

UNIT 1 INTRODUCTION TO MIS

Structure

- 1.0 Introduction
- 1.1 Objectives
- 1.2 What is Management Information System (MIS)?
- 1.3 Historic Development
- 1.4 Computer Systems and MIS
- 1.5 Organisational Systems and MIS
- 1.6 Logical Foundation of MIS
- 1.7 Typical Systems
- 1.8 The Future
- 1.9 Summary
- 1.10 Self-Assessment Exercises

1.0 INTRODUCTION

This unit introduces the subject matter. Since MIS is studied both by computer professionals and management professionals, both the technical and organisational perspectives are provided in this module. Further elaboration of these ideas form the rest of the course. This unit will trace the history of computer applications in office management through Electronic Data Processing and its evolution to Management Information System. Recent trends like Decision Support Systems, Model Management Systems, Knowledge Based Systems will be classified within the broad framework of an evolutionary trend. The significant impact of Information Systems on the society at large and the emergence of Information Technology as a dominant industry will be outlined along with future implications in the Indian context.

1.1 OBJECTIVES

After going through this unit you should be able to :

- understand the notion of MIS
- appreciate the importance of MIS in organisation
- appreciate the relative role of computer systems & information systems
- appreciate the importance of commercial applications of computers
- develop a perspective to the evolving concept of MIS through the myriad term like EDP, MIS, DSS, ESS, KBS, etc.
- appreciate the significance of Information systems to the society at large.

1.2 WHAT IS MANAGEMENT INFORMATION SYSTEM (MIS)?

The *term* Management Information System (MIS) is familiar to most managers in the private sector, public sector and the government sector. Many MIS systems are in widespread use by the managers at all levels: operational, middle and senior management. Substantially large number of programmers and systems analysts are employed by many managers to build a variety of MIS systems. Naturally in the education of programmers and systems analysis as well as general managers, the subject of MIS occupies a key role.

The *concept* of Management Information System (MIS), however, is not clearly understood by many developers as well as the end users of these MIS systems. Some consider any computer based system to be an MIS. In the governmental sector, MIS primarily means a variety of reports, thanks to the emphasis on report generation by several funding agencies. For many, MIS is an evolutionary concept that evolved when the Electronic Data Processing Systems (EDP) matured. Some others consider MIS to be a discipline of management education similar to other disciplines like Accounting and Marketing. Many view MIS as a philosophy of providing help to managers in decision making. With the revolution in

microprocessors or telecommunications and their impact on many of the MIS systems development these days, many managers view MIS as a bunch of technologies. The traditional Organisation and Methods (O & M) specialists view MIS as an implementation of the organisational systems and procedures. For many of the students of Computer Science, MIS is just a course on File Structures and File Processing with a relatively less demanding intellectual component!

In our view, Management Information Systems (MIS) involve all these and much more. The three sub-components — Management, Information and Systems — together bring out the focus clearly and effectively — *Systems* emphasizing a fair degree of integration and a holistic view; *Information* stressing on processed data in the context in which it is used by end users; *Management* focusing on the ultimate use of such information systems for managerial decision making rather than mere technology. While many professionals may like to substitute the term MIS by relatively nascent terms like Decision Support Systems (DSS) and Executive Support Systems (ESS), in our opinion MIS is the most widely used and understood terminology and retains the spirit of Management Information more comprehensively than most other terms.

While the conceptual MIS does not have to rely on a computational device, in the contemporary world where computers are ubiquitous by their presence, if not use, any meaningful MIS would exploit the power of computing and communication devices to the maximum extent.

For the purpose of this text, we would mean Management Information System (MIS) to be the set of computer based systems and procedures, designed to improve the managerial decision making process - that involve collection, organisation, distribution and storage of information for analysis and control.

Needless to mention, such a definition only includes formal decisions that can be codified in the form of systems and procedures. Care must be exercised to note that some decision situations may have far reaching consequences and yet be out of the reach of MIS. This includes innovative and intuitive decisions, emotional and personal decisions that may not lend themselves to formal frame work of analysis.

1.3 HISTORIC DEVELOPMENT

The modern digital computer was primarily designed for scientific calculations. Ever since the use of computer for the American Census work in 1954, however, the commercial application of computers far exceed the scientific applications. It is estimated that the commercial applications amount for as high as 80% of the investment in hardware and software. A significant portion of such commercial applications aims at providing the management of an enterprise, some form of information system support. The broad area that deals with such an information support came to be widely known as Management Information System (MIS).

The concept of Management Information System has changed substantially over the years. In the 50's and 60's, the management saw the potential of computers to process large amounts of data speedily and accurately. The speed and accuracy of such data processing equipment far exceeded that of human clerks, who used to undertake data processing in those days. The departments that were involved with such activities were known as *Electronic Data Processing* (EDP) departments. The focus of EDP was Record Keeping — an activity statutorily required in many organisations. The majority items whose records need to be kept were primarily accounting data — symbolically described by many users in India as Payroll data. So, many EDP departments fell in the administrative control of Accounting Departments. Interestingly in India, we had taken an early lead in such applications. A classic example in the Indian context is the extensive use of EDP by Indian Railways.

The next stage of development was concerned more with the insight and analysis that can possibly be provided by the routine availability of such accurate and timely data. In the 70's, when many organisations took to EDP with the availability of more powerful computers, there was a discernible shift from *data to information*. The focus was not on data per se but on the analysis of corporate data. There was a shift in the philosophy. Such a concept came to be widely known as '*Management Information System*'. Our use of MIS in contemporary world goes much beyond the MIS of the 70's but we retain the word as such. While many new jargon words are being proposed we find the term MIS more widely accepted and well understood (Davis[1]).

Without an excellent record keeping mechanism provided by EDP, no meaningful analysis of data would be possible. As such the, MIS presupposes, even today, an excellent record keeping function, through it is no longer fashionable to use the term EDP. The blame for EDP falling into disrepute lies squarely with the early EDP enthusiasts themselves; they were more interested in generating piles of data accurately than with their ultimate use of management. The very effort of such large data processing made it impossible to process the data in a timely manner. This was in spite of spectacular progress made in the processing capabilities of the computers of the 70's. Probably what went wrong with the EDP was their lack of focus on *levels of management*. Particularly the top management had neither the time nor the inclination to assimilate the large volumes of data presented by EDP departments. What was in fact needed was a mechanism of filtering the data to suit the level of the management. In the word of jargon what MIS provided was right information in right time people and not just all information to all people.

The 80's saw the Personal Computers (PC) revolution. In the 70's the top management relied on the staff departments of EDP and MIS to supply the necessary information. Their access to information was always indirect, until then. The Personal Computer and the desk-top metaphor changed the picture completely. With new generation software consisting of Word Processing, Database and Spreadsheet a new avenue of direct interaction with corporate data was open. At least those managers who did not mind 'getting hooked on' to the Personal Computers saw an immense potential through this avenue. Their demands for information were much higher, they were no longer content with indirect information support. The biggest pay-off for such direct use was the "what-if" analysis capability. Suddenly, the executives realized the "decision support" capability of the Personal Computer. This led to the emerge of *Decision Support Systems* — a new generation of systems with a new philosophy, pioneered by Keen []. Such DSS had to be more flexible, demanded a better user-interface and adaptable to the decision style of the decision maker. The emergence of business graphics provided further boost to the development of such systems.

The spectacular growth in the Artificial Intelligence area, particularly in the Expert Systems sub-area (in the 60's and 70's) had to wait for the 80's for the arrival of powerful machines. Until then the theoretical developments could not be translated into useful, value adding products. The information and decision hungry managers of 80's saw a huge potential in the expert systems area. Combined with DSS philosophy the expert systems could supply a superior class of managerial information support. Such systems generally come to be known as *Knowledge Based Systems* (KBS).

The exciting results of Operation Research and Management Science, in a similar vein, had to await the arrival of PC revolution. Without the power of desk top computing and the subsequent easy access to information, tangible benefits from the models could not be derived. The philosophy of DSS, combined with the power of the OR models, working behind the screen are transforming the "What-If" capability to "What-Is-Best" capability in the past few years []. Such systems that truly integrate Management Information Systems, DSS philosophy and OR/MS models came to be known as Model Management Systems (MMS) [].

The EDP targeted the operational level of the management. The MIS/DSS/MMS target the middle management. Very recently attempts have been made to provide information support to top management as well. Such systems are known as *Executive Information Systems* (EIS). The focus here is in the use of systems by direct end user whose time value is extremely high. Depending on the context of system may be MIS, DSS, EIS or KBS; but in either case the user interface must be superior. Some of the interfaces that are being researched for such EIS applications are Natural Language Interface, Voice Processing and Voice Response, Multi-Media like Graphics, Sound and Video images.

1.4 COMPUTER SYSTEMS AND MIS

The widespread availability of computer explains to a large extent the extensive use of computers to implement any meaningful MIS today. Since the major applications of computers today are for the design, development and operation of MIS systems, to a distant observer Computer Systems (CS) and Information Systems (IS) appear synonymous. However, Computer Systems provide only the technology component and successful MIS calls for understanding of the organisational systems and procedures. While the importance of good Computer Systems for the success of MIS cannot be under estimated, one should not

make the mistake of over-emphasizing Computer Systems component in the design of MIS systems. Computer Systems (CS) and Information Systems (IS) are two disciplines that sufficiently overlap and yet have quit independent existence. While the Information System (IS) is man-centric, Computer Systems (CS) is machine-centric. IS is an applied area while CS has a strong theoretical foundation. IS is specific to managerial and organisational context, while CS is far more generic. The intellectual challenge is very high in CS discipline while IS calls for a very high conceptual challenge. While many of the tools of IS are context specific, the concepts of CS are by and large context independent.

1.5 ORGANISATIONAL SYSTEMS AND MIS

Since MIS is concerned largely with managerial applications, an appreciation of the theory of organisation is a necessary pre-requisite for successful application of MIS. Some professionals in the MIS area bring forth this point in the cryptic definition of MIS as "the supply of right information, in right time, at right level".

The level of management in the context of MIS refers to a classification of management, originally developed by Anthony. The different levels of management are generally referred to as a Pyramid in a pictorial form to emphasize the fact that in any organisation there are a few top positions, a large number of supervisory staff and a much large number of operational staff. Placing these three staff positions in order from top to bottom would lead to a structure loosely resembling the historic Egyptian pyramid.

Anthony classified the three levels as *strategic*, *tactical* and *operational*. The strategic management is concerned with long term policy decisions like new plant location, new products, diversification, etc.; they typically need a summary of plant/organisational level information, but need lots of unstructured and even vague information pertaining to the environment — the competitors, fiscal policy changes of the Government, emerging technologies etc. The tactical management comprising functional managers would need some external information but a lot of organisation-wide information to exercise control like budgeting, quality level, service level, inventory level etc. The operational management is only concerned with plant/organisational level information but in a far detailed manner like individual operator specific, machine specific and shift specific performance measures. The point will be further elaborated in Section 4.4 of this Block.

To be successful, MIS is an organisation must explicitly take into account this classification of management. Since the summary information to be provided to the tactical and strategic management must be culled out of operational information, the *accuracy* and *timeliness* of information collection and dissemination is important at the operational level. However at the tactical and operational level, *relevance* is the watch-word. A relevant but slightly inaccurate data is better than irrelevant but accurate data though the goal must be for the relevant and accurate data. The context decides the tradeoffs, particularly when cost considerations in data collection and processing are involved. Historically the failures of early generation data processing departments are attributed to the lack of appreciation of this point. Some professionals call this process as the provision of *Information Filter*, meaning that only filtered information culled out of operational data must be presented to the middle and top management. Some others put it more effectively in the form of emphasizing *efficiency* at the operational level and *effectiveness* at the tactical and strategic level. In fact there is a school of thought that believes that data processing serves the need of operational management. MIS serves the needs of tactical management and strategic level of management cannot be supported by information systems at all!

The point we would like to emphasize here, is the importance of mapping organisational level and structure into the design of any MIS for successful implementation. This once again brings home the point we made earlier that knowledge of Computer Systems comprise only a small fraction of the design of MIS; the major part calls for a clear understanding of the organisational dynamics.

1.6 LOGICAL FOUNDATION OF MIS

MIS as a discipline has no intrinsic theory of its own. The data processing applications had a simple goal of accurate and efficient data processing needing just simple control mechanism. With the refinement of data processing into MIS and later DSS there was increasing demand

for "What-If capability. Such a demand necessitates the extensive use of mathematical, statistical, optimization and simulation models collectively known as the models of Operations Research and Management Science. While the models were powerful, they could not be applied to real world problems due to the non-availability of data. With streamlined data available to the decision maker through MIS systems, the power of statistical and operations research models could be very well explained. The classic example being the extensive use of Operations Research in Airline Industry []. Recently a new generation of spread sheet software with optimization capability reinforces this trend []. Thus the quantitative tools of Operation Research and Management Science form one of the logical foundation of MIS.

Since MIS is primarily concerned with managerial decision making, the theory of organisation behaviour and the underlying understanding of human behaviour in the organisational context from another logical foundation for MIS area. The socioeconomic impact of competition, globalisation, democratisation and their impact on organisational structure must be well understood before one can design a successful MIS system today.

Computing Science would form the third logical foundation to the MIS field. Since every major MIS system developed today is built on some computational device (PC to mini to mainframe to super computer with or without an underlying computer network), a clear understanding of the various facets of computing becomes a major pre-requisite to the success of a MIS professional. While all areas of computing science directly or indirectly have significance in MIS work, data and file structures, database theory, design and implementation, computer networking, expert systems and artificial intelligence tools are by far the most important areas of computing science that contribute significantly to MIS discipline as of today.

Information theory [] would form the fourth logical foundation of MIS today. Information theory developed independently an ability to analytically quantify the information content of a message. This area also developed related areas like noise reduction, error detection and control, signal processing, image processing, compression schemes, image restoration and enhancement etc. In short it provides insight into the fundamental aspects of information processing at an abstract level. With the emergence of Multi-Media, Recognition Technology etc., Information Theory will play a key role in the future development of MIS. The related areas of systems design, systems analysis and system engineering [] provide further theoretical framework for structuring the information.

1.7 TYPICAL SYSTEMS

The typical MIS systems that will be in operation in any organisation can be classified in many ways. One classification is through the functional disciplines of management like Marketing, Finance, etc. Typical systems with examples in the operational, tactical and strategic level are as follows:

Example of Typical MIS System

	Production	Finance	Personnel	Marketing
Strategic	New Plant Location	Alternative Financing	Welfare Policy	Competitor Survey
Tactical	Production Bottleneck	Variance Analysis	Performance Appraisal	Advertising
Operational	Daily Scheduling	Payroll	Leave Records	Sales Analysis

While this classification convinces the reader of the usefulness of MIS in the organisational context it still does not provide a perspective into the overall impact of MIS in an organisation. A typical young executive entering an organisation is bewildered by a plethora of terms describing various computer based systems — Payroll, Inventory System, Marketing Support, Word Processing, Electronic Mail, Bulletin Board, Board Room Presentation, DBMS etc. Where and how do these systems fit into the organisation is not at all clear to him/her. It takes years of understanding of the organisation, reading manuals

pertaining to the various systems and working experience in the actual design of one or more systems before a clear picture emerges. The remaining units in the block along with units in the other blocks like Systems Analysis, Database Management are to be studied in conjunction with the units in this block to get a better application of organisation-wide MIS system.

1.8 THE FUTURE

The previous section brought to focus the increasing impact of information processing for organisational decision making. The changing employment scene the world over brings this development into sharper focus. The dominant profession of mankind throughout the world used to be agriculture for many centuries. This is still true of countries like India which are yet to attain full economic development, the scene, however, is far difficult in economically developed countries, particularly after the Industrial Revolution. In the past industrial revolution years, the percentage of agriculture related jobs dwindled to a mere single digit percentage. Until the seventies there was a substantial growth in manufacturing oriented jobs. With the onset of *Information Revolution* the percentage of manufacturing related jobs has also been reduced substantially. The fastest growing sector is the *service sector* which is likely to account for almost 90% of the entire job market []. The workers in this category are generally known as "white-collar" or "knowledge worker". This sector precisely is likely to be influenced by the information service to a maximum extent.

Services include banking, financial organisation, health care, entertainment, travel and tourism and education. All these sectors depend heavily on the information service for their very survival. Consequently the share of total business by Information Technology (IT) industry is likely to foreshadow the Oil and Automobile industry by the turn of the century. A recent publication — "IT - The Trillion Dollar Opportunity" [] brings home this point very effectively.

Even in India, the IT industry is growing at a very respectable rate. While we got on to EDP in the early seventies, the overprotection by the political powers in the seventies and early eighties kept India very much behind the International scene in the IT area. Luckily we have been 'catching up' in the past six years and just this year the Indian IT industry crossed the Billion Dollar Mark []. With the recent liberalisation policy of the Government, it is likely to grow further.

The importance of IT to a country is so crucial these days, countries like Singapore and Hongkong have identified IT as their "strategic importance" areas for development. Even India has identified recently Software as the strategic area and plans to make it into a priority area.

The recent trends in the world scene also suggest a strong growth pattern for the information services. The collapse of Soviet Union, the emergence of Unified Germany, the thirst for democracy in several East European States, the unification efforts of Korea, Vietnam form a political pattern, the globalisation trend also pre-supposes spectacular investments in information services. The increasing competition and the resulting reduced product life cycle bring further emphasis for information sector. It is clear that Information Processing will form the dominant industry of the 21st century.

In the previous section we argued at length, the likely dominance of the information sector in the future. A natural off shot of such a change will be a perceptible change in the quality of life (other things remaining unaffected). Since transportation and communication generally have the primal and dual role, improvements in information and communication will lead to substantial reduction in transportation. Routine travel to find, chase and expedite information can be more effectively accomplished by communication. Already the emergence of FAX service has reduced the transportation of over-night express courier mail substantially. With the wide spread access to information networks substantial information in the form of tables, reports, etc. will be transferred electronically rather than through bulky paper. Such developments will lead to reduced energy consumption, reduced pollution and a better ecological balance. While such ideas may appear far fetched in the Indian context at present, they are bound to improve the quality of life in future.

Even in the not so distant future, information management can substantially improve the quality of life in the Indian context in the following manner:

- a) better land record management leading to less litigation and violence in the rural sector;
- b) better natural resource planning leading to optimum utilisation of water, oil, electricity, coal, etc. and thereby reducing unnecessary inter-state tension, rivalry, etc.;
- c) better banking and financial services with a superior service to the customers; leading to better money- management;
- d) improved legal delivery system helping a large number of small farmers, business and common man by way of speedy disposal of cases;
- e) networked educational institutions leading to better sharing of resources among larger number of citizens.

1.9 SUMMARY

This unit has provided an overview of the concept of MIS in an organisational context. While it has not told you about the steps in the development of a typical MIS, it has outlined the context and foundation. The next units will provide more information into the mechanics of MID. The examples of typical systems will help you to relate the various MIS subsystems. This unit has also provided an overview of the evolution of MIS over the past three decades and the emergence of the powerful information technology industry. It outlined the possible implications of such developments in the global and the Indian context.

1.10 SELF-ASSESSMENT EXERCISES

1. In your own words define Management Information Systems.
2. Using your employment background argue about the relevance of MIS to your day-to-day and long term planning.
3. Draw an Organisation Structure of your organisation. Map the Information Organisation with respect to this Organisation Chart.
4. What is meant by Anthony's Pyramid?
5. In your own words define the terms EDP, MIS, DSS, EIS & KBS.
6. What is the role of the Personal Computer (PC) in the information revolution?
7. Why is the IT industry emerging as the dominant industry?
8. Give two examples of the applications of IT in your organisation.