

Chapter 1

Information Systems

Summary

An information system can be defined as a 'business application of the computer'. The subject area of information systems (or management information systems as the Americans would have it) includes an understanding of:

- ◆ Business / organisations – their aims, management, structures and methods of working.
- ◆ Information systems and their use within organisations.
- ◆ The information technology used in information systems.
- ◆ The process and techniques of analysing and designing an information system.
- ◆ The professional, legal, social and ethical issues involved in the application of information systems and information technology.

The information system function within an organisation can be seen as an intermediary between the business and the information technology infrastructure of the organisation. The role of the information system specialist is further illustrated by the system development lifecycle.

1.1 What is an Information System?

An information system is a broad categorisation. The term does not mean quite what it would seem to imply. It can be defined as:

An information system is: *a business application of the computer.*

An information system, or a management information system (MIS) which is the North American term, is not just about providing information but also about processing business transactions. Information systems are also data processing systems (DP) and business transaction processing systems (TP). Examples of commonly used information systems are:

- ◆ Payroll. This system starts with details of employees and their rates of pay and processes this data to produce bank transfers, pay slips, etc. The system also provides information on, for example, the payroll cost of staff in the various departments and grades within the organisation.

- ◆ Order processing: The main input transaction is the customer order which is processed using customer and product data to output the delivery note and invoice transactions. In addition to processing the business transactions the system can produce a wealth of management information on what is selling, who is buying and the overall sales totals for each month and year.

Most organisations will have a small number of information systems that are central to their operation. Examples of this are:

- ◆ A supermarket with its sales and stock replenishment system.
- ◆ A manufacturing company with materials requirement planning and production control systems.
- ◆ A college or university with its student registration and records system.

In addition to these central systems, on which the operations of the organisation depends, there will be a number of further systems for functions such as marketing, accounts, the customer complaints department and so on. Some of these applications will be formal information systems and some will make use of standard desk top packages.

The central business systems of the organisation will be supported by an extensive IT infrastructure. Many organisations, and the large multiple retailers are good examples of this, are totally dependent of their IS / IT infrastructure. In these organisations most or all employees will be interfacing with the core information system. In the supermarket for example:

The electronic point of sale system (EPOS) reads the barcodes, looks up the prices of the merchandise and calculates the customer bill. As each item is checked through the EPOS system the sales are totalled and that total is then taken from the store's stock total to calculate the replenishment requirement for each product sold by the store. The stock replenishment system then comes into operation to order a delivery from the regional warehouse to the store and, after further calculation, electronic orders are sent to the food processor for stock to be delivered to the warehouse. Details of all transactions are stored and analysed to derive accounts, marketing and management information.

For a large supermarket chain concerned with ensuring good stock availability with minimum stock holding this is a very large and sophisticated IS. The system consists of the EPOS terminals and back office servers in the stores, warehouse systems in the depots and, in all probability, a large data centre at a head office site. The supermarket's IS will be linked to its suppliers' order processing ISs creating an 'inter-organisational information system'. The overall system is illustrated in **figure 1.1**. The overall system costs a large sum of money and many years of effort will have gone into building up and tuning the system. The supermarket can not operate without the system: if, for example, the EPOS infrastructure breaks down the store has to close its doors (and that occasionally does happen despite the efforts of the organisation to make its systems secure).

Not all systems are that large and their operation is not necessarily critical to the organisation. Your college or university does have, as already mentioned, its own information systems but they do not, in general, greatly impinge on the day to day

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function of teaching and learning – the classes can still go ahead even if the student registration and record system is not available.

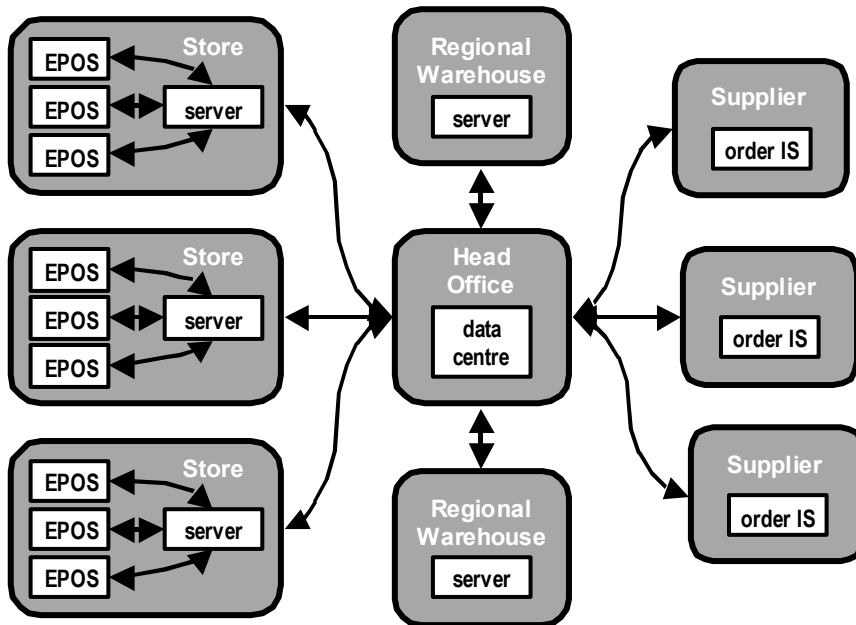


Figure 1.1 Supermarket Chain – IT Infrastructure.

1.2 The Study of Information Systems

The study of information systems has two main strands:

- ◆ The application and effect of information systems within organisations.
- ◆ The analysis, design and implementation of information systems.

To understand the application of information systems within businesses and other organisations the IS student must first have some understanding of the structure and *modus operandi* of those organisations; this is looked at in **Part II**. Following on from that, the reader needs to have some understanding of:

- ◆ The nature of information systems, how they work within organisations and their effect on those organisations; this is looked at in **Part III**.
- ◆ The scope of information technology and how it can be utilised in IS; this is the subject of **Part IV**.

Armed with this background, the IS practitioner is in a position to investigate organisational requirements for IT and design an IS; an introduction to system analysis and design is given on **Part V**. All IS development and application should be legal and within an appropriate ethical framework; this is discussed in **Part VI**.

These areas together constitute the discipline of information systems. This book examines each at an introductory level and should equip students with a

comprehensive background understanding of the field of IS. For IS students, and students in related areas of study, the topics in this book will be further developed in subsequent units of study.

The topics outlined above, together, constitute the knowledge and skill base of the system analysis role. It is also information that is useful to all other roles within the IS / IT function and many other functions in organisations, at all levels.

1.3 The IS Function within an Organisation

As indicated above, the primary role in the information systems function is that of the systems analyst. Further roles that require an understanding of the field of IS and the techniques used in IS include project manager, business analyst, analyst programmer and the system integrator. These roles exist within the IS / IT function of an organisation, shown diagrammatically in *figure 1.2*.

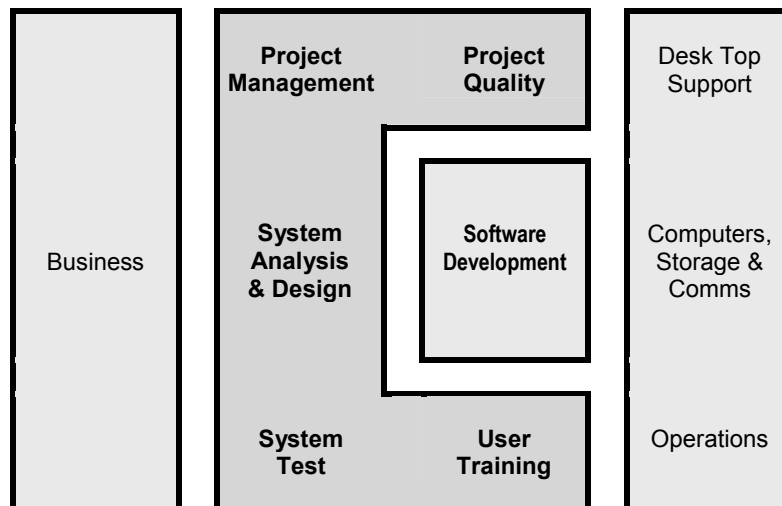


Figure 1.2 The IS Function in an Organisation

The IS function exists as the interface between the business on one hand and the IT infrastructure (computers, storage and communications network) on the other hand.

The business (organisation) performs a number of functions and many of these can be controlled or assisted by the application of IS / IT. It may well be that people within the organisation will have the knowledge and expertise to use IT equipment and information systems but, for large complex requirements that interface with other departments and (possibly) other organisations, they are likely to require the assistance of IS specialists.

IT equipment will be dispersed throughout the organisation with many / most employees having a PC or specialist terminal on their desk or at their work station. All this equipment has to be set up and maintained. The desktop / workstation IT

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equipment is very probably networked to server / central mainframe facilities and these also need to be operated and maintained.

The IS function is to analyse business operations, suggest how IT can be used to expedite these functions and to design the information systems that will be used in the business. The central role is that of system analysis and design, and this is further broken down in the next section. Further roles in the IS function are:

- ◆ Project management: Any significant IS development will normally have a project team set up to do the work involved. The project has to be planned and then the activity of the project team must be monitored to ensure that appropriate progress is being made. The role of the project manager is to plan the project, run the project team and ensure that the project is delivered on time and on budget.
- ◆ Project quality: As well as being on time the project needs to be a quality system; it must be fit for the purpose for which it is intended. To be a quality system it must meet the business objectives that have been set, operate efficiently and be readily maintained and updated. The project manager is responsible for delivering a quality system (possibly assisted by a separate quality assurance function).
- ◆ System and acceptance test: Once a system is developed the project team must check that it works. The system needs to cope with all possible inputs, produce the correct results and perform efficiently in the operational environment. After the project team has accepted the system it is the turn of the users. The acceptance test is their opportunity to check that the system does the job that they require.
- ◆ User training: As well as making sure that the system is ready the users of the system have to be ready. A new system can require radical changes in working practice and it requires careful planning to ensure all goes smoothly and that the users are fully trained when a new, or enhanced, system is introduced.

While the specification and the testing of the system are IS functions, the development of the system is the task of the programmers. The programmers take the technical specification from the system analyst and translate that into the programming instructions that the computer needs to perform the task. The programmers will also unit test their modules before handing them over for system and acceptance testing.

Traditionally information systems have been developed through the analysis, design, programming and test sequence. The process of building your own information systems can be both time consuming and expensive and more and more systems are bought in as packaged solutions. The analysis, programming and testing functions are still part of the process of adapting and installing a packaged solution but the system development processes and functions need tailoring to the requirements of the installation being undertaken.

The classic IS function started many years ago when computer systems were centralised mainframes and very few people in the business knew anything about IT. The data processing department provided the expertise necessary to create

and operate computer application systems for the organisation. Since those days, ICT equipment and some knowledge of IS / IT have become defused throughout the organisation, and the IT department is no longer the central monolith it once was. Nevertheless, most organisations of a significant size will still have an IS department and the diagram is illustrative of the function.

1.4 The System Development Lifecycle

The system development activities outlined above can be represented as stages in a system development lifecycle. Each stage of the lifecycle performs a particular function and requires a specific set of skills.

The classic system development lifecycle is the waterfall lifecycle. In the waterfall lifecycle the activities / stages are performed in sequence – a representation of the waterfall lifecycle is shown in **figure 1.3**. Note that the waterfall lifecycle can be represented with more than the five stages – the additional stages would normally be subdivisions of the stages shown.

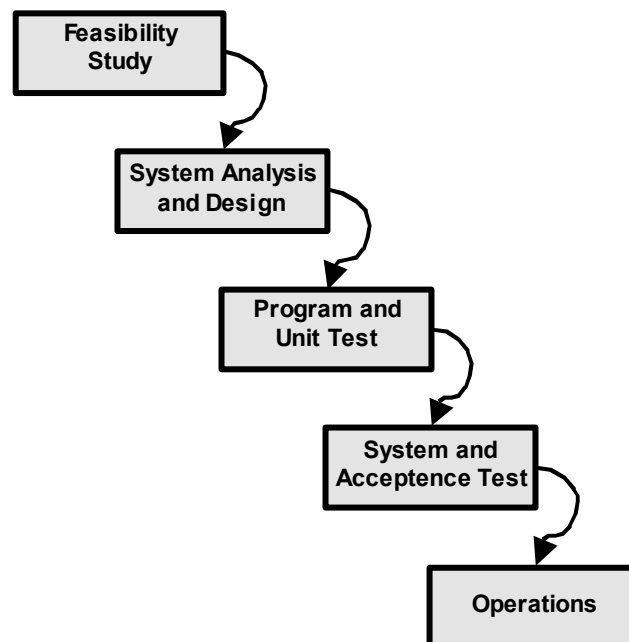


Figure 1.3 Waterfall Lifecycle

The activities of the five stages, in summary, are:

- ◆ Feasibility study:
A short study to determine if the proposed system is technically feasible, financially worthwhile and ethically justified. The feasibility study produces a report that is used to determine if the project should get the go-ahead. If the project is to proceed the feasibility study will include the terms of

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reference, a project plan and budget estimates for the future stages of the development.

- ◆ **System analysis and design:**
A full study to determine the requirements for the computer system and to map those requirements onto the computer hardware.
The stage includes a detailed study of the business needs of the organisation. This study is then mapped onto a logical system and that in turn is translated into a design for the technical implementation. The system analysis and design stage may well consider options for changing the business process and will also need to determine the appropriate hardware and system software to be used for the project.
- ◆ **Programming and unit test:**
Converts the design to computer code and tests each component of that computer code.
Computer programs need to be written for each part of the system. Using a conventional programming language programs will be written as a series of modules (possibly by a number of programmers). Each of these modules should be the subject of separate and detailed testing.
The alternatives to conventional programming are a 'fourth generation language' (4GL), application generator, or the use of bought in software packages.
- ◆ **System test and acceptance test:**
System testing, by the project team, and acceptance testing, by the users.
In the system and acceptance tests the separate modules of the system are brought together and tested as a complete system. The system needs to be tested to ensure that:
 - ◆ The interfaces between the modules work (Integration Test).
 - ◆ The system works on the intended platform and with the expected volumes of data (Volume Test).
 - ◆ The system does what the users require of it (Acceptance Test / Beta Test).
- ◆ **Operation:**
Using the system including error correction and enhancement.
The system is made live and is used for its intended business purpose. The IS function will be involved in training the users on the new system and associated procedures. There will be a support function that deals with queries and errors as they arise. There may (will) also be enhancements to improve the system and to deal with changes in business requirements.

Eventually the business requirement will change radically and / or the system (hardware and / or software) will become outmoded and a new system will be required. The lifecycle starts again.

The lifecycle is included in this introductory chapter to illustrate the role of the IS function within a organisation. There are alternative approaches to system development and the lifecycle, and the system development process is dealt with in more detail in **Part V**.