book predates 1973 in a published form, with much of the thinking taking place in the late 1970s and early 1980s. The authors of this book are under no illusion that this will be the last word on the subject but indeed hope to contribute through their further research to better insights.

2. Another source of administrative challenge lies in the fact that the field has undergone sustained and dramatic evolution in its technologies. Over a 10^6 improvement in processing and storage capacity has occurred since 1953, and the rate of change is expected to continue at the same pace at least through the 1980s and early 1990s. As in all technologies, a point of maturity will come, but we are not yet at this point. This technical explosion has continuously cast up new families of profitable applications as well as permitting old ones to be done in different ways. One painful aspect of this has been that yesterday's strategic coup often becomes today's high-overhead, inefficient liability. There is a natural tendency to harvest a particular approach too long. This tendency has been exacerbated by the prevailing accounting practice of writing off software expense as incurred rather than capitalizing it and then amortizing it over a period of years. These practices conceal both the fact that the organization has an asset and that it is becoming an aging asset.

3. The complexities of developing IS systems has forced the creation of specialized departments resulting in a series of strained relationships with the users of their service. This has been an enduring headache from the start of IS, and there is probably not a better example of C. P. Snow's two-culture problem in existence in the 1980s than the relationship between IS and general management. IS has specialized in order to harness the various necessary technical skills to get the job done. The specialists have appropriately developed their own language systems. They speak of *bits*, *bytes*, *DOS*, *CICS*, and so on to communicate among each other. General management,

however, has a quite different language, featuring words such as *sales growth*, *return on investment*, and *productivity*. While it is clear that some of the newer technologies, such as user-oriented programming languages and microcomputers, will help users, no substantial relief is in sight. A long-term need will exist for continually developing new integrating devices, such as steering committees and user department analysts, to help handle the problem. This problem is not remarkably different from that faced by the accounting profession with its special language. Despite 6,000 years of accounting history, substantial friction and misunderstanding still exist between accounting departments and users of accounting information. It is surprising to the authors that significant numbers of people who enter general management have only a sketchy ability to handle accounting information.

For numerous reasons, education will continue to only partially address these problems. The experience that students have in colleges and high schools in writing one-time, problem-solving programs—while useful and confidence-expanding—develops a very different set of skills than the skills which will be required to generate programs for processing business transactions reliably on a day-in, day-out basis. Unfortunately, this education often does not address the existence of these differences, and it produces graduates who are ill-trained for these tasks but don't know that they are ill-trained, and thus have excessive self-confidence. Another educational issue is that, cognitively, some individuals are better equipped to assimilate IS technology than others. One of our colleagues has colorfully described this as the world being divided into “poets” and “engineers” (roughly equally prevalent in general management).

4. The increased specialization of contemporary technology and the explosion of skills needed to staff it have posed a fourth, major, managerial challenge. As IS technology has evolved, it has created a proliferation of languages, data base management needs, operating systems support staff needs, and so on, all of which have increased significantly the complexity of the IS management job from an internal perspective.

5. A fifth challenge has been a significant shift in the types of applications being automated. Early applications were heavily focused on highly structured problems, such as hard transaction processing, where one could usually be quite precise about the potential stream of benefits. These applications involved automation of a number of clerical functions and operational control functions, such as inventory management, airline seat reservation, and credit extension. In the case of airline seat reservations, it was able to bring a level of structure and decision rules to the activity not previously present.

Increasingly, today's applications are providing new types of decision support information for both management control and strategic planning decisions. Evaluation of the payout of these expenditures on an objective basis either before, during, or after they are expended is almost impossible.

Individuals may have opinions about these values, but quantification turns out to be very elusive. On top of this, the best way to develop these decision support applications is quite different from the conventional wisdom for the transaction-driven systems.¹ The detailed systems study, with its documentation and controls prior to programming, is turning out to be too rigid. For these systems, prototyping or doing it rough-and-dirty is proving to be the best approach. In short, the new types of application are forcing a shift both in the ways to evaluate projects and in the best ways to manage them. This is not an argument for a more permissive approach to system design and evaluation but rather a cry to be tough-minded in a positive way.

In combination, these factors create a very complex and challenging managerial environment. They will form the backdrop in the discussions of specific managerial approaches in the succeeding chapters.

SENIOR MANAGEMENT QUESTIONS

In viewing the health of an organization's IS activity, our research indicated that a series of six critical questions repeatedly emerge in senior management's mind. We will not argue at this stage that these are the questions which *should* be raised, but rather note that they are the questions which are raised. Four of these questions are essentially diagnostic in nature, while the remaining two are clearly action oriented.

1. Is my firm being affected *competitively* either by omissions in work being done or by poor execution of this work? Am I missing bets that, if properly executed, would give me a competitive edge? Conversely, maybe I am not doing so well in IS, but I don't have to do well in IS in my industry to be a success. Failure to do well in a competitively important area is a significant problem. Failure to perform well in a nonstrategic area is something that should be dealt with more calmly.

2. Is my development portfolio *effective*? Am I spending the right amount of money, and is it focused at the appropriate applications? This question is one that is often inappropriately raised. An industry survey calculating IS expenditures as a percent of something or other for 15 industry competitors is circulated among the firm's senior management. On one dimension or another, it is observed that their firm is distinctly different from the others, which causes great excitement (normally, when their firm's figures are on the high side). After great investigation, two findings often emerge: (a) Our company has a different accounting system for IS than our competitors, and therefore the results are not meaningful. (b) Our company has a different strategy, geographical location, mix of management strengths and weaknesses than our competitors, and therefore on this dimension also, the results are not meaningful.

¹ Michael Scott-Morton and Peter Keen, *Decision Support Systems*, (Reading, Mass.: Addison-Wesley Publishing, 1980).

In short, raising the question of effectiveness is appropriate in our judgment, but, attempting to identify it simplistically through industry surveys of competitors is not.

3. Is my firm spending *efficiently*? Maybe I have the right expenditure level, but am I getting the productivity out of my hardware and staff resources that I should get? This is a particularly relevant question in the 1980s, a decade which will be dominated both by extreme levels of professional staff shortages and by intensified international competition.

4. Is my firm's IS activity insulated well enough against the *risks* of a major *operational disaster*? There is no general-purpose answer as to what an appropriate level of protection is. Rather, it varies by organization, depending on the current dependence on smoothly operating existing systems.

5. Is the *leadership* of the IS activity appropriate for the role it now plays in our organization, and the special challenges now in front of it? Historically, senior management has used the mechanism of changing IS management as one of its main tools in dealing with frustrating IS performance shortfalls. It seems clear that this high turnover is continuing in the 1980s. One key reason for this is that it represents the quickest and apparently easiest step for senior management to take when they are uneasy about departmental performance. Also, as noted in Chapter 2, the nature of the job and its requisite skills tend to evolve over time, and a set of leadership skills and perspectives for one environment may not be appropriate for another one. Further, in many situations the problem is compounded by lack of suitable metrics and data to assess performance objectively. As will be discussed in subsequent chapters, we believe the development and installation of these metrics is absolutely vital. In their absence a 50 percent improvement in ability to meet service schedules, for example, may be totally overlooked, with the emotional temperature concerning remaining problems simply being raised.

6. Are the IS resources *appropriately placed* in the firm? Organizational issues, such as where the IS resource should report, how development and hardware resources should be distributed within the company, and existence and potential role of an executive steering committee, are examples of topics of intense interest to senior management. They are not only actionable but are similar in breadth to decisions made by general management in other aspects of the firm's operations.

These questions are intuitive from the general management viewpoint and flow naturally from their perspective and experience in dealing with other areas of the firm. We have not found all of them as stated to be easily researchable or answerable in specific situations and have, consequently, neither selected them as the basic framework of the book nor attempted to describe specifically how each can be answered. Rather, we selected a complementary set of questions which not only form the outline of the book, but whose answers will give insight into the earlier questions. The following paragraphs lay out these questions in summary form, and Chapters 3 through

9 deal with them in far greater depth. Together, they form the outline of a “management audit” of the IS activity which can produce a blue book of action items.

Organization (Chapters 3 and 4). The text of Chapters 3 and 4 is most closely aligned to the previous set of questions, covering questions 5 and 6 in more depth. The following main themes are important in this area. First and foremost, What is an appropriate pattern for distributing hardware and software development resources within the corporation? The issues of patterns of distributed resources (including stand-alone mini- and microcomputers) have been well studied, and ways of appropriately thinking about them have been developed. These ways are heavily contingent, being influenced by such items as corporate organization, corporate culture, leadership style of the chief executive officer (CEO), importance of IS to achievement of corporate goals, and current sophistication of IS management. Within any pattern of distributed resources, there is need for appropriate policies administered centrally to ensure that suitable overall direction is being given.

A second complicating issue is to ensure that IS is broadly enough defined and that the covering and increasingly integrated technologies of computing, telecommunications, and word processing are in fact being adequately integrated. These issues are further complicated when breaking out of the domestic arena and dealing with international coordination. (Chapter 9 is devoted to the issues posed by different national infrastructure—such as staff availability, level of telecommunications sophistication, and specific vendor support, great geographic distance, different spoken languages, transborder data flows, national culture and sensitivity, and so forth.) Finally, issues of organization reporting chains, level of reporting, IS leadership style, and steering committees represent additional topics. In the early 1980s, we believe there are better ways to think about these issues. While common questions and methods of analysis exist, however, in different organization settings very different answers will emerge.

Planning (Chapter 5). The question, “Is my firm competitive and effectively focused on the right questions,” we believe is best answered by looking carefully at the IS planning process. The design and evolution of this process had turned out to be much more complicated than anticipated in the early 1970s when some fairly prescriptive ways of dealing with it were identified. Elements creating this complexity can be classified as falling into three general categories. The first is an increased recognition that at any point in time IS plays very different strategic roles in different companies.

This strategic role significantly influences both the structure of the planning process (who should be involved, the level of time and financial resources to be devoted to it, etc.) and its interconnection to the corporate