

INFORMATION MANAGEMENT

AN EXECUTIVE APPROACH

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PREFACE

In the end it is the effectiveness of information systems that counts. Although it is not easy to measure the impact of information systems on the efficiency of operations and the effectiveness of management's decision-making, it is clear that there is ample room for improvement.

Many reasons have been given for the failure of information systems or management information systems. We would like to mention a few major causes only:

1. Too few information systems are coupled directly with the objectives and strategy of the host organization. Data processing managers have been allowed to pursue their activities independently. Some way is needed of formally homing the information resource in on the lifestream operations and key management decision areas of an organization.
2. Too many organizations are plunging into information systems prematurely, often misapplying information resources, as seen in the context of the broader organization's interests, and, worse, precipitating the disasters that attract so much unwelcome attention. Some way is needed of defining information problems in their broadest and most complex organizational context and then fashioning a plan that will link the information system effort to that of the organization.
3. Too little attention has been paid to helping managers to define the information requirements needed to assist in achieving their true objectives in the organization. Most organizations that have used computers for more than a decade have long since computerized their basic accounting systems and have been attempting to support management functions. What has not been sufficiently realized is that defining management information needs is a far more difficult task than the conventional systems analyst has been accustomed to or equipped for. What are needed are more effective tools to facilitate the defining of management information needs.
4. Too few chief executives take the hard-nosed line of an acquaintance of ours when he asks, "What will this new system do for my profits?" Whether the organization is non-profit or not is irrelevant. The attitude is important in creating a climate of goal-orientation and in placing any information system project in its correct perspective in an organization – not as an end in itself but a means to an end. What is needed is an approach to information systems that will give a chief executive a way of steering his information resource and controlling its performance.

In consulting assignments and contacts with managers at all levels in a wide variety of organizations, in both the public and private sector, we came to the conclusion that these were the fundamental problems blocking increased information system effectiveness. Furthermore, no ready-made solutions were at hand. As a result we were forced to develop an information system methodology using whatever tools were at hand and creating them when there were none.

A further difficulty was the lack of information specialists, people able to apply information system methods and tools. We were forced to look at ways of finding and developing such people, who need a strong management orientation.

This book is about the information system methodology that was developed in response to the needs described above. It has in varying degrees been applied in consulting situations by ourselves and by practising managers, and has been taught to hundreds of such managers.

Some idea of our view of the field of information systems can be discerned from the above remarks. Some frontiers of the field appear to be:

- The definition of information system situations in organizations.
- The definition of management's information requirements.
- The whole question of people and information systems i.e. the human aspects.
- The automation of system design.

This book treats the first two in depth and makes a determined attempt to get to grips with the third. Automation of system design has been left for the experts and academics.

Since our contact has been mainly with practising managers, we have come to regard our function as a bridge between the academic textbooks on management information systems and the practitioner. This book, therefore, has the following broad objectives:

- Provide a means by which all managers, accountants and professionals can increase the effectiveness of their information systems.
- To provide a means by which systems analysts and others can equip themselves for the specialist roles of information manager or information analyst.

It has been written primarily for private and public sector managers with more than three years business experience and specifically for use in post-experience educational programs for such managers.

The reader, after completing this book, will know how to:

1. Define information system situations in their full organizational context.

2. Determine management information and transaction processing output requirements.
3. Manage the development of information systems to satisfy management information and data or transaction processing requirements.

The approach is that of general and user management towards the management of this important organizational resource – information.

While this text could be used as a basis for in-house MIS training and the development of information skills, or to provide a practical approach for business schools and universities to educate all managers (as well as information specialists) in information management, readers interested in these aspects are referred to the book we are preparing especially for teaching and learning purposes *Information Management: Text and Cases*.

In order to meet the stated objectives, the material makes extensive use of broad approaches or frameworks.

Each of us in attempting to comprehend and deal with situations in which we find ourselves, abstracts certain elements from the situation in accordance with some accustomed way of thinking. This process is most often implicit and therefore unconscious.

The opportunity for comprehending the nature of a situation more accurately and for predicting outcomes more certainly is increased greatly when the way of thinking is made explicit, so that it can be subjected to continuous testing and refinement. Man's major gains in knowledge and practice have always resulted from the conceptual breakthroughs of abstracting different elements from the totality and/or perceiving them in new and different relationships.¹

This is nothing more than modelling, namely the abstraction of key elements from a complex reality to:

- increase understanding of complex processes by describing the phenomenon and its relationships and interactions,
- assist with the analysis of a complex process on a practical basis,
- present the phenomenon in such a way that its future states may be predicted, and
- manage the phenomenon.

Since the material in this book has been aimed at practising managers, we have tried to make textual references unobtrusive, the text readable and provide diagrams and examples where possible. Further, since the material is relevant in any reasonably advanced economy, the approach is multinational in nature.

The criteria we applied when deciding what material to include in the text,

were the usefulness, practicality and validity of that material. There are sufficient references for those seeking a greater theoretical foundation, but our prime concern has been with assisting practitioners to manage their information.

Finally we would like to express our gratitude to the many students, clients and other friends who have made this work possible. In particular we must mention the lady who did most of the typing – Eeufesia Maré and our wives Heather and Jeanne for their patience, tolerance and stoicism.

Any feedback on the contents of this book will be welcome since it is appreciated that this is only a beginning. Comments should be sent to us, care of the Publisher.

NEIL M. DUFFY

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Notes:

1. Robert L. Katz. *Management of the Total Enterprise*, Englewood Cliffs, New Jersey: Prentice-Hall, Inc. 1970. p. 14.

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CHAPTER 1

INFORMATION SYSTEMS OVERVIEW

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1. Introduction

Although information systems should be an applied discipline, there is a need for an understanding of its underlying theory. Good textbooks do exist, but the manager facing an information problem or the educationist structuring an information systems course for practising managers will usually prefer a briefer overview of the more relevant theory. The purpose of this chapter is therefore to provide an information systems overview to serve as a base for the practical application of information system methodology.

During his reading of this chapter the reader should acquire an understanding of the nature of information systems, their importance to modern organizations, what steps are required to plan, analyze, design, implement and control them, and some of the controversies surrounding them.

2. The Problem of Terminology

The first problem that will be encountered in most studies of information systems will be that of getting to grips with some extraordinarily confusing and, sometimes, contradictory terminology. This is the situation with any new discipline and the only approach that can be taken to overcome this difficulty is to look behind the terms and try to understand the concepts they are attempting to project.

One basic terminological distinction needs to be made at the outset: the distinction between *information systems*, *management information systems*, *transaction processing* and *decision support systems*.

In any organization certain fundamental processes and accompanying data flows occur. For example, in a manufacturing organization the fundamental processes are the acquisition and processing of materials and the distribution of the finished products. In order to carry out these processes a variety of documents must be produced and distributed. These include goods received notes, stores requisitions, clock cards, time sheets, payslips, invoices and statements – to name a few. Without this document flow no business process could take place. The initiation, processing and distribution of these fundamental documents is what is referred to by the term *transaction processing*. Traditionally transaction processing has been carried out on a manual basis, where it has received the attention of organization and methods (O & M) people, or by means of data processing equipment, in which case it is called *data processing*.

Planning, organizing and controlling the resources and transaction processing of any organization is the function of management. To do this managers require information and the systems that provide this information are called *information systems* or *management information systems*. The latter two terms are used synonymously in much of the literature and, for that

matter, in this book. To be more specific, however, *information systems* should be used to denote both *MIS* and *transaction processing* i.e. as an encompassing term: IS = MIS plus transaction processing. Finally, *decision support systems* relates to the use of computer-based information systems to support unstructured decisions. It can therefore be viewed as a subset of MIS which tries to support both structured and unstructured management decisions.

3. The Definition of Information Systems

In defining information systems (IS) or management information systems (MIS) one can describe their purpose (what they are intended to do), their physical elements (of what they are composed) or how they function (what they do). Appreciation of this fact alone can substantially reduce the confusion resulting from the wide variety of definitions available.

In essence an information system is a collection of people, procedures, a base of data and (sometimes) hardware and software, that collects, processes, stores and communicates data for transaction processing at operational level and information to support management decision-making.

A number of important implications arise from this definition:

- It covers the what, how and why of information systems.
- Information systems have always existed in organizations and always will.
- Information systems support both the basic operations of an organization as well as its management.
- A computer is not always an essential element of an information system. This need is determined by the amount of data or information to be processed and the complexity or speed of processing required.
- A distinction is drawn between *data* for transaction processing purposes and *information* for decision-making purposes.
- Attention is drawn to the concepts underlying information systems namely

People, management, information, systems and organizations.

During the remainder of this chapter these underlying concepts will be considered in greater depth.

4. The Importance of Information Systems to Organizations

... Any organism is held together by the possession of means for the acquisition, use, retention and transmission of information.¹

This is as true for organizations as for any other 'organism'. In a previous section it was explained that the basic operations of any organization could

not function without the supportive data flows called transaction processing. In the same way management could not function without information on which to base its decisions.

Since information systems are essential to organizations, and, since they have always existed in organizations, why is the study of information systems such a relatively new discipline? Some of the important reasons for this recent concern are:

- a) The increasing complexity of the organization and its environment. Internal complexity results from such tendencies as the increased size of organizations, the emergence of multinationals and conglomerates and the greater sophistication of internal processes and organizational structures. External complexity may be traced to phenomena such as recessions and booms, international financial instability, trade unionism, ecological and social issues and the increasing effect of political cross-currents on the manager.
- b) The lengthening time span of managerial decisions due to larger capital investment expenditures. Time span is used here in the sense of the impact on the future rather than the time taken to make the decision. This development directly affects decision risks, committing organizations further into an uncertain future.
- c) The increasing rate of technological innovation. In 1940 space exploration, jet aircraft, heart transplants, computers, polio vaccine, credit cards, tubeless tyres, atomic power, man-made fibers, color television and lasers were unknown. Toffler² quotes two examples of the accelerating rate of technological change:
 - Energy consumption. Roughly half of the energy consumed by man in the past 2 000 years has been consumed in the last 100 years.
 - Transportation: It took from about 6000 BC to the 1880's to go from about 8 m.p.h. to 100 m.p.h. It took only 58 years to quadruple this speed to 400 m.p.h.
A further 20 years were needed to reach 800 m.p.h.
In the decade of the 1960's speeds of 4 800 m.p.h. were achieved by rocket planes. In addition earth orbital speeds of 18 000 m.p.h. and earth escape velocities of 26 000 m.p.h. were surpassed.
- d) Improved communications have reduced the time available for decision-making.
- e) There has been an information explosion. This is once again vividly illustrated by Toffler³ in his example relating to the production of books.
 - Prior to 1500 AD 1 000 titles a year were produced in Europe.
 - By 1950 120 000 titles per year were produced in Europe.
 - By 1960 this figure had reached 160 000 per year.
 - By the mid 1960's 365 000 titles per year were being produced world wide.

- f) A good deal of money is being spent on information systems to help management deal with the effects outlined above. Management naturally wishes to improve the quality of this information because of its impact on decision-making.

An example cited by a local manager illustrates the increased need for a good MIS in the light of the trends described above:

Twenty years ago:

A new plant cost \$2 million. It took 18 months from preliminary plans to completion and produced a million units per annum. The product had a 30 year life cycle.

Today:

The new plant costs \$5 million. It takes 30 months from preliminary plans to completion and produces 3 million units per annum. Product life cycle has fallen to 15 years.

The net effect of this new investment is that:

- There is more at stake because it is more capital intensive (risk).
- The available time over which the investment must pay for itself has been reduced by one year because of the increased building time (complexity), and by 15 years because of the shorter product cycle (technological change).
- The marketing problem is tougher because of the new plant's capacity (technology) and because customers are better informed (improved communication).

Another factor that has led to an increased interest in information systems by managers is the normal growth of small businesses into larger businesses. When the business has a single owner/manager no formal management information systems are required. He can manage quite adequately with basic manual transaction processing and has all the necessary internal information at his fingertips. Subsequent growth of the organization leads progressively to:

- More formalized procedures for transaction processing since the owner/manager can no longer personally supervise all these activities. At a later stage mechanization or computerization may occur at this level.
- Basic control information becomes difficult to acquire and the first, formal manual procedures are instituted, then formal mechanized or computerized procedures.
- Finally, as additional layers of management are added, the chief executive

- feels the need for formal information systems for planning, and the requirement for a formal MIS is realized.

5. The Evolution of Information Systems

Davis⁴ traces the threads from which MIS has emerged as follows:

- a) From management accounting MIS has drawn on the concepts of
 - relevant costs for a decision, and
 - variance analysis.
- b) Management science has contributed a systematic approach, models and optimal decisions using techniques such as linear programming, dynamic programming and queueing theory.
- c) From management theory has come behavioral theory and satisficing rather than optimizing. Satisficing occurs with the adoption of the first solution meeting the minimum requirements of a problem.
- d) Computer processing has assisted with technological developments such as large internal storage, data communications, large direct access storage and the software advances of high-level languages and data base management systems.

6. Management Concepts in Information Systems

6.1 BASIC MANAGEMENT THEORY

There is no widespread agreement on the subject of organizational goals or objectives. For example, organizational goals have been stated to be maximization of profits, survival and the current results of negotiations by the most powerful coalitions in an organization.

Whatever the goals of the organization, however, they are achieved by means of a resource conversion process in which inputs of men, money, machines, materials and information are converted to outputs of products and services. Control over this conversion process is exercised by management.

The functions of management are also the subject of a wide diversity of opinions. For the purposes of information systems the most important management functions are planning, organizing and controlling. Before these functions can be carried out, however, decisions must be made.

6.2 DECISION-MAKING

There is considerable support for the view that the fundamental task of a manager is decision-making under conditions of uncertainty. Regardless of one's views on this matter it is clear that decision-making is a fundamental link in a chain leading to the attainment of organizational goals.