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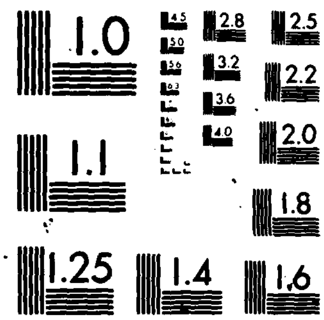

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REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A095 102
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) FACTORS IN MANAGEMENT INFORMATION SYSTEM FAILURES	5. TYPE OF REPORT & PERIOD COVERED FINAL REPORT 8 Dec 80
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) ELDON WYNN GARRISON	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Student, HQDA, MILPERCEN (DAPC-OPP-E), 200 Stovall Street, Alexandria, VA 22332	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS HQDA, MILPERCEN, ATTN: DAPC-OPP-E 200 Stovall Street, Alexandria, VA 22332	12. REPORT DATE 8 Dec 80
	13. NUMBER OF PAGES 86
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report) UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Professional Report, Graduate School of Business, University of Texas at Austin

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Management Information System failure
Technology
Communications
Role of Top Management
MIS Development Cycle
Monetary Resources
Cost/Benefit Analysis
Development of Knowledge
Management Integrated Model Information, Capital and Control System

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report is a survey of current literature (1970 - 1980) on factors that can adversely affect the successful completion and execution of a management information system project. Several areas are examined, including: (1) technology, (2) the human resource, (3) monetary allocations, and (4) the development of knowledge during the project life cycle. Some of the problems that exist are: (1) mismanagement of technology and failing to understand its role in MIS, (2) inadequate verbal and written communication skills, (3) insufficient support and involvement on the part of top management, (4) failure to have a definitive

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approach to project development, (5) inadequate documentation of requirements and specifications, (6) improper use of personnel, (7) inability to quantify intangible costs and benefits, (8) inadequate documentation of planning and development stages, and (9) a scarcity of empirical research for validating the perceived causes of failure in MIS projects. The Management Integrated Model Information, Capital and Control System (MIMIC²S) is presented as an example of the type model needed for successful development and execution of any project to include a MIS.

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FACTORS IN MANAGEMENT INFORMATION SYSTEM FAILURES

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Final report December 8, 1980

Approved for public release; distribution unlimited.

A Professional Report submitted to the Graduate School of Business, The University of Texas at Austin, in partial fulfillment of the requirements for the degree of Master of Business Administration.

FACTORS IN MANAGEMENT INFORMATION SYSTEM FAILURES

APPROVED:

FACTORS IN MANAGEMENT INFORMATION SYSTEM FAILURES

by

ELDON WYNN GARRISON, B.B.A.

PROFESSIONAL REPORT

Prepared for B.A. 398 Under the Supervision of

Dr. Eugene B. Konecci, The Kleberg Professor,

in Partial Fulfillment of the Requirements

For the Degree of

MASTER OF BUSINESS ADMINISTRATION

THE UNIVERSITY OF TEXAS AT AUSTIN
Graduate School of Business
December, 1980

A C K N O W L E D G M E N T S

I would like to offer my thanks to several people for making completion of this report possible.

Dr. Eugene B. Konecci's, the Kleberg Professor, personal support and cooperation gave impetus and direction to my efforts. His ability to cause one to think and plan has improved not only my own goals in life, but those of countless other students as well.

Many friends and fellow students have offered continued support throughout this educational program and in the completion of this report. I am particularly grateful to Brian Deaton. Through hours of conversation, he allowed me to draw on his years of experience in the field of MIS.

I also owe a note of appreciation to the United States Army for giving me this opportunity to further my education under a fully funded program.

Last, but most important, my thanks to my wife, Barbara, for putting up with me during the often traumatic experience of preparing this report.

E. W. G.

The University of Texas at Austin

November 6, 1980

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CHAPTER I

INTRODUCTION

Background

Information plays a vital role in the management of today s world. However, there seems to be a decreasing ability to deal with the amount of information generated. Technology has enabled mankind to compile vast data bases; yet, the systems for filtering, editing, and manipulating these data have not always proven very effective in enhancing the decision-making capabilities of managers.

Management Information Systems (MIS) are supposedly designed to facilitate the assimilation of information. The manager can then selectively use the information needed to make better decisions instead of being overwhelmed by an information overload.

There are too many definitions of MIS to enumerate here. For purposes of this report, a Management Information System shall be defined as any system which functions "to capture data from events in the real world, process the data into information useful to a manager, and transmit the information to him in a timely and useful way."[1] Although computers are not mentioned in this definition, the literature on MIS almost always assumes computerized systems. This will also be the case in this report.

Purpose

The purpose of this report is to provide an overview of current literature on MIS in order to determine what are perceived to be the principal causes for the failure of MIS. It is assumed that most readers will have at least a slight familiarity with MIS as a function. But, ideally, familiarity will not be a necessary precondition for reading and utilizing the report.

It is anticipated as a result of this report that an individual given the responsibility for developing a MIS could, even as a novice or layman gain insight into the problems and pitfalls that lie ahead. Hopefully, he would also realize that the task is not an insurmountable

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[1]Gerald M. Hoffman, "The Contribution of Management Science to Management Information," Interfaces (TIMS), 9 (November, 1978): 35.

one, and that a precisely delineated approach yields more satisfactory results than a haphazard one.

Scope

In order to avoid outdated information, the liaterature reviewed has been limited to the past decade (1970-1980) with a preponderance of material from the latter half of the period.

In cases where authors gave proposed remedies for the ostensible causes of failure, those remedies have been included. It might be prudent at this stage to point out that the causes for MIS failure reviewed are mostly the opinions of authors, since substantiating data seem to be lacking.

In trying to organize the report by types of failure, the classification task was very difficult. Consequently, the categorization of a particular cause of failure may be a point of contention with the reader. However, there seem to be three classifications of problems in the literature: technological, human aspects, and money and knowledge, which are discussed in Chapters II, III and IV respectively. Any difficulties in classifying problems were resolved arbitrarily on my part. The particular problem seems more important than its relative classification.

The review of probable causes of failure in MIS is accomplished through addressing MIS in a generic sense. That is, specific applications and/or equipment are not examined. I feel that specificity was not of particular importance since the problems apply to MIS as a function.

CHAPTER II

TECHNOLOGY

This chapter is not intended to delve into a discussion of particular types of hardware and software that are available.[1] However, when considering the factors that affect the success or failure of an MIS, technology cannot be ignored. In general, technology has far outpaced man's ability to utilize it and understand its application. The pace of this advance is illustrated by the statement of Paul La Voie:

> If progress made in the automotive industry had kept pace with that in the computer industry over the past 30 years, we would find that the auto industry today would be able to offer a Rolls Royce for $2.50 with an EPA rating of two million miles per gallon.[2]

The literature generally upholds the view that the technology for supporting decision-making is

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[1]For a detailed discussion of the topic see John Wood Hester, "Technical Developments in Management Information Systems" (Professional Report, Graduate School of Business, The University of Texas at Austin, May 1979).

[2]"EDP Today: Computers Move into the Office," Modern Office Procedures, 23 (May 1978): 80.

available.[3] The problems lie in the misunderstanding of the computer's capabilities and limitations, faulty applications of technology, and resistance to change brought about by this technology.

Capabilities and Limitations

Computers have a tendency to intimidate people. The speed with which they manipulate data and the volume of output produced seem to give computers a life and will of their own. Often, for the uneducated, this leads to overestimation of capabilities and ascription of traits to the computer that simply have no basis in reality. The sophistication of the computer lies in the incredible calculation speeds for accomplishing simple tasks, and the success in utilizing the technology embodied in the computer is well-defined procedures used repititiously.[4]

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[3]William A. Jones III, "The Manager's Role in Design of an Integrated Management Information System--A Framework for Planning and Development" (Professional Report, Graduate School of Business, The University of Texas at Austin, May 1974), p. 8.

[4]Richard F. Denning, "Computing the Need," Business Insurance, 14 (March 3, 1980): 19.

It is very difficult to convince some people that the computer is, in reality, an overgrown calculator. It does nothing, unless instructed to, and it facilitates making decisions rather than actually making them. For example, attributing intelligence to them makes computers appear to manage systems that require only routine decisions. It must be emphasized that people, not computers, run businesses.

Realistic expectations of computer capabilities, e.g., preparing information that enables management to make better decisions, can lead to successful applications, because the computer is viewed as a managerial tool and not a miracle worker. Conversely, unreasonable expectations (e.g., the computer is able to manage risk), lead to user dissatisfaction, because the results are not what was expected.[5] These same unreasonable expectations cause systems to be created that should not exist. This happens because the reports generated by the system are of practically no value and detract from management's prime activities--decision-making and action--upon which

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[5]Leroy G. Farber and Richard L. Ratliff, "People Problems Behind MIS Failures," Financial Executive, 48 (April 1980): 19.

corporate success depends. Excessive records are window dressing and detract from the efforts and function of a MIS.[6] Estimates of computer output that is useless and extraneous to any decision-making requirement run as high as 50 percent.[7]

If one accepts the idea that computers are not omnipotent, then one might ask what capabilities the computer could realistically be expected to have. The special computational characteristics of computers are effective in several areas:

(1) Timeliness of reports: Reports can be generated at whatever frequency management deems necessary.[8]

(2) Detail: The computer is particularly adept at keeping track of vast quantities of data such as is necessary in keeping perpetual inventories.[9]

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[6] *Denning*, p. 19.

[7] Farber and Ratliff, p. 20.

[8] Farber and Ratliff, p. 20.

[9] Farber and Ratliff, p. 20.

(3) Convenience: The computer makes data more accessible and facilitates summarization and cross-referencing.[10]

(4) Validation Checks: Reduction of input errors can be accomplished through logic checks. Errors that are made can be corrected throughout the transaction sequence practically instantaneously.[11]

(5) Flexibility: The computer offers flexibility in the computation and format of data thus enabling the astute user to obtain information that is relevant to the decisions that have to be made.[12] Notice, however, that this flexibility is largely dependent on the user.

The use of computers in MIS does not create a need to teach managers how to do business or utilize information. It does create a need, though, "to educate managers to the extent of the computer-based MIS'

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[10]Farber and Ratliff, p. 21.

[11]Farber and Ratliff, p. 21.

[12]Farber and Ratliff, p. 21.

capabilities so that the manager can take full advantage of the new tool."[13]

Faulty Applications

Many times MIS systems that are ineffective to begin with are automated under the mistaken premise that automation will result in a good system. Not only is this a cost ineffective approach, but it only serves to speed up a mess.[14]

Another misapplication occurs when the task to be performed is outclassed by the computer system designed to perform it, or the computer system itself is simply not suitable for the task. There seems to be a tendency to think in terms of "more is better" when dealing with electronic support systems. However, this is not necessarily true. One needs to look at the frequency of execution, size of the task, and the amount of

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[13] Irwin H. Derman, "Do You 'MIS' Understand," Business Horizons, 15 (October 1972): 60.

[14] Denning, p. 21.

flexibility required as a result of possible changes in input and output requirements. If the sizes of the system and of the task are not closely matched, then the cost of the technology involved in that system can easily exceed the benefits.[15]

A further problem in applying available technology is one closely allied with the "more is better" concept. This problem, though, is the failure to consider the skills and sophistication of the staff when implementing systems. The story is recounted of a firm implementing a sophisticated forecasting model that later had to be abandoned, because the only person capable of using the model left the firm.[16] The point is simply that the sohpistication of the system cannot exceed the sophistication of the staff, unless the firm is willing to invest time and money in educating manager and staff so that they are able to use the technology and equipment.

Sometimes problems are caused by a credibility gap. This occurs when hardware salesmen give embellished versions, which may or may not be intentionally misleading, of what their hardware can deliver in support of

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[15]Farber and Ratliff, pp. 19 and 20.

[16]Farber and Ratliff, p. 20.

business-decision information. Then, what the system actually delivers causes disenchantment on the part of management.[17] Managers need to keep in mind that hardware salesmen are compensated for the number of units sold and not for the number of satisfied customers.

Resistance to Technological Change

Resistance to technological change is caused primarily by two factors: (1) fear of the computer itself and (2) interface problems among users, systems designers, and programmers. Recognition of these problems is needed because if users oppose the changes, the system will fail, regardless of its effectiveness.

Fear of the computer involves the mystique caused by the jargon, which frightens and discourages many people. The insecurity caused by the lack of necessary facility in vocabulary heightens fears of job displacement or downgrading. This fear can attain such magnitude that sabotage of the system can be a very likely occurrence, and computer systems are very vulnerable in this aspect.[18]

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[17]Around M. Kneitel, "The Comput-A-Cator in Business," Journal of Systems Management, 27 (May 1976): 15.

[18]Farber and Ratliff, p. 21.

The same deficiency in the specialized vocabulary of technology leads to interface problems among users, designers, and programmers, because they cannot communicate. This can be partially overcome by requiring users to play an active role in the planning and designing of systems. However, the user's resistance may be so great as to cause changes in either the system or the user staff. Minimizing the impact of this can be accomplished in part by maintaining open communication lines. Be honest about how technological changes will affect their jobs and offer retraining or assistance in relocating should the employee find the situation intolerable. These actions can and should be undertaken to lessen the trauma of change.[19]

Summary

The technology for supporting managerial decisions is presently at such a developed state that it, in and of itself, is not a problem. The problem seems to be that the computer is expected to make decisions, and that process is still too complex for

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[19]Farber and Ratliff, pp. 21 and 22.

technology. Further aspects of the problem include inadequate concern for matching system complexity with staff sophistication, understanding the applications for which a computer is suited, hostility brought about by foisting technology on an unsuspecting and ill-prepared staff, and subscribing to the belief that "more is better."

Recognition of the problems brought about by technology can help alleviate the disruptions somewhat. But in some instances, particularly in problems caused by resistance to technology, education seems to be a very viable alternative.

CHAPTER III

HUMAN ASPECTS

> Where human systems and technical systems interact, it is usually the case that our ability to understand and manage the human side of the equation lags our ability to develop the technical side.[1]

Perhaps the most significant aspects of MIS failure involve the human resource. It is difficult, in fact, to list any cause of failure that does not have its origins in some kind of human interface with the system. As the quote above suggests, our ability to deal with the human resource is somewhat lagging, and the manager must be cognizant of the problem areas that arise as a result.

Communications

Communications requires three basic elements: (1) a source, (2) a message, and (3) a receiver or destination, which, in turn becomes the source of

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[1]Mary E. Lippitt, A Behavioral Analysis for Planning MIS Implementation, Management Information Systems Research Center Working Paper Series, MISRC-WP-80-10 (University of Minnesota, Minneapolis, Minn., 1979), p. 1.

further communication. Problems can crop up at any point in the process and render the system useless.

<u>Verbal</u>

As mentioned above,[2] inadequate verbal skills cause interface problems with some personnel, leading to difficulties in communications. Also, the use of jargon is often a factor in shifting responsibility for poor performance or in intimidating less knowledgeable supervisors. Irwin H. Derman refers to this as using "alphabet soup" and gives the following illustration:

> Setting: Friday, 4 p.m.
> Manager (angry): "Why were the payroll checks late today?"
> DP (data processing) Manager (apologetic): "Because my request for 2314S was disapproved last spring!"
> Manager (regrouping): "Oh."[3]

Derman went on to say:

> The DP Manager could just as easily have said his Fragistan was on the fritz. The DP Manager is engaged in the well-known "alphabet-soup" game;

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[2]See Chapter II, pp.12-13.

[3]Irwin H. Derman, "Do You 'MIS' Understand," Business Horizons, 15 (October 1972): 59.

> using such phrases as "Hasp," "RJE," "2701," and so on. DP Managers have found this an effective technique for avoiding both criticism and a decrease in next year's budget.
>
> Any general manager who receives a memorandum filled with computer jargon should demand an English translation. After all, if a salesman said he didn't get the Jones' contract because the "moon was in the seventh house," you would probably fire him. On the other hand, if he said that Jones was feeling lousy the day of the presentation, you would probably understand.[4]

Full and open communications can help avoid interface problems both prior to and after the actual implementation of a MIS. Any system that is cloaked in secrecy or forced down the corporate throat will cause resistance that will probably doom the system to failure.[5]

Written

Oral communications are a problem, but so are written communications. For example, a computer printout 200 pages long does little to aid an executive in making a decision. What he does need is information in

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[4]Derman, p. 59.

[5]William B. Carper, "Human Factors in MIS," Journal of Systems Management, 28 (November 1977): 50.

a format that is brief and can be easily and quickly assimilated. To accomplish this, Arnold M. Kneitel offers a universal formula for communicators to consider: (1) Get the reader's attention by offering a well organized format, using a logotype and as few sheets as feasible; (2) Maintain interest through the proper use of language, sticking with short, simple words as much as is practical; (3) Facilitate decision making by underlining key points, using captions, computing ratios, making comparisons, and data ranking; and (4) Keep in mind that the report should cause some form of action. That is, it should trigger a decision leading to an action. Whether that action takes an overt or covert form is immaterial. These may not seem to be very profound, given their simplicity, but sometimes the more mundane attributes are the most difficult to achieve. For, as Kneitel notes, "Good communication isn't recognized; it just does its job."[7]

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[6]Arnold M. Kneitel, "The Comput-A-Cator in Business," Journal of Systems Management, 27 (May 1976): 18, 19.

[7]Kneitel, p. 18.

Informal Networks

When speaking of communication, attention must be drawn to the existence of not only a formal network but an informal one as well. This informal network exists as a result of man's need to maintain social contact with fellow workers and the resultant social environment existing within the organization. It is also supported by management's perceived need for "soft, unstructured" information in making many decisions. As a result, people often resist giving up informal or unofficial communication systems. This must be recognized, or the situation may arise as one researcher discovered, wherein:

> Managers still maintained volumunious hand-kept reports and journals after advanced MIS had been successfully in operation for many months.[8]

It should be obvious that the result is a tremendous waste of resources and concomitant erosion of the MIS effort.

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[8] Olen Clifton Billingsley, III, "Some Possible Behavioral Problems Associated with the Implementation of a Total Management Information System" (Professional Report, Graduate School of Business, The University of Texas at Austin, December 1972), p. 68.

The Role of Top Management

Top management support for MIS is a necessary condition for its success. However, many of them shun involvement in any aspect of MIS. Instead, a critical function of MIS effort such as the design of the system is delegated to a lower echelon employee--a systems analyst or an assistant controller. That person must then design a system based on plans and assumptions never fully communicated to him.[9] Despite this,

> Top management wants middle management to react to the events that actually occur, not to those that might have occurred had the real world been kind enough to conform to the planning assumptions.[10]

It would seem logical, therefore, that Derman is correct in saying that, "Top management involvement in the planning process is a prerequisite for successful design and implementation."[11] This viewpoint is shared by Carper, who believes that many CEOs[12] only pay lip service

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[9]Derman, p. 56.

[10]William A. Jones, III, "The Manager's Role in Design of an Integrated Management Information System--A Framework for Planning and Development (Professional Report, Graduate School of Business, The University of Texas at Austin, May 1974), p. 19.

[11]Derman, p. 57.

[12]Chief Executive Officer.

to MIS, because they do not believe computerized information systems really work. And, things that the CEO does not support usually fail.[13]

Not only is it important to have the support of and participation by top management in MIS, the lead executive in the information service department is pivotal and should be held accountable for the success or failure of the MIS effort.[14] Furthermore, the chances for MIS success are practically zero if this executive is more than two levels below the CEO.[15]

Developing the MIS

MIS, as does any project, cycles through several stages. Though the various stages are called by many names, the nomenclature is not particularly important. For purposes of this report the stages will be designated as: (1) analysis of the current situation, (2) determination of requirements and specifications,

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[13]Carper, pp. 49 and 50.

[14]John V. Soden, "Understanding MIS Failures," Data Management, 13 (July 1975): 33.

[15]Phillip Ein-Dor and Eli Segere, "Organizational Context and the Success of Management Information Systems," Management Science, 24 (June 1978): 1074.

(3) development of alternative system designs, (4) analysis of the alternative designs, (5) choosing of an alternative and implementation, and (6) evaluation of the system. It is not the purpose of this report to enter into a detailed discussion of each of these stages, but to discuss relevant factors that impact on whether the end result will succeed of fail.

Project Team Concept

In attacking MIS projects, the development assignment is far too frequently given to system designers and programmers. Problems result because of this almost completely technical orientation. These technical personnel are generally more concerned with creating an efficient system, wherein their expertise lies, than with creating an effective one. For example, in the case of programmers, they "don't understand complex business functions any better than top executives understand programming."[16] Why then should they be expected to come up with a support system for a function that is not understood?

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[16]G. E. Mueller, "Blueprinting a Workable MIS," Administrative Management, 39 (September 1978): 25.

A viable approach to MIS efforts is the project team. Unfortunately, a practice in wide use is to assign people to the team based on availability and immediate productivity rather than on the basis of knowledge. In this way, it is hoped, excessive "overhead" costs can be avoided. This should not be allowed to happen, though. "It is critical to top quality systems development that only people with a wide knowledge of operations and plans be assigned to the MIS team."[17,18]

Leadership Factors

There is no magic formula for determining either the leadership or composition of the project team. However, one needs to be aware that the philosophy, political ability, and managerial skills of the lead executive in the information services department will bear heavily on the eventual success or failure of the MIS effort, regardless of whether or not that person is the project leader. For that reason, he is often referred to as the MIS architect. Such lead executives can be

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[17]Emphasis added.

[18]Derman, p. 57.

categorized into five types:[19]

(1) The "flamboyant conceptualizer" is a creative communicator, strategically-oriented, persuasive, and sees the whole picture. He wants vast commitments of resources in order to force MIS "revolution" rather than "evolution," and he attracts bright, motivated, inexperienced young people. His lack of specificity in developing detailed control measures for the MIS effort, coupled with the magnitude of the attempted changes, lead to costly failures and abandonment of the effort. He is usually found in larger, less well-managed companies where the opportunities for cost savings in clerical areas are plentiful. As a result, he is often overly optimistic in calculating ROI when attempting to justify the requests for resource allocations.[20]

(2) The "benign under-achiever" takes virtually no risks. His primary failure is missed

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[19] John V. Soden, "Understanding MIS Failures," Data Management, 13 (July 1975): 32.

[20] Soden, p. 32.

opportunities, and he works with a very stable (and uninspired) group of professionals organized into a team that has weak controls and attempts to keep a low profile on the project. The lack of crisp performance measures allows him to hide his failures. This individual is usually found in mature industries where management is status-oriented rather than achievement-oriented.[21]

(3) The "tyrant" has very strong budget controls, and these are the only controls utilized. He does not recognize or understand the benefits of new information systems or new technologies. He maintains a stable organization with turnover confined, for the most part, to talented new employees who become frustrated by the lack of opportunity.[22]

(4) The "efficiency expert" is a very exceptional individual, because he recognizes the need for strong, well-balanced controls. His primary focus is on quantitative measures, and the

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[21]Soden, p. 32.

[22]Soden, p. 32.

systems development effort is toward operational areas that are designed to support centralized clerical activities, efficiency, and effectiveness. A strong organization is maintained with a concentration of talented systems programming individuals. He is given an increasing scope of responsibility, because he is operations-oriented, and he maintains a tight rein on administrative functions. The activities he controls serve as maintenance enhancement activities with the primary objective of reducing MIS departmental costs. Quick response to user requests is a benefit, although there is little contribution to long-term improvement of the decision-making capabilities within the company.[23]

(5) The "fast tracker" combines the positive attributes of both the "flamboyant conceptualizer" and the "efficiency expert." Needless to say, finding this individual within an organization is a very rare occasion.[24]

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[23]Soden, p. 32.

[24]Soden, p. 32.

It is, to reiterate, crucial that the traits of this executive be recognized. However, the skills of the project team leader are simply those required of any functional manager: planning, organizing, staffing, directing, coordinating, and evaluating.[25] Thus, appointment of a person with those identified skills as the team leader should prove adequate to the task.

Nontechnical Roles

In addition to analysts and programmers, there are also several other roles that need to be filled on the team. These roles are also considered to be vital for mission success and should be filled by personnel with nontechnical backgrounds and perspectives.

One role is that of organizational development, which focuses on total system changes. Because MIS changes such patterns and expectations of organizational performance as the formal and informal cultures, the organizational development function is to facilitate adaptation of MIS technology to the institution's culture.

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[25]Eric J. Eno, "The Administrative Generalist and MIS," Public Administration Review, 39 (September/October 1979): 488.

This adaptation ranges from achieving concensus on MIS parameters at higher management levels to gaining acceptance for the project at working levels. The ability to motivate commitment is the skill required here, and a nontechnical individual is more likely to have it than would a computer expert.[26]

Too often users are offered no alternatives other than to "take or leave" a system, and they take it thinking "something is better than nothing." Because of this, the role of user advocacy must be filled. The analyst approaches design with three types of criteria in mind: (1) equipment constraints, (2) standards and conventions internalized through his prior work experience, and (3) user requirements or desires. However, he is more comfortable with the first two, and they, therefore, get more attention in the ultimate design. It is _imperative_ that the user advocate role be someone other than the principal designer. Otherwise, users will be intimidated by technology and, as a result, will demonstrate an unwillingness to control their own destinies.[27]

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[26]Eno, p. 486.

[27]Eno, pp. 486 and 487.

In order to maintain the functions of control, efficiency, and planning, the data base must be independent of the uses to which it is put, and this requires an MIS advocate. He sees that planned applications yield products that are accessible and usable by programs serving other MIS functions. One of his primary functions is to remind analysts of their responsibility to the overall MIS of the organization.[28]

One of the major causes of poor systems design is the lack of communication between the user and the specialist. This unhappy state is brought about because each fears appearing ignorant to the other. It would seem, then, that bridging this gap is a necessary role to be fulfilled, and it involves insuring that the user and specialist understand each other. The user's needs must be clearly spelled out early in the project's development, and he must understand how the MIS will meet those needs. In addition, the user should also gain insight into how the MIS will affect his customary way of doing things.[29]

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[28]Eno, p. 487.

[29]Eno, p. 487.

If it seems to the reader, at this point, that there may be more to think about in getting an MIS project off the ground, the assumption is quite correct. A further consideration, previously alluded to several times, is the importance of the user.

The User

The user is the individual for whom the system is being designed. It would then seem intuitively logical that he be included in the project from its inception as a member of the project team. This will help dispel problems arising from unrealistic expectations of what the system is able to do. Although the term "user" is used in the singular, realistically, a representative from every using department should be on the team. In this way, open lines of communication are maintained between the team and managers of the departments that the system will hopefully support.

Users as team members also insure that management is kept abreast of both progress and problems in the design effort. This can help to create an atmosphere of total involvement of all management personnel! However, care must be taken that users are assigned the correct tasks. They cannot be expected to know and do detailed work such as is performed by systems analysts and programmers.[30] The importance of user participation is underscored by Lucas in his statement, "users do not understand much of the output they receive."[31] One way to preclude this is through active involvement and open communications.

Given that the project team is now formed in accordance with the proposed guidelines, consideration will now be given to a cursory review of the development process.

Situation Review

As already mentioned, it is a universally accepted tenet that a project should start with a review of the current situation. Without this step it is impossible to determine if any need for a MIS exists. Often organizations find themselves in the unenviable position of having automated a function without regard for whether

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[30]Jones, pp. 44 and 45.

[31]Henry J. Lucas, Jr., Why Information Systems Fail (New York: Columbia University Press, 1975), p. 2.

a need existed. In effect, a system was designed and implemented for "appearances sake." In this stage, the purpose needs to be stated explicitly, and the present capabilities and proposed capabilities delineated.

Specification of Requirements

The second step in the process is to determine the system requirements. In doing this, determination of the user's needs is paramount. Why? As Eno succintly puts it: "Failure to try to support the user will likely result in failure of the user to support the project."[32] Jones puts it another way: "Specific management requirements are prescribed as the framework to formulate attainable system objectives."[33]

Unfortunately, the user specifications for requirements are not usually accurately determined until the system has been tried out; thus, the system normally has to go through several iterations before the user is satisfied. Specification, then, is an error in the basic assumption that a user can accurately specify his requirements. The answer may lie in application simulation:

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[32]Eno, p. 488.

[33]Jones, p. 29.

"inexpensively creating a lashed-up computer system that will produce, however inefficiently, products to satisfy the user needs."[34] This allows the user to try it and see if the results are acceptable.

It is essential that the simulation appear as finally intended to the user. The system continues to operate then, with brief user specifications created, resulting in technically correct, efficient programs to replace the lash-up, and integrating them into the application simulation. This allows the user continued use of the system, and insures that he recognizes the benefits. Concurrently, the system stays in touch with the user's world and allows analysts and programmers to develop data systems in a timely fashion. Hopefully, the process results in: (1) user specifications being real requirements, (2) benefits that are actual, not promised, and (3) a system available in a shorter time frame.[35]

Another procedure for dealing with the specification of requirements is through the use of a contingency

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[34]James W. Frank, "Management Information Systems: Applications Design by Trial and Error," Infosystems, 26 (September 1979): 78.

[35]Frank, p. 78.

method for selecting a requirements assurance strategy. Here again, the premise is that the biggest cause of information systems failing to satisfy user needs is incomplete or inaccurate specification of requirements.[36]

Uncertainty is determined by four contingencies: (1) project size, (2) degree of structuredness of decisions to be supported, (3) user-task comprehension, and (4) developer task proficiency.[37] Their contribution to uncertainty is depicted in Figure 1.

The next step is to measure the contingencies and determine the level of uncertainty with the aid of a worksheet as shown in Figure 2. Then one must select an information requirements assurance strategy suitable for the level of uncertainty observed.[38] These strategies are outlined in Figure 3. The model in complete form is shown in Figure 4.

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[36]J. D. Nauman, G. Davis, and J. McKeen, Determining Information Requirements: A Contingency Method for Selection of a Requirements Assurance Strategy, Management Information Systems Research Center Working Paper Series, MISRC-WP-80-102 (University of Minnesota, Minneapolis, Minn., 1979), p. 4.

[37]Nauman, Davis, and McKeen, pp. 5-7.

[38]Nauman, Davis, and McKeen, p. 8.

CONTINGENCY TYPE	CONTINGENCY DEGREE	CONTRIBUTION TO UNCERTAINTY
Project Size	Small	-
	Large	+
Degree of Structuredness	Structured	-
	Unstructured	+
User-task Comprehension	Complete	-
	Slight	+
Developer-task Proficiency	High	-
	Low	+

SOURCE: J. D. Nauman, G. Davis, and J. McKeen, Determining Information Requirements: A Contingency Method for Selection of a Requirements Assurance Strategy, Management Information Systems Research Center Working Paper Series, MISRC-WP-80-02 (Minneapolis: University of Minnesota, 1979), p. 5.

FIGURE 1

CONTINGENCY ANALYSIS

CONTINGENCIES	REQUIREMENTS UNCERTAINTY		
	Low	Moderate	High
I. Project Size			
a. Project development time	Short		Long
b. Total project development cost	Small		Large
II. Degree of Structuredness			
a. Goal clarity (specificity)	High		Low
b. Existence and definition of general model of process or procedures	Well Defined		Poorly Defined
III. User Task Comprehension			
a. Understanding of problem	High		Low
b. Understanding of application system	High		Low
IV. Developer Task Comprehension			
a. Previous experience with same or similar system	High		Low
b. Previous experience in user area	High		Low
V. Overall Assessment			
Sum of responses			
Times uncertainty factor:	0	1	2
	+	+	
Uncertainty score	= _____		

SOURCE: J. D. Nauman, G. Davis, and J. McKeen, Determining Information Requirements: A Contingency Method for Selection of a Requirements Assurance Strategy, Management Information Systems Research Center Working Paper Series, MISRC-WP-80-02 (Minneapolis: University of Minnesota, 1979), p. 15.

FIGURE 2

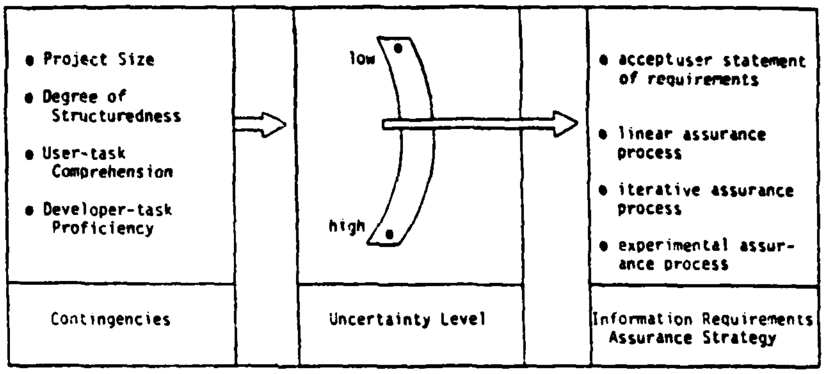
UNCERTAINTY WORKSHEET

Requirements Assurance Strategy	Process Characterization
accept user statement of requirements	elicit - document
linear assurance process	elicit - document - sign off
iterative assurance process	elicit - document - elicit - document - ... document - sign off
experimental assurance process	elicit - demonstrate - elicit - demonstrate - ... document - sign off

SOURCE: J. D. Nauman, G. Davis, and J. McKeen, Determining Information Requirements: A Contingency Method for Selection of a Requirements Assurance Strategy, Management Information Systems Research Center Working Paper Series, MISRC-WP-80-02 (Minneapolis: University of Minnesota, 1979), p. 9.

FIGURE 3

INFORMATION REQUIREMENTS ASSURANCE STRATEGIES



SOURCE: J. D. Nauman, G. Davis, and J. McKeen, Determining Information Requirements: A Contingency Method for Selection of a Requirements Assurance Strategy, Management Information Systems Research Center Working Paper Series, MISRC-WP-80-02 (Minneapolis: University of Minnesota, 1979), p. 12.

FIGURE 4

THE CONTINGENCY MODEL

Design and Analysis of Alternatives

In the project stage (where design alternatives are being generated), one must insure that several alternatives are generated and subsequently analyzed. Otherwise, there is no assurance that the system implemented will be anywhere near maximum possible efficiency and effectiveness. In-house designs also should not be the only designs considered. Often it can be advantageous from both cost and time perspectives to see what packaged software is available. Sometimes only insignificant modifications are needed in order to meet specified requirements.

Implementation

Avoiding implementation failure is another prerequisite for project success. To accomplish this, two complementary courses of action, in addition to those already described for specification of requirements, need to be undertaken. They are: (1) expansion of management support for the system and (2) a training program.[39]

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[39]Nestor Guimaraes, Understanding Implementation Failure: Case Analysis on the MIS/User Interface, Management Information Systems Research Center Working Paper Series, MISRC-WP-80-13 (University of Minnesota, Minneapolis, Minn., 1980), pp. 17-18.

The issue of management involvement and support has already been addressed and should not need further explication.

Education of organizational personnel can help in areas concerning misconceptions, such as the implementation of a MIS resulting in

> the elimination of great portions of lower and middle management positions. . . . Most authors suggest an extensive educational program be instituted in order to minimize this fear, but company educational programs have a poor history of success and may be perceived as an attempt to "brainwash" the managers into submission long enough for the system to be properly installed; soon afterwards, it would be predicted, the axe will fall.[40]

I believe that with an honest educational attempt, user involvement, and open communications throughout the development process these erroneous perceptions can be decreased significantly.

Resistance to implementation is another area in which education can be of vital significance. There are many causes for this resistance most of which are due to ignorance. These causes of resistance include:

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[40]Billingsley, p. 58.

(1) A threat to one's status or power. MIS makes jobs seem more, or less, important than before, and people do not like losing status to a machine.

(2) A threat to one's economic security. That is, fear of displacement by a machine.

(3) Feelings of insecurity. The technological threat is perceived as a personal attack by something not understood, and the employee becomes insecure, frustrated, paranoid, withdrawn, and hostile.

(4) A threat to one's ego. The MIS is viewed as a direct threat, which the employee is powerless to fight, and he perceives himself as becoming a glorified "button pusher."

(5) Feelings of uncertainty or unfamiliarity. These are often caused by fear of the unknown.

(6) An increase in job complexity. Here, the perception is that only "brains" can handle the work.

(7) Changed relationships between superiors and subordinates. Here, the junior person may become a de facto superior of senior people,

because he controls the type and flow of information which the firm has available for its use.

(8) Job or role ambiguity. This is caused by a loss of autonomy and control by middle managers resulting in uncertainty about their role within the organization.

(9) Job regidity and time pressures. MIS is viewed as the epitome in programmed operations and therefore as invalidating the existing social system and its attendant informality.

(10) Changed interpersonal relationships and work patterns. MIS is thought of as an interloper destroying the social and political structures of the work environment.[41]

The effects of resistance range from sabotage of the system, or blaming it for everything that goes wrong, by operating personnel, to avoiding the system by ignoring its output on the part of middle and top management.[42] All these causes and effects, though, are possible candidates for a reduction in strength through

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[41]Carper, pp. 48 and 49.

[42]Carper, p. 49.

educating (or reeducating) personnel impacted by the system and through the other counter-measures previously discussed in this chapter.

Evaluation and Feedback

Even after implementation is successful, the project is still not completed. It must be remembered that the system is, or should be, dynamic and not static. There needs to be periodic evaluation of the system in order to insure that the MIS is maintaining its effectiveness and efficiency. This evaluation compares the actual objectives, scope, and benefits of the MIS with the objectives, scopes, and benefits as determined during the design stage. MIS needs the feedback from these evaluations in order to maintain quality assurance as much as any product line put out by a manufacturing process does.

Summary

> Because of the tremendous differences in learning ability between people, the extension of computer utilities could result in chaos if information services are not socially engineered to accommodate the vast range of individual differences while exist in our society. If we are genuinely

> concerned with the application of computers in information systems and with social effectiveness, we must recognize that advances in man-machine communications will be inspired and consumated by advances in man-man communication.[43]

If the project team does not recognize the interactions of man and machines in the whole development process, and the attendent problems, the effort is doomed to failure.

Special problems have been examined in the areas of communications, the role of top management, the formulation of a project team, and the development cycle as it impacts on the MIS efforts. The complexities involved seem almost insurmountable. However, they must be overcome and dealt with or the development cycle becomes one of enthusiasm, incipient doubt, schedule slippage, cost overruns, finger pointing, and scrapping of the project. This results in an information system

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[43] Maurice Glenn Gardner, "Human Factors Applications in Information Systems Design and Implementation" (Professional Report, Graduate School of Business, The University of Texas at Austin, May 1975), p. 66.

that does little for only a few.[44] In this age of scarce resources, such waste cannot, and should not, be tolerated.

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[44]Richard F. Denning, "Computing the Need," Business Insurance 14 (March 1980): 19.

CHAPTER IV

MONEY AND KNOWLEDGE

There are other factors, though, tied closely to the human and technological aspects that bear strongly on whether MIS efforts will succeed or fail. For purposes of this report those factors are discussed under the nomenclature of money and knowledge.

Money

Scarcity

Overall expenditures for the support of information systems average about 1 percent of sales revenue. Out of that 1 percent, approximately 35 percent is used for purchasing hardware resources. The rest covers personnel, supplies, services, and telecommunication costs.[1] Out of the portion alloted for personnel, 60 percent goes for maintenance of old systems--some as old

[1] William M. Taggart, Jr., Information Systems: An Introduction to Computers in Organizations (Boston: Allyn and Bacon, Inc., 1980), p. 160.

as 25 years--and 40 percent is applied to the development of new information systems. As a result, there is a national backlog of 18 to 30 months for the development of new information systems that is chasing the remaining 40 percent of the human resource allocated for this purpose.[2] It should be evident that monetary resources are scarce with regard to the MIS effort, and the use of that resource needs to be evaluated very carefully.

Need

Prior to committing monetary resources, the proposed application should be examined very closely for necessity and cost effectiveness.[3] Whether the present system lends itself to automation should be one of the first questions asked. Also, the effectiveness and efficiency of the present system are issues that should be addressed. Many times it is less expensive to perform tasks manually because of expense involved in using time

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[2]John Diebold, "New Directions in Management," Infosystems, 26 (October 1979): 42.

[3]Richard F. Denning, "Computing the Need," Business Insurance, 14 (March 3, 1980): 21.

on the computer. Going to an automated MIS should be based less on fashion and more on need![4]

Cost Versus Benefit

On a monetary basis, the decision on installing a computerized MIS is not as simple as it might appear. As mentioned, the MIS function has to compete with other functions in the organization for available resources. The lack of commitment of these resources often leads to MIS failure. The difficulty seems to lie in the fact that most budgetary allocations are made on the basis of cost/benefit analysis, and many MIS benefits cannot be quantified, e.g., opportunity costs, customer good will, risk of litigation, public image and the work environment. This is unfortunate, because the MIS function should be perceived in the same light as production, marketing, and finance.[5] Another reason for cost/benefit ratios being invalid for the allocation of resources to

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[4]Denning, p. 21.

[5]Phillip Ein-Dor and Eli Segev, "Organizational Context and the Success of Management Information Systems," Management Science, 24 (June 1978): 1)7).

MIS is that some predictions of costs and benefits simply do not materialize. This is caused by unrealistic expectations of the system, poor design, internal opposition, bad guesses, misinformation, and a lack of information. Cost benefit analysis can be improved through avoiding these problems and exhaustively listing all costs and benefits, both quantifiable and nonquantifiable. These lists should then be scrutinized very closely and subjected to periodic analysis and review for as long as the system is operational.[6]

A further recommendation for improving the cost/benefit ratio goes back to the phase where requirements are defined and specified. In determining requirements for the response time of the system, one needs to ask if instant status reports on data are necessary. Interactive terminals are an additional expense that may not be vital to the successful functioning of the system. One way of determining needed response time is to keep a log of internal and external information requests and

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[6]Leroy G. Farber and Richard L. Ratliff, "People Problems behind MIS Failures," Financial Executive, 48 (April 1980): 23.

compare current answering time requirements versus those proposed.[7]

Knowledge

Monetary considerations include all the overhead costs associated with the development life cycle of a MIS effort, i.e., salaries and related administrative expenses incurred for all personnel and studies prior to on-line availability of the MIS. Most of these preimplementation expenses result from the quest for knowledge and its dissemination to the organization.

The Quest

The quest for knowledge begins with predevelopment studies during the review of the current situation. In addition to reviewing organizational goals and objectives, an overview of the existing system must be developed and understood. This can be accomplished through interviews with personnel involved in the system and setting the system information and communication flows

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[7]Denning, p. 19.

down on paper. These methods allow comparisons between how the system is perceived to work versus how it actually works. It also offers an opportunity for determining individual duties and responsibilities; documented by interviews and job description, or summary, sheets. This may seem to be of secondary importance, but it is not. Many people, if asked, cannot delineate precisely what they are or are not responsible for. If individuals do not know their responsibilities, then they cannot know their information requirements. This leads to wasted resources through redundancy and duplication of effort; resources that the organization can ill afford to be careless with.

Another piece of knowledge needing to be developed in the initial study period is a summary of client and customer opportunities/problems. Development of MIS will always have some impact on customers and clients, and, if one is unaware of the external environment, opportunities for improved service can easily be overlooked. This would be imprudent because any improvement in an organization should have the ultimate goal of offering improved products and/or service to those who provide the organization's reason for existing.

Resource estimates also need to be calculated and set down in writing. This estimate statement would include personnel resources for users, analysts, and programmers and requirements for hardware resources such as processing units, peripheral devices, and software.

The generation of knowledge occurs on a continuing basis throughout the development process. Some further examples of the documentation that results are:

(1) Situation review: Financial statements, organizational charts, existing report formats, Data Name Dictionary review, existing system flow diagrams, and existing application flow diagrams.

(2) Requirements identification and specifications: Interview records, interview problem summary, general requirements statement, proposed system flow diagrams, proposed application flow descriptions, proposed report formats, and additions to the Data Name Dictionary.

(3) Physical design: Application flow diagrams and general specifications.

(4) Program preparation: General program description, hierarchy diagrams, program flow charts, and decision tables.

(5) Procedure preparation: User manual, application control chart, manual procedures, and operation run procedures.

(6) System conversion: Application test plan, data base/file initialization plan, and training guides.[8]

Development of knowledge, though, is not the only task that must be accomplished. The deleterious effects of inadequate knowledge on the part of organizational personnel upon whom it will be incumbent to interface with the MIS has already been discussed. In order to minimize resistance to change and disruption of the social environment, personnel needing additional training and education to bring them up to "speed" must be identified. The most technologically perfect MIS is useless if those it was designed to support lack the necessary skills to achieve interface with the system.

Scientific Knowledge

As pointed out at the beginning of this report, the causes of MIS failure, as outlined herein, are

[8]Taggert, pp. 385, 423.

largely the opinions of authors recognized as having extensive experience in the MIS field. Unfortunate though it may be, there does not seem to have been extensive research to provide empirical data for validation of these opinions. At least most of the literature reviewed did not offer supporting data.

Although many of the "causes" for MIS failure seem to make sense, it would seem that a logical course of action would be to try and increase knowledge through empirical research, rather than to continue speculating on the subject. The contention is not being made that no hard research has been conducted; only that it is not sufficient. This is an enigma, given that so much activity is taking place in the development of MIS that surely a fertile field of study is available.

Monetary resources allocated for the development and continuation of MIS functions are relatively scarce. As a result, very careful planning needs to be done so that resources are not squandered.

Developing and implementing a major MIS effort can take several years to accomplish. A great deal of knowledge is generated in the process, but it is not free. When estimating the time it will take for the MIS effort, one should allow a hefty fudge faction in attempting to quantify the cost of this knowledge. Through careful, astute planning and analysis the nasty surprises of cost overruns and deficient systems caused by inadequate knowledge can be avoided.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

This report has attempted to focus on four areas where particular care must be exercised in order to enhance the chances for success in Management Information System efforts. The areas discussed were: (1) technology, (2) human aspects, (3) money, and (4) knowledge.

The technological problems do not lie in the inability to support data processing tasks. Rather, the problem is in personification of the computer and the lack of concern for matching the sophistication of the technology used with the sophistication of those expected to use it. Coupled with unrealistic expectations of computerized systems, this lack of prudent applications has led to a false picture, wherein technology is depicted as the culprit in MIS failure.

Man/machine interfaces seem to cause, either directly or indirectly, a fair portion of the problems encountered in developing MIS. These problems include:

-Resistance to technology)

-Inadequate communication.

-Lack of education as to the effects of technological changes on the work environment.

The importance of having the support and involvement of top management was discussed, and a method for dealing with MIS development efforts was delineated, i.e., the project team concept. Composition of the team is another critical factor that must be weighed very carefully. Relegating the development task to those with only technical qualifications can be disastrous. Many different roles and responsibilities have to be assigned on the team so that a MIS is developed that will be not only function in theory, but in reality as well.

The costing of MIS efforts is another area that often results in unsatisfactory results. Cost/benefit analysis needs to be conducted very carefully and should include as many costs and benefits that are normally thought of as nonquantifiable as is possible.

Resources have to be allocated from an available base that has demands placed on it from many directions. Thus, realistic demands and needs must be developed in order to achieve efficiency and effectiveness in the use of those resources.

Vast amounts of knowledge must be generated in the development effort. Developing this knowledge is not only time consuming but costly as well. However, without proper documentation of the existing system, the proposed system, courses of action for implementation, and evaluation, misdirection and chaos is often the result. Also, the organization must be supplied with the knowledge that it needs for acceptance and utilization of the system.

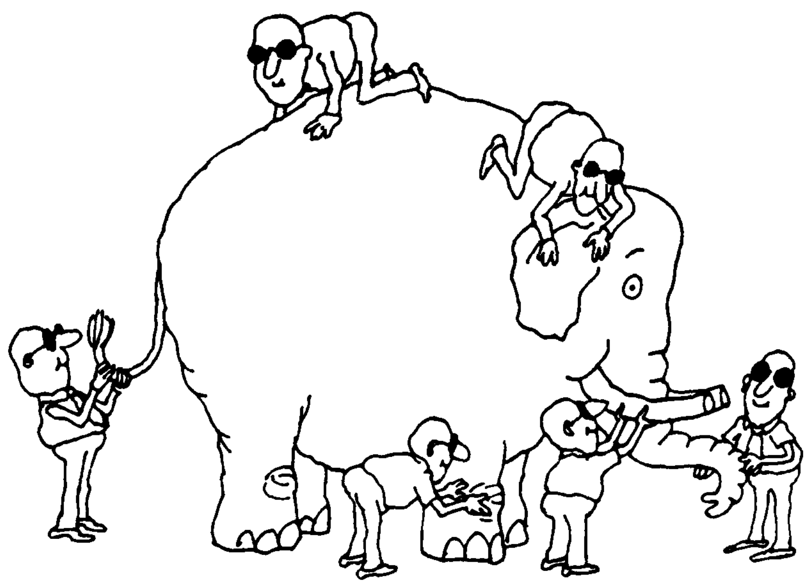
Knowledge is also an area in which the scientific community needs to expend more effort. One can write opinions, based in theory, on MIS failure, but I believe that without concurrent presentation of valid, empirical data to support those opinions they, more often than not, fall on deaf ears. This should not have to happen . The magnitude and scope of activities in the development of MIS should offer a fertile field for the researcher wanting to add weight to his opinions.

Conclusions

The MIS development effort is a very complicated, time-consuming task. Recognition of the problems that can negate the effort is imperative. Some development processes take several years, and many are scrapped without being brought to fruition, with the accompanying waste of resources and sense of despair on the part of those involved.

I believe that many of the problems involved in MIS development are caused by: (1) a lack of awareness of the many factors that contribute to MIS failure, (2) a lack of direction in how to take the project from inception to conclusion, and (3) a lack of detail in assessing what the current situation is, what the desired situation is, and the resources and constraints for attaining the desired state of affairs.

There is an old tale, depicted in Figure 5, in which six blind, though astute, men come upon an elephant. Each is asked to describe what the object is that they have encountered. The first man, feeling the side, thinks it is a wall. The remaining five men compare the tusk to a spear, the trunk to a snake, the leg to a tree, the ear to a fan, and the tail to a rope. Much the same happens in MIS development if an overall perspective is not maintained. Knowledgeable leadership, capable of viewing the whole system, is needed so that one part of



SOURCE: William M. Taggart, Jr., Information Systems: An Introduction to Computers, in Organizations (Boston: Allyn and Bacon, Inc., 1980), p. 13.

FIGURE 5

SIX BLIND MEN

the system is not taken out of context and lavished with attention to the detriment of the remaining components of the system.

The only way one can keep track of and accomplish the myriad tasks and innumerable details involved in MIS development is to have a methodology that will provide an adequate framework for planning and analysis through all of the stages of development from preproposal studies to implementation and evaluation. Otherwise, one will become bogged in a morass of confusing details, invalid plans and assumptions, inadequate and wasted resources, and ultimate failure of the project.

Recommendations

In order to achieve direction, maintain consistency in purpose, develop sufficient analytic documentation, and provide for a well balanced, integrated effort, I would recommend a model be used to carry out the MIS effort.

Though there are probably other models available, I have yet to see any as all-inclusive as the Management Integrated Model Information, Capital and Control System, or MIMIC^{2}S as it is usually referred to.[1] This model was formulated over several years by Dr. Eugene B. Konecci, the Kleberg Professor in the Graduate School of Business at the University of Texas at Austin. Dr. Konecci evolved this model based on his many years experience as a management practitioner in both the public service and business sectors. Selected illustrations are shown in the Appendix to demonstrate the level of detail and sequencing of effort induced by the model.

The model is very flexible in its application. It can be used in project planning, product development, starting new businesses, or any other application where detailed planning and analysis are essential components. And, a major MIS project is one of the most demanding of projects, in its complexity, that one can attempt.

The model has five stages which move one through an iterative refining process for detailed and systematic analysis of complex problems or projects. It is very capable of taking one all the way from preproposal studies to implementation and evaluation of

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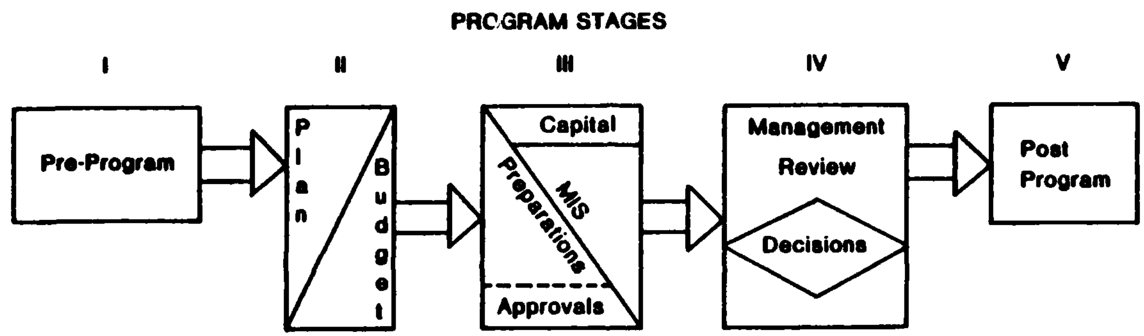
[1]For a detailed explanation and application of the MIMIC^{2}S Model, I would recommend Management Integrated Model: MIMIC^{2}S (Wm. C. Brown Company, Dubuque, Iowa, 1980), written by Dr. Konecci.

the project. The methodology allows identification of goals and objectives, levels of knowledge, the state of technology, resources and constraints, and the individual subsystems involved. Tradeoffs are also identified between what would be ideal and what can be reasonably expected.

As stated in this report, a broad perspective is needed to supervise MIS development projects. For the novice, or layman, placed in the position of being responsible for MIS efforts, or even for those adept in the field, the MIMIC^{2}S model offers a powerful tool for successful accomplishment of the task.

A P P E N D I X

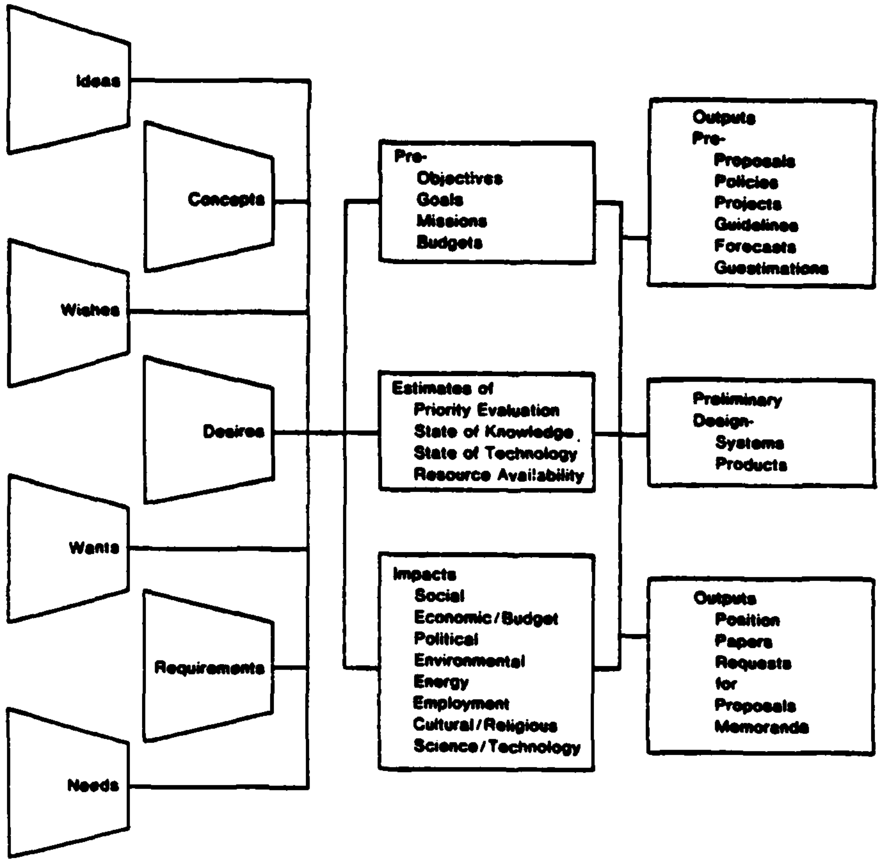
The illustrations in this appendix are included so that a reader can see the logical progression of the MIMIC^{2}S model and the documentation that can be generated through iterations of each stage and cycle. The flexibility of the model allows one to develop the level of planning and documentation applicable to any size project. The level of detail is a management decision, but the model can easily handle any range from very general to highly specific.



SOURCE: Eugene B. Konecci, Management Integrated Model: $MIMIC^2S$ (Dubuque, Iowa: William C. Brown Company, 1980), p. 5.

ILLUSTRATION 1

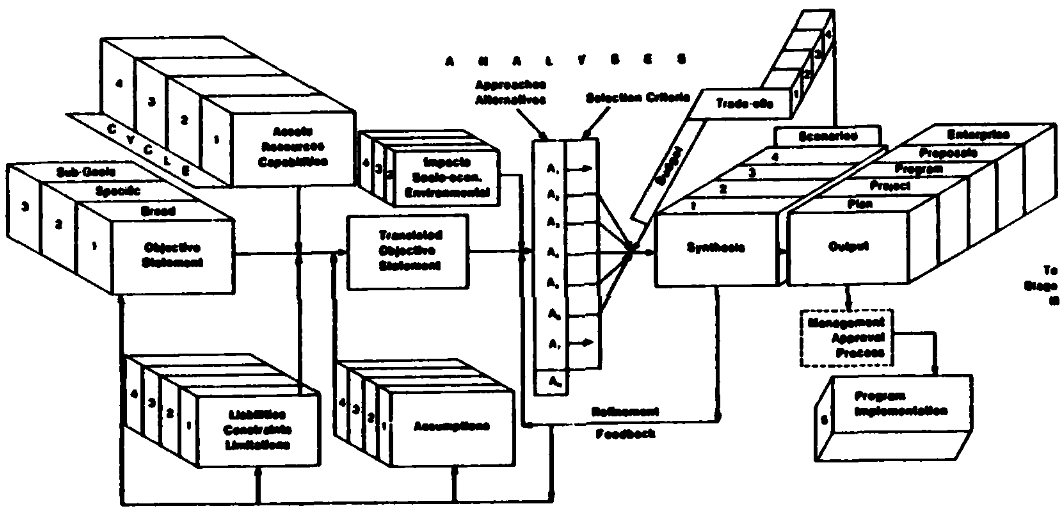
PROGRAM STAGES



SOURCE: Eugene B. Konecci, Management Integrated Model: MIMIC^{2}S (Dubuque, Iowa: William C. Brown Company, 1980), p. 12.

ILLUSTRATION 2

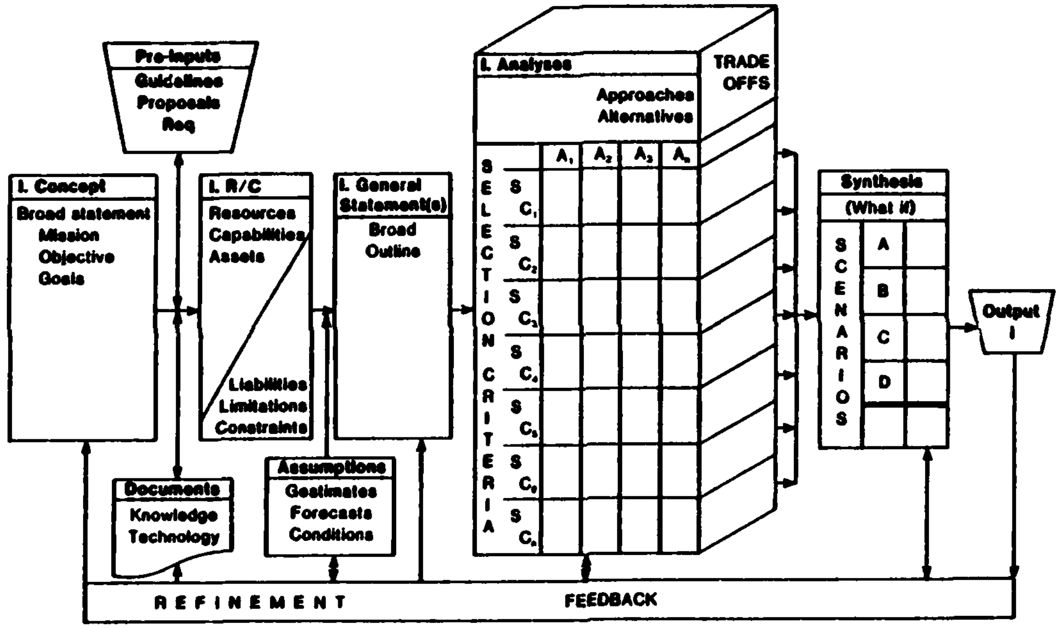
STAGE I: PREPROGRAM



SOURCE: Eugene B. Konecci, Management Integrated Model: MIMIC^{2}S (Dubuque, Iowa: William C. Brown Company, 1980), p. 15.

ILLUSTRATION 3

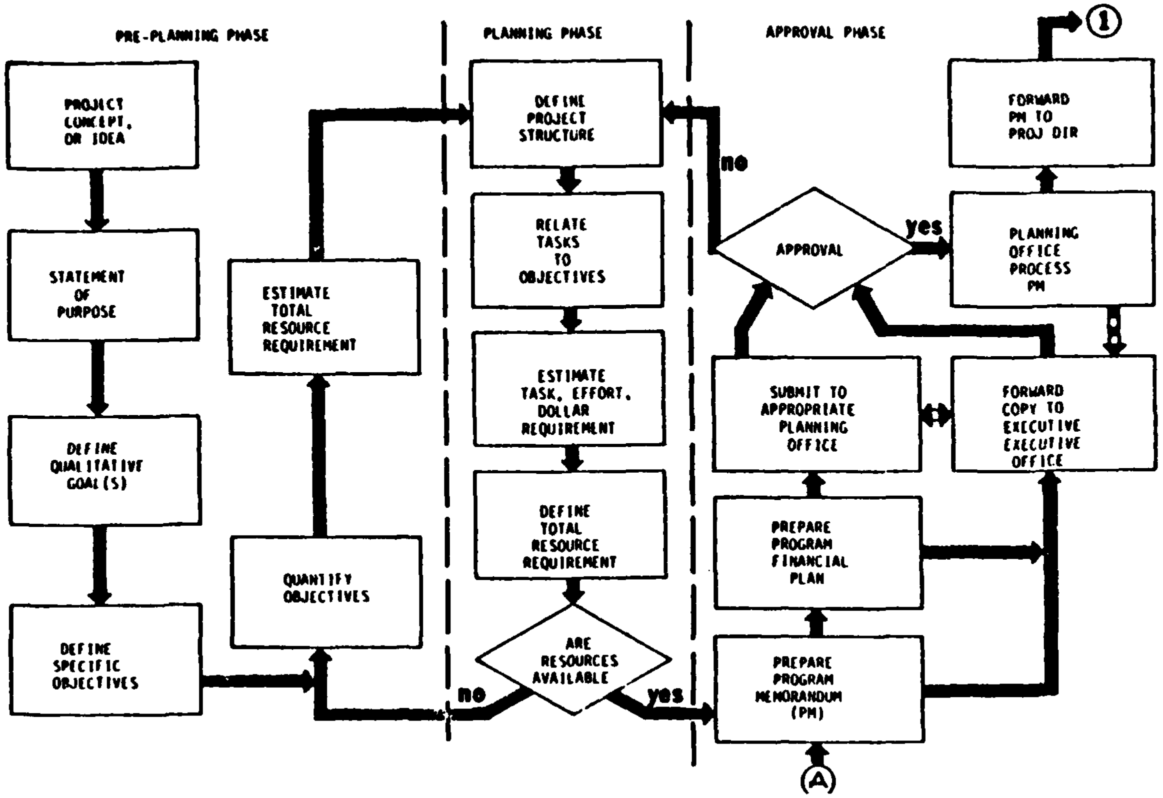
STAGE II



SOURCE: Eugene B. Konecci, Management Integrated Model: MIMIC^{2}S (Dubuque, Iowa: William C. Brown Company, 1980), p. 19.

ILLUSTRATION 4

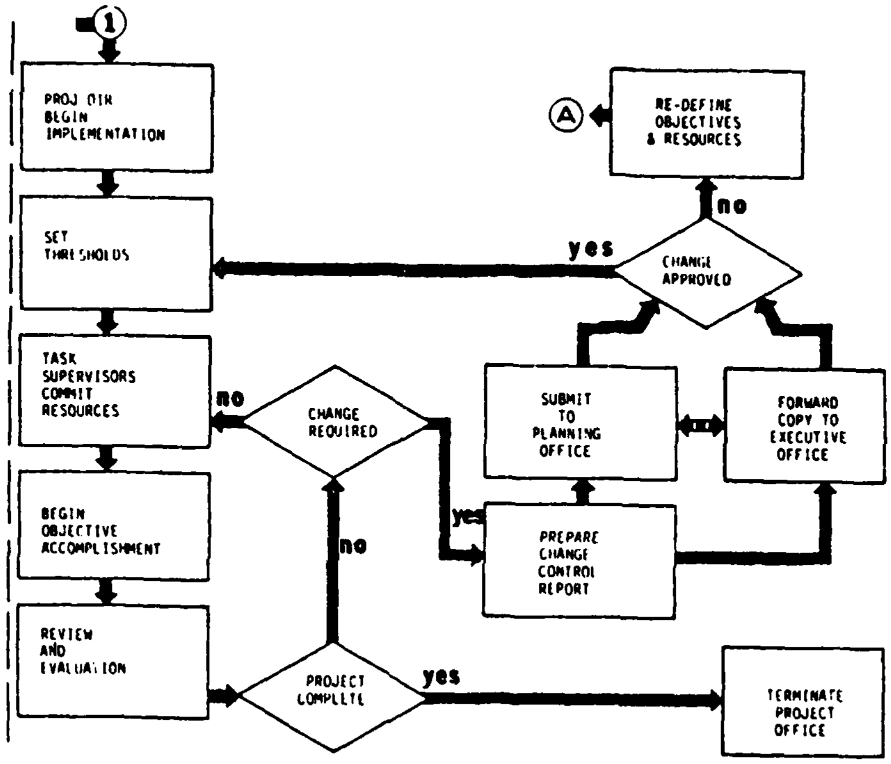
CYCLE I



SOURCE: Eugene B. Konecci, Management Integrated Model: MIMIC^{2}S (Dubuque, Iowa: William C. Brown Company, 1980), p. 46.

ILLUSTRATION 5

MIMIC^{2}S STAGES I & II



SOURCE: Eugene B. Konecci, Management Integrated Model: MIMIC^{2}S (Dubuque, Iowa: William C. Brown Company, 1980), p. 47.

ILLUSTRATION 6

MIMIC^{2}S STAGES III, IV & V

Implementation Phase

B I B L I O G R A P H Y

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