Management Information Systems
Management Information Systems

Ninth Edition

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Aims of the book

This new edition has the same objectives as the previous editions, namely to provide a thorough coverage of the principles, application and design of management information systems in both public and private sector organisations. The book provides comprehensive coverage of the organisational, managerial and systems theory background which is vital for the development of successful information systems. It is aimed at both the producers of information, for example, accountants, systems analysts, computer specialists, operational researchers and so on, and the users of information who are management at all levels. The book is particularly relevant for:

A. Students preparing themselves for professional examinations which include the study of information systems. Examples include: the Chartered Association of Certified Accountants; the Institute of Chartered Accountants; the Chartered Institute of Management Accountants; the Chartered Institute of Public Finance and Accountancy; the Chartered Institute of Bankers; the Institute of Administrative Management; the British Computer Society; the Chartered Institute of Secretaries and Administrators; the Institute of Accounting Technicians.

B. Students on BTEC, diploma and degree courses in business studies and accountancy where the study of information systems is part of the curriculum.

C. Students on systems analysis and computer science diploma and degree courses.

D. Students on management courses who need to understand the principles of information systems design.

E. Managers and others in industry, commerce, local authorities and public corporations who wish to gain a working knowledge of management information systems.

Scope of the book

This edition, the ninth in 29 years, contains numerous detailed revisions and extensions of coverage. There are many more current examples and new material on organisational cultures, organisational development, learning organisations,
knowledge management, value chain analysis, strategy formulation, balanced scorecard, benchmarking, intranets, extranets, CASE tools and intelligent agents.

There are assignments, cases and a selection of examination questions, both with and without answers, which can be used to aid assessment and revision.

Approach

For ease of study the book is divided into self-contained chapters with numbered headings. Each chapter is followed by self-review questions, cross-referenced to appropriate headings. You should attempt to answer the self-review questions unaided then check your answers with the text.

To gain genuine understanding of any technical subject constant reinforcement of knowledge and practice in answering problems is vital. Special attention has been given to this and, at suitable stages, the book includes several Assessment and Revision sections. These contain:

- assignments for individual or group activity
- mini-cases with tasks to be accomplished
- examination questions (with and without answers)
- suggestions for further reading.

Most of the examination questions used have been drawn from past professional examinations and are cross-referenced accordingly. To ensure full coverage of the book's contents occasionally it has been necessary to develop other questions and mini-cases of an equivalent standard.

Note for lecturers

This book is suitable both for topic based teaching or student centred learning using the questions without answers, assignments and cases provided in the Assessment and Revision sections.

A Lecturers' Supplement is available free to lecturers adopting this book as a course text. The supplement contains:

- guidance notes on the cases
- answers to the questions in the book
- OHP masters of key diagrams from the book.
I would like to thank everybody who has contributed comments on earlier editions and suggestions for improvements which I have endeavoured to include wherever possible. I would like to give special thanks to Dr Zahid Parvez, Senior Lecturer in Information Management at the Business School, University of Wolverhampton, for his advice on developments in information and communication technologies.

Examination Questions

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Chartered Institute of Marketing (CIM)
Institute of Administrative Management (IAM)

T. Lucey
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1.1 What is a management information system (MIS)?

There is no universally accepted definition of an MIS and those that exist reflect the emphasis – and prejudices! – of the particular writer. The term MIS has become almost synonymous with computer based data processing and indeed many books with MIS in the title turn out to be exclusively concerned with topics such as systems analysis, file design and the various other technical facets of computer based systems. This emphasis results in a production-orientated definition of MIS of which the following by INFOSEC is a typical example:

Any telecommunications and/or computer related equipment or interconnected system or sub-systems of equipment that is used in the acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission or reception of voice and/or data, and includes software, firmware and hardware.

(INFOSEC, National Information Systems Security Glossary NST1SS1 no. 4009, 1999)
This book does not take a production-orientated view and emphasises that the means of producing the information – whether by computer or manual methods – is a secondary consideration compared with the importance of ensuring that the correct problems are addressed and that relevant information is available when, where, and in the form required to be usable by management. Then, and only then, should the means of producing the information be considered.

This book takes a decision focus to the design and operation of the MIS which means that the information system is viewed as a means of processing data, i.e. the routine facts and figures of the organisation, into information which is then used for decision making. It is changes in decision behaviour which distinguish data from information. Figure 1.1 summarises this approach.

![Figure 1.1](image)

Decision focus of MIS

This means that MISs are qualitatively different from data processing systems and that management involvement and interaction between information specialists and management are the key features of successful MIS design.

Having regard to the emphasis of this book an MIS can be defined as:

A system to convert data from internal and external sources into information and to communicate that information, in an appropriate form, to managers at all levels in all functions to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible.

Note the emphasis in the definition is on the use of information not on how it is produced.

### 1.2 Problems with MIS

There is abundant evidence from numerous surveys both in the UK and the USA that existing MISs, often using advanced computer equipment, have had relatively little success in providing management with the information they need. The typical reasons discovered for this include the following:

- lack of management involvement with the design of the MIS
- narrow and/or inappropriate emphasis of the computer system
- undue concentration on low-level data processing applications particularly in the accounting area
- lack of management knowledge of computers particularly in small and medium sized enterprises (SMEs)
- poor appreciation by information specialists of management’s true information requirements and of organisational problems
- lack of top management support.
To be successful an MIS must be designed and operated with due regard to organisation and behavioural principles as well as technical factors. Management must be informed enough to make an effective contribution to systems design and information specialists (systems analysts, accountants, operations researchers and others) must become more aware of managerial functions and needs so that, jointly, more effective MISs are developed.

Management do not always know what information they need and information specialists often do not know enough about management to be able to produce relevant information for the managers they serve. An example given by Kaplan and Norton graphically illustrates this point.

They reported that a group of American industrialists visiting Japan found that their counterparts were regularly supplied with information on the proportion of products which pass through the factory without reworking or rectification. They found that a typical percentage of products that needed no reworking was 92 per cent. The American managers found that this information was not available to them in their factories at home, but on investigation it was found that their ratio was 8 per cent. They then worked on this factor for six months at which point the ratio had moved up to 66 per cent and, more importantly, productivity was 25 per cent higher.

There is no doubt that better communication between management and information specialists, plus a wider knowledge by both groups of MIS principles would greatly facilitate the task of developing relevant and appropriate information systems. There is, unfortunately, no simple checklist of essential features which, if followed, will automatically produce the perfect MIS.

What is required is an awareness and understanding of key principles and function so that the design, implementation and operation of the MIS is the result of informed decisions and judgements rather than haphazard development without regard to real organisational requirements.

### 1.3 Knowledge requirements for MIS

By their nature, MIS draw upon a wide and growing range of concepts and techniques and Figure 1.2 shows the major areas of knowledge which are considered to be the most important in the development and operation of MIS.

Figure 1.2 has been drawn not only to show the various areas of knowledge, which are each developed in subsequent chapters of the book, but also to show that interrelationships exist between all the areas. This point is stressed because the knowledge areas are not self-contained, independent entities but interact with, and complement, each other. The understanding of these interactions and cross relationships makes the task of designing an MIS much more difficult but, conversely, enhances the likelihood of designing relevant information systems which make a positive contribution to the organisation.

It will be seen that encircling the core of the diagram is an area entitled ‘Behavioural factors’. This attempts to show in a diagrammatic form the all-pervasive influence and importance of behavioural considerations in the design and operation of an MIS. Even within areas which are conventionally deemed to be purely quantitative, the reactions, motivations, aspirations and capabilities of the people involved must be considered.
An example is the accounting technique of budgetary control which is often regarded by accountants as a neutral, technical process but which is viewed by the personnel affected as anything but neutral. Properly designed, such systems may have beneficial motivating effects but all too often are seen by the managers and staff as unwanted impositions which cause resentment and dysfunctional behaviour, i.e. behaviour which does not contribute to organisational objectives. Because of the overall importance of behavioural considerations they are dealt with throughout the book in context with the topic under consideration.

Each of the knowledge areas shown in Figure 1.2 is introduced in the following paragraphs.

Figure 1.2
Knowledge requirements for the development and operation of MIS

1.4 The nature of data, information knowledge and communications

The processing of data into information and communicating the resulting information to the user are the very essence of an MIS. Data is the term for collections of facts and figures: hours worked, invoice values, part numbers, usage rates, items received, etc. These basic facts are stored, analysed, compared, calculated and generally worked on to produce messages in the form required by the user, i.e. the manager, which is then termed information.

The full explanation of what is meant by information is dealt with in detail in the next chapter, but at this stage information can be briefly defined as data that
have been processed and communicated in such a way as to be useful to the recipient. Members of management use the information produced together with the information already within their heads, called knowledge, to plan, control, make decisions or to modify the produced information so as to share the new knowledge with others in the organisation. Knowledge management, which is the tools and techniques for collecting, managing and disseminating knowledge within the organisation, is of increasing importance in today’s high-technology business environment and is dealt with in more depth in Chapter 8.

This outline of the process is simple and readily understandable but further study will show that information is a more complex and ambiguous concept than so far indicated. From the viewpoint of developing relevant MIS, rather than the routine production of standardised reports, consideration must be given to the source of the information, the means by which it is communicated and, most important of all, the meaning attached to the message received and the use made of it. This final link in the communication chain is clearly of critical importance to both the information system designer and user and again emphasises the pervasive nature of human and behavioural factors in an MIS.

A theme which is developed in this book is that the value of information can only come from the results of decisions and actions based on the information.

In summary, data incur costs, information – which is properly communicated and acted upon – can create value.

1.5 General system concepts

Many of the concepts of General Systems Theory (GST) have direct applicability to organisations and MIS. GST emphasises that not only is it necessary to examine and analyse the individual parts of the system or organisation – known as the reductionist approach – but also it is vital that the system is viewed as a totality where the whole is greater than the sum of the parts – known as the holistic approach. Systems are composed of sub-systems, or expressed in commercial terms, organisations consist of departments and sections, and these parts interact and are interdependent.

Accordingly it is necessary to consider these interrelationships otherwise the system or organisation as a whole will not function efficiently and will be slower to adapt to changing conditions, which is a primary requisite to survival. The reductionist approach ignores these vital interrelationships by treating the individual parts as self-contained entities – which they are not.

A simple organisational example of this would be if a stock control system in a firm was to be analysed in order to make it more efficient and it was decided that no attempt was to be made to consider the linkages which exist between the production control system, the replenishment system and the stock control system itself. In such circumstances even if the stock control system operated at peak efficiency, the overall effect would be less than optimal and a condition of sub-optimality would occur.
1.6 Organisation processes and structures

Organisations are artificially contrived structures with procedures and objectives which should, and usually do, adapt to changes in the environment. MIS exist in organisations in order to help them achieve objectives, to plan and control their processes and operations, to help deal with uncertainty and to help in adapting to change or, indeed, initiating change.

Accordingly it is important for information system designers to be aware of the various influences on organisation design. These range from earlier mechanistic concepts, largely stemming from the ‘scientific management’ movement in the early part of the last century, to more modern ideas which recognise the social and behavioural characteristics of the members of the organisation and the need for adaptation and change to deal with ever more rapidly changing conditions.

1.7 Management functions and levels

As already stated, the value of information derives from the actions management takes as a result of using the information. It follows that information specialists need to know what types of task and functions management have to perform so that they are able to produce relevant – therefore usable – information.

The tasks and functions management have to perform vary greatly in detail according to the type and size of organisation and the way responsibilities are arranged. However, there are many common elements and managerial tasks can conveniently be grouped into five areas: planning, decision making, organising and coordinating, leadership and motivation, and control.

Obviously the emphasis given to each area varies from manager to manager and is especially dependent upon the level of the manager in the organisation.

In broad terms, three levels of management can be seen in all organisations. Top or strategic management, middle or tactical management and junior or operational management.

There are clear differences in information requirements between a manager at the operational or transactional level such as, say, a transport supervisor and a manager at the strategic or top level such as, for example, the marketing director. At the highest level, structured, formal MIS may actually be counterproductive for, at these levels, informal MIS and external influences become increasingly important.

Another factor which affects the tasks managers have to perform, and hence their information requirements, is the extent of functional authority within the organisation. Functional authority is that which is exercised by specialist managers and staff throughout the various departments and units of the organisation. Possibly the most common example of this is the Personnel or Human Resources department which has functional responsibility for many personnel and industrial relation activities throughout the whole organisation.

Whilst each of the five functional areas, which in total constitute the task of management, needs relevant information, three particular areas – planning, decision making and control – make heavy demands on the organisation’s MIS and thus are given special attention in this book.
1.8 The nature of planning and decision making and the techniques available

Planning and decision making have rightly been called the primary management tasks and these tasks occur at every level of management although, naturally, the type of planning and decision making will vary between the levels.

Planning is the process of deciding in advance what is to be done and how it is to be done. The planning process results in plans which are predetermined courses of action that reflect organisational objectives and the plans are implemented by decisions and actions. Thus, effective planning and decision making are inextricably linked, for without decisions and actions the planning process is a sterile exercise.

In order to provide appropriate information, MIS designers must be aware of the types of decisions made at the various levels of an organisation. A useful, broad classification is that given by H.A. Simon who classified decision making into programmed and non-programmed areas.

Programmed decisions are those that are routine and repetitive and where the decision rules are known. Conversely, non-programmed decisions are novel and unstructured and the nature of the problem and decision rules are complex and little understood. It follows from these brief descriptions that radically different information and procedures are required for the different decision types, which has obvious implications for MIS design.

To create value from information, changes in decision behaviour must result and consequently there must be a decision focus to the MIS. This means that the MIS must be designed with due regard to the types of decision, how decisions are taken, how the decision maker relates to the organisation, the nature of the organisation, its environments and so on. Acceptance and understanding of this emphasis by both managers and information specialists are the primary requisites to effective MIS design. Managers, and the MIS which supports them, must distinguish between effectiveness and efficiency.

- Effectiveness means doing the right thing i.e. producing the desired results.
- Efficiency is a measurement of the use of resources to achieve the desired results.

Thus an organisation may be producing the wrong output efficiently and is thus an ineffective organisation. Good management concentrates on what must be done before considering how it should be done and the MIS should help them do this.

1.9 Control principles – feedback and feedforward

Control has already been mentioned as one of the main management tasks. Much of the lower and middle management effort, and consequently much of the routine output of an MIS, is concerned with control activities. Control is the process of ensuring that operations proceed according to plan and at the most basic level this is done by comparing the actual results or output of the system against a target and using any differences found to adjust the input side of the system so as to
bring activities in line with the target. In practice the target may be termed a norm, a budget, a standard, a performance or stock level and so on.

The procedure outlined above, i.e. input – process – output – monitor and compare – adjustment, requires what is known as a feedback control loop and such a loop is a common feature of many aspects of MIS, for example, stock control, budgetary control, production control and so on. It will be realised that the basic system described is relatively mechanistic and is therefore not necessarily suitable for all facets of the organisation’s activities. For example, there is the implicit assumption that the target or plan does not change and that conditions in the next control cycle will be similar to those in the past. Clearly, in volatile and uncertain conditions these assumptions are hardly likely to be correct.

The principles of control, control cycles, feedback, feedforward and so on are dealt with in detail in Chapters 12 and 13.

Where a self-regulating feedback system is not able to control a process adequately it may be feasible to use feedforward. This is where monitoring at some early stage of a system or process may indicate that an adjustment should be made at a later stage of the process, prior to the final output. Feedforward is not an automatic process and requires management intervention for it to operate successfully and, consequently, it does not have the degree of ‘automatic’ control inherent in a feedback system.

1.10 The influence of information and communications technologies (ICT)

ICT is a general expression covering computers, telecommunications and electronics and there is little doubt that ICT is having a profound influence on all aspects of life, including organisations and MIS. Much of the expenditure on computers and ICT incurred by organisations to date has been on relatively routine data processing applications, particularly in the accounting area, and in operational control systems such as stock control.

Of course these are vital tasks but of themselves they do not constitute MIS. These traditional data processing systems, which are often highly sophisticated and complex, perform the essential role of processing the day-to-day transactions and provide much of the data from which management information can be prepared. The rapid growth of technology and the dramatically falling cost of computing capability mean that more and more aspects of managerial planning and decision making can be assisted by information technology provided, of course, that the information system is developed in accordance with properly defined objectives and principles.

Although there are many overlaps and interrelationships, it is possible to distinguish three types of system using ICT:

1. Data processing (or transaction processing). These are computer and electronics based systems for recording, processing and reporting on the day-to-day activities of the organisation. Examples include: ledger keeping, payroll, barcode readers, automatic teller machines (ATMs), electronic point of sale (EPOS) systems.
2. **Office support systems.** These systems provide day-to-day assistance with the functions of the office. Examples include: word processing, electronic mail, telephones, fax.

3. **End user systems.** These systems seek to provide management with direct assistance with their work. Examples include: decision support systems, expert systems, executive information systems.

Contrary to the impression given by some consultants and computer manufacturers, the mere fact of using ICT does not of itself automatically bring benefits. If ICT is misapplied or installed without sufficient analysis of the real management or organisational problems then no benefits will be gained and money will be wasted. Examples abound: the £48m computer system developed by the Government for use by the Training and Enterprise Councils (TECs) which was unused because it did not meet the TECs’ needs, the TAURUS system for computerising the Stock Exchange which was finally abandoned at a cost of £400m because it could not meet the Stock Exchange’s requirements; the difficulties and huge cost increases in the LIBRA project, a network of computers designed to provide linkages in the criminal justice system in the UK, the reversion to manual systems by the manufacturers of Parker Knoll furniture and so on.

The Parker Knoll example is of particular interest because it is an example of de-automation producing dramatic efficiency gains. Parker used to monitor the movements of 1700 parts on an inventory control network with 15 shop-floor computer terminals. These have been replaced by a basic manual card system (adapted from the Japanese KANBAN system) whereby a card is placed in each pile of stocks. When stocks fall sufficiently for the card to appear, staff arrange for a further batch to be made. The firm is also replacing modern high-technology machine tools with older models. Although the high-technology machines were faster and could do several different jobs, set-up times were in hours rather than the minutes required for the older machines. The result of these changes has been a production increase of 20 per cent, fewer mistakes and lead times reduced from 12 weeks to under three days.

The key moral from this example is that automating inefficient methods, as Parker did previously, does not produce benefits. The methods and systems must be right before any attempt is made to automate them and no ICT system should be installed unless it is demonstrably better than the best manual method. The proper, planned use of ICT can, of course, be highly beneficial but benefits do not automatically accrue. As an example of a properly planned, successful ICT system consider the case of Radiodetection. Radiodetection designs and manufactures an extensive range of equipment for the location, fault-finding, monitoring and mapping of underground pipes and cables. The company was established in 1970 in Bristol and has 17 locations worldwide.

With the first phase commencing in 2001, the firm is installing a state-of-the-art Enterprise Resource Planning/e-business system that has to accommodate a vast range of product types and options which make inventory control and other aspects of the complex organisation daunting tasks. There are already significant benefits from the systems so far installed. These include: reduced inventories, better debtor handling, lower warranty costs and reduced material and component costs. Errors have been reduced and there are improved communications with suppliers and customers resulting in increased customer satisfaction and
improvements in the supply chain. When the system is fully operational the company expects a payback of 400/500 per cent.

### 1.11 Changes affecting organisations

A common feature of the environment in which all types of organisation operate is the presence of an apparently ever-accelerating rate of change. Management, and the information systems that support them, have to learn to deal with change and to adapt their operations and systems and the organisations themselves in order to survive and prosper.

Typical of the changes taking place are the following:

- **More competition**: all types of organisations face greater competitive pressures. These may be Tesco competing with Sainsbury’s, Asda and Waitrose or it may be competition from the new discount stores from abroad such as Lidl, Aldi, Netto and others. There are similar pressures in the public sector. For example, local authorities must implement compulsory competitive tendering for an ever-increasing proportion of the services they provide and government agencies have to be competitive in pricing and cost control in order to meet targets and so on.

- **Faster pace**: the faster pace of society and business is apparent in many ways. New models of all types of manufactured goods have shorter life cycles, this in turn means that product development must also be speeded up. The knowledge and training that people have rapidly becomes obsolete because of changing requirements. Existing work patterns and practices need to be updated more or less continuously to keep pace, current information rapidly becomes out of date, technology seems to change month by month and so on.

- **Increased globalisation**: because of lower trade barriers, faster transport and communications, and the easier flow of capital, effectively there is a world market in manufactured and agricultural products and raw materials such as oil, coal, iron ore, etc. In addition, banking and financial services operate on an international scale.

The effect of these developments is that there is increased competition for virtually every product, commodity or service. There is a further problem with the global marketplace: that of volatility. Currencies, markets and political environments change continually and often unpredictably. The global marketplace has caused dramatic changes in the location of certain types of businesses. Many Western firms have set up manufacturing plants in various parts of Asia and China to take advantage of lower labour and overhead costs with obvious consequences for domestic manufacturers. Similar movements are taking place in the service sector. As examples the banking group HSBC, British Airways, Prudential Insurance, British Telecom and other organisations have transferred their call centres from the UK to India utilising improved global communications to gain lower overheads.

The process is not just one way. For example, Japanese, Korean and American firms have established factories in the UK making cars, televisions, computers and domestic appliances in order to secure an entry into the lucrative European market. This inward investment has several advantages for the UK. Firstly there
are the direct employment and financial effects of the new factories. In addition there are indirect but arguably more important benefits arising from the introduction of more efficient management practices and higher quality and productivity standards which permeate to domestic manufacturers.

Foreign investment by multinationals (i.e. firms which own and control production and/or service facilities outside their home countries) takes place according to a worldwide corporate strategy which considers markets, relative costs and revenues, taxation, and political factors.

Multinationals operate *process specialisation* whenever possible. This means that processes are specialised within particular factories spread throughout the world. For example, a car manufacturer may locate labour-intensive processes in lower wage countries with the final stages of manufacture located nearer the intended market. Ford Motors are following this policy and have announced that production will be planned globally based on just five centres.

Inward investment has many advantages to the host nation and, in general, is actively encouraged. However, it may increase uncertainty and volatility in the business environment because decisions taken in one country may have immediate and disastrous consequences in the host country. For example, in 2000 BMW announced that they were selling the company that made Rover cars in the UK with the effect that many workers were made redundant with a knock-on effect on component suppliers. In 2004 ALSTOM, the French multinational, announced the closure of Metro-Cammell, the train manufacturer based in Birmingham, and the transfer of production to Spain with the loss of 1000 jobs in the UK.

### 1.12 The drive for productivity and quality

Increased competition and more discerning consumers have meant that all types of organisation are striving for greater productivity, whilst maintaining or enhancing quality. This applies to both service and manufacturing organisations. In manufacturing the greatest stimulus has been from the Japanese. The Japanese have developed a total quality approach with the target of zero defects. This has been accompanied by lean production methods which have dramatically increased productivity. A key feature of *lean production* is the use of *just-in-time (JIT)* systems.

The aim of JIT systems is to produce the required items, of high quality, exactly at the time they are required. There is the pursuit of excellence at all stages with a climate of continuous improvement. The key elements of JIT are:

- a move towards zero inventory
- elimination of non-value added activities e.g. the internal movement of components
- an emphasis on perfect quality i.e. zero defects
- short set-ups
- a move towards a batch size of one
- 100 per cent on-time deliveries
- a constant drive for improvement
- demand–pull manufacture.
The application of efficient production techniques such as JIT and the use of computers and robots (known as advanced manufacturing technology – AMT) have enabled some manufacturing companies throughout the world to become very successful. Collectively these are known as World Class Manufacturers.

The drive for productivity is also apparent in numerous service industries. Improved methods and the use of Information Technology have enabled banks and building societies to increase business yet at the same time to reduce the number of staff. In the UK banks have gradually been closing branches in response to changing patterns of usage. Fewer people visit traditional branches and more and more customers use online banking either with the long-established high street banks or with the new virtual banks such as Egg, First Direct, Cahoot and others. British Telecom has reduced staff in each of the years since privatisation even though more services are now offered and turnover has increased. The same movement can also be seen in the privatised utilities for electricity, gas and water.

1.13 Changing employment patterns

A long-term seeming inexorable change in employment is taking place in Britain and other developed countries. There are now many more part-time workers or workers on short or temporary contracts. More women are employed than men and organisations are seeking to gain flexibility and lower costs by shrinking their core workforce of full-time employees and employing sufficient part-time or temporary workers to cope with fluctuations in demand. In many firms JIT inventory management is now accompanied by JIT labour. Because of the improvements in ICT and the ever-growing use of the Internet more and more workers are able to work from home and maintain immediate contact with their organisations.

In addition, changes in manufacturing techniques, the growth in the use of technology and other changes in the workplace have increased demand for skilled/educated personnel at the expense of the unskilled. This means that many unskilled workers are now effectively unemployable even in boom times. Although a number of these changes no doubt benefit the individual organisation when considered in isolation, there are wider, social costs. These include: greater stress and insecurity, a growing gap in incomes between those in work and those unemployed, a sense of alienation from society of the long-term unemployed, poorer health, possible increase in crime, etc.

Key point summary

- The book adopts a decision focus to the MIS with an emphasis on the user’s requirements for relevant information not on the means of production.

- There are wide-ranging knowledge requirements for the MIS including: the nature of data and information, general systems concepts, organisation principles, planning and decision making, control principles, management functions and the use of information technology.
There is an all-pervasive influence of behavioural factors on the design and operation of the MIS.  
Management and the MIS must concentrate on what before how.  
Coping with change is the primary task of management and the MIS which supports them.  
Areas of change include: greater competition, faster pace, new technologies and methods, globalisation and employment patterns.

Self review questions

1. Define an MIS. (1)  
2. What problems have been found from surveys of MIS? (2)  
3. What are the main areas of knowledge required for MIS design? (3)  
4. Distinguish between data and information. (4)  
5. What is the reductionist approach? (5)  
6. What is the holistic approach? (5)  
7. What is the role of the MIS in organisations? (6)  
8. Into what groups can management functions be classified? (7)  
9. What is planning? (8)  
10. Distinguish between programmed and non-programmed decisions. (8)  
11. What are feedback and feedforward? (9)  
12. What are the three major areas in which ICT is influencing information systems? (10)  
13. What major internal and external changes are taking place with which organisations have to deal? (11)

References and further reading

Answers to examination questions

Assessment – Chapters 1-4

A1. (a) This can be taken directly from the book.
   (b) These characteristics can be summarised as shown in Figure EQ1.
   (c) The theoretical answer is that the costs of producing extra information should be compared with the additional benefits obtainable by using the additional information. However, it is often difficult to assess the incremental benefits, and sometimes the incremental costs. Asking for extra information is a well-known ploy used for delaying taking a decision. Used for this purpose, the extra information is not likely to produce extra benefits.

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Planning information</th>
<th>Control information</th>
<th>Decision making information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not segregated by function or department. Transcends organisational divisions</td>
<td>Follows organisation divisions. Related to specific functions, departments and managers</td>
<td>All matters that could change as a result of taking the decision</td>
</tr>
<tr>
<td>Time scale</td>
<td>Covers relatively long periods and seeks to show trends</td>
<td>Cover short time periods, shifts, days, weeks and months</td>
<td>Related to decision being taken. Approximate information speedily prepared often most valuable</td>
</tr>
<tr>
<td>Amount of detail</td>
<td>Patterns and trends more important than fine detail particularly for long-range planning</td>
<td>Detail and precision important but trends also of importance</td>
<td>All relevant matters. Therefore may be detailed or in broad terms</td>
</tr>
<tr>
<td>Orientation</td>
<td>Objective is to provide insight into the future</td>
<td>Shows past results and activities and relates these to targets, standards and budgets</td>
<td>Decision making is entirely concerned with future changes. The past is irrelevant except as a guide to the future</td>
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A2. All levels of management require information on which to base decisions, to organise, to plan and to control.

Whilst timing is important, other factors such as completeness, accuracy and relevance are equally important in assessing the value of information to an organisation.

Clearly the quality of management information is directly related to its timing, but this in itself is linked to the particular situation giving rise to the need for such information. To illustrate, the following examples are given:
(a) Provision of historical information – into this category come annual accounts where there is no conflict between speed and accuracy, as time is taken to produce the information required; most companies, however, have a well defined timetable.

(b) Provision of information for control purposes as, for example, in production or quality control. Speed and accuracy are important to avoid costly delays or bad production.

(c) Provision of information for planning purposes. Here the time scale may well be years and thus there is less pressure on time and no need for a fine degree of accuracy.

It is well to understand that by accuracy is meant an acceptable level dependent on the circumstances. The cost/benefit ratio is something not to be overlooked.

A well-designed management information system will provide the various levels of management with appropriate information to enable them to manage. Thus the starting point must always be the uses to which information is to be put.

The following factors will influence the design of such a system:

(i) The organisation structure – including the number of levels through which information must flow. Generally decisions should be taken at the lowest level.

(ii) The data processing cycle – starting with how and where data originates; the preparation and input of data; processing and output of resultant information.

(iii) The form of reports. Very often delay occurs through too much transcription. Techniques such as teleprinters and visual display units can overcome this using online or real-time data processing.

The overall consideration, of course, will be the comparison of the costs of producing the information with the benefits to be obtained from having it.

A3. Systems theory is a broad conceptual basis for examining the operations of any system, whether a business, a school, a machine and so on.

The elements which need to be identified include:

- the environment and boundaries. This will include the idea of a hierarchy of systems
- the inputs to the system
- the outputs from the system
- the processes contained within the system. This will include the resources required to operate the procedures
- the objectives that the system wishes to achieve.

Relating these broad categories to a business system we find that they concern management functions such as planning, control and decision making.

Thus planning deals with setting the objectives and deciding the pattern of operations in both the long and short term. Information is needed from both external and internal sources.

Control deals with the feedback of results to ensure that operations are proceeding according to plan. At lower levels control information is mainly internal but longer term control means adjusting to the environment and relies on external information.

Decision making occurs in planning and control at all levels. It requires relevant, timely and accurate information from both internal and external sources.

A4. A closed system is one which does not interact with its environment where an open one does. In practical terms this means that modern organisations must interact with the environment, must change to suit the environment and must continually adapt so as to keep up to date in order to ward off competitors and to survive!
The environment may be a local one, the national economy or the international scene. As examples of industries which did not react and adapt to the environment (in this case Japanese – market penetration) consider the UK car industry and the UK television industry. The environmental changes may be technological ones, for example the traditional Swiss watchmaking industry was decimated by not reacting to micro-chip technology.

However, it should be said that organisations have always had to interact with their environment so it is probably too simplistic a view that traditional organisations were closed systems which implies no interaction whatsoever.

There is considerable evidence to indicate that the organisation which adapts to environmental changes is able to survive and prosper in conditions in which the more traditionally organised and structured organisations contract and founder.

The modern organisation (an open system) must be prepared and organised for change. This implies a second order level of feedback. The first order level feedback provides information regarding the progress of control parameters (stock levels, standard cost, etc.) against targets whereas the second order feedback is of a higher level concerning the behaviour of the system itself in coping with operations, i.e. does the system need to be altered to suit the changes?

A5. Implicit in the systems approach to solving organisational problems is the recognition of the overall objectives. It is said to be objective-orientated. One would assume that such objectives were determined by the board in this case and that they were clearly understood.

We are told that the production plan was decided upon after ‘consideration of all factors’ so one would assume that the sub-system (production department) objectives were established with a full knowledge of the overall goals.

However, it is clear that sub-optimisation has taken place in the production department. This is the term used to describe the situation that exists where the sub-system goals are pursued to the detriment of those of the system as a whole.

The evidence is in the change of production levels which has taken place without reference to the central authority. Reasons why such sub-optimisation takes place vary but it can be caused by:

(a) poor communication – i.e. overall system objectives not clearly identified and subordinate nature of sub-system objectives not properly explained.

(b) control systems failing to carry out their monitoring function thus highlighting variances from planned targets.

(c) a lack of coordination between sub-systems leading to over decoupling.

If one assumes the original targets to be in the best interests of the company as a whole then the existence of such sub-optimisation is a matter for concern to other sub-systems, e.g. stores, accounts and sales.

Conclusion

General acceptance of the systems approach is required and a clear identification of overall system objectives. This must be followed by an understanding of the way sub-system goals contribute to the achievement of overall goals.

Communication is a key factor with a well thought out management information system.

A6. The question is concerned with the systems approach to solving organisation problems. A prime feature of such an approach is that it is ‘objective orientated’. As a first step therefore the correct objectives are set and a system designed for their achievement.

It is important that the overall organisational objectives are well defined before considering those of the particular area being studied. This is the task of top
management. Having done this the overall objectives should be unambiguously communicated to those responsible for sub-systems. The sub-systems’ objectives must be consistent with the achievement of the overall objectives.

There will of course be problems in establishing the relevant objectives in any area under study.

**Quantification**
It is often difficult to state objectives in quantitative terms. For example, a computer may be able to produce ‘more and better’ information for stock control purposes. However, it may be difficult to state precisely what the savings may mean in terms of actual reduction in stock levels as a result of the information provided. Nevertheless, the attempt should be made.

**Sub-optimisation**
Within a company production, sales and finance are frequently in conflict. Sales want as much diversification as possible to satisfy customers’ whims with a ‘next day’ delivery service. Production want long, interruption-free runs of standard products with plenty of time to change planned production (because of stocking and scheduling problems). Finance wants to minimise the stock holdings and demands early settlement from customers to improve cash flow.

Ideally, each sub-system should work as independently of any other sub-system as possible (be ‘decoupled’) in order that reference need not be made to other sub-systems when decisions are made. Hopefully the systems approach will help to avoid such optimism.

Conflicting objectives. It is quite common to have objectives in all systems which conflict with one another, in which case of course some form of compromise is necessary. As an example, there may well be a conflict of requirements between capital costs, and operating costs and high safety standards.

Changing circumstances. The objectives may need to be changed due to outside circumstances, e.g. government intervention or competition. For example, it may be necessary to offer a ‘same day’ service instead of a ‘48 hours’ service because a competitor is doing so (because not do so would mean a loss of business and customers).

A7. (a) An open system is one which interacts with its environment and consequently is affected by changes in the environment and, to a limited extent, affects its environment.

(b) Organisation theory recognises that all organisations, private, social, profit and non-profit seeking must be open systems. They receive inputs from the environment and produce outputs which go into the environment. They must take account of changes in their environment which include competitive and market changes, social, legal, financial and cultural influences and many others. The ability to adapt to change is a key feature of successful organisations and adaptation can only take place with open systems which are attuned to environmental influences.

A8. (a) Data are events, facts and results which have been recorded. They are the raw materials from which information is produced. Information is data that have been processed in such a way as to be useful to the recipient.

(b) Information, properly used, adds value to planning, decision making and control. Information does not have value in itself, its value derives from the changes in decision behaviour caused by the information being available. Without information most decision making would be simply guess work.
(c) Useful information has the following features:
- relevance for problem/decision being considered
- communicated in time to the right person
- accurate and complete enough for the problem
- understandable by the user.

A9. Three major barriers to good communication in organisations are:
1. Badly designed and badly written reports and statements. Messages produced with unexplained technical terminology (jargon) and without considering the precise requirements of the recipient and which do not communicate efficiently. Highlighting, concise summaries and clear layouts all help to promote understanding.
2. Organisational structure and protocol. Numerous levels in the structure, rigid hierarchies and adherence to formal rules and procedures tend to delay messages and cause poor communications.
3. Information overload. Too often management are swamped with data (often incorrectly called ‘management information’) which are routinely produced. This means that vital messages are not read in time or at all. A key result of many surveys is that management do not need more information, they need better information.

Assessment – Chapters 5 to 9

A1. In answering a question of this type it would be necessary first to identify the members of the classical school. These include Taylor, Gilbreth, Fayol, Urwick, Brech, Weber and so on.

The scientific managers (Taylor et al.) concentrated on the factory floor and by specialisation and work organisation greatly improved the efficiency of production. Their approach was a mechanistic one which was the forerunner of modern work study. The classical theorists (Fayol et al.) were concerned with the organisation as a whole and particularly with its structure and with the development of management principles which were thought to be universally applicable. These included span of control, the principle of authority, functionalism and so on. Weber and others demonstrated the apparent inevitability of hierarchical structures in organisations and the group as a whole showed how important it was to consider structure (departments, relationships and hierarchies) as an essential part of the development of an efficient organisation.

A2. Decentralised organisations are those where local managers not at the top of the organisation have the power to make decisions and commit resources, usually within specified limits. The main advantages and disadvantages are:

**Advantages**
- decision making is speedier
- decisions are more likely to reflect local conditions
- information delays are reduced and local information is likely to be more relevant
- motivation of local management is increased and decentralisation provides good training for potential senior management
- senior management have more time for strategic matters.
Disadvantages
(a) better quality and better trained managers are required
(b) sub-optimal activities can take place
(c) first class information and control systems, which may be expensive, are required
(d) there may be a lack of overall control/guidance resulting in an inconsistent approach to problems.

A3. The Hawthorne studies marked a major shift from the classical/scientific management approach to the consideration of social and psychological factors, especially the influence of the work group and informal cultures. The human relations school grew out of these studies and its main principles can be summarised thus:
1. People should not be treated in ‘isolation’ but as members of a group. The group exerts strong influence on performance, decision making and so on.
2. People are motivated by social factors and thus the amount of work is determined by technical/physical factors and social factors.
3. Leaders will develop in groups and are important in setting group norms and motivating individuals.

The Tavistock Institute of Human Relations extended and modified the results of the original Hawthorne studies. The work of Trist and Bamforth in the Durham coal mines concluded that effective work was a result of the interdependence of technological and operational factors (equipment, layout, etc.) and the social needs of the employees in the working group. It was discovered that there were clear benefits from allowing people to complete a whole task rather than specialised fragments. The findings have become known as the socio-technical approach.

A4. Main points:
(a) Economic security, reputation/standing, recognition of achievements, social contacts, interesting work. In general, although money is a motivator it appears not to be a lasting motivator. Factors associated with the work and self-esteem appear to be stronger motivators for most people.
(b) This is clearly an important part of every manager’s job and a key to improving efficiency. Because motivation is a personal matter, the conditions which motivate vary from person to person. However, the following list provides the main factors:
   • provide support and feedback
   • make the job as complete and challenging as possible
   • provide good training
   • arrange for career development
   • encourage group and team working
   • good working conditions
   • promote good communications
   • be frank and fair
   • provide adequate pay.

A5. Line authority is the direct authority exercised in the chain of command. Every manager has line authority over his subordinates.
   Functional authority is the power to exercise command or influence over specialised functions, e.g. personnel, accounting. This means that, within their area of expertise, a functional specialist may give instructions to a line manager.
Staff authority is restricted to the provision of advice or service. It is usually exercised by people who are ‘assistants’ to others.

It is normal for the accounting function to have functional authority over accounting and finance matters throughout the organisation. To an extent this is a dilution of the authority of line managers but with the complexity of modern organisations this is probably inevitable.

A6. Flexible organisations are those which are capable of adapting to changing circumstances. Their features include:

- use of networks of control authority and communication rather than formal hierarchies
- emphasis on the use of specialist knowledge
- commitment to task and progress rather than to a particular organisation
- adjustment and redefinition of tasks is continuous
- emphasis on advice rather than instruction and lateral rather than vertical communication.

Flexible organisations have many advantages but may exert pressures on individuals thus:

- the lack of clear authority may be a source of ambiguity, conflict and tension
- uneven work demands and the need to learn new skills may cause anxiety
- continual readjustments may mean difficulties in developing group loyalties
- flexible structures may make it more difficult for individuals to see their career patterns and thus cause discontent
- constant changes favour those with political skills and may cause less fortunate people to become frustrated.

A7. Conflict develops when there are recognisable entities (groups, sections, department, teams and so on) which perceive they are in competition for some scarce resource (for example, money, facilities, awards, status).

The main way of avoiding conflict is by setting overriding goals. These are goals which are attractive to both groups but which require cooperation for their achievement. Wherever possible, conflict should be avoided by management emphasising the need for cooperation and interdependence and by not creating circumstances in which undue competition occurs.

A8. (a) The main principles and explanations can be taken from the text. The principles include: span of control, definition of objectives and duties, the scalar principle, specialisation and division of labour, and the principle of correspondence.

(b) The main criticisms of the classical approach are:

- there was undue emphasis on structures, formal authority and control
- the behaviour and needs of the people in organisations was largely ignored
- the approach was prescriptive with only limited analysis of actual behaviour.

The contributions of the classical theorists provided a foundation upon which later researchers could build and they made the study of management respectable in an intellectual sense.

A9. This can be taken directly from the text.

A10. The reasons for the decline in morale and productivity may be a single factor or a combination of numerous factors. Some possible factors are listed below:

(a) Resentment. All or the most senior subordinate may feel resentment at the appointment of an ‘outsider’.
(b) Resistance to change. The new manager may introduce new practices and methods which are resisted.
(c) Style of management. Almost inevitably there will be a new style of management which may cause problems. Whichever way the style develops – greater or lesser control – difficulties may occur.
(d) Incompetence of new manager. The new manager may not have the requisite technical, managerial or organisational skills to cope with the demands of the job.
(e) Job changes. The new manager may have introduced new methods, or swapped jobs around in the department causing inefficiencies and reducing commitment. If the jobs are less satisfying, motivation will be reduced and personnel alienated.

A11. Stakeholders can be defined as those people or organisations that have a financial or other form of interest in the organisation. Typically these include:
- the owners or shareholders
- the staff, including management
- the customers and suppliers of the organisation
- trades unions, trade organisations
- the firm’s bankers
- environmental groups
- the Government, especially the Department of Trade and Industry, the Inland Revenue, and Customs and Excise.

A12. (a) A functionally based business is described in the text, the usual functions being production, marketing, purchasing, etc. Other ways of organising structures are product-based, geographically or regionally based, market-based structure, e.g. as in banking.
(b) Traditionally, especially in manufacturing, functionally based organisations have been popular. The advantages of such structures include expertise is concentrated and enhanced, authority for particular functions is clearly recognised, common standards and approaches throughout the organisation are encouraged. The disadvantages include conflicts with line managers, focused functional expertise may not recognise other important interactions, difficult information flows across and between functions, slower reaction to changing conditions.

A13. This can be largely answered from the text. Points to stress are that OD takes a systems view of the organisation and requires complete commitment from senior management. OD specialists normally have a behavioural science background but good interviewing, listening and teamwork skills are vital.

A14. (a) Probably the best known contrasting styles are McGregor’s Theory X and Theory Y. Theory X uses coercion and authoritarian methods whilst Theory Y allows greater freedom and participation to improve performance. These are the classic extremes between authoritarian and democratic methods.
(b) There are two main divisions of the workforce. A relatively large number of telesales staff in one or a small number of locations and a dispersed number of travelling salespeople working largely alone.
The telesales staff use relatively standard procedures in one or few locations making supervision and monitoring relatively easy. In such circumstances a more regulated
management style is possible although not necessarily desirable. Good working conditions and the creation of a friendly atmosphere are important in such circumstances.

The work of the travelling salespeople is more varied and individual making supervision and the creation of motivation more difficult. It is likely that a more open, democratic style with good communication will foster job satisfaction and increase commitment. Properly designed remuneration, commission and bonus systems will assist.

A15. (a) The existing culture is similar to the classic ‘role culture’ with clearly defined duties and rules, formality, defined procedures and so on.

(b) The role culture, often found in large organisations in the public and private sectors, is best suited to stable conditions such as those previously faced by B Company. There is now greater uncertainty and the need for greater flexibility. The established rules and hierarchy of B Company are likely to inhibit innovation and will not create a learning organisation.

(c) To cope with rapidly changing products, markets and technologies a ‘task culture’ may be required. This is characterised by less formality, more team working and organisational power depending more on expertise than formal position. Information flows upwards, downwards and laterally should be encouraged and learning and innovation fostered throughout the organisation.

In practice, changing an organisation’s culture is not easy. There are always ingrained beliefs, values and behavioural patterns that are difficult to alter.

A16. (a) Flat organisation structures have fewer management levels and tend to be more flexible and have larger spans of control. There is likely to be better communications and more contact between senior management and junior employees. However, they may not improve morale because the managers that remain may become overstretched and have less time for motivating and training staff. Also promotion possibilities may be reduced because there are fewer middle management posts.

(b) How a manager deals with the staff under his control depends on many factors. These include: his own training and capabilities, the capabilities of the staff, the nature of the work, the dispersion of staff and so on.

Too wide a span of control could cause numerous problems. These include: lack of time for staff training and motivation loss of control causing quality to fall, less time for longer term planning, stress/overload for the manager and the subsequent loss of morale.

A17. This can be largely answered from the text.

A18. The key points in this problem are that initially there were few stakeholders in the business and the objectives were largely concerned with fulfilling F’s personal ambitions. As the firm has grown there is now more formality and demarcation of functions. In particular, the board of directors will set objectives with operational issues being delegated to a more junior level. A longer term view must be taken, given the expectations of a widening number of stakeholders. These include: shareholders/loan providers, employees, managers, creditors, customers, etc.

There is now more delegation in the organisation with the corresponding need for more formal monitoring of progress towards meeting lower level divisional objectives which contribute towards the overall strategic objectives.

A19. (a) It is likely that the problems at the Casterbridge office (high staff turnover, poor quality, mistakes) are clear indicators of low staff morale and poor motivation.
Motivation conditions behaviour and there are numerous theorists (outlined in the text) who have contributed to the understanding of what motivates people. As examples, Maslow suggests there is an hierarchy of needs ranging from basic physiological needs (hunger, warmth) through higher order needs leading to self-actualisation. In a somewhat similar manner, Herzberg categorises some needs as ‘hygiene factors’ (salary, working conditions) which help to remedy demotivation whilst other higher order needs are required to increase motivation. This second category, called ‘motivators’, includes recognition and opportunities for advancement.

It would seem from the senior partner’s remarks that he has a Theory X view of the problem, i.e. there is not enough control and supervision. Whilst it is clear that there are adequate ‘hygiene factors’ (good working conditions and wage rates) it seems clear that there are insufficient motivators of recognition and esteem.

(b) Jane should discuss with individual staff and find out their thoughts on the work, conditions, their aspirations and their ideas for improvement. Adoption of a more democratic (Theory Y) style, the encouragement of genuine communication, the giving of praise and recognition for work done should help to improve the situation.

A20. (a) The model alluded to in the question is Lewin’s force field analysis covered in the text. Listing the forces in the question produces the data in Table EQ1.

<table>
<thead>
<tr>
<th>Forces for change</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive pressures from other steel firms especially state subsidised ones</td>
<td>X</td>
</tr>
<tr>
<td>Lack of domestic demand</td>
<td>X</td>
</tr>
<tr>
<td>Increased demand in Far East</td>
<td>X</td>
</tr>
<tr>
<td>Exchange rate increase</td>
<td>X</td>
</tr>
<tr>
<td>Customer complaints</td>
<td>X</td>
</tr>
<tr>
<td>New chief executive</td>
<td>X</td>
</tr>
<tr>
<td>Need for more efficiency</td>
<td>X</td>
</tr>
</tbody>
</table>

(b) The force field analysis argues that the forces for change are reinforced and those resisting change are reduced. The main problem is that many of the forces are external and outside management’s control, although obviously attempts will be made to influence the external forces, e.g. by collaboration with other steel firms perhaps to obtain government subsidies, most attention will be directed onto internal forces. Ideally, change is best achieved through the willing participation of all concerned but this is far from easy. In this example, the attitudes of existing management and the trade unions would receive most attention. It may be that the possibility of the collapse of the firm, without major changes, may assist the resisting forces to argue for the needed changes but changing entrenched attitudes and beliefs is difficult.
Assessment – Chapters 10 to 13

A1. Report on computer-based financial model
To: Treasurer
From: A.N. Other

As requested I give below the answers to the questions you posed.

(a) What is a model? A model is any representation of reality. It may be a physical model (e.g. an architectural model of a town layout) or an abstract model. These are representations of reality in numeric, algebraic, symbolic or graphical form. For example, a balance sheet is a model which depicts the relationship between a firm’s assets and liabilities at a given point in time. A balance sheet is essentially a static model and a model which permits analysis and projections can be considerably more useful. Such a model is a computer-based financial model which is essentially a linked series of equations and formulae (expressed in computer instructions) which enable projections, forecasts, statements, etc., to be prepared.

(b) What procedures are involved in constructing a model? To construct a useful and appropriate model is a complex task requiring much detailed investigation and a thorough technical knowledge of the area involved (e.g. budgeting, loans fund, financial forecasts, etc.). It is essentially an iterative process as it is extremely unlikely that a perfect model will be produced first time. The major steps in producing a computer based financial model are as follows:

1. Establish the objectives of the model. This is a management task and involves answering many questions such as: what results/calculations/forecasts are required from this model? What will be the frequency of use? What will be the required input data? What format will be required?

2. Define the logic of the model. Management having specified the objectives it is usual to work backwards from the model’s objectives identifying the relationships between the variables and eventually specifying all data that must be input to the model. It is at this stage that identification of the critical variables becomes of crucial importance. All models are a simplification of reality and the real skill in model building comes from identifying the important variables and disregarding the unimportant ones.

3. Code of model. Once the logic has been defined and expressed in the forms of flowcharts and/or equations and/or decision tables, the logic is coded into a series of instructions.

4. Test model. After coding and compilation where appropriate, the model (as any other program) is tested using sample input data.

5. Model revision. Almost inevitably the model will not meet the exact requirements or changed circumstances so that some revision will be necessary.

(c) Advantages of using a computer-based model. Although there are many problems involved in establishing a comprehensive model a number of significant advantages accrue. These include:

(i) ability to handle large volumes of data speedily
(ii) ability to carry out long series of calculations without error
(iii) ability to test various possible circumstances and see the results which would be virtually impossible manually, e.g. to test out effects on budget calculations of 10 per cent, 12 per cent, 15 per cent, etc., inflation rates; various wage cost increases and so on.
(iv) inclusion in a comprehensive modelling package of a whole range of facilities including investment appraisal, cash flow forecasting, etc.
A2. (a) Information characteristics:

- Planning information. Is future orientated and often covers a relatively long time period. Trends and patterns are more important than fine detail. Often there is wide coverage involving both internal and external sources. Considerable use is made of forecasting techniques.

- Control information. Shows past results and activities and often relates the results to a target, standard or budget. Often very detailed and is usually concerned with specific functions, operations, departments or personnel.

- Operating information. This is information about the essential day-to-day activities of the business, e.g. the information on a customer’s order, information on stocks, production figures and so on. There is a huge range and volume of operating information which is often in great detail. The information is specific and, consolidated and summarised, provides a prime input for the provision of planning and control information.

(b) The main problems associated with the production and use of planning and control information include the following:

- Planning information. Planning always relates to the future and the only certain thing about the future is that it is unknown. This is the key problem regarding planning information for which there is no complete solution. There are difficulties with forecasting in uncertain conditions and often great difficulty in obtaining essential information from external sources, even if it is known what factors will be important over the planning period involved which, of course, is not always the case. The user of planning information has to exercise judgement or flair in deciding whether or not to accept the forecasts presented. If conditions change, or unknown factors arise – which is likely to happen – forecasts based on past results are unlikely to be of much value.

- Control information. The effectiveness of control information relates to the speed at which it is gathered and processed ready for use. The information must be directed at the appropriate level in the organisation for maximum effectiveness. Surveys have shown that control information is often not used, mainly because of the following reasons:
  (i) it arrived too late
  (ii) the subjects covered were outside the manager’s control
  (iii) it was insufficiently detailed or thought to be inaccurate or in a form which could not be understood.

A3. It is necessary for companies to establish and periodically review their objectives for the following reasons:

(a) An up-to-date statement of objectives sets a framework for the organisation’s activities and serves as a focal point for management’s efforts.

(b) The objectives provide the supporting detail to the broad, overall goals of the organisation.

(c) Objectives help to clarify how the organisation intends to develop over the short, medium and long term.

(d) Periodic reviews of objectives ensure that relevant objectives are being pursued, provide a structure for debates about the organisation’s activities and provide an important formal reason for examining the environment.
Objectives are specific to each organisation and must reflect the purpose of the organisation, whether a manufacturing concern, a charity, a college, a bank and so on.

Drucker suggests that there are eight areas in which objectives of performance and results have to be set for a typical commercial organisation, namely:

- market standing
- innovation
- productivity
- physical and financial resources
- profitability
- manager performance and development
- worker performance and attitude
- public responsibility.

A4. This can be largely answered from the text. Note particularly the importance of external information and forecasts relating to the market and consumers, demographic trends, economic and financial trends, social and political factors and others.

A5. The three factors, timeliness, retrieval and presentation, centralised–decentralised are critical factors to consider when designing information systems.

(a) Timeliness of information. Research studies indicate that a major source of dissatisfaction with information systems is the arrival of information too late to be able to be used effectively. The more formal the information system the greater the care which needs to be taken to ensure timely arrival. With information systems involving feedback and control processes, timing is the critical factor. The late arrival of information may cause control action to be totally inappropriate for current conditions; at the level of the organisation, stock levels may have already begun to rise of their own accord when belated control information indicating low stock levels is acted upon causing stock levels to be increased sharply; at the level of the economy, information on demand management is often three to six months behind current events making effective fiscal control action more difficult and likely to be less appropriate. The whole process of gathering raw data, processing, information production and communication must be minutely scrutinised to cut out delays and reduce the time lag between event and information about that event being given to the user. With systems where there are fluctuating values, (stocks, cash flows, production, etc.), the late arrival of control information causes a change from negative to positive feedback with a consequently greater chance of system instability.

(b) Retrieval and presentation. The accessibility of information, i.e. the ease of retrieval, is an important factor in all information systems. Undue difficulties, e.g. complicated request forms, delays, complex coding systems, etc., make retrieval by the manager more difficult and cumbersome and make it more likely that the manager will avoid using the formal information systems and substitute his own, perhaps less efficient and objective, system. At the technical level, manufacturers have paid considerable attention to the problems of information retrieval, e.g. direct access storage media, database management systems, microfiche, keyword – in context (KWIC) systems, etc.

Another powerful reason for the less efficient use of information systems is the problem of information presentation. Research indicates that managers
consider a substantial amount of information they receive to be badly presented. The following factors should be carefully considered by system designers:

- Are the layout, heading, captions, etc. of the report clear?
- Would a graphical/pictorial representation be preferable to tabular format?
- Is the report too detailed, not detailed enough?
- Are trends, exceptions, comparisons clearly shown?
- Is technical terminology kept to an unavoidable minimum and adequately explained?
- Above all has the manager been consulted about the presentation?

(c) Centralised and decentralised information stores. In general, as information systems become more formal and mechanised there is, or has been until very recently, a strong tendency for the information processing to become more centralised. This has some advantages, for example, greater control, possible financial savings, standardised systems/coding, etc., easier to implement.

Of course there are several disadvantages of centralised systems, for example, remoteness, delays, slowness to react to change, lack of immediacy, possible resentment by departments serviced by the central system, possible lack of relevance, etc.

The reference above to recent developments is of course to such things as terminals, VDUs, microprocessors, etc. Such developments blur the distinction between centralised and decentralised information stores because of the immediacy of response and interrogation at the point of information need coupled with a centralised information store. The advent of the silicon chip and associated microprocessor will enable more decentralisation of information processing and storage because of its cheapness, power and availability.

A6. (a) Typically the three levels are described as:

- Strategic or top management. This level of management coordinates the activities of the business as a whole and is concerned with establishing overall objectives for the organisation and developing and implementing appropriate policies in order to achieve objectives.
- Tactical or middle management. This level of management's task is to implement top management policy and to direct the operations and functions of the organisation.
- Operational or lower management. This level is concerned with the day-to-day processes of supervision and direction of the routine activities of the organisation.

(b) Characteristics of decision making at the three levels:

- Strategic. An open system perspective is necessary because of the unstructured, long-term nature of decision making (non-programmed as defined by Simon). This decision making is largely concerned with external factors and trends and is judgmental.
- Middle. Characterised by medium- to short-term decisions with a greater – but not exclusive emphasis – on internal factors. Coordination and control activities form the basis of much decision making at this level.
- Lower. Decision making is highly structured (programmed as defined by Simon) and operates according to well defined rules. Often the decisions are quantitatively based and are invariably short term.
(c) Examples of assistance provided by computer-based information systems for the three organisational levels.

- **Strategic level** – ‘decision-support’ systems involving modelling, information retrieval.
- **Middle level** – analysis and exception reporting systems, spreadsheets for modelling, budgeting and similar control systems.
- **Lower level** – essentially automated decision making used in accordance with predetermined criteria, e.g. stock control and reordering systems, aspects of production control.

A7. See Figure EQ2 on p. 342.

A8. (a) Dysfunctional behaviour is behaviour which produces organisation inefficiency. With an obvious target such as a computer such behaviour is quite common and manifests itself in numerous ways, including projection, avoidance and aggression.

Projection means that people blame the new system for all problems even where they previously existed and are unconnected with the new system.

Avoidance means that people especially in managerial positions ignore the new system and persist with older, less efficient systems.

Aggression can take many forms including miscoding, delaying tactics, even physical damage to the equipment.

(b) Dysfunctional behaviour tends to occur with change that is not sympathetically managed. Ways of minimising adverse reaction include:

- **(i)** full and genuine participation in the design of new systems
- **(ii)** open dialogue and frank communications before any changes are made
- **(iii)** where appropriate safeguards should be given regarding status or job changes, redundancies, etc.
- **(iv)** full training before, during and after implementation.
- **(v)** reasonable, mutually agreed targets and norms.
- **(vi)** full managerial support for change.

A9. This can be largely answered from the text. Make sure you are aware of the importance of information flows in the control process.

A10. The key features of Theories X, Y and Z as styles of management include:

- **Theory X** assumes workers are lazy and dislike work avoiding it wherever possible. In consequence there would be clearly laid down plans, schedules and directions. There would be centralised decision making and close control.

- **Theory Y** assumes that workers find work natural and desirable and accordingly management seek to release the personal potential of staff. Subordinates are involved in setting objectives and encouraged to participate in decision making.

- **Theory Z** extends Theory Y by seeking a high degree of consensus and trust. A consensus of values throughout the organisation is sought and employee commitment is rewarded. There is an emphasis on open and democratic relationships and on consensus decision making. Ideally there should be long-term employment and career paths.

Some of the contingencies which may affect the choice of management style include:

- the nature of the work and technology used
- the ability and education level of employees
Stock control procedure with closed loop system

1. Information equivalent
   (a) Future usage (ex prod. control)
   (b) Current usage (requisitions)

2. Physical
   Goods ex suppliers
   Goods ex returns

Inputs from environment

Stock control system

Effector
Changes to parameters
Purchase requisition

Adjustments
GRNs
Requisitions
Return to stores
Notes
Changes to parameters

Process
Maintenance of stock records

Sensor
Measurements of actual performance

Comparator
Comparison with plans

Purchasing
Actions
Purchase Requisitions

(a) Purchase orders to suppliers
(b) Stock reports:
Overstocking
Obsolete stocks, etc. for higher management decisions

Outputs to environment

Figure EQ2
Stock control procedure with closed loop system
• employee expectations and traditional norms of behaviour
• national and cultural factors.

A11. The items listed in the question represent major changes in the company’s environment which are likely to have significant impacts, especially on management.

Possible impacts on management:
• increased pressure to maintain market share/profitability in the face of increased competition
• less security
• more travel and need to learn other languages
• need to change management style to deal with new conditions and legislation.

Overall, managers are likely to have to be more aggressive and flexible.

Possible impacts on staff:
• more job insecurity
• greater pressure for performance
• need for more flexibility.

A12. The key features of strategic tactical and operational planning can be taken from the text. The key features are that strategic planning is concerned with the long-term future of the organisation, tactical planning allocates and schedules resources to fulfil the strategic plan and operational planning deals with the day-to-day running of the organisation.

A13. The main theories on job satisfaction were developed by Maslow and Herzberg which are covered in some detail in the text. Apart from the listing of the main factors (ranging from pay to recognition) it is necessary to stress that job satisfaction needs constant re-enforcement. It is not a one-off task.

A14. (a) The main stakeholders and the importance of maintaining relationships with them are as follows:
• Shareholders. There must be continuing improvement in their return on investments. Contact should be maintained with the major investors via the financial institutions.
• Customers and guests. Good relationships are essential to gain repeat business. The different types of guests, tourists, business, non-residents must be analysed to ensure the correct services/facilities are provided.
• Staff. Management must ensure that there is proper training and support and must provide proper recognition.
• Suppliers. The provision of high-quality goods and services is of prime importance, so good, long-term relationships must be maintained.
• Regulatory authority. Local council monitors standards, safety, health and hygiene, etc., so good working relationships are essential.

(b) Benchmarking is the process of comparing the organisation’s practices with those of others to identify weaknesses and areas for improvement. Specific areas should be identified, e.g., meals, housekeeping, bars, business services, porters, etc., and benchmarked with organisations, not necessarily competing hotels, that provide similar services. It is important that the hotel’s staff are kept fully informed of the exercise and its results to ensure cooperation.

Once the process is completed and changes made they must be evaluated and monitored. Appropriate performance indicators, focusing on customer satisfaction, should be established and reviewed regularly.
A15. The definitions of structured, semi-structured and unstructured decisions can be taken from the text. The decisions in the question are those that require a combination of the analysis of information following given rules (i.e. a structured process) and the use of subjective judgement and factors (i.e. an unstructured process). Thus they are typical semi-structured decisions.

A16 (a) The information deficiencies are both internal and external:

- Internal. Inaccurate recording of trees being grown, incomplete data about age of trees and lack of integration of internal information systems may mean less up-to-date management information.
- External. Information is lacking on competitive prices and demand for wood and wood-based products. There is a lack of information on climate changes and its effects on different species of trees and a lack of historical data on demand for the different species and products.

(b) The implementation of any new information systems may be difficult for the following reasons. The company appears to be in a state of flux with unclear objectives. The current information system is incomplete and lacks essential data. Almost certainly, there is a lack of information system expertise in the company. Because of impending changes, no clear definition is possible of the requirements for a new system.

A17 and A18. These answers can be taken from the text.

A19. (a) (i) The manager requires an exception report showing only those products which are below reorder level or likely to be so in the next few days.

(ii) The systems concept is filtering. Filtering takes noise out of the feedback so that the manager can concentrate on the relevant matters.

(b) Can be taken from the text.

(c) The systems concept described is that of entropy and negative entropy, details of which can be taken from the text.

A20. (a) Organisations set objectives having regard to their mission and to the needs of their stakeholders. The mission may be an explicit statement or may be implicit but widely known.

The stakeholders for the local authority are the people and groups in the local community and the relevant departments of central government. Central government are likely to set some objectives, targets and restraints that will, to some extent, govern the local objectives. The particular needs of the local communities must be assessed in detail and objectives set, within the centrally imposed constraints, that satisfy these needs by providing economic, efficient and effective services. These will relate to areas such as housing, law and order, traffic, maintenance, social services and so on. The objectives of the MNC will all be directed towards meeting the requirement of its major stakeholder, its shareholders. Although there will be sub-objectives relating to products, markets, quality, delivery, etc., they are all subservient to its overriding objective of increasing long-term value for the shareholder.

(b) Measurement of performance will relate to the nature of the objective set. Where possible, specific quantitative targets and measurements will be used but some objectives, especially for the local authority, are not easily measurable although desirable. For example, if an objective had been set to reduce the fear of crime, how would this be measured and assessed?

Care must be taken not to impose a proliferation of measures and targets which can itself be counterproductive. On the other hand, concentration on a single measure can also cause distortions. Some form of balanced scorecard approach is likely to be most effective.
Assessment – Chapters 14 to 16

A1. (a) This can be taken largely from the text. Key points include: planning information is long term, often external, without great detail, future looking. On the other hand, control information is mainly internal, often detailed and is essentially a monitoring exercise on past transactions.

(b) Deterministic systems: these are totally predictable with outputs known with certainty given a particular input. Computer programs are an example.

Probabilistic systems: these are systems which contain uncertainty so that outputs are not exactly predictable. A stock control system cannot predict the exact stock level in the future although the average level can usually be predicted.

Adaptive systems: these are systems which change and adapt to suit changes in conditions and data input. There is an element of learning in such systems. Organisations as a whole are adaptive systems.

A2. The answer can be taken from the text.

A3. Productivity is usually defined as the output per worker. Machinery of all types, materials handling, IT and various forms of capital equipment all contribute to improvements in productivity.

(a) The special features of IT that can improve productivity include:
   - faster access to information and records
   - automatic processing and decision making
   - wider range of information availability through files and databases
   - electronic communications of all types
   - automatic monitoring of balances, stock levels, debtors, etc.
   - reduction of errors caused by human processing
   - ability to use simulations, modelling and operational techniques.

(b) The use of IT can harm performance in various ways:
   - where IT use is uncontrolled, files and data may be lost or corrupted
   - competitors may be able to access confidential files through networks
   - unauthorised amendments to programs and files may be made for fraudulent purposes
   - computer viruses may cause disastrous problems.

A4. Ten important characteristics to evaluate information systems.

1. Effectiveness, i.e. does system accomplish its objectives?
2. Quality, i.e. what errors are produced, what are delays and service performance?
3. Costs, i.e. are initial and running costs acceptable?
4. Efficiency, i.e. are objectives achieved in a cost-effective manner?
5. Flexibility, i.e. is system capable of responding to change?
6. Acceptability, i.e. is system acceptable to, and relied upon by, users?
7. Complexity, i.e. is system simple enough to manage and use or is it over-complex?
8. Controllability, i.e. is system controllable and capable of being adapted by the users?
9. Capacity, i.e. is system capable of handling the tasks it is asked to perform?
10. Reliability, i.e. what is the amount of down time?
A5. Key points in report:
1. Central system
   - Advantages: central control, consistent standards in development and operations and central database open to all.
   - Disadvantages: cost of communications, remoteness of users and single system vulnerable to breakdown.
2. Distributed systems
   - Advantages: regions directly involved, lower communication costs, faster response and less impact caused by breakdown.
   - Disadvantages: control over development standards, etc. more difficult, hardware costs likely to be higher and more staff in total required.

A6. (a) Possible Level 1 dataflow diagram: see Figure EQ3.

(b) Possible Level 2 ‘explosion’ of order processing: see Figure EQ4.

(c) Other process specification tools are:
   - structured English
   - 4th generation program languages
   - decision tables
   - decision trees.

A7. (a) This part can be taken from the text.
(b) Data dictionary: this is defined by the British Computer Society as ‘An index of data held in a database used to assist in maintenance and any other access to the data’.
   It is thus a list or record of each data store and each dataflow in the system. It is a form of technical documentation to ensure that everyone in the organisation defines and uses data consistently.

A8. (a) The key elements of the five categories given can be taken from the text. The main points are:
transaction processing is the routine structured systems which process operational information

management information systems, in this context, are those that produce management reports, based on transaction processing, for routine management purposes for planning, control and decision making

decision support systems support management decision making in an interactive manner in semi-structured situations

executive information systems provide flexible access to all types of corporate information. They use the database developed by transaction processing and are typically used by senior management

expert systems are linked suites of programs which capture the special knowledge of experts and makes this more widely available

(b) Possible applications include:

Sales and marketing:
- Transaction processing systems: invoice production
- Management information system: sales analyses
- Decision support systems: modelling effects of price changes
- Executive information systems: access to sales trends
- Expert systems: developing competitive strategies.

Finance:
- Transaction processing: ledger keeping
- Management information system: credit control report
- Decision support system: project appraisal using DCF
- Executive information system: access to departmental operating performance
- Expert system: assessing loan applications in banks.
A9. (a) Can be taken from the text
   (b) Typical of the methods the systems analyst may use are the following:
      ● Detailed interviews with staff and executive. These help to clarify requirements but care must be taken to avoid concentration on current problems only.
      ● Case observation and analysis of work being done and types of decisions made. Again care must be taken to consider future developments and infrequently occurring, but critical, work.
      ● Analysis of the key performance indicators require to measure success. Typically these are targets with a financial bias, e.g. cash flow, profitability, return on capital employed, but other factors need attention for long-run success. Examples include quality, customer relations, staff training and so on.
      ● Prototyping. Details can be taken from the text.
      ● Modelling the system. Details can be taken from the text.
A10. (a) Details of expert systems can be taken from the text.
   (b) Can be taken from the text.
   (c) Typical changes that might occur if an expert system was implemented include:
      ● workload and status of repair centre engineers is likely to be diminished
      ● possible redundancies at the repair centre
      ● communication and coordination between field engineers and the repair centre may become more difficult
      ● because the new system is more decentralised, both financial and quality control may become more difficult
      ● job responsibilities will need to be redefined.
A11. (a) Details of negative feedback can be taken from the text.
   (b) Spreadsheets enable simple but effective models to be developed so that various options can be examined using the ‘what if’ facility. This makes them useful for tactical decision making which uses mainly internal data which can easily be incorporated into the spreadsheet calculations.
   (c) Typical problems which may occur are:
      ● lack of clear documentation making it difficult for other staff to use the models
      ● lack of audit trails
      ● unsystematic use and development due to poor training.
A12. The two businesses have dramatically different characteristics.
    The garden centre has the following characteristics:
      ● small business
      ● local market
      ● low value products with low margins
      ● low administrative/information system expertise
      ● dealing mainly with individuals
      ● small resources.
    On the other hand, the consultancy has the following characteristics:
      ● large business
• international market
• high value products
• substantial in-house expertise
• large resources.

In consequence e-commerce is likely to be of much greater use and application for the consultancy. Their clients are likely to expect such developments and their non-physical products/services are better suited to e-commerce than bulky low-value garden items. The garden centre could, for a small cost, have a non-interactive website designed for them giving details of their products, opening hours, etc. but anything more elaborate is not likely to be worthwhile.

A13. (a) There are a large number of devices and systems developed to aid communications including: emails, faxes, mobile and fixed telephones, local area networks, voicemail, videolinks, tele- and video conferencing.

(b) Despite the physical developments outlined above there are numerous barriers to good communications. These are explained in detail in Chapter 2.

A14. (1) Business correspondence. This has been transformed by word-processing software, ink-jet and laser printers thereby raising quality, increasing speed and reducing costs. Distribution has been enhanced by emails and faxes that combine speed with security.

(2) Mathematical calculations. Although simple one-stage calculations are best done with an electronic calculator, exploring different values soon becomes cumbersome. The use of spreadsheets and PCs has greatly facilitated this process. This reduces time and errors and is more flexible.

(3) Communicating an order. Traditionally done by typewriter and post this can be done using order templates, word processing and email or faxes. Alternatively, where there is a close link between supplier and customer, electronic data interchange can be used where computer files can be directly exchanged.

A15. (a) The steps in this process are:

• Determine the overall business strategy to ensure that the online banking proposal will support this and not be in conflict.
• Analyse all the effects (staffing, recruitment, branch network, etc.) likely to be affected by the online proposal.
• Precisely specify what facilities/services the online system should provide and the level of security.
• Review all competing online banking services and examine any surveys on their effectiveness, problems, etc.
• Budget the likely costs, charges, revenues, etc., and determine whether the proposal will be profitable.
• Using specially recruited staff or outside consultants, design the website and system.

(b) Outsourcing the development

1. Advantages:

• speedier
• draws on experienced, highly skilled staff
• avoids the recruitment problems associated with such specialised and scarce staff.
• the consultancy will provide support in the future.
2. Disadvantages:
- assessing expertise and reliability of a consultancy is difficult
- lack of control over development and operation of site
- possible loss of security
- ongoing support may be expensive.

A16. (a) Errors
1. The data store ‘Payment type’ should be read not written to. Reverse arrow.
2. The process ‘Raise despatch note’ should update the data store ‘Order’. Reverse arrow.
3. The invoice from Process 3 should go to external entity ‘customer’. Change over external entity to ‘customer’ not ‘invoice’.

(b)

![Figure EQ5](image)

Corrected version of order process

A17. (a) The information system should provide a quick and efficient method of sharing, accessing and processing information to reduce the lead time for new drugs. This general aim would be assisted by the use of an intranet within ZX. The search for particular items will be easier and quicker if all documentation is in an electronic format. The completeness of the search will be enhanced because the use of an intranet and appropriate search engines will enable all references to be accessed. Document transfer is virtually instantaneous. Control may be enhanced because the manager will be able to monitor concurrent
processing rather than relying on the existing cumbersome linear reporting system.

(b) An extranet means that databases and information that is normally internal and confidential is shared with other organisations albeit with safeguards – passwords, etc.

However, there are potential problems. There may be competitive advantages in keeping research and development confidential and there may be difficulties with incompatible systems.
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