Management Information Systems
CIS302
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Vice-Chancellor’s Message

The Distance Learning Centre is building on a solid tradition of over two decades of service in the provision of External Studies Programme and now Distance Learning Education in Nigeria and beyond. The Distance Learning mode to which we are committed is providing access to many deserving Nigerians in having access to higher education especially those who by the nature of their engagement do not have the luxury of full time education. Recently, it is contributing in no small measure to providing places for teeming Nigerian youths who for one reason or the other could not get admission into the conventional universities.

These course materials have been written by writers specially trained in ODL course delivery. The writers have made great efforts to provide up to date information, knowledge and skills in the different disciplines and ensure that the materials are user-friendly.

In addition to provision of course materials in print and e-format, a lot of Information Technology input has also gone into the deployment of course materials. Most of them can be downloaded from the DLC website and are available in audio format which you can also download into your mobile phones, IPod, MP3 among other devices to allow you listen to the audio study sessions. Some of the study session materials have been scripted and are being broadcast on the university’s Diamond Radio FM 101.1, while others have been delivered and captured in audio-visual format in a classroom environment for use by our students. Detailed information on availability and access is available on the website. We will continue in our efforts to provide and review course materials for our courses.

However, for you to take advantage of these formats, you will need to improve on your I.T. skills and develop requisite distance learning Culture. It is well known that, for efficient and effective provision of Distance learning education, availability of appropriate and relevant course materials is a *sine qua non*. So also, is the availability of multiple plat form for the convenience of our students. It is in fulfilment of this, that series of course materials are being written to enable our students study at their own pace and convenience.

It is our hope that you will put these course materials to the best use.

Prof. Abel Idowu Olayinka
Vice-Chancellor
For e word

As part of its vision of providing education for “Liberty and Development” for Nigerians and the International Community, the University of Ibadan, Distance Learning Centre has recently embarked on a vigorous repositioning agenda which aimed at embracing a holistic and all encompassing approach to the delivery of its Open Distance Learning (ODL) programmes. Thus we are committed to global best practices in distance learning provision. Apart from providing an efficient administrative and academic support for our students, we are committed to providing educational resource materials for the use of our students. We are convinced that, without an up-to-date, learner-friendly and distance learning compliant course materials, there cannot be any basis to lay claim to being a provider of distance learning education. Indeed, availability of appropriate course materials in multiple formats is the hub of any distance learning provision worldwide.

In view of the above, we are vigorously pursuing as a matter of priority, the provision of credible, learner-friendly and interactive course materials for all our courses. We commissioned the authoring of, and review of course materials to teams of experts and their outputs were subjected to rigorous peer review to ensure standard. The approach not only emphasizes cognitive knowledge, but also skills and humane values which are at the core of education, even in an ICT age.

The development of the materials which is on-going also had input from experienced editors and illustrators who have ensured that they are accurate, current and learner-friendly. They are specially written with distance learners in mind. This is very important because, distance learning involves non-residential students who can often feel isolated from the community of learners.

It is important to note that, for a distance learner to excel there is the need to source and read relevant materials apart from this course material. Therefore, adequate supplementary reading materials as well as other information sources are suggested in the course materials.

Apart from the responsibility for you to read this course material with others, you are also advised to seek assistance from your course facilitators especially academic advisors during your study even before the interactive session which is by design for revision. Your academic advisors will assist you using convenient technology including Google Hang Out, You Tube, Talk Fusion, etc. but you have to take advantage of these. It is also going to be of immense advantage if you complete assignments as at when due so as to have necessary feedbacks as a guide.

The implication of the above is that, a distance learner has a responsibility to develop requisite distance learning culture which includes diligent and disciplined self-study, seeking available administrative and academic support and acquisition of basic information technology skills. This is why you are encouraged to develop your computer skills by availing yourself the opportunity of training that the Centre’s provide and put these into use.
In conclusion, it is envisaged that the course materials would also be useful for the regular students of tertiary institutions in Nigeria who are faced with a dearth of high quality textbooks. We are therefore, delighted to present these titles to both our distance learning students and the university’s regular students. We are confident that the materials will be an invaluable resource to all.

We would like to thank all our authors, reviewers and production staff for the high quality of work.

Best wishes.

Professor Bayo Okunade
Director
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<table>
<thead>
<tr>
<th>Role</th>
<th>Names</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Ibiyinka Temilola Ayorinde</td>
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</tr>
<tr>
<td>General Editor</td>
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</tr>
</tbody>
</table>
## Table of Contents

### About this course manual

1. How this course manual is structured

### Course Overview

3. Welcome to Management Information Systems C1302
4. Course outcomes

### Getting around this course manual

6. Margin icons

### Study Session 1

7. Basic Concepts of MIS
   - Introduction
   - Terminology
   - 1.1 Management
   - 1.2 Data and Information
     - 1.2.1 Characteristics of Information
     - 1.2.2 Value of Information
   - 1.3 Information as an Aid to Decision Making
     - 1.3.1 The Intelligence Stage
     - 1.3.2 The Decision Stage
     - 1.3.3 The Choice Stage
     - 1.3.4 The Review Stage
   - 1.4 System
     - 1.4.1 What is MIS
   - Study Session Summary
   - Assessment
   - Bibliography

### Study Session 2

17. System Concepts
   - Introduction
   - Terminology
   - 2.1 What is a System
   - 2.2 Components of a System
     - 2.2.1 System Boundaries
     - 2.2.2 Systems and Sub Systems
     - 2.2.3 Outputs and Inputs
     - 2.2.4 Subsystem Interface
     - 2.2.5 Interface Problems
     - 2.2.6 System and its Environment
Study Session 4

System Development Life Cycle (SDLC) ................................................................. 48
Introduction ............................................................................................................. 48
Terminology ............................................................................................................ 48
4.1 An Overview of SDLC ..................................................................................... 48
   4.1.1 Planning and Requirement Analysis ....................................................... 49
   4.1.2 Designing System Architecture ............................................................... 50
4.2 Building or Developing the System ................................................................. 50
   4.2.1 Testing the System ................................................................................. 51
   4.2.2 Deployment of the System .................................................................... 52

Study Session 3

Management Information System (MIS) and Information Technology (IT) ................ 37
Introduction ............................................................................................................. 37
Terminology ............................................................................................................ 37
3.1 IT and MIS ....................................................................................................... 38
   3.1.1 Functions of MIS .................................................................................... 38
   3.1.2 Characteristics of MIS .......................................................................... 39
3.2 Computers and Its Processing Capability ....................................................... 40
   3.2.1 Supercomputers .................................................................................... 40
   3.2.2 Mainframes ............................................................................................ 40
   3.2.3 Minicomputers ...................................................................................... 40
   3.2.4 Workstation Computers ....................................................................... 40
   3.2.5 Personal computers .............................................................................. 41
3.3 Computer Networks and Client/Server Computing ......................................... 41
3.4 Network Structure .......................................................................................... 42
3.5 Information Technology on the Emergence of Networks ............................... 43
3.6 The Role of IOS within the Network Structure .............................................. 43
Study Session Summary ......................................................................................... 46
Assessment ............................................................................................................. 46
Bibliography .......................................................................................................... 47
## Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Session Summary</td>
<td>97</td>
</tr>
<tr>
<td>Assessment</td>
<td>98</td>
</tr>
<tr>
<td>Bibliography</td>
<td>98</td>
</tr>
<tr>
<td><strong>Study Session 9</strong></td>
<td>99</td>
</tr>
<tr>
<td>Networks and Telecommunications</td>
<td>99</td>
</tr>
<tr>
<td>Introduction</td>
<td>99</td>
</tr>
<tr>
<td>Terminology</td>
<td>99</td>
</tr>
<tr>
<td>9.1 The Telecommunications Revolution</td>
<td>99</td>
</tr>
<tr>
<td>9.1.1 The Information Superhighway</td>
<td>100</td>
</tr>
<tr>
<td>9.1.2 Components and Functions of a Telecommunications System</td>
<td>100</td>
</tr>
<tr>
<td>9.1.3 Components of a telecommunications system</td>
<td>101</td>
</tr>
<tr>
<td>9.2 Telecommunications System Components</td>
<td>101</td>
</tr>
<tr>
<td>9.2.1 Types of Signals: Analog and Digital</td>
<td>101</td>
</tr>
<tr>
<td>9.2.2 Communication Channels</td>
<td>102</td>
</tr>
<tr>
<td>9.2.3 Communications Processors and Software</td>
<td>102</td>
</tr>
<tr>
<td>9.3 Enterprise Networking and Standards</td>
<td>104</td>
</tr>
<tr>
<td>9.3.1 Connectivity and Standards</td>
<td>105</td>
</tr>
<tr>
<td>9.3.2 Facilitating Applications</td>
<td>105</td>
</tr>
<tr>
<td>9.3.3 Electronic Data Interchange and Electronic Commerce</td>
<td>106</td>
</tr>
<tr>
<td>9.4.1 The Challenge of Managing Enterprise Networking</td>
<td>106</td>
</tr>
<tr>
<td>9.4.1 The Telecommunications Plan</td>
<td>107</td>
</tr>
<tr>
<td>9.4.2 Implementing the Plan</td>
<td>108</td>
</tr>
<tr>
<td>Study Session Summary</td>
<td>109</td>
</tr>
<tr>
<td>Assessment</td>
<td>109</td>
</tr>
<tr>
<td>Bibliography</td>
<td>109</td>
</tr>
<tr>
<td><strong>Study Session 10</strong></td>
<td>110</td>
</tr>
<tr>
<td>Transaction Processing System</td>
<td>110</td>
</tr>
<tr>
<td>Introduction</td>
<td>110</td>
</tr>
<tr>
<td>10.1 Meaning of Transaction Processing Systems</td>
<td>110</td>
</tr>
<tr>
<td>10.1.1 Types of Transactions</td>
<td>111</td>
</tr>
<tr>
<td>10.1.2 Characteristics of Transaction Processing Systems</td>
<td>111</td>
</tr>
<tr>
<td>10.1.3 Features of TPS</td>
<td>111</td>
</tr>
<tr>
<td>10.2 Process of Transaction Processing System</td>
<td>112</td>
</tr>
<tr>
<td>10.2.1 Data Entry</td>
<td>113</td>
</tr>
<tr>
<td>10.2.2 Data Capture</td>
<td>113</td>
</tr>
<tr>
<td>10.2.3 Data Validation</td>
<td>114</td>
</tr>
<tr>
<td>10.2.4 Processing and Revalidation</td>
<td>114</td>
</tr>
<tr>
<td>10.2.5 Data Storage</td>
<td>115</td>
</tr>
<tr>
<td>10.2.6 Output Generation</td>
<td>115</td>
</tr>
<tr>
<td>10.2.7 Query Support</td>
<td>116</td>
</tr>
</tbody>
</table>
### Study Session Summary

<table>
<thead>
<tr>
<th>Study Session</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>118</td>
</tr>
<tr>
<td>12</td>
<td>130</td>
</tr>
<tr>
<td>13</td>
<td>139</td>
</tr>
</tbody>
</table>

### Study Session 11

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decision Support System</td>
<td>118</td>
</tr>
<tr>
<td>Introduction</td>
<td>118</td>
</tr>
<tr>
<td>Terminology</td>
<td>118</td>
</tr>
<tr>
<td>11.1 Managers and DSS</td>
<td>118</td>
</tr>
<tr>
<td>11.1.1 Framework of Decisions Support Systems</td>
<td>120</td>
</tr>
<tr>
<td>11.2 Types of DSS</td>
<td>122</td>
</tr>
<tr>
<td>11.2.1 Data-Driven DSS</td>
<td>122</td>
</tr>
<tr>
<td>11.2.2 Model-Driven DSS</td>
<td>122</td>
</tr>
<tr>
<td>11.2.3 Knowledge-Driven DSS</td>
<td>123</td>
</tr>
<tr>
<td>11.2.4 Document-Driven DSS</td>
<td>123</td>
</tr>
<tr>
<td>11.2.5 Communications-Driven and Group DSS</td>
<td>123</td>
</tr>
<tr>
<td>11.2.6 Inter-Organizational or Intra-Organizational DSS</td>
<td>124</td>
</tr>
<tr>
<td>11.2.7 Function-Specific or General Purpose DSS</td>
<td>124</td>
</tr>
<tr>
<td>11.3 Components of DSS</td>
<td>125</td>
</tr>
<tr>
<td>11.4 Web-Based DSS</td>
<td>127</td>
</tr>
</tbody>
</table>

### Study Session 12

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Information Systems</td>
<td>130</td>
</tr>
<tr>
<td>Introduction</td>
<td>130</td>
</tr>
<tr>
<td>12.1 The Nature of Operational Information Systems</td>
<td>130</td>
</tr>
<tr>
<td>12.1.1 Management Advantages of OIS</td>
<td>130</td>
</tr>
<tr>
<td>12.2 Operational Accounting and Financial Information Systems</td>
<td>131</td>
</tr>
<tr>
<td>12.2.1 Financial Accounting Systems</td>
<td>131</td>
</tr>
<tr>
<td>12.2.2 General Ledger System</td>
<td>132</td>
</tr>
<tr>
<td>12.2.3 Fixed Asset System</td>
<td>132</td>
</tr>
<tr>
<td>12.2.4 Sales Order Processing System</td>
<td>132</td>
</tr>
<tr>
<td>12.2.5 Accounts Receivables System</td>
<td>132</td>
</tr>
<tr>
<td>12.2.6 Accounts Payable System</td>
<td>132</td>
</tr>
<tr>
<td>12.2.7 Inventory Control System</td>
<td>133</td>
</tr>
<tr>
<td>12.2.8 Purchase Order Processing System</td>
<td>133</td>
</tr>
<tr>
<td>12.2.9 Payroll System</td>
<td>133</td>
</tr>
<tr>
<td>12.3 Operational Marketing Information Systems</td>
<td>133</td>
</tr>
<tr>
<td>12.4 Operational Production Information Systems</td>
<td>136</td>
</tr>
<tr>
<td>12.5 Operational Human Resource Information Systems</td>
<td>137</td>
</tr>
</tbody>
</table>

### Study Session 13

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Security</td>
<td>139</td>
</tr>
<tr>
<td>Introduction</td>
<td>139</td>
</tr>
</tbody>
</table>
## Table of Contents

- Terminology .................................................. 139
- 13.1 Threats to information .................................. 139
  - 13.1.1 Security Categories .................................. 140
  - 13.1.2 Threats to Users .................................. 140
- 13.2 Stopping a Virus ........................................ 141
  - 13.2.1 Avoiding Phishing Attack ......................... 141
  - 13.2.2 Security Controls .................................. 141
  - 13.2.3 Securing E-Commerce servers .................... 142
- Study Session Summary ..................................... 142
- Assessment .................................................. 142
- Bibliography ................................................ 143

## Notes on Self Assessment Questions

[144]
About this course manual

Management Information Systems CIS302 has been produced by University of Ibadan Distance Learning Centre. All course manuals produced by University of Ibadan Distance Learning Centre are structured in the same way, as outlined below.

How this course manual is structured

The course overview

The course overview gives you a general introduction to the course. Information contained in the course overview will help you determine:
- If the course is suitable for you.
- What you will already need to know.
- What you can expect from the course.
- How much time you will need to invest to complete the course.

The overview also provides guidance on:
- Study skills.
- Where to get help.
- Course assignments and assessments.
- Margin icons.

We strongly recommend that you read the overview carefully before starting your study.

The course content

The course is broken down into Study Sessions. Each Study Session comprises:
- An introduction to the Study Session content.
- Study Session outcomes.
- Core content of the Study Session with a variety of learning activities.
- A Study Session summary.
- Assignments and/or assessments, as applicable.
- Bibliography
Your comments

After completing Management Information Systems we would appreciate it if you would take a few moments to give us your feedback on any aspect of this course. Your feedback might include comments on:

- Course content and structure.
- Course reading materials and resources.
- Course assignments.
- Course assessments.
- Course duration.
- Course support (assigned tutors, technical help, etc.)

Your constructive feedback will help us to improve and enhance this course.
Welcome to Management Information Systems CIS302

CIS 302 (Management Information System (MIS)) is a four [4] credit unit course which deals with the understanding of the purpose, functions, components and applications of transaction processing systems and management reporting systems in private and public organizations, and also describes and evaluates policies for information resource management.

Management Information System is a planned system of collecting, storing, and disseminating data in the form of information needed to carry out the functions of management. (Tutorials Point (I) Pvt. Ltd., 2014).

The study of management information system helps to convert data from internal and external sources into information that can be used to aid effective decision making. An organization may have different types of information systems, some of which are useful for the day-to-day operational decisions, and some of which are useful in making tactical and strategic decisions. In other words, MIS represents a managerial approach to information systems concepts and applications.

While computers have become pervasive in every aspect of our lives, networks including the internet have made computer facilities present almost everywhere. As a result, managers have a major responsibility for determining their information system needs and for designing and implementing information systems that support these needs. At the same time, computer technologies have created opportunities for managers to improve customer service, reduce costs, improve productivity, increase market share, and increase profits.

This course will give a clear understanding from the concepts of systems and its components to its applications at various levels of organisation and various types of functional business areas. There are fifteen chapters in all.
Course outcomes

Upon completion of Management Information Systems CIS302, you will be able to:

- Build a fundamental & theoretical foundation for Management Information Systems
- Investigate the major resources for information systems
- Understand and use methodology for systems analysis
- Review key factors in the management of information systems
- Explore the impact of developing technologies on MIS
- Recognize, evaluate & react responsibly to ethical dilemmas in the Management of Information Systems
- Continue development of computer competency
- Explore the Internet
Getting around this course manual

Margin icons

While working through this course manual you will notice the frequent use of margin icons. These icons serve to “signpost” a particular piece of text, a new task or change in activity; they have been included to help you to find your way around this course manual.

A complete icon set is shown below. We suggest that you familiarize yourself with the icons and their meaning before starting your study.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Assessment</th>
<th>Assignment</th>
<th>Case study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion</td>
<td>Group Activity</td>
<td>Help</td>
<td>Outcomes</td>
</tr>
<tr>
<td>Note</td>
<td>Reflection</td>
<td>Reading</td>
<td>Study skills</td>
</tr>
<tr>
<td>Summary</td>
<td>Terminology</td>
<td>Time</td>
<td>Tip</td>
</tr>
</tbody>
</table>
Study Session 1

Basic Concepts of MIS

Introduction

In this study session, you will be looking at the basic concepts of MIS. You will begin by explaining what is meant by management. Moving on, you will discuss data and information. Under which you will examine the characteristics and values of information. Furthermore, you will discuss information as an aid to decision making. As such, you will highlight the four stages of decision making. Lastly, you will take a look at system and make attempt at defining MIS.

Learning Outcomes

When you have studied this session, you should be able to:

1.1 define management
1.2 discuss data and information
1.3 describe information as an aid to decision making
1.4 define a system

Terminology

<table>
<thead>
<tr>
<th>Deviation</th>
<th>The action of departing from an established course or accepted standard.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIS</td>
<td>Management information system, or MIS, broadly refers to a computer-based system that provides managers with the tools to organize, evaluate and efficiently manage departments within an organization.</td>
</tr>
</tbody>
</table>

1.1 Management

Management has been defined in process or activities that describe what managers do in the operation for their organization plan, organize, initiate and control operations. They plan by setting strategies and goals and selecting the best course of action to achieve the goals. They organize the necessary tasks for the operational plan, set these tasks up into homogenous groups and assign authority delegation; they control the performance standards and avoiding deviation from standard. (Chetan, 2015).
Decision-making is a fundamental prerequisite of each of the foregoing processes. The job of MIS is to facilitate decisions necessary for planning, organizing and controlling the work and functions of the business so that specified goals of business are achieved.

<table>
<thead>
<tr>
<th>ITQ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question</strong></td>
</tr>
<tr>
<td>What is the fundamental prerequisite of the processes of management?</td>
</tr>
<tr>
<td><strong>Feedback</strong></td>
</tr>
<tr>
<td>Decision-making. Every step taken in management should aid decision making</td>
</tr>
</tbody>
</table>

1.2 Data and Information

Data refers to raw, unevaluated facts, figures, symbols, objects, events, etc. Data may be a collection of facts lying in storage, like a telephone directory or census records. Information is a processed data i.e. it is data that have been put into a meaningful and useful context and communicated to a recipient who uses it to make decisions. Information involves the communication and reception of intelligence or knowledge. It appraises and notifies, surprises and stimulates, reduces uncertainty, reveals additional alternatives or helps eliminate irrelevant or poor ones, and influences individuals and stimulates them to action. An element of data may constitute information in a specific context; for example, when you want to contact your friend, his or her telephone number is a piece of information; otherwise, it is just one element of data in the telephone directory (Babu et al., 1987).

Computers have made the processing function much easier. Large quantities of data can be processed quickly through computers aiding in the conversion of data to information. Raw data enter the system and are transformed into the system’s output, that is, information to support managers in their decision making. Figure 1.1 shows how data can be transformed to information while Figure 1.2 shows data as the input that undergoes a process to give the output which is our information.

![Figure 1.1: Transformation of Data to Information (Source: www.tutorialspoint.com)](image-url)
1.2.1 Characteristics of Information

The characteristics of good information are relevance, timeliness, accuracy, cost-effectiveness, reliability, usability, exhaustiveness, and aggregation level. This is summarized in figure 1.3. Information is relevant if it leads to improved decision making. It might also be relevant if it reaffirms a previous decision. If it does not have anything to do with your problem, it is irrelevant. For example, information about the weather conditions in Nigeria in January is relevant if you are considering a visit to Nigeria in January. Otherwise, the information is not relevant.

Timeliness refers to the currency of the information presented to the users. Currency of data or information is the time gap between the occurrence of an event in the field until its presentation to the user (decision maker). When this amount of time is very short, we describe the information system as a real-time system.

Accuracy is measured by comparing the data to actual events. The importance of accurate data varies with the type of decisions that need to be made. Payroll information must be exact. Approximations simply will not suffice. However, a general estimate of how much staff time was devoted to a particular activity may be all that is needed.
1.2.2 Value of Information

Information has a great impact on decision making, and hence its value is closely tied to the decisions that result from its use. Information does not have an absolute universal value. Its value is related to those who use it, when it is used, and in what situation it is used. In this sense, information is similar to other commodities. For example, the value of a glass of water is different for someone who has lost his way in Arctic glaciers than it is to a wanderer in the Sahara Desert.

Information supports decisions, decisions trigger actions, and actions affect the achievements or performance of the organization. If we can measure the differences in performance, we can trace the impact of information, provided that the measurements are carefully performed, the relationships among variables are well defined, and possible effects of irrelevant factors are isolated. The measured difference in performance
due to informational factors is called the realistic value or revealed value of information.

For most information systems, particularly those supporting middle and top management, the resulting decisions often relate to events that are not strictly defined and involve probabilities that cannot be quantified. The decision-making process often is obscure and the outcomes are scaled by multiple and incomparable dimensions. In such cases, we may either attempt to perform a multi-attribute analysis or derive an overall subjective value. The subjective value reflects people's comprehensive impression of information and the amount they are willing to pay for specific information (Ahituv et al., 1994).

<table>
<thead>
<tr>
<th>ITQ</th>
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<tbody>
<tr>
<td><strong>Question</strong></td>
</tr>
<tr>
<td>The value of an information could be absolute, true or false?</td>
</tr>
<tr>
<td><strong>Feedback</strong></td>
</tr>
<tr>
<td>False. Its value is related to those who use it, when it is used, and in what situation it is used. In this sense, information is similar to other commodities.</td>
</tr>
</tbody>
</table>

### 1.3 Information as an Aid to Decision Making

The process of decision making can be described as comprising four steps: intelligence, design, choice, and review (Simon, 1977).

#### 1.3.1 The Intelligence Stage

This encompasses collection, classification, processing, and presentation of data relating to the organization and its environment. This is necessary to identify situations calling for decision.

#### 1.3.2 The Decision Stage

During the decision stage, the decision maker outlines alternative solutions, each of which involves a set of actions to be taken. The data gathered during the intelligence stage are now used by statistical and other models to forecast possible outcomes for each alternative. Each alternative can also be examined for technological, behavioural, and economic feasibility.

#### 1.3.3 The Choice Stage

In the choice stage, the decision maker must select one of the alternatives that will best contribute to the goals of the organization.
1.3.4 The Review Stage

Past choices can be subjected to review during implementation and monitoring to enable the manager to learn from mistakes. Information plays an important role in all four stages of the decision process. Figure 1.4 indicates the information requirement at each stage, along with the functions performed at each stage and the feedback loops between stages.

![Diagram of the decision process with information required at each stage.]

Figure 1.4 Role of information in the decision process.
(Source: Babu et al.)
1.4 System

The system can be described as a set of elements joined together for a common objective. A subsystem is a part of a larger system with which one is concerned. The organization, for instance, is a system and the parts (divisions, departments, functions, unit etc) are the subsystems. The system concept of MIS is, therefore one of optimizing the output of the organization by connecting the operating subsystems through the medium of information exchange.

1.4.1 What is MIS

MIS is an organized method of providing past, present and projection information relating to internal operations and externals intelligence. It supports the planning, control and operational functions of an organization by furnishing uniform information in proper time frame to help the process of decision-making.

Management Information System is generally defined as an integrated user-machine system for providing information to support operations, management and decision-making functions in an organization. The system utilizes computer hardware and software, manual procedure, models for analysis. Information is viewed as a resource much like land, labor and capital. It must be obtained, processed, stored, manipulated and analyzed, distributed etc. An organization with a well-defined information system will generally have a competitive advantage over organization with poor MIS and no MIS.

Though there are a number of definitions for MIS, all of them converge on a single point, i.e. the MIS is a system that supports the decision-making function of the organization. The difference lies in defining the elements of MIS. However, in today’s world, the MIS is a computerized business processing system generating information for the people in the organization to meet the information needs for decision-making to achieve the corporate objective of the organization.
Study Session Summary

In this study session, you examined the basic concepts of MIS. You started by explaining what management is. You further explained data and information. Under which you discussed the characteristics and value of information. Subsequently, you explained what a system and an MIS means.

Assessment

SAQ 1.1 (tests Learning Outcome 1.1)
Setting goals is not always relevant in management, true or false?

SAQ 1.2 (tests Learning Outcome 1.2)
1. Can you point out the characteristics of good information?
2. What will you use to measure the value of information?

SAQ 1.3 (tests learning outcome 1.3)
1. How will you define a system?
2. What is the central goal of MIS?

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Study Session 2

System Concepts

Introduction

In this study session, you will examine the different system concepts. You will begin by explaining what a system is. Thereafter, you will highlight the components of a system. Furthermore, you will explain the system concepts in business. In addition, you will describe information system as a sub system. Moving on, you will evaluate the structure of an enterprise. After which you will discuss some basic concepts and strategies in the study of system. Likewise, you will look at the different types of information system. You will end the session by describing the framework of information systems and how to use system approach in problem solving.

Learning Outcomes

When you have studied this session, you should be able to:

2.1 define a system
2.2 highlight the components of a system
2.3 discuss information system as a sub system
2.4 explain the structure of an enterprise
2.5 list some basic components and strategies in the study of systems
2.6 highlight the types of information systems
2.7 give a framework of information systems
2.8 use the systematic approach in problem solving

Terminology

<table>
<thead>
<tr>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>The modification or control of a process or system by its results or effects, for example in a biochemical pathway or behavioural response.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subsystems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usually refers to hardware, but it may be used to describe software.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>A point where two systems, subjects, organizations, etc. meet and interact.</td>
</tr>
</tbody>
</table>
2.1 What is a System?

A system is a group of interrelated components working together toward a common goal by accepting inputs and producing outputs in an organized transformation process. System will have the following basic interacting components or functions:

1. Input
2. Processing
3. Output
4. Feedback and
5. Control

Systems have characteristics such as boundaries, outputs and inputs, methods of converting inputs into outputs, and system interfaces. Systems are composed of interrelated and interdependent subsystems. Examples of systems are all around us. An excellent example is your class. The components of the classroom situation, including an instructor, the students, textbooks, and facilities, all interact to make the accomplishment of learning goals possible. A business is also a system. A business uses resources such as people, capital, materials, and facilities to achieve the goal of making a profit. Business procedures, such as order handling, Marketing research, financial planning, and manufacturing, are the interactions that need to be managed to achieve this objective. Further examples are shown in Table 2.1.

Table 2.1: A business as a System (Source: Lin C., 2015).

<table>
<thead>
<tr>
<th>System</th>
<th>Input</th>
<th>Processes</th>
<th>Output</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>University</td>
<td>Students, Faculty, Textbooks</td>
<td>Education/Courses</td>
<td>Graduates</td>
<td>surveys, grades</td>
</tr>
<tr>
<td>Toyota Plant</td>
<td>raw materials, components</td>
<td>assembly line</td>
<td>mini-vans</td>
<td>customer surveys, quality reports</td>
</tr>
<tr>
<td>Fast Food IS</td>
<td>consumer orders</td>
<td>processing software</td>
<td>receipts, cook’s order list</td>
<td>invalid entry message</td>
</tr>
<tr>
<td>Video Store IS</td>
<td>rentals, returns</td>
<td>processing software</td>
<td>reports, rental agreement</td>
<td>error reports</td>
</tr>
</tbody>
</table>
2.2 Components of a System

Components of a system which are common to all kinds of systems are explained below:

2.2.1 System Boundaries

Every system has a boundary that defines its scope of activities. For example, the activities in your class include lectures, discussion, continuous evaluation, grading, and preparation of assigned course work. These activities may represent the boundary of the system for which a teacher is responsible. Within the system of the classroom, the teacher is responsible for organizing class time, assigning homework to students, and evaluating student progress. The boundary, then, delineates an area of responsibility. When defining a system, you must establish a boundary.

System boundaries are also established within a business system. A sales manager may be responsible for managing, motivating, and evaluating the performance of a sales organization.

The owner of the business, however, faces different boundaries and may develop a financial plan, a marketing strategy, and a long-range business plan. Figure 2.1 shows an example of a system boundary for a manufacturing system.
2.2.2 Systems and Sub Systems

Systems may consist of numerous subsystems, each of which has elements, interactions, and objectives. Subsystems perform specialized tasks related to the overall objectives of the total system. For example, an educational system may consist of individual courses that are subsystems. Each course provides specific knowledge that is a part of the overall educational system and contributes to its goals. In a business system, various functions are subsystems.

Marketing, finance, and manufacturing, for example, are subsystems. Within the marketing subsystem, the sales order entry and credit-checking functions are subsystems. Each subsystem uses its resources to meet specific objectives.

Successful achievement of these goals requires good management of internal resources. For instance, in managing the sales order-entry function, the supervisor needs to develop sales order procedures, maintain sales order records, and train sales order personnel.

2.2.3 Outputs and Inputs

The inner workings of a system or subsystem are organized to produce outputs from inputs. In this conversion process, some value or utility should be added to the inputs. For example, a training program should produce trained employees with certain skills, knowledge, or behaviour from its inputs-untrained employees. The outputs of one subsystem usually become inputs into the next. The outputs of a course in introductory data processing concepts, for instance, become inputs into the next course in Java programming.
As you would expect, the outputs of a subsystem have to adhere to certain standards to be acceptable to the next. If students coming out of the introductory data processing course don’t understand basic concepts of file organization and file processing, they won’t have the prerequisite skills needed for Java. If they were not permitted to enter Java until they meet certain standards, though, the problem would be alleviated. The more exactly standards are adhered to; the easier it will be to interface the two courses, or subsystems.

### 2.2.4 Subsystem Interface

An interface is a connection at system or subsystem boundaries. An interface serves as a medium to convey the output from one system to the input of another system. An example will help clarify this concept. Two typical business systems that interface with each other are inventory control and purchasing. If inventory levels drop below a certain level, then additional stock of these items should be purchased. Purchasing will need to know what quantity of a particular item to obtain to replenish the stock and information on sales and inventory turnover to learn which items are in greatest demand so these items can be replenished on a timely basis.

An inventory control system will provide information on stock to be reordered based on sales and inventory turnover trends. However, if the inventory control subsystem triggers erroneous information about the amount of stock to be reordered, then inputs into purchasing will be wrong. This problem can be partially overcome by establishing an economic order quantity, or the quantity of an item that is most economical to buy, for each item in inventory. This quantity, derived from order history and inventory turnover rate, can serve as a standard and prevent reordering too much or too little stock.

### 2.2.5 Interface Problems

In the previous section we mentioned that adhering to standards can alleviate some interface problems. However, you might encounter other types of interface problems. Sometimes the output of one subsystem is not sufficient to accommodate the needs of the next subsystem. For example, the production subsystem may not be able to produce enough stock to meet sales demands during certain peak periods. One way of handling this interface problem is through the use of slack resources. In this situation a business can build excess inventory during slack times to meet the demand for inventory at peak times.

Another system interface problem can occur between the authoring subsystem and the editorial subsystem in the development of a textbook. Authors who wait until the last minute to finish their writing may not be able to produce a manuscript fast enough to meet production schedules,
which involve editing, artwork, layout and design, typesetting, and proofreading tasks. The publisher can avoid this problem in several ways. First, the publisher can ask the author to complete several chapters before production activities begin. This procedure is another example of using slack resources. Second, the publisher can ask the author to adhere to certain standards for input into the production subsystem. For example, the author can create and store all text using a word processing package that can be transported to a computer-based type-setting system without reworking. Third, the author could hire a library researcher, photo researcher, and typist to provide a support subsystem to expedite the development of manuscript. This method creates a new subsystem to solve a system interface problem.

2.2.6 System and its Environment

The system’s environment consists of people, organizations, and other systems that supply data to or that receive data from the system. Not surprisingly, different managers perceive the environment differently. A sales manager, for example, may envision the system environment to be the company’s customers and vendors of the products and services being marketed. On the other hand, the owner of the business may perceive the environment to include the firm’s competitors, financial institutions that provide resources for expansion, and government agencies with jurisdiction over company plans and products. Moreover, various kinds of systems may interact with the environment in different ways.

Open systems operate in an external environment and exchange information and material with that environment. The external environment consists of the activities external to the system boundary with which the system can interact. An open system needs to receive feedback to change and to continue to exist in its environment. For example, a marketing system, which is an open system, operates in an environment of competition. If a competitor introduces new technology by providing customers with on-line order-entry terminals, the marketing function must adapt to the change in the environment or remain at a competitive disadvantage. One way of accommodating the change in the environment is to offer a similar on-line order-entry service. The same type of adjustment is necessary when an airline offers a new service, such as a frequent flier bonus program. Though the new service may temporarily give the air carrier a competitive advantage, the other airlines soon follow suit and offer similar programs.

In contrast, a closed system is relatively self-contained; it doesn’t exchange information with its environment. Closed systems don’t get the feedback they need from the external environment and tend to deteriorate. For instance, if a training program administrator doesn’t respond to the needs of the business environment for trained graduates, students may no
longer be able to get jobs and may go elsewhere for training. Eventually, the training program may be discontinued.

2.2.7 System Feedback
A system needs feedback to do its job. Feedback is an indicator of current performance rates when compared to a set of standards. With effective feedback, continuing adjustments in the activities of a system can be made to assure that the system achieves its goals. Measuring performance against a standard is an effective control mechanism. Employees need feedback to learn how well they are achieving job goals. Students receive grades or other kinds of evaluations from instructors that show whether the students are meeting course objectives.

2.2.8 System Entropy
Systems can run down if they are not maintained. Systems entropy corresponds roughly to chaos or disorder - a state that occurs without maintenance. If employees do not have opportunities to learn new concepts and techniques, the skills they apply to performing job tasks will become out of date. The process of maintaining a system is a process of decreasing entropy or increasing orderliness. Sending auto-mobile mechanics to training classes to learn new diagnostic techniques is an example of decreasing entropy. Orderliness can be achieved through preventive maintenance checks, such as a yearly physical examination for an employee or a routine tune up for an automobile, and then taking action as a result of these regular checks. These checks provide valuable feedback to help detect faults or problems when none have been anticipated. Diagnostic tools for equipment and machinery help prevent downtime, which may cause delays in production and cost thousands of dollars in lost business.

2.2.9 System Stress and Change
Systems change over time. Some of these changes occur because of identified problems, new business opportunities, and new management directives. Systems may also change as a result of stresses. The achievement levels needed to meet existing goals may change. For example, because of reduced profit margins on sales, a division sales manager may insist on a sales increase of 10 percent instead of 7 percent to achieve the same profits. The tendency is to localize the stress so that only one subsystem, in this case the division sales force, feels most of the pressure for adjusting to new demands. It is easier to deal with change within one subsystem than within the total system because stress may require rethinking existing work methods and organization. In this case the sales manager may have to develop more effective procedures to improve the profitability of sales. The sales manager may recommend
cutting down calls to smaller customer accounts and substituting telemarketing to service their needs.

Salespeople might need to reallocate their time so they can pay special attention to customers who purchase the most profitable product lines and encourage customers who purchase less profitable lines to look at high-margin products. All these procedures require a close analysis of the current system, changes in work procedures, and effective time management. Another source of system stress occurs if inputs cannot be monitored but the system is expected to produce the same quality of output. Many colleges and universities screen applicants using standardized test scores, high school grades, and references. Some educational institutions, however, have open admissions policies that allow all high school graduates to apply and be admitted. Because admitting candidates without the necessary academic skills for college study places undue stress on the entire educational system, colleges with open admissions policies typically localize this stress by establishing remedial programs and hiring specially trained teachers for these students. Students are expected to pass remedial course work before entering regular college courses.

In a business situation, the same thing happens. New workers participate in training programs before they begin to work in the firm. During the training period, they learn specific job related practices so they can become productive in the work environment as soon as possible. After training, they receive jobs and responsibilities consistent with their skill levels and backgrounds. This orientation and training process helps minimize the stress that might occur if the new employees were placed directly into positions within the firm. Although one way to deal with stress is by changing the activities of a subsystem, it is also important to remember that the subsystem is a part of the whole system and interacts with other subsystems to achieve the organization’s overall objectives. Therefore, managers may need to consider the entire system in responding to a problem and to modify activities in other subsystems as well.

<table>
<thead>
<tr>
<th>ITQ</th>
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<tbody>
<tr>
<td><strong>Question</strong></td>
</tr>
<tr>
<td>What is the major cause of increased system entropy?</td>
</tr>
<tr>
<td><strong>Feedback</strong></td>
</tr>
<tr>
<td>The major cause of increased system is lack of maintenance. Systems entropy corresponds roughly to chaos or disorder - a state that occurs without maintenance.</td>
</tr>
</tbody>
</table>
2.2.10 Systems Concepts in Business

The systems approach is a way of analysing business problems. This approach views the business organization as a system of interrelated parts designed to accomplish goals. Each subsystem is both a self-contained unit and a part of a larger system. Managers must understand the goals of the total system and design the function and subsystems within the total system to accomplish the goals. More specifically, management is the practice of organizing resources including people, materials, procedures and machines to achieve objectives. In other words, it entails organizing subsystems to accomplish specific tasks. Using a system approach, a manager organizes various activities of the business into separate organizational subsystems.

To consider an example, the market research subsystem of the business may obtain information from the customers about modifications that are about to be made in the firm’s products and services. The market research subsystem can transmit this information to the manufacturing subsystem that builds product design changes into its processes. Finally, the marketing subsystem sells the finished products to the customers. If technical problems occur, the service subsystem may need to provide follow-up support.

2.4 Information System as a Sub System

In many ways, information systems have the same characteristics as systems in general. The major purpose of an information system is to convert data into information - information is data with meaning. In a business context, an information system is a subsystem of the business system of an organization. Each business system has goals, such as increasing profits, expanding market share, and providing service to customers. Information systems that provide information that lets management allocate resources effectively to achieve business objectives are known as tactical systems.

Information systems that support the strategic plans of the business are known as strategic planning systems as shown in Figure 2.2. Generally speaking, information provides managers with the feedback they need about a system and its operations i.e. feedback they can use for decision-making. Using this information, a manager can reallocate resources, redesign jobs, or reorganize procedures to accomplish objectives successfully. An information system consists of components that interact to achieve the objective of providing information about day to day activities that managers can use to control business operations.

Information systems can also provide information to enable managers to allocate resources and establish long range business plans.
An information system contains such elements as hardware, software, personnel, databases, and procedures to accomplish its objectives. The hardware consists of the computer and computer-related activities. Software consists of the instructions that the hardware uses to process information. Software includes both application software and system software. Application software consists of the programs written to support specific business functions, such as order entry, inventory control, and accounts receivable. System software enables the hardware to run application software. System software consists of the programs that handle such functions as sorting data, converting pro-grms into the machine language the computer can understand, and retrieving data from storage areas. Information-processing personnel, such as systems designers and programmers, design and write the application programs to support information processing activities. Operations personnel, such as data entry operators and equipment operators, handle day-to-day operations activities. The components are summarized in Figure 2.3 below.
Finally, all personnel have to follow specific procedures to organize and manage a company’s information-processing activities. These procedures include designing and implementing programs, maintaining hardware and software, and managing the operations function.

The interactions among these elements constitute the information-processing procedures that are used to generate information needed for decision-making. Figure 2.4 shows several subsystems that make up a system.

![Figure 2.4: Several subsystems make up this corporate accounting system. (Source: Sousa K. J. and Oz E., 2014).](image)
2.5 The Structure of an Enterprise

As we know, the entire enterprise has been organized into subsystems, including the marketing subsystem, the service subsystem, and the administrative subsystem. The marketing subsystem promotes and markets microcomputer products and services. When customers have problems with their microcomputers or need preventive maintenance, they use the service subsystem. Finally, the administrative subsystem takes care of billing customers, purchasing equipment and supplies from vendors, paying vendors, and handling accounting activities.

The marketing subsystem of the dealership is managed by a sales manager who recruits salespeople, including experienced veterans and new trainees, to demonstrate and sell the equipment. These salespeople are trained to follow certain procedures, such as giving equipment demonstrations and making follow-up calls. These procedures are an important part of the “system” of selling microcomputer hardware and software. When they are not followed, profitability suffers. The sales manager needs an information system to provide feedback on how the system is working. On a day-to-day basis, he may receive information about sales-people who have successfully closed sales, about customers who are complaining, and about technical problems with equipment. This feedback makes it possible to re-view the procedures and activities of the current system.

ITQ

Question

What role does feedback play in a business enterprise?

Feedback

Every enterprise activity should be evaluated and this is done with the aid of feedback mechanism.
2.6 Some Basic Concepts and Strategies in the Study of Systems

1) **Abstraction:** We have developed an exceptionally powerful technique for dealing with complexity. We abstract from it. Unable to master the entirety of a complex object, we choose to ignore the inessential details, dealing instead with the generalized, idealized model of the object.

2) **Formality:** Rigor at each stage in the development of a system.

3) **Divide and conquer:** Divide a complex problem into a set of simpler problems that can be solved.

4) **Hierarchical ordering:** Order the simplification of the problem in “divide & conquer” in hierarchies.

5) **Cohesion & coupling:** Modularise the system such that interactions within components (cohesion) is maximised and interactions between components (coupling) is minimised. This way, the impact of errors, when they arise, is localised and does not cascade through the system. Diagnosis of offending components is also made easier.

6) **Information hiding:** Each module (or subsystem) must have available to it just the information that is needed by it.

7) **Conceptual integrity:** Consistency in design.

8) **Completeness:** Ensuring that the design meets all the specifications.

9) **Logical independence:** Emphasis on the statement of system objectives in terms of logical functions independent of physical implementation.

10) **Correctness & Efficiency:** Correct in the sense that the design meets all the user requirements. Efficient is that the system accomplishes the objectives with minimum computing resources.

---

**ITQ**

**Question**

Abstraction is a strategy of dealing with complexities in a system, true or false?

**Feedback**

In abstraction, the inessential details are ignored, dealing instead with the generalized, idealized model of the object. Hence dealing with the complexities
2.7 Types of Information Systems

Information systems can be classified in many ways, but for our purposes here, we will consider their classifications based on the mode of processing, on the system objectives, and on the nature of interaction of the system with its environment.

2.7.1 Classification by mode of processing

1. **Batch processing systems**: The transactions are collected as they occur, but processed periodically, say, once a day or week.
2. **On-line batch systems**: The transaction information is captured by on-line data-entry devices and logged on the system, but it is processed periodically as in batch processing systems.
3. **On-line Real-time systems**: The transaction data capture as well as their processing in order to update records (and generate reports) is carried out in real-time as the transaction is taking place.

2.7.2 Classification by System Objectives

1. **Transaction Processing Systems**: Their objective is to process transactions in order to update records and generate reports, i.e., to perform score-keeping functions.
2. **Decision Support Systems**: Their objective is to support the managerial decisions. Usually, these systems are based on a model of the decision-making domain, and utilize techniques from management science, finance or other functional areas of business in order to build such models. These systems are also used often for attention-directing purposes, i.e., for directing the attention of managers to a problematic aspect of operations.
3. **Expert Systems**: These systems incorporate expertise in order to aid managers in diagnosing problems or in problem solving.

2.7.3 Classification based on the Nature of Interaction with Environment

1) **Transformational Systems**: These are systems that transform inputs received from the environment in order to generate reports (output).
2) **Reactive Systems**: These are systems characterized by being, to a large extent, event-driven, continuously having to react to external and internal stimuli.

The components of accounting systems such as payroll, general ledger are usually batch processing systems, and also transaction processing systems that are transformational systems. Systems for determination of
sample sizes for audit testing, on the other hand may be decision support systems. Systems aiding provision for doubtful accounts (or loan loss reserves for financial institutions) may be expert systems.

**ITQ**

**Question**
What category of system is payroll?

**Feedback**
Payroll continuously react to external and internal stimuli hence it is a reactive system

### 2.8 Specification of Information Systems

Specification of any system before its development is crucial. Specifications perform for information systems the same function that blue-prints and engineering specifications perform for physical structures. Specifications serve as benchmarks for evaluating designs as well as their implementation. They also facilitate quality assurance via verification (are we building the system right, i.e., do the design and implementation meet the specifications?) and validation (are we building the right system, i.e., does the system meet the user needs?).

#### 2.8.1 Formal vs. Informal Specifications

In the development of information systems in business, informal specifications through graphical modelling have been used at least since late 70s. We shall be studying many of these modelling tools. Recently, formal specification languages (such as Larch, VDM, Z, FOOPS and OBJ) have been developed. While their use in business systems development is in its very early stages, they are expected to play an important role in the future. These formal specification techniques attempt to mathematically specify structure, function, and behavior of information systems.

#### 2.8.2 Components of specifications

Specification of an information system is given by their:

1. Structure: How it is organised.
4. Data: Its meaning and organization.
### ITQ

**Question**

Specifications are the blue-prints of information system. True or false?

**Feedback**

Specifications perform for information systems the same function that blue-prints and engineering specifications perform for physical structures.

### 2.9 A Framework of Information Systems

The activities of an organisation are of three kinds: operational, tactical and strategic planning. Operations are the day-to-day activities of the firm that involves acquiring and consuming resources. First-line supervisors must identify, collect and register all transactions that result in acquiring and expending these resources. When sales are made or goods are shipped, a department manager needs to record these vents. These day-to-day transactions produce data that are the basis for the operational systems. The tactical function of an organisation is the responsibility of its middle-level managers. They review operational activities to make sure that the organisation is meeting its goals and not wasting its resources. The time frame for tactical activities may be month to month, quarter to quarter, or year to year. For example orders for raw materials might be monitored monthly, productivity might be assessed quarterly, and department budgets might be reviewed annually. Managers responsible for control have to decide how to allocate resources to achieve business objectives. Data that can be used to predict future trends help managers make these resource allocation decisions. The top management of the organisation carries out strategic planning. Figure 2.5 shows the diagram.
Though managers responsible for operational and tactical decision making are primarily involved in reviewing internal data, the managers responsible for planning are also interested in external information. They need to set the organization’s long range goals, for example, by deciding whether to introduce new products, build new physical plant facilities, or invest in technology. For making these decisions, they need to know the activities of the competing firms, interest rates, the trends in government regulations. Strategic planners address problem that involves long-range analysis and prediction and often require months and years to resolve.

**ITQ**

**Question**

The strategic planning is done at the mid-level of management, true or false?

**Feedback**

The top management of the organisation carries out strategic planning. So the statement is false.
2.10 Using the Systems Approach in Problem Solving

An owner of a business like the microcomputer dealership must constantly analyze problems and reorganize the resources of the system to deal with these problems effectively. The systems approach is a valuable method of problem solving that takes into account the goals, environment, and internal workings of the system. The systems approach to problem solving involves the following steps:

1. Define the problem.
2. Gather data describing the problem.
3. Identify alternative solutions.
4. Evaluate these alternatives.
5. Select and implement the best alternative.
6. Follow up to determine whether the solution is working.

We can understand how the systems approach works by applying it to a problem that the microcomputer dealer might experience.

### ITQ

**Question:**
What are the things one must consider in using system approach to solve problems?

**Feedback:**
To use the system approach to solve problems, one should consider the goals, environment, and internal workings of the system.

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### Study Session Summary

In this study session, you examined system concept. You explained what a system is. You also highlighted the different components of a system. Furthermore, you looked at information system as a sub system and explained the structure of an enterprise. In addition, you talked about some basic concepts and strategies in the study of system. You ended the session by describing the framework of information system and how to use the system approach in solving problems.
Assessment

SAQ 2.1 (Tests learning outcome 2.1)
How do you describe a system?

SAQ 2.2 (Tests learning outcome 2.2)
A system has several components, highlight them.

SAQ 2.3 (Tests learning outcome 2.3)
Briefly explain how information system can be a subsystem of a business system.

SAQ 2.4 (Tests learning outcome 2.4)
Can you enumerate the subsystems of an enterprise

SAQ 2.5 (Tests learning outcome 2.5)
In the study of systems, there are several strategies; list any five.

SAQ 2.6 (Tests learning outcome 2.6)
List the modalities for categorizing information systems.

SAQ 2.7 (Tests learning outcome 2.7)
List the levels of management

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Cornford T. and Shaikh M. (2013). Introduction to Information


Study Session 3

Management Information System (MIS) and Information Technology (IT)

Introduction

In this study session, you will examine management information system (MIS) and information technology (IT). You will begin by highlighting the different functions and characteristics of MIS. Thereafter, you will look at the computer and its processing capability. Under which you will examine the supercomputers, mainframe, minicomputers, workstation computers and personal computer. After all these, you will discuss the computer networks and client server computing. This will lead to you describing network structure and information technology on the emergence of network. Finally, you will look at the different roles of IOS within the network sector.

Learning Outcomes

When you have studied this session, you should be able to:

3.1 define IT and MIS
3.2 discuss computers and its processing capability
3.3 explain computer networks and client/server computing
3.4 define a network structure
3.5 discuss information technology on the emergence of networks
3.6 state the role of IOS within the network structure

Terminology

<table>
<thead>
<tr>
<th>Database</th>
<th>A collection of information that is organized so that it can easily be accessed, managed, and updated</th>
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</thead>
<tbody>
<tr>
<td>PC</td>
<td>A personal computer (PC) is a general-purpose computer whose size, capabilities, and price make it feasible for individual use</td>
</tr>
<tr>
<td>IOS</td>
<td>iOS (formerly iPhone OS) is a mobile operating system created and developed by Apple Inc. exclusively for its hardware.</td>
</tr>
</tbody>
</table>


3.1 IT and MIS

Information Technology (IT) is sometimes referred to as a technological side of an information system, which includes hardware, software, networks and other devices. In other words, IT is a sub-system of an information system or management information system.

3.1.1 Functions of MIS

MIS is an organized collection of people, procedures, software, databases, and devices used to provide routine information to managers and decision makers

Thus, MIS must perform the following functions in order to meet its objectives.

1. Data Capturing: MIS captures data from various internal and external sources of an organization. Data capturing may be manual or through computer terminals. End users typically, record data about transactions on some physical medium, such as a paper form, or enter it directly into a computer system.

2. Processing of Data: The captured data is processed to convert it into the required management information. Processing of data is done by such activities as calculating, comparing, sorting, classifying and summarizing. These activities organize, analyze, and manipulate data using various statistical, mathematical, operations research and other business models.

3. Storage of Information: MIS stores processed or unprocessed data for future use. If any information is not immediately required, it is saved as an organizational record. In this activity, data and information are retained in an organized manner for later use. Stored data is commonly organized into fields, records, files and databases.

4. Retrieval of Information: MIS retrieves information from its stores as and when required by various users. As per the requirements of management users, the retrieved information is either disseminated as such or it is processed again to meet the exact management information demands.

5. Dissemination of Information: Management Information, which is a finished product of MIS, is disseminated to the users in the organization.

ITQ

Question

The terms IT and MIS are synonymous, true or false?

Feedback

Though the two terms are related, they mean different things. In fact IT is a subsystem of MIS dealing with the technology aspect. Hence, the above statement is false.
3.1.2 Characteristics of MIS

1. System Approach: The information system follows a System’s approach. This system’s approach implies a holistic approach to the study of system and its performance in the light for the objective for which it has been constituted.

2. Management Oriented: This is an important characteristic of MIS. For designing of MIS, a top-down approach should be followed. Top-down approach suggests that the system development starts from the determination of management needs and overall business objectives. The MIS development plan should be derived from the overall business plan. Management oriented characteristic of MIS also implies that the management actively directs the system development efforts.

3. Need Based: MIS design and development should be as per the information needs of managers at different levels, strategic planning level, management control level and operational control level. In other words, MIS should cater to the specific needs of managers in an organization’s hierarchy.

4. Exception Based: MIS should be developed on the exception based reporting principle, which means an abnormal situation, i.e. the maximum; minimum or expected values vary beyond tolerance limits. In such situations, there should be exception reporting to the decision maker at the required level.

5. Future Oriented: Besides exception based reporting, MIS should also look at the future. In other words MIS should not merely provide past or historical information; rather it should provide information, on the basis of projections based on which actions may be initiated.

6. Integrated: Integration is a necessary characteristic of a management information system. Integration is significant because of its ability to produce more meaningful information. For example, in order to develop an effective production scheduling system, it is necessary to balance such factors as Set-up costs, Work force, Overtime rates, Production capacity, Inventory level, Capital requirements and Customer services.

7. Long Term Planning: MIS is developed over relatively long periods. Such system does not develop overnight. A heavy element of planning is involved. The MIS designer must have the future objectives and needs of the company in mind.

8. Sub-System Concept: The process of MIS development is quite complex and one is likely to lose insight frequently. Thus, the system, though viewed as a single entity, must be broken down into digestible sub-systems which are more meaningful at the planning stage.

9. Central Database: A central database is the mortar that holds the functional systems together. Each system requires access to the master file of data covering inventory, personnel, vendors, customers, etc. It seems logical to gather data once, validate it properly and place it on a central storage medium, which can be accessed by any other sub system.
3.2 Computers and Its Processing Capability

The classification of computers depends on computing capacity and data processing speed. Figure 3.1 shows classification of computers according to physical size. Below is an overview of the classifications.

3.2.1 Supercomputers

Supercomputers are widely used in scientific applications as aerodynamic simulation, processing of geological data. They are the most powerful computers which are used to solve problems requiring complex calculations. Supercomputers are relatively rare because of their size and huge cost (Wasaa, 2008). They are used by universities, government agencies and large businesses among others. The National Weather Service uses a supercomputer to store models of weather patterns to help predict storms or sunny days.

3.2.2 Mainframes

These are the huge computers you see in a big room where people in white coats mill around. Until the mid-1970s they were the only computers available. With the invention of the mini-computer and later the personal computer, many people said mainframes were too big, too expensive, and not needed anymore. The Internet and the advent of computer networks literally saved the mainframe from oblivion. Mainframes have the necessary power and speed to process millions of transactions from the Internet and networks and have the storage capacity needed for all the data captured and processed by larger Information Systems.

3.2.3 Minicomputers

Mini-computers have less power and capacity than a mainframe but more than a personal computer. They were responsible for bringing computing capacity to a level that smaller companies could afford. Now they are used in smaller networks that don’t require the power and speed of mainframes. While they are still useful in many cases, they are sometimes replaced by more powerful workstation and personal computers that are connected to emulate the power of a mini-computer.

3.2.4 Workstation Computers

The workstation computer can be easily confused with a personal computer (PC) because it is configured much the same way. However, this computer has more computing capacity in its CPU than a typical personal computer. Scientists and engineers are the main users of workstations, although people who process graphics find a workstation necessary, since the processors can handle the huge amounts of data associated with graphic files.
3.2.5 Personal computers

While this class of computer used to be called a microcomputer, and sometimes still is, that label gives a false impression of what the machine can do. The prices of PCs have dropped drastically in the last few years, while computing capacity and power have continued to increase. Many small businesses find it cheaper and easier to connect multiple PCs to form a small network than to purchase more expensive equipment (http://studynam.com).

<table>
<thead>
<tr>
<th>Size</th>
<th>Characteristics</th>
<th>Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super computers</td>
<td>Largest, fastest, powerful and most expensive; they also generate a lot of heat</td>
<td>Used for advanced scientific research such as nuclear physics</td>
</tr>
<tr>
<td>Mainframes</td>
<td>Less powerful and less expensive than supercomputers; they also have a large storage capacity</td>
<td>Used to handle all kinds of problems, whether scientific or commercial, i.e., performing complex mathematical calculations; they are mostly found in banks, hospitals, airports, etc.</td>
</tr>
<tr>
<td>Minis</td>
<td>Smaller and less powerful than the mainframe</td>
<td>Used in scientific laboratories, research institutions, engineering plants and places where processing automation is required.</td>
</tr>
<tr>
<td>Micros</td>
<td>Smallest, cheapest and relatively least powerful; uses a microprocessor to process data; examples: desktop, laptop, and personal digital assistant (PDA)</td>
<td>Used to perform a variety of tasks including research, communication, banking, learning institutions, libraries, etc.</td>
</tr>
</tbody>
</table>

Figure 3.1: Classification of Computers according to Physical Size (Source: Nyamoti, 2013)

ITQ

Question

The most suitable computer for performing complex calculations is supercomputer; true or false?

Feedback

Supercomputers are widely used in scientific applications as aerodynamic simulation, processing of geological data. They are the most powerful computers which are used to solve problems requiring complex calculations. As such, the above statement is true.

3.3 Computer Networks and Client/Server Computing

With the increasing popularity of networks, there is the need to understand the server/client structure. At the heart of every network is a server. It can be a mainframe, mini-computer, workstation, or a souped-up personal computer. It’s where some of the data, applications software, and other instructions that network users need in order to communicate
with and process transactions on the network are stored. The client computer is the node on the network that users need in order to access and process transactions and data through the network. This is shown in Figure 3.2.

![Client/Server Computing](http://studynama.com)

Figure 3.2: Client/Server Computing (Source: http://studynama.com)

There are many different configurations for networks, and which one works best depends on the requirements, needs, and wants of the people who own and use the network. Managers should analyze their situation and determine the proper configuration to meet their needs.

### 3.4 Network Structure

The concept of network structure is necessary for management purposes in organisations. Managers need to understand this concept in order to run their organizations properly. Network is a specific kind of relationship joining a particular group of people, objects, or events. Two factors needed for constituting a network can be obtained from this definition; first, a network is formed by a group of elements; second, these elements establish specific relationships among them. We must show that the establishment of a co-operative network is not a purpose itself but it must be a dynamic structure that allows consolidating the competitive position of its members.

By means of a network structure, the competitive position of the enterprises can be reinforced as these concentrate on what they do best, and on what maintains their success in the market.

In this way, other enterprises make the activities left, in which they have distinctive competences too. The enterprises outsource those activities that are ballast and bureaucratize them. The enterprises that belong to a network have not all the elements needed for manufacturing a product or providing a service under their absolute control. Within the networks, the involved elements belong to independent enterprises and are placed along the value system of a product or service. All this drives to an organizational structure in which the enterprises generate more value in those areas where they have specific competencies. The success of these emergent organizational
forms seems to be based, on a great extent, on an effective co-ordination by means of the use of advanced information systems, which are based on the Information Technologies (IT). There is an increasing interest in the relationship between the emerging organizational ways and the function of the IT/IS insofar as the progresses in each field have influenced the others.

<table>
<thead>
<tr>
<th>Question</th>
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<tbody>
<tr>
<td>The two factors that are essential for the existence of a network include - and ------</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two factors needed for constituting a network can be obtained from the definition; first, a network is formed by a group of elements; second, these elements establish specific relationships among them</td>
</tr>
</tbody>
</table>

3.5 Information Technology on the Emergence of Networks

At the moment, the most spectacular and potentially powerful uses of the information systems technology go beyond the individual borders of the enterprises. The most important function of IT in the nineties is the better management of the interdependencies among the enterprises. Information Technology has to be the most powerful instrument to reduce the co-ordination costs. While the traditional uses of IT tried to facilitate the internal processes of the enterprises, the Inter-organizational Information Systems (IOS) are addressed towards the efficiency of a group of enterprises.

Below are some of the benefits of IT in organizations.

1. IT influences the nature, punctuality and detail level of the information shared by Enterprises
2. IT reduces the transaction costs, while it provides a better management of the risks
3. IT reduces the co-ordination costs

In order to benefit from the advantages of IT, the enterprises have to keep in mind that IT cannot be isolated from its organizational context. Technological and organizational implementations have their various benefits since they depend on and determine each other. Although IT might have the above mentioned positive effects on the organizations, the will and capabilities of the directors of the company are needed in order to make the most of those advantages. In order to make the most of the whole potential of the IOS, it will be required that the managing directors get involved with the project, since they have a wider and more strategic view of the company. In this way, a system coherent with the objectives of the company would be implemented. This system would allow taking even more profit from IT, what would have positive repercussions on the enterprise and would facilitate the achievement of its objectives. The
The active participation of the Management Board in the planning of the IOS brings a problem related to the fact that IT is a relatively new resource that did not exist when most of the current managers were trained. Therefore, they usually do not feel comfortable with these new technologies.

A positive consequence of the revolution of communication and Information Technologies is that there are more available options for designing the labour now, because the technology can be used to increase the capacities of the workforce, and the information can be transferred to those places where the labour is carried out. Workers do not need to be located according to parameters of time and space to coordinate any more. We consider that technology, although it is not the ground for the emergence of a new and innovative way of organizing the enterprises, plays an important role in its operation. Technology allows doing things in a different way, which provides the directors some organizational possibilities that would be unthinkable without its implementation. Thus, using a mathematical expression, we can state that Information Technologies are necessary but they are not enough to achieve greater business competitiveness.

### ITQ

**Question**

Greater business competitiveness can be achieved by Information Technology alone

**Feedback**

Technologies are necessary but they are not enough to achieve greater business competitiveness

### 3.6 The Role of IOS within the Network Structure

The enterprises involved in an alliance must decide whether to use the manual management of all the exchanged data, or to complement that management with the interconnection of their respective computer applications. This interconnection may bring, however, compatibility problems in the integration of the data from the different enterprises, since those applications would have possibly been designed without taking into account any requirement of integration among enterprises. The establishment of co-operation networks implies the need for wider communication in the organizational field, as well as the requirement of capability to integrate the information systems from different enterprises.

The enterprises inside a network cannot operate properly if they have not the possibility to communicate quickly, accurately, and over long distances. Within a network, it does not make any sense to restrict the application of modern computer technologies to the individual borders of each enterprise. The Management Board of the enterprises in the network must, on the contrary, consider the possibilities of coordinating the
processing of data outside the limits of their own organizations by means of an IOS.

The application of the IT which provides the electronic integration among the shareholders of an industry may make easier the outsourcing of activities, as well as be a basic part of the proper operation of the reticular structures. An IOS may play an important role in the coordination of interdependent activities, which would be carried out by distant organizational units. Thus, the enterprises can reduce their dependency on strategies of backward-forward integration in order to ensure the control over the production process.

The concept of network emphasizes the interdependency among enterprises, which is provoked by the presence and the sharing of the following key attributes: objectives, experience, labour, taking of decisions, responsibility, trust, and acknowledgement or reward. The enterprises within a network will adopt a common objective, namely to provide a quicker and better service to the final customer. With this aim in view, independent organizations will have to establish close interrelationships, in which Information Technologies have a vital role to play. In this way, the aim of optimizing the flow of profits along the supply chain could be achieved too. IOSs are, basically, new means to facilitate the relationships among organizations; they are, therefore, a strategic instrument. However, an IOS allows to obtain operative advantages too, such as:

1. Reducing paper-work and manual operations;
2. Reducing the stock levels;
3. Accelerating the product and material flow;
4. Standardizing of procedures;
5. Accelerating the flow of information about changes on the demand;
6. Reducing telecommunication costs.

The IT is a basic support that facilitates the co-ordination of different enterprises through EDI systems, shared databases, email, videoconferences, which will allow them to work together.

They will be able to share information on the markets, on the needs for materials, on stock levels, production schedules, and delivery programs. A key factor in an efficient exchange of information within a network is the computer connection of its members. The computer links accelerate the transference of information, since it provides the automatic transmission of data between physically distant computers. These links can be used as a strategic instrument to increase the competitiveness of the enterprise, binding it electronically with its customers and suppliers through inter-organizational systems. The electronic connection facilitates the approaching of the linked enterprises, which means that the companies may provide the customers direct access to the internal databases, as well as just-in-time stock control.
Study Session Summary

In this session, you examined management information system (MIS) and information technology (IT). You started by listing the function and characteristics MIS. Also, you looked at computers and its processing capabilities. In addition, you examined computer networks and client/server computing. Likewise, you examined the network structure. After which you explained information technology on the emergence of networks. You ended the session with a discussion on the roles of IOS within the network structure.

Assessment

SAQ 3.1 (tests learning outcome 3.1)
How will you define Management Information System (MIS)

SAQ 3.2 (tests learning outcome 3.2)
Computers can be classified according to their capabilities. List the classes.

SAQ 3.3 (tests learning outcome 3.3)
Differentiate the server system from the client system

SAQ 3.4 (tests learning outcome 3.4)
What is your understanding of the term network?

SAQ 3.5 (tests learning outcome 3.5)
List two ways IT can be of benefit to an organisation.

SAQ 3.6 (tests learning outcome 3.6)
State the role of IOS in a network
Bibliography


Study Session 4

System Development Life Cycle (SDLC)

Introduction

In this session, you will be looking at the system development life circle. You will begin by explaining the planning and requirement analysis. Likewise, you will describe the designing system architecture. You will also discuss how to build or develop the system. Furthermore, you will examine how to test a system. You will end the session with an explanation on system evaluation and maintenance.

Learning Outcomes

When you have studied this session, you should be able to:

4.1 discuss planning and requirement analysis

4.2 describe how to build or develop the system

Terminology

<table>
<thead>
<tr>
<th>Blueprints</th>
<th>A reproduction of a technical drawing, documenting an architecture or an engineering design, using a contact print process on light-sensitive sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowchart</td>
<td>A type of diagram that uses an algorithm, workflow or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows.</td>
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</table>

4.1 An Overview of SDLC

Like any other product development, system development requires careful analysis and design before implementation. System development generally has the following phases: Planning, Analysis, Design, Implementation and Support (Tutorials Point (I) Pvt. Ltd., 2014). This is shown in Figure 4.1 below.
4.1.1 Planning and Requirement Analysis

The project planning part involves the following steps:

1. Reviewing various project requests
2. Prioritizing the project requests
3. Allocating the resources and
4. Identifying the project development team

The techniques used in information system planning are:

1. Critical Success Factor
2. Business System Planning
3. End/Mean Analysis

The requirement analysis part involves understanding the goals, processes, and the constraints of the system for which the information system is being designed. It is basically an iterative process involving systematic investigation of the processes and requirements. The analyst creates a blueprint of the entire system in minute details, using various diagramming techniques like:

1. Data flow diagrams
2. Context diagrams

Requirement analysis has the following sub-processes:

1. Conducting preliminary investigation
2. Performing detailed analysis activities
3. Studying current system
4. Determining user requirements
5. Recommending a solution
What diagramming techniques are available for the creation of a blueprint details of a system?

There are several of such. The notable ones include Data Flow Diagrams and Context Diagrams.

The requirement analysis stage generally completes by creation of a 'Feasibility Report'. This report contains:

1. A preamble
2. A goal statement
3. A brief description of the present system
4. Proposed alternatives in details

The feasibility report and the proposed alternatives help in preparing the costs and benefits study. Based on the costs and benefits, and considering all problems that may be encountered due to human, organizational or technological bottlenecks, the best alternative is chosen by the end-users of the system.

4.1.2 Designing System Architecture

System design specifies how the system will accomplish this objective. System design consists of both logical design and physical design activity, which produces 'system specification' satisfying system requirements developed in the system analysis stage. In this stage, the following documents are prepared:

1. Detailed specification
2. Hardware/software plan

The combination of logical design and physical design will produce ________

System design consists of both logical design and physical design activity, which produces 'system specification'.
4.2 Building or Developing the System

The most creative and challenging phase of the system life cycle is system design, which refers to the technical specifications that will be applied in implementing the candidate system. It also includes the construction of programmers and program testing. It has the following stages:

1. Acquiring hardware and software, if necessary
2. Database design
3. Developing system processes
4. Coding and testing each module

The final report prior to implementation phase includes procedural flowcharts, record layout, report layout and plan for implementing the candidate system. Information on personnel, money, hardware, facility and their estimated cost must also be available. At this point projected cost must be close to actual cost of implementation.

<table>
<thead>
<tr>
<th>ITQ</th>
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<tbody>
<tr>
<td><strong>Question</strong></td>
</tr>
<tr>
<td>There are different phases of system cycle, the phase that is most challenging is________</td>
</tr>
<tr>
<td><strong>Feedback</strong></td>
</tr>
<tr>
<td>The most creative and challenging phase of the system life cycle is system design, which refers to the technical specifications that will be applied in implementing the candidate system.</td>
</tr>
</tbody>
</table>

4.2.1 Testing the System

System testing requires a test plan that consists of several key activities and steps for programs, strings, system, and user acceptance testing. The system performance criteria deals with turnaround time, backup, file protection and the human factors.

Testing process focuses on both:

1. The internal logic of the system/software, ensuring that all statements have been tested;
2. The external functions, by conducting tests to find errors and ensuring that the defined input will actually produce the required results.

In some cases, a 'parallel run' of the new system is performed, where both the current and the proposed system are run in parallel for a specified time period and the current system is used to validate the proposed system.
**ITQ**

**Question**

Turnaround time is a factor in determining system performance. True or false?

**Feedback**

The system performance criteria deals with turnaround time, backup, file protection and the human factors. Therefore, the above statement is true.

**4.2.2 Deployment of the System**

At this stage, system is put into production to be used by the end users. Sometime, we put system into a Beta stage where users’ feedback is received and based on the feedback, the system is corrected or improved before a final release or official release of the system.

**4.2.3 System Evaluation and Maintenance**

Maintenance is necessary to eliminate the errors in the working system during its working life and to tune the system to any variation in its working environment. Often small system deficiencies are found, as system is brought into operation and changes are made to remove them. System planner must always plan for resources availability to carry on these maintenance functions

**ITQ**

**Question:**

In planning for system maintenance, what would you put in place as a system planner?

**Feedback:**

System planner must always plan for resources availability to carry on these maintenance functions

---

**Study Session Summary**

In this session, we examined system development life cycle (SDLC). We also discussed designing system architecture, testing and developing of the system, system evaluation and maintenance, and planning and requirement analysis
Assessment

SAQ 4.1 (Tests learning outcome 4.1)
1. System development is in phases; list them in the sequential order
2. What are the contents of a “Feasibility Report”?
3. The system design has two components; list them

SAQ 4.2 (Tests learning outcome 4.2)
1. The development of a system design will involve what stages?
2. As a computer scientist what will you be looking for while testing a system?
3. What do you understand by system deployment?
4. What do you think is the significance of System Evaluation and Maintenance?

Bibliography


Study Session 5

MIS Development Process (MISDP)

Introduction

In this study session, you will be discussing the MIS development process. You will start the session by explaining why MIS development is necessary. You will continue the discussion by describing how to plan for an MIS. Subsequently, you will evaluate the information system requirements. Under which you will be discussing information system analysis and design, technology for the information system, system test planning and execution. You will conclude the session by explaining how the system operates and highlighting the factors that contribute to a system’s failure or success.

Learning Outcomes

When you have studied this session, you should be able to:

5.1 highlight the need for MIS development process (MISDP) and its challenges
5.2 describe information system requirement

5.1 The Need for MIS Development Process (MISDP) and Its Challenges

In going through the development for management information system, we should bear the following in mind:

1. The management information system needs good planning.
2. This system should deal with the management information not with data processing alone.
3. It should provide support for the management planning, decision-making and action.
4. It should provide support to the changing needs of business management.

Major challenges in MIS implementation are:
1. Quantity, content and context of information - how much information and exactly what should it describe.
3. Availability of information - frequency, contemporariness, on-demand or routine, periodic or occasional, one-time info or repetitive in nature and so on.
4. Accuracy of information.
5. Reliability of information.

5.1.1 Planning for MIS

MIS design and development process has to address the following issues successfully:

1. There should be effective communication between the developers and users of the system.
2. There should be synchronization in understanding of management, processes and IT among the users as well as the developers.
3. Understanding of the information needs of managers from different functional areas and combining these needs into a single integrated system.
4. Creating a unified MIS covering the entire organization will lead to a more economical, faster and more integrated system, however it will increase in design complexity manifold.
5. The MIS has to be interacting with the complex environment comprising all other sub-systems in the overall information system of the organization. So, it is extremely necessary to understand and define the requirements of MIS in the context of the organization.
6. It should keep pace with changes in environment, changing demands of the customers and growing competition.
7. It should utilize fast developing in IT capabilities in the best possible ways.
8. Cost and time of installing such advanced IT-based systems is high, so there should not be a need for frequent and major modifications.
9. It should take care of not only the users i.e., the managers but also other stakeholders like employees, customers and suppliers.

Once the organizational planning stage is over, the designer of the system should take the following strategic decisions for the achievement of MIS goals and objectives:

1. Development Strategy: Example - an online, real-time batch.

3. Resources for the Development: Designer has to select resources. Resources can be In-house versus external, customized or use of package.

4. Manpower Composition: The staffs should have analysts, and programmers. Information system planning essentially involves:

5. Identification of the stage of information system in the organization.

6. Identification of the application of organizational IS.

7. Evolution of each of this application based on the established evolution criteria.

8. Establishing a priority ranking for these applications.

9. Determining the optimum architecture of IS for serving the top priority applications.

Figure 5.1: MIS Development Process (Source: Tutorials Point (I) Pvt. Ltd., 2014).

<table>
<thead>
<tr>
<th>ITQ</th>
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</thead>
<tbody>
<tr>
<td><strong>Question</strong></td>
</tr>
<tr>
<td>In MISDP, resources for the development are necessary. As a planner, what are your options in the selection of resources?</td>
</tr>
</tbody>
</table>

| Feedback |
| Resources can be In-house versus external, customized or use of package |
5.2 Information System Requirements

The following diagram illustrates a brief sketch of the process of information requirement analysis:

![Diagram: Information Requirement Analysis](image)

**Figure 5.2: Information Requirement Analysis (Source: Tutorials Point (I) Pvt. Ltd., 2014).**

The following three methodologies can be adopted to determine the requirements in developing a management information system for any organization:

1. Business Systems Planning (BSP) - this methodology is developed by IBM.
   - i. It identifies the IS priorities of the organization and focuses on the way data is maintained in the system.
   - ii. It uses data architecture supporting multiple applications.
   - iii. It defines data classes using different matrices to establish relationships among the organization, its processes and data requirements.

2. Critical Success Factor (CSF) - this methodology is developed by John Rockart of MIT.
   - i. It identifies the key business goals and strategies of each manager as well as that of the business.
   - ii. Next, it looks for the critical success factors underlying these goals.
   - iii. Measure of CSF effectiveness becomes an input for defining the information system requirements.

3. End/Means (E/M) analysis - this methodology is developed by Wetherbe and Davis at the University of Minnesota (Tutorials Point (I) Pvt. Ltd., 2014).
i. It determines the effectiveness criteria for outputs and efficiency criteria for the processes generating the outputs.

ii. At first it identifies the outputs or services provided by the business processes.

iii. Then it describes the factors that make these outputs effective for the user. Finally it selects the information needed to evaluate the effectiveness of outputs.

**ITQ**

**Question**

John Rockart of MIT popular work on End/Means Analysis determines the effectiveness criteria for outputs and efficiency criteria for the process generating the outputs. True or false?

**Feedback**

Though the End/Means analysis determines the effectiveness criteria for outputs and efficiency criteria for the process generating the outputs, it wasn’t John Rockart work. Therefore, the statement is false.

### 5.2.1 Information System Analysis and Design

System analysis and design follows the typical System/Software Design Life Cycle (SDLC) as discussed in the previous chapter. It generally passes through the following phases:

1. Problem Definition
2. Feasibility Study
3. Systems Analysis
4. System Design
5. Detailed System Design
6. Implementation
7. Maintenance

In the analysis phase, the following techniques are commonly used:

1. Data flow diagrams (DFD)
2. Logic Modeling
3. Data Modeling
4. Rapid Application Development (RAD)
5. Object Oriented Analysis (OOA)
5.2.2 Technology for Information Systems

The technology requirement for an information system can be categorized as:

1. Devices
2. Data centre systems - It is the environment that provides processing, storage, networking, management and the distribution of data within an enterprise.
3. Enterprise software - These are software systems like ERP, SCM, Human Resource Management, etc. that fulfill the needs and objectives of the organizations.
4. IT services - It refers to the implementation and management of quality IT services by IT service providers through people, process and information technology. It often includes various process improvement frameworks and methodologies like six sigma, TQM, and so on.
5. Telecom services

5.2.3 System Test Planning and Execution

The system should be fully tested for errors before being fully operational. The test plan should include for each test:

1. Purpose
2. Definition
3. Test inputs
4. Detailed specification of test procedure
5. Details of expected outputs

Each sub-system and all their components should be tested using various test procedures and data to ensure that each component is working as it is intended. The testing must include the users of the system to identify errors as well as get the feedback.

5.2.4 System Operation

Before the system is in operation, the following issues should be taken care of:

1. Data security, backup and recovery;
2. Systems control;
3. Testing of the system to ensure that it works bug-free in all expected business situations;
4. The hardware and software used should be able to deliver the expected processing;
5. The system capacity and expected response time should be maintained;
6. The system should be well documented including:
7. A user guide for inexperienced users,
8. A user reference or operations manual for advanced users,

Once the system is fully operational, it should be maintained throughout its working life to resolve any glitches or difficulties faced in operation and minor modifications might be made to overcome such situations.

### ITQ

**Question**

The system capacity and expected response time should be maintained before setting up the operating system. True or false

**Feedback**

True

### 5.2.5 Factors for Success and Failure

MIS development projects are high-risk, high-return projects. Following could be stated as critical factors for success and failure in MIS development:

1. It should cater to a specific, well-perceived business.
2. The top management should be completely convinced, able and willing to such a system. Ideally there should be a patron or a sponsor for the system in the top management.
3. All users including managers and other employees should be made an integral part of the development, implementation, and use of the system.
4. There should be an operational prototype of the system released as soon as possible, to create interest among the users.
5. There should be good support staff with necessary technical, business, and interpersonal skills.
6. The system should be simple, easy to understand without adding much complexity. It is a best practice, not to add up an entity unless there is both a use and user for it.
7. It should be easy to use and navigate with high response time.
8. The implementation process should follow a definite goal and time.
9. All the users including the top management should be given proper training, so that they have a good knowledge of the content and function of the system, and can use it fully for various managerial activities such as reporting, budgeting, controlling, planning, monitoring, etc.
10. It must produce useful outputs to be used by all managers.
11. The system should be well integrated into the management processes of planning, decision-making, and monitoring.
Study Session 5 MIS Development Process (MISDP)

ITQ

Question
MIS development projects are high risk and low return project, true or false?

Feedback
MIS development projects are both high-risk, high-return projects. The statement is false.

Study Session Summary

In this study session, you discussed the MIS development processes. You started by explaining the needs for MIS development processes and its requirement. You continued by describing how to plan for an MIS. In addition, you evaluated the information system requirement. Under which you described information system analysis and design, technology for information system, system test planning and execution and system operations. You ended the session by highlighting the factors that determine the success and failure of developing a system.

Assessment

SAQ 5.1 (tests learning outcome 5.1)
1. The MISDP has helped to curb many problems of MIS yet its implementation is not without challenges. Enumerate some of the challenges that you know
2. In the planning of MISDP, list four issues one may want to address.

SAQ 5.2 (tests learning outcome 5.2)
1. Information Requirement Analysis is an important phase of MISDP. Enumerate the process.
2. What categories of technology are available for information system?
3. In system testing is done to cover specific areas such as:
Bibliography


Study Session 6

Managing Data Resources

Introduction

In this study session, you will be discussing how to manage data resources. You will begin by describing the relationship between an organization and data management. You will further the discussion by evaluating how data is organized in a traditional file environment. Thereafter, you will describe file organization terms and concepts. You will also describe the database management system. Under which you will look at the logical and physical views of data, how to design a database, comparing different database alternatives, and how to create a database. Moving on, you will discuss different trends in database management. Likewise, you will describe the management database requirements. The session will end with a discussion on database environment and applications.

Learning Outcomes

When you have studied this session, you should be able to:

6.1 *discuss* organization and data management
6.2 *define* database management systems
6.3 *explain* database trends
6.4 *highlight* management requirements
6.5 *describe* database environment

6.1 Organisations and Data Management

It has been very difficult for organizations to manage their data effectively. In trying to do so, we have to meet two very big challenges which are standing out. Implementing a database requires a widespread organisational change in the role of information and information managers, the allocation of power at all senior levels, the ownership and sharing of information and patterns of organisational agreement. A database management system (DBMS) challenges the existing power arrangements in an organisation and for that reason often generate political resistance. In a traditional file environment, each department constructed files and programs to fulfill its specific needs. Now, with a database, files and programs must be built that take into account the full organization’s interest in data. Although the organization has spent the money on hardware and software for a database environment, it may not
reap the benefits it should if it is unwilling to make the requisite organisational changes.

Moving to database environment can be a costly long-term process. In addition to the cost of DBMS Software, related hardware, and data modelling, organizations should anticipate heavy expenditure for integrating, merging and standardizing their data that will populate their database to eliminate inconsistencies, redundancies and errors that typically arise when overlapping data are stored and maintained by different systems and different functional areas.

You should understand the managerial and organisational requirements as well as the technologies for managing data as a resource. Organizations need to manage their data assets very carefully to make sure that the data can be easily accessed and managed by the managers and employees across the First, we describe the typical challenges facing business trying to access information using traditional file management technologies. Then we describe the technology of database management systems, which can overcome many of the drawbacks of traditional file management systems and provide the firm wide integration of information required for digital firm applications.

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<th>ITQ</th>
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<td><strong>Question</strong></td>
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<tr>
<td>What is the major cause of the political resistance encountered in implementing DBMS within organisations?</td>
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<tr>
<td><strong>Feedback</strong></td>
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<td>A database management system (DBMS) challenges the existing power arrangements in an organisation and for that reason often generate political resistance.</td>
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### 6.1.1 Organizing Data in a Traditional File Environment

Information is becoming as important a business resource as money, material, and people. Businesses are realizing the competitive advantage they can gain over their competition through useful information, not just data. Why should you know about organizing data? Because it’s almost inevitable that someday you’ll be establishing or at least working with a database of some kind. As with anything else, understanding the lingo is the first step to understanding the whole concept of managing and maintaining information. It all comes down to turning data into useful information, not just a bunch of bits and bytes.
6.1.2 File Organization Terms and Concepts

The data hierarchy in traditional file management system. The first few terms, **field, record, file, database**, are depicted in Figure 6.1, which shows the relationship between them. An entity is basically the person, place, thing, or event about which we maintain information. Each characteristic or quality describing an entity is called an attribute. Each record requires a key field, or unique identifier. The best example of this is your Customer ID Number: there is only one per person. That explains in part why so many companies and organizations ask for your PAN Number when you do business with them. Suppose you decide to create a database for your newspaper delivery business. To succeed, you need to keep accurate, useful information for each of your customers. You set up a database to maintain the information. For each customer, you create a record. Within each record you have the following fields: customer name, address, ID, date last paid. Smith, Jones, and Brooks are the records within a file you decide to call Paper Delivery. The entities then are Smith, Jones, and Brooks, the people on whom you are maintaining information. The attributes are customer name, address, ID, and date last paid. The key field in this file is the ID number; perhaps you’ll use their phone number, since it will be unique for each record. This is a simplistic example of a database, but it should help you understand the terminology.
6.1.3 Accessing Records

When we were describing secondary storage, we talked about magnetic tape and disk storage for computer data. To understand how information is accessed from these mediums, think about the difference between a music cassette tape and a music CD. If you want to get to a particular song on a cassette tape, you must pass by all the other songs sequentially. If you want to get to a song on CD, you can go directly to that song without worrying about any of the others. That is the difference between sequential and direct access organization for database records.

Sequential file organization, in conjunction with magnetic tape, is typically used for processing the same information on all records at the same time. It is also good for processing many records at once, commonly called batch processing.

Direct or random file organization is used with magnetic disks. Because of increased speed and improved technological methods of recording data on disks, many companies now use disks instead of tapes. The other advantage that disks have over tapes is that disks don’t physically deteriorate as fast as tapes do. There is less danger of damaging the surface of the disks than there is of breaking a tape.

Indexed Sequential Access Method

To explain the indexed sequential access method (ISAM), let’s go back to the example of the cassette tape. A cassette tape label has a printed list of the songs contained on it which gives you a general idea of where to go on the tape to find a particular tune. So too with computer records on a sequential access tape using the key field. It gives the computer a pretty accurate idea of where a particular record is located. That’s why it’s so important to have a unique ID as the key field. You and your customer could have a difficult time if the key field is duplicated among several records. Each key field and the ultimate location of that record on the storage device is maintained in the index.

Direct file access method

This access method also uses key fields in combination with mathematical calculations to determine the location of a record. If you order something by phone from a mail order catalogue, the person taking your order does not have to wait for the computer to randomly select your record; using the direct file access method, the computer can find you very quickly. Here, you have understand that the records are not stored sequentially but at random. The transform algorithm uses the value in the key field to find the storage location and access the record.
6.1.4 Problems with the Traditional File Environment

Many problems, such as data redundancy, program-data dependence, inflexibility, poor data security, and inability to share data among applications, have occurred with traditional file environments. We’ve spoken about “islands of information” before. Building and maintaining databases is where this situation is most evident and most troublesome. Usually it begins in all innocence, but it can quickly grow to monstrous proportions. For instance, after you move and change addresses, you notify everyone of your new address, including your bank. Everything is going smoothly with your monthly statements. All of a sudden, at the end of the year, the bank sends a Christmas card to your old address. Why? Because your new address was changed in one database, but the bank maintains a separate database for its Christmas card list and your address was never changed in it. If you received two Christmas cards, you’re probably a victim of data redundancy. That is, your information is now in two separate databases with duplicate records. In this instance, each database file has different data on the same record. That can be a nightmare on Main Street. Even more troublesome is when several departments or individuals decide to set up their own islands of information.

This usually happens because they find the main system inflexible or it just doesn’t fit their needs. So they set up their own fields and records and files and use them in their own programs to manipulate data according to their needs.

Now each department is spending lots of money and time to establish and maintain separate islands of information. Even worse, the fields and records for Marketing probably don’t have the same structure and meaning as the fields and records for Accounting, or those for Production. Each record describes basically the same entity (customers or products), but it is very possible that each database file will have different information, or attributes, in records concerning the same entity. All of this may have happened with the best of intentions. All the departments began with the goal of making their part of the organization more efficient. Eventually these good intentions can cost big dollars to bring the islands together, resolve data conflicts between them, and retrain people to understand the new database structures.

Managers and workers must know and understand how databases are constructed so they know how to use the information resource to their advantage. Managers must guard against problems inherent with islands of information and understand that sometimes resolution of short-term problems is far costlier in the long term.
6.2 Database Management Systems

The key to establishing an effective, efficient database is to involve the entire organization as much as possible, even if everyone seemingly will not be connected to it or be a user of it.

Perhaps they won’t be a part of it in the beginning, but they very well could be later on.

You’ve heard the old saying, “Don’t put all your eggs in one basket.” When it comes to data, just the opposite is true. You want to put all your corporate data in one system that will serve the organization as a whole.

A Database Management System (DBMS) is basically another software program like Word or Excel or Email. This type of software is more complicated: it permits an organization to centralize data, manage them efficiently, and provide access to the stored data by application programs.

A DBMS has 3 components, all of them are important for the long-term success of the system.

1. **Data Definition Language (DDL).** Marketing looks at customer addresses differently from Shipping. So you must make sure that all users of the database are speaking the same language. Think of it this way: Marketing is speaking French, Production is speaking German, and Human Resources is speaking Japanese. They are all saying the same thing, but it’s very difficult for them to understand each other. Defining the data definition language itself sometimes gets shortchanged. The programmers who are creating the language sometimes say “Hey, an address is an address, so what.” That’s when it becomes critical to involve users in the development of the Data Definition Language.

2. **Data Manipulation Language (DML).** This is a formal language used by programmers to manipulate the data in the database and make sure they are formulated into useful information. The goal of this language should be to make it easy for users. The basic idea is to establish a single data element that can serve multiple users in different departments depending on
the situation. Otherwise, you’ll be tying up programmers to get information from the database that users should be able to get on their own.

3. **Data Dictionary.** Each data element or field should be carefully analysed to determine what it will be used for, who will be the primary user, and how it fits into the overall scheme of things. Then write it all down and make it easily available to all users. This is one of the most important steps in creating a good database. Why is it so important to document the data dictionary? Let’s say Suvidha, who was in on the initial design and building of the database, moves on and Joe takes her place. It may not be so apparent to him what all the data elements really mean, and he can easily make mistakes from not knowing or understanding the correct use of the data. He will apply his own interpretation, which may or may not be correct. Once again, it ultimately comes down to a hardware problem.

### ITQ

**Question**

How will you define DBMS?

**Feedback**

Your definition should reflect the fact that DBMS is basically another software program like Word or Excel or Email but more complicated which permits an organization to centralize data, manage them efficiently, and provide access to the stored data by application programs.

### 6.2.1 Logical and Physical Views of Data

Physical views of items are often different from the logical views of the same items when they are actually being used. For instance, assume you store tablets of paper in your lower right desk drawer. You store your pencils in the upper left drawer. When it comes time to write your request for a pay raise, you pull out the paper and pencil and put them together on your desktop. It isn’t important to the task at hand where the items were stored physically; you are concerned with the logical idea of the two items coming together to help you accomplish the task. The physical view of data cares about where the data are actually stored in the record or in a file. The physical view is important to programmers who must manipulate the data as they are physically stored in the database. Does it really matter to the user that the customer address is physically stored on the disk before the customer name?

Probably not. However, when users create a report of customers located in Indiana they generally will list the customer name first and then the address. So it’s more important to the end user to bring the data from
their physical location on the storage device to a logical view in the output device, whether screen or paper.

Database Management Systems have three critical components: the data definition language, the data manipulation language, and the data dictionary. Managers should ensure that all three receive attention. Managers should also make sure that end users are involved in developing these three components.

6.2.2 Designing Databases

Every tool has its job. You wouldn’t use a screwdriver to pound a nail in the wall (or maybe you would), nor would you use a hammer to turn a bolt. Each type of database that we discuss in this section has its own advantages and disadvantages, so you should choose the right type of database for the job you want to do.

Hierarchical Databases

The hierarchical data model presents data to users in a treelike structure. Think of a mother and her children. A child only has one mother and inherits some of her characteristics, such as eye color or hair color. A mother might have one or more children to which she passes some of her characteristics but usually not exact ones. The child then goes on to develop its own characteristics separate from the mother.

Network Database

A network data model is a variation of the hierarchical model. Take the same scenario with one parent and many children and add a father and perhaps a couple of stepparents. Now the parents aren’t restricted to only one (the mother) but to many parents. That is, a parent can have many
children and a child can have many parents. The parents pass on certain characteristics to the children, but the children also have their own distinct characteristics.

The network data model. As with hierarchical structures, each relationship in a network database must have a pointer from all the parents to all the children and back, as the above figure demonstrates. These two types of databases, the hierarchical and the network, work well together since they can easily pass data back and forth. But because these database structures use pointers, which are actually additional data elements, the size of the database can grow very quickly and cause maintenance and operation problems.

**Relational Data Model**

A relational data model uses tables in which data are stored to extract and combine data in different combinations. The tables are sometimes called files. In a relational database, each table contains a primary key, a unique identifier for each record. To make sure the tables relate to each other, the primary key from one table is stored in a related table as a secondary key. For instance, in the Customer table the primary key is the unique Customer ID. That primary key is then stored in the Order Table as the secondary key so that the two tables have a direct relationship.

Use these three basic operations to develop relational databases:

1. **Select**: create a subset of records meeting the stated criteria
2. **Join**: combine related tables to provide more information than individual tables
3. **Project**: create a new table from subsets of previous tables

The biggest problem with these databases is the misconception that every data element should be stored in the same table. In fact, each data element should be analysed in relation to other data elements with the goal of making the tables as small in size as possible. The ideal relational database will have many small tables, not one big one. On the surface that may seem like extra work and effort, but by keeping the tables small, they can serve a wider audience because they are more flexible. This setup is especially helpful in reducing redundancy and increasing the usefulness of data.

**Advantages and Disadvantages**
Hierarchical and network databases can be very efficient as long as you plan ahead. But as you know, needs change, and neither one of these databases offers a lot of flexibility to change with business needs. It’s sort of like parents and children; once you establish the tie, it’s pretty hard to amend. Relational database management systems are more flexible, especially if you keep the tables small. It is much easier for non-techies to create the query language in a relational system. It’s also easier to add new data elements, although if you do, you’ll have to go back and fill in the missing information for the old records or just forget them altogether.

### 6.2.3 Comparing of Database Alternatives

The above table compares these alternatives on several dimensions to show you the advantages and disadvantages of each. What you should remember is that none of these databases is very good if you don’t keep the end user in mind. If you’re not careful, you’ll wind up with lots of information that no one can use.

### 6.2.4 Creating a Database

First, you should think long and hard about how you use the available information in your current situation. Think of the good and the bad of how it is organized, stored, and used. Now imagine how this information could be organized better and used more easily throughout the organization. What part of the current system would you be willing to get rid of and what would you add? Involve as many users in this planning stage as possible. They are the ones who will prosper or suffer because of the decisions you make at this point.

Determine the relationships between each data element that you currently have (entity-relationship diagram). The data don’t necessarily have to be in a computer for you to consider the impact. Determine which data elements work best together and how you will organize them in tables. Break your groups of data into as small a unit as possible (normalization). Even when you say it’s as small as it can get, go back again. Avoid redundancy between tables. Decide what the key identifier will be for each record. See, you’ve done all this and you haven’t even touched the computer yet!

Give it your best shot in the beginning: it costs a lot of time, money, and frustration to go back and make changes or corrections or to live with a poorly designed database. There are three types of databases: hierarchical, network, and relational. Relational databases are becoming the most popular of the three because they are easier to work worth, easier to change, and can serve a wider range of needs throughout the organization.
6.3 Database Trends

Recent database trends include the growth of distributed databases and the emergence of object-oriented and hypermedia databases.

6.3.1 Distributed Databases

These are usually found in very large corporations that require multiple sites to have immediate, fast access to data. As the book points out, there are lots of disadvantages, so you should be careful in determining if this is the right way for you to run your business.

6.3.2 Object-Oriented and Hypermedia Databases

Many companies are steering away from strictly text-based database systems. Data as objects can be pictures, groups of text, voice, audio, etc. Object-oriented databases bring the various objects from many different sources and get them all working together. As we move away from strictly text-based information systems and incorporate video and sound, graphics and text, the hypermedia database will become more common. The below given figure helps explain the concept of a hypermedia database by showing how the various elements are networked. The attraction to this type of database is that it allows the user to decide which path to follow from one node to another.
6.3.3 Multidimensional Data Analysis

As technology improves, so does our ability to manipulate information maintained in databases. Have you ever played with a Rubik Cube - one of those cute little multicolour puzzle boxes you can twist around and around to come up with various colour combinations? That’s a close analogy to how multidimensional data analysis or on-line analytical processing (OLAP) works (see the Figure given below). In theory, it’s easy to change data around to fit your needs.

6.3.4 Data Warehouses

As organizations want and need more information about the company, the products, and the customers, the concept of data warehousing has become very popular. Remember those islands of information we keep talking about? Unfortunately, too many of them have proliferated over the years, and now companies are trying to rein them in using data warehousing. No data warehouses are not great big buildings with shelves and shelves of bits and bytes stored on them. They are huge computer files that store old and new data about anything and everything a company wants to maintain information on. Since the data warehouse can be cumbersome, a company can break the information into smaller groups called data marts.

It’s easier and cheaper to sort through smaller groups of data. It’s still useful to have a huge data warehouse, though, so that information is available to everyone who wants or needs it. You can let the user determine how the data will be manipulated and used. Using a data
warehouse correctly can give management a tremendous amount of information that can be used to trim costs, reduce inventory, put products in the right stores, etc.

**ITQ**

**Question**

What is the technological relevance of data marts?

**Feedback**

Data warehouses could be cumbersome to run but can also be broken into smaller groups called data marts.

### 6.3.5 Linking Databases to the Web

Even though Web browsers have been around for only a few years, they are far easier to use than most of the query languages associated with the other programs on mainframe computer systems. That’s why many companies are starting to link their databases to a Web-like browser. They are finding out that it’s easier to provide their “road warriors” with Web-like browsers attached to the computer at the main office. Employees anywhere can have up-to-the-minute access to any information they need. It’s also proving cheaper to create browser applications that can more easily link information from disparate systems than to try to combine all the systems. There are many ways to manipulate databases so that an organization can save money and still have useful information. With technological improvements, companies don’t have to continually start from scratch but can blend the old with the new when they want to update their systems.

### 6.4 Management Requirements

Key organizational elements in the database environment. Nothing is ever as easy as it sounds. There is a lot more to a viable, useful database than just its structure as shown in Figure 6.5 below.
6.4.1 Data Administration

Ask any manager what his resources are and he’s likely to list people, equipment, buildings, and money. Very few managers will include information on the list, yet it can be more valuable than some of the others. A data administration function, reporting to senior management, can help emphasize the importance of this resource. This function can help define and structure the information requirements for the entire organization to ensure it receives the attention it deserves. Data Administration is responsible for:

1. Developing information policies
2. Planning for data
3. Overseeing logical database design
4. Data dictionary development
5. Monitoring the usage of data by techies and non-techies

No one part of the organization should feel it owns information to the exclusion of other departments or people in the organization. A certain department may have the primary responsibility for updating and maintaining the information, but that department still has to share it across the whole company. Well-written information policies can outline the rules for using this important resource, including how it will be shared, maintained, distributed, and updated.

6.4.2 Data Planning

At the beginning we said that as many users as possible should be brought together to plan the database. We believed it so much then that we’ll say it again here. By excluding groups of users in the planning stages, no matter how insignificant that group may seem a company courts trouble.
6.4.3 Database Technology, Management and Users

Change isn’t just something you experience by chance; in all likelihood, it will be required throughout the corporate structure. You need to get the non-techies talking and working with the techies. Users will take on more responsibility for accessing data on their own through query languages if they understand the structure of the database. Users need to understand the role they play in treating information as an important corporate resource. Not only will they require a user friendly structure for the database, but they will also need lots of training and hand holding up front. It will pay off in the long run.

Database administration functions can:

1. Define and organize database structure and content.
2. Develop security procedures to safeguard the database.
3. Develop database documentation.
4. Maintain the database management software.

As with any other resource, managers must administer data, plan their uses, and discover new opportunities for the data to serve the organization through changing technologies.

6.5 The Database Environment and Applications

Now, we are having basic understanding about the databases and the requirements of the management and the organisation. Let us continue by knowing the database environment which will give you a clear idea about how it is performing. Let us recall what we learned earlier in this chapter. Database is an organized collection of logically related data. Information data that was processed to increase the knowledge of the person who uses it. Example, the bank that owns your ATM card is collecting data about your transactions (date, amount, time, location, ATM No, etc). The monthly statement contains information about your account. The bank maintains a database of related data such as your name and address, the amount of money you transfer and where you transfer it to and the ATM transaction information.

ITQ

Question
The school is an example of database environment. True or false

Feedback
True as several database could be generated there
6.5.1 The Range of Database Applications

A database Application is a set of programs that were developed to support the needs of the database users. The application is used to perform the basic function of adding new data, modifying or deleting data, or reading data to create meaningful information, such as the invoice shown above. Database applications are divided into five categories; from a single user on a personal databases, to workgroup, departmental, enterprise, and Internet/Intranet/Extranet databases.

Personal databases: Designed to support one user and are used for simple applications, typically developed by the end user

Workgroup Database: Small team of professionals who collaborate on the same project. e.g., a team of systems analysts developing an information system will share a common database to create their schema, programs and documents. The workgroup members use PCs that are linked by the way of a local area network (LAN). The database is managed by a computer, called database server, which is part of the network.

Department Databases: A department is a function within the organization such as accounting, and marketing. The databases are designed to support the function of the organization. For a marketing department the database would tracks data concerning customer, orders, and salespersons

Enterprise Database: An enterprise database supports the entire enterprise (all the departments). At times a single enterprise database isn’t practical, so multiple databases are maintained. This is due to performance issues, diverse needs of users, and complexity of systems. Enterprise databases include: (1) Enterprise resource planning (ERP) and (2) Data warehousing.

ERP systems have evolved from the material requirement (MRP) and manufacturing resource planning (MRP II) systems of the 1970s and 1980s. The ERP systems include additional functionality such as customer resource management, and personnel. Because of the complexity of ERP systems, a database is a must work with current operational data of the enterprise, data in the data warehouse are derived by extracting and basis. Users work with the historical data of the warehouse to identify patterns and trends and answer strategic business questions. Data warehousing is discussed later in the course.

Internet, Intranet, and Extranet Databases

The internet is the most recent change that had a tremendous effect on businesses and their information systems and databases. The internet is a worldwide network that easily enables users with multiple platforms, to
connect, using a web browser (Netscape or Explorer). The databases must be made web-enabled to allow customers process data on the databases. Companies also use the internet technology to link their internal databases such as personnel, e-mail. This network is known as Intranet. Intranet is protected by software known as fire wall to protect ii from access by people outside the company. Using the internet, companies can do business online with their customers, providing better service at reduced cost. E.g., Dell Computers is selling computers primarily online, and Oracle Corporation reported a saving of one billion dollar per year by configuring systems and processing orders via the internet. This interaction is referred to as business-to-customer (B to C). Using the internet, companies can develop Extranet to exchange data with their suppliers and other companies, known as business-to-business (B to B). Typically the access to the company intranet is restricted to only certain companies and restricted data.

**ITQ**

**Question:**
What does database application mean to you.

**Feedback:**
Whatever is it that it means don’t forget that a database application is a set of programs that were developed to support the needs of the database users.

### Study Session Summary

In this study session, you discussed how to manage data resources. You started with a discussion on the relationship between organizations and data management. Also, you looked at how data are organised in a traditional file environment. Furthermore, you describe the database management system, the database trends and management database requirements. You ended the session by examining the database environment and the range of database applications.

### Assessment

**SAQ 6.1 (Tests learning outcome 6.1)**

1. Enumerate some of the challenges of data management in an organisation
2. Can you sequentially list out the hierarchy in the traditional file management system?
SAQ 6.2 (Tests learning outcome 6.2)
DBMS has component systems. List them

SAQ 6.3 (Tests learning outcome 6.3)
1. List two areas where database have taken new trends
2. What informed the linking of database to the web?

SAQ 6.4 (Tests learning outcome 6.4)
Data management system has functional units. Can you list them

SAQ 6.5 (Tests learning outcome 6.5)
1. Can you think of two database environment and examples of information obtained?
2. There are 5 categories of database applications, Name them.

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Study Session 7

Enterprise Resource Planning (ERP)

Introduction

In this study session, you will be examine the Enterprise Resource Planning (ERP). You will begin the session by explaining the reasons for ERP. Likewise, you will illustrate the features of the ERP. Also, you will examine the advantages and the disadvantages of the ERP. You will end the session with a discussion on the scope of ERP.

Learning Outcomes

When you have studied this session, you should be able to:

7.1 define Enterprise Resource Planning

7.2 highlight the scope of ERP

7.1 What is ERP?

ERP is an integrated, real-time, cross-functional enterprise application, an enterprise-wide transaction framework that supports all the internal business processes of a company. It supports all core business processes such as sales order processing, inventory management and control, production and distribution planning, and finance as shown in Figure 7.1 below.
ITQ

Question

ERP is a wide transaction framework that supports all the external business processes of a company, true or false?

Feedback

Though ERP is a wide transaction framework, it supports the internal (not external) business processes of a company.

7.1.1 Reasons for ERP

ERP is very helpful in the following areas:

1. Business integration and automated data update
2. Linkage between all core business processes and easy flow of integration
3. Flexibility in business operations and more agility to the company
4. Better analysis and planning capabilities
5. Critical decision-making
6. Competitive advantage
7. Use of latest technologies
7.1.2 Features of ERP

The following diagram illustrates the features of ERP:

- accommodating variety
- seamless integration
- resource management
- Integration management information
- supply chain management
- Integration data model

![Features of ERP diagram]

Figure 7.2: Features of MIS (Tutorials Point (I) Pvt. Ltd., 2014).

7.1.3 Advantages and Disadvantages of ERP

The advantages of ERP are:

1. Reduction of lead time
2. Reduction of cycle time
3. Better customer satisfaction
4. Increased flexibility, quality, and efficiency
5. Improved information accuracy and decision making capability
6. Onetime shipment
7. Improved resource utilization
8. Improve supplier performance
9. Reduced quality costs
10. Quick decision-making
11. Forecasting and optimization
12. Better transparency

Just as we have highlighted the advantages of ERP above, we shall also list some of the disadvantages of ERP. Hence, below is a list of its disadvantages:

1. Expense and time in implementation
2. Difficulty in integration with other system
3. Risk of implementation failure
4. Difficulty in implementation change
5. Risk in using one vendor

### ITQ

**Question:**
ERP is useful in inventory taking but not in financing. True or false

**Feedback:**
The statement is false. ERP supports all core business processes such as sales order processing, inventory management and control, production and distribution planning, and finance.

### 7.2 Scope of ERP

#### 7.2.1 Finance
Financial accounting, Managerial accounting, treasury management, asset management, budget control, costing, and enterprise control.

#### 7.2.2 Logistics
Production planning, material management, plant maintenance, project management, events management, etc.

#### 7.2.3 Human resource
Personnel management, training and development, etc.

#### 7.2.4 Supply Chain
Inventory control, purchase and order control, supplier scheduling, planning, etc.

#### 7.2.5 Work flow
Integrate the entire organization with the flexible assignment of tasks and responsibility to locations, position, jobs, etc.

### ITQ

**Question**
ERP is useful in the maintenance of workflow by rigid assignment of tasks and responsibility to locations, positions, jobs. True or false?

**Feedback**
Though ERP is useful in the maintenance of workflow, the assignment
of tasks is flexible. Therefore, the statement is false.

Study Session Summary

In this study session, you examined the Enterprise Resource Planning (ERP). You started by explaining the reasons why ERP is important. Also, you highlighted the features, advantages and disadvantages of the ERP. Furthermore you examined the scope of ERP in finance, logistics, human resources, supply chain and work flow.

Assessment

SAQ 7.1 (Tests learning outcome 7.1)
1. Briefly explain the term “Enterprise Resource Planning”.
2. List four areas where ERP could be relevant
3. What are the features of ERP
4. Give 2 merits and demerits of ERP

SAQ 7.2 (Tests learning outcome 7.2)
In what areas do you consider ERP relevant?

Bibliography


Study Session 8

End User Computing (EUC)

Introduction

In this study session, you will be considering the End User computing (EUC). You will begin with an explanation on user written components. Under which you will discuss the meaning of end user computing and end user development (EUD). Subsequently, you will discover who the end users are. This discovery will lead to another discussion on why these set of people referred to as end-users. After this, you will evaluate the end user’s computing tools and the end-user’s system tools. You will end the session by explaining the information centre.

Learning Outcomes

When you have studied this session, you should be able to:

- 8.1 define user written components
- 8.2 state who the end-users are
- 8.3 define end-user computing tools
- 8.4 describe the end-user system’s tools
- 8.5 discuss the information center

Terminology

| Spreadsheet | An interactive computer application for organization, analysis and storage of data in tabular form. |

8.1 User Written Components

In order for each user to add the functions he/she wants, the programs must be designed to accept user-written components in appropriate places. There must be a way to store and manage them. Most important, since most users do not have the time or inclination to learn the tools and skills of a professional programmer, reasonable compromises are required. The expressiveness and generality of full-fledged programming languages are traded for usability by a variety of metaphors and tricks. Programming can be done much more easily within the metaphor — a
desktop with file cabinets and wastebaskets; a formula of spreadsheet locations or mathematical symbols; a sequence of GUI actions; a circuit diagram; an application specific language — than with conventional programming. Because the appropriate metaphors, with their capabilities and limitations, differ widely depending on the users and their purposes, there is no one method of end-user programming. Instead there is a variety of techniques, such as Programming by Demonstration, visual programming, and many domain specific languages and formalisms. Ideally there is a smooth progression from simple but limited metaphors, to more complex and powerful techniques as the user-programmer advances.

Computing usually adds to its provision rather than replacing one approach by another. This is equally true of end-user computing and the end-user is now involved in all of the above ways. This set of notes seeks to address the questions of “who is the end-user”, “what kinds of end-user systems are there”, “what support should be given to end-user at the various levels of the company”, “the need for an adequate human-computer interface for the end-user”, “software provision for end-users” and the problems that end-users can generate for the company.

<table>
<thead>
<tr>
<th>ITQ</th>
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<tbody>
<tr>
<td><strong>Question</strong></td>
</tr>
<tr>
<td>Why will Excel be considered as a spreadsheet?</td>
</tr>
<tr>
<td><strong>Feedback</strong></td>
</tr>
<tr>
<td>Generally spreadsheets are interactive computer application for organization, analysis and storage of data in tabular form. Excel software bears these features.</td>
</tr>
</tbody>
</table>

### 8.1.1 Meaning of EUC

We will see the meaning of the term “end user” as a user of an application program. Typically, the term means that the person is not a computer programmer. A person who uses a computer as part of their daily life or daily work, but is not interested in computers as such. When end-users, who have not necessarily been taught how to write code in conventional programming languages, write computer programs. Examples include spreadsheet users who write formulas and macros.

EUC is an environment in which the user has relatively free control over the process. He may use data that is interchanged through the mainframe of the MIS division, or he may create his own data. But he is in control; he is responsible for the product and the effectiveness of the use of the equipment. It has since been suggested that the only distinction between EUC and corporate computing is the reporting relationship within the
Organisation. Computing which reports directly to the Information Systems function is corporate computing; the rest is EUC.

### 8.1.2 End-User Development (EUD)

Specifically, the practice of users developing their own information systems, is often but not always with the support of professional systems developers. The practical involvement of end-users in application development necessitates the easy access to computing facilities. This may be:

1. Timesharing on a centralised mainframe
2. The use of stand alone personal computers
3. The use of personal computers which are connected to local area networks and mainframes.

In addition to being provided with hardware and software, extra facilities are a necessary condition of successful End user applications development. In particular:

1. Education and training on the use of software tools
2. Assistance in the technical aspects of writing, testing, and debugging applications
3. Availability of reference material
4. Aid in accessing the corporate database

### 8.1.3 Reasons for End User Computing

The major advantages attributed to EUC include:

1. Enhanced productivity of professional and white-collar workers.
2. Overcoming the shortage of DP professionals.
3. Provision of user-friendly and responsive systems.
4. Overcoming the implementation problems by transferring this process to the user.

System implementation has always been a major problem for developers. If users develop their own systems, clearly the implementation problem goes away.

### 8.2 Who are the End Users?

In general an end-user is anyone who has to interface to a computer who is not employed specifically to do so (*i.e.* is not a data entry clerk or an operator). This includes executives interfacing to EIS facilities, middle managers or technicians who use a PC or a terminal to an on-line system, clerks accessing a central database to download data for local processing, individuals using a PC in stand alone mode for their own work, individuals using a PC in stand alone mode for an activity which the corporate management has decided shall be done by computer (*e.g.* office
automation), clerks interfacing to a computer system which has replaced their manual system (without their having any input) and clerks writing data preparation documents.

Web integration is, however, creating a new class of end-user. S/he is an end-user in one organisation who, through integration (3-tier client / server), has suddenly become a user of a system in another organisation. A further complication is that now a system may have to cope with two different kinds of end-user at the same time. For example the parcel tracking system at FEDEX could be accessed by both a company employee and an external customer, both trying to track a parcel (though not necessarily the same parcel). We may group them into the following categories:

1. Non programming
2. Command level
3. End-user programmers (including senior management professionals)
4. Functional support personnel
5. End user computing support personnel
6. DP Programmers

This list covers a very wide range of personnel carrying out a wide range of tasks throughout organisation - and the list continues to grow.

### 8.2.1 Why are they end-users?

When the large data processing type applications (payroll, inventory etc.) had been developed on large machines, a demand arose for Management Information. The users were potentially sophisticated professionals. As stated above, the traditional IS department development time was too long, and there is a shortage of trained analysts and developers.

IS customers are often dissatisfied with the performance of delivered application systems:

1. These systems often take so long to develop that organisational and/or market requirements have completely changed by the time they are made available to the users.
2. Even though significant care is taken by trained analysts to ensure that user requirements are well defined, it is often the case that misunderstandings occur.
3. The traditional methodologies generally do not allow requirements to be changed during development, whereas in practice, the systems requirements are often unstable, requiring a flexible approach to analysis and design
4. The very fact of the existence of a new system will change the environment in which that system exists, prompting the emergence of changing requirements.
8.2.2 Applications Suitable for End-user Development

Applications suitable for end-user development can be grouped into the following 5 categories:

1. One time enquiries
2. Simple Reports
3. Minor Changes to Reports or Enquiries
4. Presentation of Data in Alternate Forms
5. What if Analyses

Applications not suitable for end-user development:

1. data entry involving organisation files and databases (where the data must be validated for accuracy and reliability)
2. high volumes of transactions, requiring processing efficiency and multiple processing steps
3. use of ‘traditional’ computer languages designed for use by professional programmers, requiring detailed statement of processing procedures and controls
4. changing of data values in existing databases and files
5. applications spanning several departments or divisions in the organisation
6. applications requiring formal documentation
7. applications requiring a long development process
8. applications requiring detailed formal specifications.

8.2.3 Risks in End User Computing

1. **Errors in analysis.** Poorly trained End-users often are incapable of correctly analysing data or systems. Resulting DS software is therefore often of questionable quality.
2. **Lack of documentation.** Most End-users are not trained in formal techniques of analysis and design. Documentation is often inadequate or even non-existent, making maintenance difficult and expensive.
3. **Faulty Model.** Many Decision Support Systems (DSS) rely on corporate models developed by End-users for use with spreadsheets. As these systems are used by senior executives as aids in strategic decision-making, the consequences are not difficult to assess.
8.3 End User Computing Tools

There are 2 major classes of End User Computing tools:

1. application packages
2. fourth generation languages

8.3.1 Application Packages

These are pre-written software packages that are marketed commercially. They are available to support common business functions such as payroll, purchase ledger, sales ledger, production scheduling, inventory control etc. Many of the packages allow for some customization through specification of key parameters (e.g., discount % for prompt payment).

8.3.2 Fourth Generation Programming Languages

These languages allow users to develop their own computer programs and even link a series of them together to form a small system. These languages can be run on most types of computer. There are many classes of fourth generation languages:

1. query language/report writers
2. graphics languages
3. statistical analysis packages
4. decision support/financial modelling tools.

ITQ

Question

Who is an end user?

Feedback

In general an end-user is anyone who has to interface to a computer who is not employed specifically to do so (i.e., is not a data entry clerk or an operator).

Question

Fourth generation languages allow users to develop their own computer programs and even link a series of them together to form a small system. Can you name any two classes of such?

Feedback

There are many classes of fourth generation languages:

1. query language/report writers
2. graphics languages
3. statistical analysis packages
4. decision support/financial modelling tools

8.4 End-User Systems Tools

The following list indicates some of the tools to which end users have access and for which they may need support.

1. **Text and multimedia handling tools** – word processing, desktop publishing, web-publishing, presentation software, document management systems, work-flow management systems;
2. **Data handling tools** – spreadsheets, statistical packages, decision support systems, databases;
3. **Communication tools** – electronic mail, voice over IP, fax, WAP, pagers;
4. **Office automation tools** – diary management, electronic notebooks, directories, project management tools, personal digital assistants, Bluetooth;
5. **Group systems / computer supported collaborative work** – teleconferencing;
6. **Graphic design** – graphic software, computer aided design;
7. **Knowledge management** – expert systems, data mining, information retrieval, intelligent agents.

8.4.1 Supporting the End-User

The organisation of an MIS department centred on the needs of the end-user was covered earlier in the unit. This section looks at some other aspects of end-user support which follow from the above list of models of use.

1. End-user computing now includes general purpose office automation. In order to operate effectively this type of application must include top management and must be supported by top management.
2. Systems are increasingly being used, not by clerks employed specifically for data entry but by staff using them as just another tool in their normal jobs. If the tool is not seen to be effective then it will not be used. It is essential that end users are much more fully integrated into the system design process and that prototyping methodologies are adopted. The most important aspect of the systems design, after functionality and flexibility, then becomes the interface design.
3. The Information Centre concept is directed primarily at those end-users who are using PCs for their own personal work. Users
who are using stand alone PCs as part of their job (eg word processing in the typing pool) must be given detailed training programmes and must be involved in key decisions (eg on what package to standardise or where to site the communal printers). This includes induction training for new staff.

4. A particular problem with the Information Centre concept is where the provision of end-user support has been contracted out to a third party, either as a straightforward outsourcing deal or because the software being used has been provided by a third party and the third party is providing the help to the users of that software.

5. Users of external information sources need as much support as those in (c). They tend to get forgotten since, usually, they are difficult to track.

6. Packages such as decision support software (eg mathematical modelling, decision support trees, etc) may get omitted if not carefully targeted.

7. It is not possible to provide training for end-users who are not members of the “company” (ie the general public). It is essential, therefore, that any user interface is both “naïve user” and security proof, as well as being simple to use. It is important also that any device to be used by the general public provides added-value. If it does not then it will not be used.

8. New technologies (eg Web Services) are emerging all the time. A programme of education is as important as any training.

8.4.2 The Models of End-User Systems

The above discussions of end-users identify clearly the different kinds of end-user system provision. They may be summarized as follows (the word terminal is used here to distinguish a local facility on which no local processing is done from one on which local processing is done - the form of the device is irrelevant):

1. On-line terminal for specific information provision;
2. On-line terminal for general information provision (eg a terminal to an on-line database such as LEXIS);
3. On-line terminal used as part of a self-organising group activity, either via a terminal to a mainframe or through a LAN (eg diary management, document preparation);
4. On-line terminal which is being used as part of a wider corporate system, such as the manager’s terminal in one store of a department store chain or an order entry terminal in an on-line transaction processing system such as a booking system;
5. APC which is being used for an individual’s own work, which may (at some times) be used as a terminal in any of the above ways (the manager in the department store may be doing...
spreadsheet work as well as reconciling the days takings) - this is the conventional client/server situation;

6. as (d) but where the PC is completely stand alone and, probably, used only for a single task such as word processing;

7. a sophisticated workstation such as a graphics design workstation, where there is interaction with other users but where the operation is more akin to (b) than to (d);

8. a small computer, such as a notebook, used either for mobile use (eg British Gas manuals) or intermittently (eg a travelling salesperson);

9. devices operated directly by the public, such as an ATM or a kiosk;

10. general purpose terminals, as in (b) or (d), but where the end-user is a member of the public.

**ITQ**

**Question**

Pagers are examples of communication tools. True or false?

**Feedback**

Communication tools – electronic mail, voice over IP, fax, WAP, pagers.

### 8.5 The Information Centre

One major requirement which is now needed is support for that class of end-user that is working alone but on a task which is strategic to the organisation. This is normally provided in the form of an Information Centre, which is both a place (often known as the “help-desk”) and a group of people. The Information Centre owes its existence to the problems which end users created when PCs first came into offices about fifteen years ago. Now the role has more to do with establishing and enforcing the role of PCs in meeting the IT strategy than just supporting the end-user. For example, the information centre must take the lead in ensuring that personal computers are not the Achilles heel when it comes to data protection.

The concept of the Information Centre was launched early in the 1980s when end-users were quite naive. Today, a number of organisations are establishing “self-help” groups from among the more sophisticated of their users. Unless the members of the group are “hybrids”, however, they are still going to need considerable IT technical expertise to back them up. With the emergence of the Web and the Intranet much of the work of the Information Centre can be replaced by a suitably designed Intranet Site. On the other hand, access by customers and access by
employees of other organisations demands a much higher level of involvement in the support provided. Full details of the background to and the operation of an Information Centre are as follows.

8.5.1 Problems

It became clear very quickly that the managers had bought something that they didn’t understand and either had to discard the machine (as happened in many schools who were encouraged by government to acquire computers) or had to be supported to get the most out of their purchases. The particular problems which were posed for the organisations into which these PCs had been introduced were:

1. Lack of standardisation between the various purchases leading to:
   i. inability to share data;
   ii. no economy of scale in purchasing;
   iii. a variety of requirements for maintenance, in the few cases where the problem had actually been considered.

2. Lack of control over the requirements of legislation, such as software copyright, data protection, health and safety and the specific legal constraints covering the organisation.

3. Demands for assistance with:
   i. systems analysis and design;
   ii. programming;
   iii. software procurement;
   iv. sizing - machines which have been purchased but are too small for the job
   v. maintenance;
   vi. fall-back;
   vii. lack of documentation;
   viii. data security;
   ix. environmental control;
   x. file conversion and data acquisition;
   xi. data organisation.

8.5.2 Defining the Information Centre

The term “Information Centre” was conceived by IBM as a way to support not only PCs but also those users who wished to obtain, and process (possibly using fourth generation languages), data which was held on a central corporate database. The Information Centre was to be: “A small group of specialist personnel whose brief is ‘to support and promote the use of personal computing throughout the organisation’”. In particular the Information Centre would:

1. support personal computing using PCs or 4GLs by:
   i. offering advice and support to the individual;
ii. defining standards and undertaking corporate activities 
   \((e.g.\) arranging maintenance) for the organisation;

2. organise and supply data to the individual either from the 
corporate database or from national or international databases.

8.5.3 The Physical Centre

The Information Centre would be a physical entity, not just a conceptual 
entity. There would have to be a location to which people could go for 
advice and demonstrations. The Centre would consist of:

1. A physical centre, which would have:
   i. a reception area with a desk or window at which to 
      receive enquiries;
   ii. a demonstration room equipped with a variety of up to-
      date PC equipment and software;
   iii. a library with software and documentation;
   iv. offices for a manager and systems analysts;
   v. a workshop for technicians.

2. A group of staff comprising:
   i. an Information Centre manager;
   ii. receptionist(s)/secretary;
   iii. librarian/demonstrator;
   iv. a small group (say 3) of analysts/programmers
   v. a small group (say 2) of technicians.

The exact composition of the staff would depend on the size and the 
physical structure of the organisation. The above would be appropriate 
for a single site organisation with a turnover of about £M100 per annum.

8.5.4 Management Structure

In organisations where the Computer Centre already reports directly to 
the Board \((i.e.\) there is a Chief Information Officer) the Information 
Centre is normally part of the Computer Centre.

In organisations where the Computer Centre reports to some other 
function \((e.g.\) finance) the Information Centre is usually independent and 
reports directly to the Board. A structure which is becoming common 
now is for the Chief Information Officer (a Board level appointment) to 
be responsible for:

i. a strategy group;
ii. the Information Centre, and
iii. the Computer Centre.

This arrangement allows the end-users to see the Information centre as 
independent from the Computer Centre, yet still provide a co-ordination 
mechanism.
8.5.5 Skill Requirements
The kind of skills needed by computer professionals in the Information Centre is quite different from those working in the conventional data processing department. A deep knowledge of software packages, communications, contract matters and trouble shooting is more important than information gathering, although conventional analyst or technician skills are required to some degree.

8.5.6 System Development
Panko identifies five environments in which development for end-user computing is taking place. These vary from DP systems through single-user systems that can be bought off the-shelf to systems, which are developed specifically for departments.

1. Environment 1 - conventional DP systems.
2. Environment 2 - one-off PC applications.
3. Environment 3 - large end-user projects in which several people are going to use a system, some of whom might be outside the sponsoring department - the development would still be done by the end users themselves.
4. Environment 4 - large end-user projects which have to be delegated to computer specialists to develop.
5. Environment 5 - departmental systems.

All this does, however, involve the development of systems specifically for end-users. Remember that end-users must be involved, through participative design, in any systems in environments one or five.

ITQ

Question:
Information center is both a place and a people. True or false?

Feedback:
The statement is true. An Information Centre is both a place (often known as the “help-desk”) and a group of people from which information can be sourced.

Study Session Summary
In this Study Session, you looked at the end-user computing (EUC). You began by explaining the user written components. You also described what an end-user computing is. You furthered the discussion by pointing-out who an end-user is. Also, you discussed the end user
computing tools and system tools. The session came to an end with an explanation on the information center.

Assessment

SAQ 8.1 (Tests learning objective 8.1)
Who is an end user?
Define the term end-user development

SAQ 8.2 (Tests learning objective 8.2)
What are the important roles of EUC

SAQ 8.3 (Tests learning objective 8.3)
Enumerate some of the end user development tools that you know

SAQ 8.4 (Tests learning objective 8.4)
Can you highlight some models of end user tools?

SAQ 8.5 (Tests learning objective 8.5)
What do you understand by information centre?

Bibliography

Study Session 9

Networks and Telecommunications

Introduction

In this study session, you will discuss networks and telecommunication. You will also explore the telecommunication revolution and the information superhighway. In addition, you will describe the components of telecommunication system. You will thereafter explain enterprise networking and standards. Finally, you will look at the challenges of managing enterprise networking.

Learning Outcomes

When you have studied this session, you should be able to:

9.1 discuss the telecommunications revolution
9.2 highlight the telecommunication system components
9.3 explain the enterprise networking and standards
9.4 highlight the challenges of managing enterprise networking

Terminology

<table>
<thead>
<tr>
<th>Protocols</th>
<th>The special set of rules that end points in a telecommunication connection use when they communicate. Protocols specify interactions between the communicating entities.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data conferencing</td>
<td>A communication session among two or more participants sharing computer data in real time.</td>
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</table>

9.1 The Telecommunications Revolution

Anytime, anywhere, any way is the mantra of many computer users. Improving telecommunications technologies, the process of electronically communicating information, are making it possible. Talking about the marriage of computers and communications, you simply can’t pick up a newspaper or magazine or watch television without hearing about the explosion of telecommunications and networks. Some experts point to the early 1990s and the breakup of the AT&T monopoly as the turning point in this revolution. That one incident, along with the growth in personal
computers since then, could very well be how all this started. Those two forces now seem to be changing every facet of our lives.

9.1.1 The Information Superhighway

You can hardly keep up with the mergers and acquisitions in the telecommunications and entertainment industries. Many people compare the present-day Information Revolution to the Industrial Revolution at the turn of the 20th century. You can easily draw many parallels between the two. When most people think of the information superhighway, they immediately think of the Internet. But the many networks developed by private corporations and public entities are also part of the superhighway. All these networks together are creating what some pundits call “the death of distance.” People and companies are developing whole new ways of working, playing, learning, and communicating. We need to know how these networks are actually constructed and discuss the various elements involved in connecting all these computers. Knowing how it all works can give you insight into the changes that have taken place and an idea of what the future holds.

9.1.2 Components and Functions of a Telecommunications System

The following Figure shows the hardware and software components of a telecommunication system.

![Figure 9.1: Components of a Telecommunications System](Source: Prentice Hall PowerPoint Presentation, 2003)

We’ll be explaining how the pieces fit together throughout this unit
9.1.3 Components of a telecommunications system

Remember that data moving across the Internet and other networks are not limited to text, but also include video, audio, and pictures. This fact alone explains many of the mergers between telecommunications companies and entertainment companies. They are starting to understand that there is a whole new way of delivering not just information, but also entertainment via networks.

9.2 Telecommunications System Components

Some people look at networks simply as one computer hooked to another by a piece of wire. Networks are a little more involved than that: There are many, many pieces of equipment between those two computers: look again at Figure 9.1. The major element that gets all the hardware and software working together is the protocols. Protocols are used to tell the hardware components how to transmit data within a network and between networks. They can also be thought of as a set of rules and procedures for exchanging information between computers in networks. They define how the various communication links are established, how information is transmitted, and how errors are detected and corrected between networks. Most important, the use of protocols allows different makes and types of computers to talk to each other.

Protocols are usually embedded in the software for the particular application that you want to use to complete a function on the network. If you’ve used the Internet at all, you’ve used protocols but probably didn’t even realize it. Do these sound familiar?

1. Hypertext Transfer Protocol or http, used for the Web
2. Simple Mail Transfer Protocol or SMTP, used for email
3. File Transfer Protocol or FTP, used to transfer files between one computer and another computer
4. Transmission Control Protocol/Internet Protocol or TCP/IP, used to connect networks

TCP/IP is the protocol that allows you to access the Internet itself through your Internet service provider or a direct connection through your school or workplace. We noted that many companies are building interfaces to their databases that allow employees to pull data from dissimilar systems and assimilate them into a coherent output form. The use of the Internet Protocol within software programs is what allows that to happen.
9.2.1 Types of Signals: Analog and Digital

Note that the computer understands only zeros and ones. Everything going into a computer system must be transformed into digital signals. In the networking world, however, most of the data are transmitted over telephone lines. These lines don't recognize zeros and ones. They only understand what are called analogue signals. To change the signals back and forth between analogue and digital transmission methods, you need a modem.

The purpose of a modem (modulator/demodulator) is to:

1. Change digital signals from computers to analogue signals that telephone lines can carry
2. Change analogue signals back to digital signals that the computer can understand

9.2.2 Communication Channels

A channel is the facility through which information is transmitted between physical locations in a network. That’s just a fancy way of saying that a channel is the highway on which data travel. When the telecommunication companies want to wire a building, generally they run one major line from the main fiber optic cable to the building. Then they can hook up individual computers and telephone lines within that building. When you do the same thing with individual homes, costs increase dramatically.

All the transmission channels discussed in this section combine to give you what seems to be a single clear channel from one physical location to another physical location. In fact, it is very likely that when you access the Internet and call up the Gardening Web site, you are using a combination of twisted wire, fibre-optic cable, microwave stations, and satellites to get from your computer to the other computer. When you transmit the latest information from the Garden.com Web site to your personal computer, the speed at which it moves across all the transmission media is measured in bits per second (BPS) or the baud rate. The bandwidth of a communication channel is measured by the difference between the highest and lowest frequencies that can be transmitted by that channel.

9.2.3 Communications Processors and Software

In most cases you won’t use front-end processors, multiplexers, concentrators, or controllers on your personal computer. These pieces of equipment are used on larger networks and are reserved for the techies. They are interesting pieces of the puzzle, though, so let’s go ahead and look at them. Sometimes the host computer on a large network gets overloaded processing data, monitoring transmissions, controlling the
system, etc. That’s where front-end processors come in handy. Front-end processors don’t store data or application programs. You can’t use them for general computing. This type of computer does nothing but process the electronic transmissions between computers on a network system. It’s there to relieve the host computer from transmission processing so the host can serve your basic computing needs. A Concentrator is a telecommunications computer that collects data signals and holds them. When enough signals are collected, the computer sends them on to the host as a batch. A controller computer simply processes signals between the CPU and terminals, printers, or other peripheral devices attached to the network.

Multiplexers are similar to front-end processors, but their location inside the network is different. Let’s use a hypothetical situation that is becoming more and more common in businesses throughout the world. Suppose your local bank was bought out by a big bank in Ibadan. How can that be? Oh well, you sigh, how will I be affected? Probably not much. The local branch will still exist but will be electronically connected to the big bank. The home office will install a small network of computers, let’s say 10 terminals, in the local branch.

Remember that each computer in a network must be connected to the other computers in the network and in turn, each computer must be connected to the host computer in the center of the network. Does it make sense for each of the 10 terminals to be separately wired to the host computer in Ibadan? You’d have to use a separate telephone line for each computer - that’s 10 telephone lines. Typically each terminal will only be used a small portion of the day. So if terminal 1 is transmitting only a few times a day, and terminal 2 is transmitting only a few times a day, and terminal 3 is..... Well, you get the idea. What the Ibadan bank will do is to install a multiplexer component in the branch to which each of the 10 terminals will be connected. The multiplexer gathers the signals from each terminal and transmits them to the Ibadan bank over a single transmission line. Now you’re talking efficiency.

Routers

How does your Internet Service Provider manage to send your email to the right place? We’re talking millions and millions of people sending email every day. If you ever noticed, each computer user connected to a network has a separate, individual address. No two addresses are exactly the same. All of these addresses are stored on various computers placed around the networks. Software stored on routers uses these addresses to route the data to the right location. Routers use protocols to help route data around the many networks to get them to their correct destination. Routers also allow different types of computers on the various networks to “talk” to each other. If you are using a PC with a Windows 98 operating system, and you want to send an email to someone who is using
a Macintosh computer with the MAC operating system, you can do that because of the router. Still puzzled? See if this helps: You own a LG television set hooked up to a cable service. Your neighbour owns a Sony television set and uses a satellite to receive programming. How is it that both of you can receive “Star Sports” at the same time? “Back-office” technology allows the signals to be adapted to various makes and models of televisions and to the varying methods of sending those signals through to your television. That’s what routers do on a data network. The system of routers and associated transmission media form what’s known as a network backbone. Think of your own body. Without your backbone, you’d have a tough time standing, sitting and moving. That’s similar to a network backbone. All the computers, physical wires, wireless media, processors and software come together in a network backbone to give us a whole new way of communicating.

Protocols are the rules used in networks to ensure that transmissions can pass between the various components. Communication channels consist of wired and wireless media. Processors and software are combined with the protocols and transmission media to form a network backbone. Many small networks can be connected to form larger networks, which in turn can be connected to the Internet.

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<th>ITQ</th>
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<tr>
<td><strong>Question</strong></td>
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<tr>
<td>What do you understand by network backbone?</td>
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<tr>
<td><strong>Feedback</strong></td>
</tr>
<tr>
<td>The system of routers and associated transmission media form what’s known as a network backbone.</td>
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</table>

### 9.3 Enterprise Networking and Standards

It’s likely that as a company grows, so will its networking capabilities and needs. Through enterprise networking, a company can build a new network and connect it to existing, separate networks. We noted earlier how different types of computers can be connected through the use of software so that you don’t have to replace your current computers. One way that companies are increasing and improving their current system technology without purchasing all new information systems is through the use of TCP/IP protocols. Companies can create interfaces for different databases to access information without actually combining the data physically in one huge computer. They do so through the use of the Internet protocol (IP). Using this protocol, they can reduce the disruption to the organization and decrease the overall costs of adding to their networks.
9.3.1 Connectivity and Standards

Typically, individuals connect to the Internet through an Internet service provider. However, businesses have to create their own networks. In order to compete, organizations must create their own proprietary networks and measure how well their computers and computer-based devices communicate and share information. This measurement is called **connectivity**. Computer users often lament the fact that it’s difficult to share data between different platforms. Most of this problem is resolved through **open systems**: non-proprietary operating systems, user interfaces, and networking protocols. Open systems allow users to exchange data and information easily and efficiently without worrying about the type of hardware used on the individual computers.

9.3.2 Facilitating Applications

What most businesses are starting to realize is that E-commerce is more than just throwing a nice-looking Web page with fancy graphics out on the Internet. You have to build new processes or change your existing methods. But it is extremely difficult to merge the old, traditional methods with the needs of the Internet. For instance, if you take orders for your business through email, who is going to monitor the email and process the orders? If you establish teleconferencing and data conferencing as a way of reducing travel costs and increasing collaboration with distant locations, what kind of equipment do you need and who will be responsible for maintaining that equipment? In fact, it may very well be more expensive to establish an E-commerce operation than to create or grow an “old-fashioned” business.

Often E-commerce and E-business includes the capability of teleconferencing, data conferencing, and videoconferencing with employees or customers around the world. These may sound like the same technology, but they aren’t. Here’s the difference:

1. **Teleconferencing**: basic technique of conferring simultaneously via telephone or email groupware
2. **Dataconferencing**: teleconferencing coupled with the additional capability of working on the same document or data simultaneously
3. **Videoconferencing**: teleconferencing with the additional capability of viewing participants on video screens
4. **Groupware**: allows many people to work collaboratively across the room or across the World.
9.3.3 Electronic Data Interchange and Electronic Commerce

Electronic Data Interchange (EDI) allows two businesses to send documents to each other electronically instead of using the old-fashioned paper trail. While EDI does decrease the cost of manual systems and greatly reduce the chances of error, it is more expensive to set up than a Web-based system. Both ends of the EDI must have the equipment and software to handle the system and people must be trained in its use. These requirements have made EDI cost-prohibitive for small companies: they are essentially locked out of the opportunity to do business electronically with customers and suppliers. Web based commerce is much easier for smaller companies because of the use of standard software and because they don’t necessarily have to purchase special equipment or software. We’ll look at Web-based or Internet-based E-commerce more closely in the next lesson. The cost of doing business on the Internet is not easily apparent. Many organizational changes must be made which add to the bottom line. E-commerce and E-business involve more technologies than just computers: tele-, data-, and videoconferencing are vital elements of doing business electronically. Email is the most widely used service on the Internet. Businesses must consider using all available technologies and resources when tackling E-commerce and E-business.

ITQ

Question
What is the most widely used service on internet?

Feedback
Email is the most widely used service on the Internet.

9.4.1 The Challenge of Managing Enterprise Networking

As technology invades every facet of our lives, both at work and personally, the average person is becoming well versed in its use. Most of the time you, as a manager, can leverage this to your advantage. After all, what Joe in Production learns on his home computer can very well be incorporated into his computer use at work. However, you increasingly run the risk of renegades creating databases and programs that are incompatible with the rest of your system. It can cost you and the rest of the company a lot of time and money to rein in their efforts and ensure cohesion throughout the organization. You do have to give the end users some latitude, though, so they don’t feel stifled by the system. You just
need to impress upon everyone the need to stay in touch with the rest of the organization and the fact that information is a companywide resource.

Organizational issues come into play when you are establishing or changing work methods in conjunction with networks and especially E-Commerce. Organizational cultures are powerful forces that you have to deal with and that have a pervasive influence on any organizational change. It becomes very evident with networks that there are a lot of hidden costs. You can’t just count the dollar cost of the necessary hardware and software. You have to consider the disruptions to everyday work while you’re establishing the network. What about the extra training users require? It’s not free! And you have to hire new people who have the expertise to build and maintain the network. While we’re talking about costs, what about the money you could lose if the network quits working (downtime) or its security is compromised? The more complex your network, the more costly it will be. Not just to build it, but to fix it when it breaks down.

You, as a manager, have the responsibility to manage your enterprise networking operations just as you would any other operation. You have to:

1. **Manage the changes.** These include reengineering the business processes taking place behind the scenes and the organizational changes affecting the people.
2. **Train the people.** Include both the Information Technology staff and the end users in your plan.
3. **Manage data as a vital organizational resource.** Determine your organization’s vital data, who will be responsible for them, who will have access, and how you will determine accuracy and viability.
4. **Plan for the future.** Hopefully your business will grow and so too should your network. Too often managers allow the network to lag behind the rest of the business; don’t be one of them.

### 9.4.1 The Telecommunications Plan

Just as you plan for new opportunities in other areas of your company, you should have a telecommunications plan that spells out how technology can enhance your operations, increase your competitiveness and meet your customers’ needs and wants. Approaching enterprise networking haphazardly will cost you time and money. Where do you start? First, inventory your current equipment, your current processes, and your current needs. Determine where you are before you try to figure out where you’re going. Then investigate opportunities your organization can take advantage of using networking technologies.

Your plan should mesh with your overall business plan to provide support for your organization. Compare where you are presently in your core
business processes and where you want to go. How well does your telecommunications plan meet your business needs? You might be surprised to find through careful analysis and comparison that the two conflict.

Finally, take a look at the potential for telecommunications to affect your organization. By giving your sales force better networking equipment, could you reduce the time it takes to process an order? If you increase the efficiency of your network, is it possible to increase the number of loan applications processed by each employee?

9.4.2 Implementing the Plan

Now that you know where you’re going, how are you going to get there?

To summarize the text:

1. Determine the necessary topology: LAN, WAN, VAN, or Network Services
2. Determine the type of services offered: Voice mail, email, teleconferencing, data conferencing
3. Determine the type and level of security: private lines, dedicated leased lines, public lines
4. Determine the accessibility: multiple access for a thousand workers or limited access for a small number
5. Determine the utilization: high-frequency, high-volume, low frequency, low-volume
6. Determine the cost: include development, operations, maintenance, expansion, and overhead
7. Determine the installation difficulties: transmission media, hardware, software, and persware
8. Determine the connectivity standards: getting all the pieces to work together

**ITQ**

**Question:**
The possibility of two or more people collaborating from different countries is hinged on ________

**Feedback**
Groupware allows many people to work collaboratively across the room or across the World.
Study Session Summary

In this study session, you discussed networks and telecommunications. You also explored the telecommunication resolution, the information super highway, the components and functions of telecommunication systems and management issues and decisions.

Assessment

SAQ 9.1 (Tests learning outcome 9.1)
1. What forces led to the revolution in telecommunication
2. What do you understand by the term information superhighway?

SAQ 9.2 (Tests learning outcome 9.2)
Electronic signals are categorized into two, name them.

SAQ 9.3 (Tests learning outcome 9.3)
In what ways can one manage enterprise network operations

Bibliography


Study Session 10

Transaction Processing System

Introduction

In this study session, you will be looking at the Transaction Processing System. You will begin by giving the meaning transaction processing system. Thereafter, you will highlight the different types and characteristics of the TPS. You will hence, end the session by highlighting the processes of the transaction processing system.

Learning Outcomes

When you have studied this session, you should be able to

10.1 define transaction processing systems
10.2 highlight the processes of transaction processing system

10.1 Meaning of Transaction Processing Systems

Transaction processing systems were among the earliest computerized systems. Their primary purpose is to record, process, validate, and store transactions that take place in the various functional areas of a business for future retrieval and use. A transaction processing system (TPS) is an information system that records company transactions (a transaction is defined as an exchange between two or more business entities). Transaction processing systems (TPS) are cross-functional information systems that process data resulting from the occurrence of business transactions. Transactions are events that occur as part of doing business, such as sales, purchases, deposits, withdrawals, refunds, and payments. Transaction processing activities are needed to capture and process data, or the operations of a business would grind to a halt.

Let us look at a simple example of a business transaction. McDonald’s, which sells a large number of hamburgers every day, orders raw materials from its suppliers. Each time the company places an order with a supplier, a transaction occurs and a transaction system records relevant information, such as the supplier’s name, address, and credit rating, the kind and quantity of items purchased, and the invoice amount.
10.1.1 Types of Transactions

Note that the transactions can be internal or external. When a department orders office supplies from the purchasing department, an **internal transaction** occurs, when a customer places an order for a product, an **external transaction** occurs.

1. **Internal Transactions**: Those transactions, which are internal to the company and are related with the internal working of any organization. For example Recruitment Policy, Promotion Policy, Production policy etc.

2. **External Transactions**: Those transactions, which are external to the organization and are related with the external sources, are regarded as External Transaction. For examples sales, purchase etc.

**ITQ**

**Question**
Recruitment policy is a form of internal transactions, true or false?

**Feedback**
Recruitment policy is done within the organisation, so it is internal

10.1.2 Characteristics of Transaction Processing Systems

1. A TPS records internal and external transactions for a company. It is a repository of data that is frequently accessed by other system

2. A TPS performs routine, repetitive tasks. It is mostly used by lower-level managers to make operational decisions

3. Transactions can be recorded in batch mode or online. In batch mode, the files are updated periodically; in online mode, each transaction is recorded as it occurs.

4. There are six steps in processing a transaction. They are data entry, data validation, data processing and revalidation, storage, output generation, and query support.

10.1.3 Features of TPS

1. A TPS supports different tasks by imposing a set of rules and guidelines that specify how to record, process, and store a given transaction. There are many uses of transaction processing systems in our everyday lives, such as when we make a purchase at retail store, deposit or withdraw money at a bank, or register for classes at a university. Almost all organizations, regardless of
the industry in which they operate, have a manual or automated TPS

2. A TPS is the data life-line for a company because it is the source of data for other information systems, such as MIS and DSS (Decision Support Systems). Hence, if the TPS shuts down, the consequences can be serious for the organization.

3. A TPS is also the main link between the organization and external entities, such as customers, suppliers, distributors, and regulatory agencies.

4. TPS exist for the various functional areas in an organization, such as finance, accounting, manufacturing, production, human resources, marketing, quality control, engineering, research and development. Until a few years ago, many companies viewed the TPS for each business function as a separate entity with little or no connection to other systems in the company. Today, however, many companies are trying to build cross-functional TPS to promote the free exchange of information among different business units. This is a desirable goal, but is still very difficult to achieve.

**ITQ**

**Question**

MIS is dependent on TPS for its data. True or false?

**Feedback**

TPS is the data life-line for a company because it is the source of data for other information systems, such as MIS and DSS (Decision Support Systems). Hence, if the TPS shuts down, the consequences can be serious for the organization. Therefore, the above statement is true.

### 10.2 Process of Transaction Processing System

The seven steps in processing a transaction are:

1. Data entry
2. Data Capture
3. Data validation
4. Processing and revalidation
5. Storage
6. Output generation
7. Query support

To be processed, transaction data must first be entered into the system. There are a number of input devices for entering data, including the
keyboard and the mouse. Documents generated at the point where a transaction occurs are called source documents and become input data for the system. For example, when a customer returns an item at a store, the sales receipt becomes the source document for the transaction “return item for refund”. An ATM receipt for a bank transaction becomes.

10.2.1 Data Entry

To be processed, transaction data must first be entered into the system. There are a number of input devices for entering data, including the keyboard and the mouse. Documents generated at the point where a transaction occurs are called source documents and become input data for the system. For example, when a customer returns an item at a store, the sales receipt becomes the source document for the transaction “return item for refund”. The use of automated methods of data entry is known as source data automation. Several methods have been developed to accomplish this automation, though very few completely automate the data entry process. They are all based on trying to reduce or eliminate many of the activities, people and data media required by traditional data entry methods.

Methods for Data Entry

1. Keyboard/video display terminals
2. Optical character recognition (OCR) devices, such as optical scanning wands and grocery check-out scanners.
3. Magnetic ink character recognition (MICR) devices, such as MICR reader/sorters used in banking for check
4. Other technologies, including electronic mice, light pens, magnetic stripe cards, voice input, and tactile. Input also be used as input device depending upon the application requirement.

10.2.2 Data Capture

We could capture transaction data as close as possible to the source that generates the data. Salespersons capture data that rarely changes by prerecording it on machine-readable media, or by storing it on the computer system.

Tips for Data Capturing

1. Capture data by using machine-readable media initially (barcoded and magnetic stripe credit cards), instead of preparing written source documents
2. Captures data directly without the use of data media by optical scanning of bar codes printed on product packaging. It ensures the accuracy and reliability of data by comparing
10.2.3 Data Validation

There are two steps in validation: **error detection and error correction**, Error detection is performed by one set of control mechanisms, error correction is performed by another. Some commonly used error detection procedures are checking the data for appropriate font (text, numbers, etc.), checking for aberrations (values that are too low or too high), and checking for missing data, invalid data, and inconsistent data. Missing data refers to fields that are missing a mandated data value. For example, if the number of hours worked by a part-time employee is missing on a payroll form; that is a missing-data error.

**Invalid data** is data that is outside the range. For example, if the number of hours worked by a part-time employee is 72 hours per week instead of the 1120 hours, then we have invalid data.

**Inconsistent data** means that the same data item assumes different values in different places without a valid reason.

10.2.4 Processing and Revalidation

Once the accuracy and reliability of the data are validated, the data are ready for processing. There are two ways to process the transactions: online and batch mode. Following methods are available for Data Processing:

1. **Online transaction processing** (OLTP) is the almost instantaneous processing of data. The term *online* means that the input device is directly linked to the TPS and therefore the data are processed as soon as it is entered into the system. Input device may be at a remote location and be linked to the system by networks or by telecommunications systems. Some examples of online transaction processing are ATM transactions, student registration for classes. The processing of flight reservations is another good example of an online system in which data are processed. A travel agent checks for seat availability, using the data in a central computer system, and lately notifies the customer as to the status of his or her ticket. Once the reservation is made, the airline system updates its files and sends a confirmation to the travel agent. Online processing is possible because of storage, such as disks, that process data in a random order.

2. **Batch Processing**, in which transactions are accumulated over time and processed identically. Batch processing may be done on a daily, weekly, or monthly basis or any other time period appropriate to the application. For example, a company may process the travel expenses of its employees on a monthly basis, whereas Bath processing usually involves. Gathering source
documents originated by business transactions, such as sales orders and in-voices, into groups called batches. Recording transaction data on an input medium, such as magnetic disks or magnetic tape. Sorting the transactions in a transaction file in the same sequence as the records in a sequential master file. A transaction file contains information about a group of transactions that occurred in a given period of time. It is processed using techniques such as sorting, merging, and so on. Once the transaction file has been processed, the next step is to update the master file, which is permanent record of all transactions that have occurred. Each time the master file is updated with information from the transaction file, a new master file, including most current transaction data, is generated. Although until the early 1960s batch processing was the only method for processing data, today there are other methods. However, batch processing continues to be a popular method because it is often the most sensible and practical approach. For example, batch processing lends itself well to payroll operations, since pay checks are generated periodically. Processing jobs in batches also results in more efficient use of computer resources. Finally, quality control is sometimes easier in batch processing, since errors detected at the end of a batch can be rectified before the next batch is processed.

10.2.5 Data Storage

Processed data must be carefully and properly stored for future use. Data storage is a critical consideration for many organizations because the value and usefulness of data diminish if data are not properly stored. The kind of processing and the type of storage medium are, to some extent, related issues. For example, magnetic tape is often used to store data that is Batch processed. However, online transaction processing cannot be done on magnetic tape; it relies on other types of storage media, such as magnetic disks. The next step in the processing of a transaction is to output the results of the transaction to the decision maker. Note that storage and output may not always occur in the same order. We can output the results of the transaction to the decision maker and then store them, or store the result and then output them to the decision maker.

10.2.6 Output Generation

Once data has been input, validated, processed, revalidated and stored, the output can be communicated to decision makers in two ways:

1. Documents and reports
2. Forms: screens or panels.
Documents are a popular output method. They can be processed further, either to generate additional information or to present the same information in a different format. Some examples of documents are invoices, pay checks, purchase, invoices, sales receipts, and job orders.

What then is the difference between documents and reports? A document is usually a record of one transaction, whereas a report is a summary of two or more transactions. For example, the manager of a retail store may receive an invoice (i.e., a document) from a supplier indicating the quantity and type of each item ordered and the total cost of the order. A report, on the other hand, may summarize all the invoices from a given supplier. Computer output need not always be presented in hard-copy form (such as reports, documents, and printouts), but can also appear on computer screens and panels. Such soft-copy presentations are known as forms.

10.2.7 Query Support

The last step in processing a transaction is querying (asking questions of) the system. Query facilities allow users to process data and information that may otherwise not be readily available. For example, a sales manager may query the system ‘find the number of damaged items in a given store’. Many transaction processing systems allow you to use the Internet, intranets, extranets, and web browsers or database management query languages to make inquiries and receive responses concerning the results of transaction processing activity. Typically, responses are displayed in a variety of pre-specified formats or screens. Examples of queries include:

1. Checking on the status of a sales order
2. Checking on the balance in an account
3. Checking on the amount of stock in inventory

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<tr>
<td><strong>Question:</strong></td>
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<tr>
<td>What do you understand by inconsistent data</td>
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<td><strong>Feedback:</strong></td>
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<td><strong>Inconsistent data</strong> means that the same data item assumes different values in different places without a valid reason.</td>
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</table>
Study Session Summary

In this study session, you described the Transaction Processing System. You began the session by explaining what the TPS means. Thereafter, you described the different types and characteristics of the Transaction processing unit. You brought the session to an end by discussing the various process of the TPS.

Assessment

SAQ 10.1 (Tests learning outcome 10.1)
1. Define the term transaction processing system
2. List the types of transaction

SAQ 10.2 (Tests learning outcome 10.3)
List the characteristics of transaction processing system

Bibliography

Study Session 11

Decision Support System

Introduction

In this study session, you will be looking at the Decision Support System. You will begin by discussing the relationship between managers and the DSS. Going further, you will describe the framework of the Decision Support system. Also, you will highlight the different types of DSS. You will end the session with a discussion on components of DSS and the web-based DSS.

Learning Outcomes

When you have studied this session, you should be able to:

11.1 explain the relationship between managers and DSS
11.2 highlight the types of DSS
11.3 list the components of DSS
11.4 describe web-based DSS

Terminology

| LAN | A local area network (LAN) is a group of computers and associated devices that share a common communications line or wireless link to a server. |
| EIS | An environmental impact statement (EIS), under United States environmental law, is a document required by the National Environmental Policy Act (NEPA) for certain actions "significantly affecting the quality of the human environment". |

11.1 Managers and DSS

In order for decision makers to make quality decisions, they should, to the best of their abilities by:

1. thoroughly check a wide range of alternatives
2. gather full range of goals and implications of choices
3. weigh costs and risks of both positive and negative consequences
4. intensively search for new information for evaluating alternatives
5. take all new information into account, even when it doesn’t support initial course of action
6. re-examine positive and negative consequences of all alternatives, including initially rejected ones
7. make detailed provisions for implementation, including contingency plans for known risks

When we discussed Transaction Processing Systems and Management Information Systems, the decisions were clear-cut: “Should we order more raw materials to support the increased production of our product?”

Most decisions facing executives are unstructured or semi-structured: “What will happen to our sales if we increase our candy bar prices by 5%?”

**Decision Support Systems (DSS)** help executives make better decisions by using historical and current data from internal Information Systems and external sources. By combining massive amounts of data with sophisticated analytical models and tools, and by making the system easy to use, they provide a much better source of information to use in the decision making process. Decision Support Systems (DSS) are a class of computerized information systems that support decision-making activities. DSS are interactive computer-based systems and subsystems intended to help decision makers use communications technologies, data, documents, knowledge and/or models to successfully complete decision process tasks.

**DSS and MIS**

In order to better understand a decision support system, let’s compare the characteristics of an MIS system with those of a DSS system:

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<th>DSS</th>
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<td>Un-structured decisions</td>
</tr>
<tr>
<td>Semi-structured</td>
<td></td>
</tr>
<tr>
<td>Reports based on routine flows of data</td>
<td>Focused on specific decisions / classes of decisions</td>
</tr>
<tr>
<td>General control of organization</td>
<td>End-user control of data, tools, and sessions</td>
</tr>
<tr>
<td>Structured information flows</td>
<td>Emphasizes change, flexibility, quick responses</td>
</tr>
<tr>
<td>Presentation in form of reports</td>
<td>Presentation in form of graphics</td>
</tr>
<tr>
<td>Greater emphasis on models</td>
<td>Assumptions, ad hoc queries</td>
</tr>
</tbody>
</table>
Traditional systems development | Develop through prototyping; iterative process

You can also understand the differences between these two types of systems by understanding the differences in the types of decisions made at the two levels of management. Are your decisions routines, or are your decisions non routines? You might find it helpful to review the information about decision making processes from the previous lesson.

**ITQ**

**Question**

DSS and MIS are similar in terms of there presentation formats, true or false?

**Feedback**

MIS presentation is in form of reports while DSS presentation is in form of graphics

**11.1.1 Framework of Decisions Support Systems**

A conceptual framework for Decision Support Systems (DSS) is developed based on the dominant technology component or driver of decision support, the targeted users, the specific purpose of the system and the primary deployment technology. Five generic categories based on the dominant technology component are proposed, including Communications-Driven, Data-Driven, Document-Driven, Knowledge-Driven, and Model-Driven Decision Support Systems. Each generic DSS can be targeted to internal or external stakeholders. DSS can have specific or very general purposes.

Finally, the DSS deployment technology may be a mainframe computer, a client/server LAN, or a Web-Based architecture. The goal in proposing this expanded DSS framework is to help people understand how to integrate, evaluate and select appropriate means for supporting and informing decision-makers. Because of the limitations of hardware and software, early DSS systems provided executives only limited help. With the increased power of computer hardware, and the sophisticated software available today, DSS can crunch lots more data, in less time, in greater detail, with easy to use interfaces. The more detailed data and information executives have to work with, the better their decisions can be.

**Need for an Expanded Framework**

Decision Support Systems should be defined as a broad category of information systems for informing and supporting decision-makers. DSS
are intended to improve and speed-up the processes by which people make and communicate decisions. We need to improve how we define Decision Support Systems on both a conceptual level and on a concrete, technical level. Both managers and DSS designers need to understand categories of decision support so they can better communicate about what needs to be accomplished in informing and supporting decision makers.

Decision Support Systems do vary in many ways. Some DSS focus on data, some on models and some on communications. DSS also differ in scope, some DSS are intended for one “primary” user and used “stand-alone” for analysis and others are intended for many users in an organization. A Decision Support System could be categorized in terms of the generic operations it performs, independent of type of problem, functional area or decision perspective. His seven types included: file drawer systems, data analysis systems, analysis information systems, accounting and financial models, representational models, optimization models, and suggestion models.

**An Expanded Framework**

The following expanded DSS framework is still evolving. The author and others have used the framework to classify a large number of software packages and systems. Anecdotal reports indicate that people who have tried to use it in describing a proposed or existing DSS have found it comprehensive, useful and parsimonious. It seems to help one categorize the most common Decision Support Systems currently in use. The framework focuses on one major dimension with 5 generic types of DSS and 3 secondary dimensions. The primary dimension is the dominant technology component or driver of the decision support system; the secondary dimensions are the targeted users, the specific purpose of the system and the primary deployment technology. Some DSS are best classified as hybrid systems driven by more than one major DSS component.

**ITQ**

**Question**

What do you understand by the term “hybrid systems”

**Feedback**

Some DSS are best classified as hybrid systems driven by more than one major DSS component.
11.2 Types of DSS

11.2.1 Data-Driven DSS

Data-Driven DSS take the massive amounts of data available through the company's TPS and MIS systems and cull from it useful information which executives can use to make more informed decisions. They don’t have to have a theory or model but can “free-flow” the data.

The first generic type of Decision Support System is a Data-Driven DSS. These systems include file drawer and management reporting systems, data warehousing and analysis systems, Executive Information Systems (EIS) and Spatial Decision Support Systems. Business Intelligence Systems are also examples of Data-Driven DSS. Data-Driven DSS emphasize access to and manipulation of large databases of structured data and especially a time-series of internal company data and sometimes external data. Simple file systems accessed by query and retrieval tools provide the most elementary level of functionality. Data warehouse systems that allow the manipulation of data by computerized tools tailored to a specific task and setting or by more general tools and operators provide additional functionality. Data-Driven DSS with Online Analytical Processing (OLAP) provide the highest level of functionality and decision support that is linked to analysis of large collections of historical data.

11.2.2 Model-Driven DSS

A second category, Model-Driven DSS, includes systems that use accounting and financial models, representational models, and optimization models. Model-Driven DSS emphasize access to and manipulation of a model. Simple statistical and analytical tools provide the most elementary level of functionality. Some OLAP systems that allow complex analysis of data may be classified as hybrid DSS systems providing modelling, data retrieval and data summarization functionality. Model-Driven DSS use data and parameters provided by decision-makers to aid them in analysing a situation, but they are not usually data intensive. Very large databases are usually not needed for Model-Driven DSS. Model-Driven DSS were isolated from the main Information Systems of the organization and were primarily used for the typical “what-if” analysis. That is, “What if we increase production of our products and decrease the shipment time?” These systems rely heavily on models to help executives understand the impact of their decisions on the organization, its suppliers, and its customers.
11.2.3 Knowledge-Driven DSS

The terminology for this third generic type of DSS is still evolving. Currently, the best term seems to be Knowledge-Driven DSS. Adding the modifier “driven” to the word knowledge maintains a parallelism in the framework and focuses on the dominant knowledge base component. Knowledge-Driven DSS can suggest or recommend actions to managers. These DSS are personal computer systems with specialized problem-solving expertise. The “expertise” consists of knowledge about a particular domain, understanding of problems within that domain, and “skill” at solving some of these problems. A related concept is Data Mining. It refers to a class of analytical applications that search for hidden patterns in a database. Data mining is the process of sifting through large amounts of data to produce data content relationships.

11.2.4 Document-Driven DSS

A new type of DSS, a Document-Driven DSS or Knowledge Management System, is evolving to help managers retrieve and manage unstructured documents and Web pages. A Document-Driven DSS integrates a variety of storage and processing technologies to provide complete document retrieval and analysis. The Web provides access to large document databases including databases of hypertext documents, images, sounds and video. Examples of documents that would be accessed by a Document-Based DSS are policies and procedures, product specifications, catalogues, and corporate historical documents, including minutes of meetings, corporate records, and important correspondence. A search engine is a powerful decision aiding tool associated with a Document-Driven DSS.

11.2.5 Communications-Driven and Group DSS

Group Decision Support Systems (GDSS) came first, but now a broader category of Communications-Driven DSS or groupware can be identified. This fifth generic type of Decision Support System includes communication, collaboration and decision support technologies that do not fit within those DSS types identified. Therefore, we need to identify these systems as a specific category of DSS. A Group DSS is a hybrid Decision Support System that emphasizes both the use of communications and decision models. A Group Decision Support System is an interactive computer-based system intended to facilitate the solution of problems by decision-makers working together as a group. Groupware supports electronic communication, scheduling, document sharing, and other group productivity and decision support enhancing activities. We have a number of technologies and capabilities in this category in the framework – Group DSS, two-way interactive video, White Boards, Bulletin Boards, and Email.
11.2.6 Inter-Organizational or Intra-Organizational DSS

A relatively new targeted user group for DSS made possible by new technologies and the rapid growth of the Internet is customers and suppliers. We can call DSS targeted for external users. An Inter-organizational DSS. The public Internet is creating communication links for many types of inter-organizational systems, including DSS. An Inter-Organizational DSS provides stakeholders with access to a company’s intranet and authority or privileges to use specific DSS capabilities. Companies can make a Data-Driven DSS available to suppliers or a Model-Driven DSS available to customers to design a product or choose a product. Most DSS are Intra-Organizational DSS that are designed for use by individuals in a company as “standalone DSS” or for use by a group of managers in a company as a Group or Enterprise-Wide DSS.

11.2.7 Function-Specific or General Purpose DSS

Many DSS are designed to support specific business functions or types of businesses and industries. We can call such a Decision Support System a function-specific or industry-specific DSS. A Function-Specific DSS like a budgeting system may be purchased from a vendor or customized in-house using a more general-purpose development package. Vendor developed or “off-the-shelf” DSS support functional areas of a business like marketing or finance; some DSS products are designed to support decision tasks in a specific industry like a crew scheduling DSS for an airline. A task-specific DSS has an important purpose in solving a routine or recurring decision task. Function or task-specific DSS can be further classified and understood in terms of the dominant DSS component that is as a Model-Driven, Data-Driven or Suggestion DSS. A function or task-specific DSS holds and derives knowledge relevant for a decision about some function that an organization performs (e.g., a marketing function or a production function). This type of DSS is categorized by purpose; function-specific DSS help a person or group accomplish a specific decision task. General purpose DSS software helps support broad tasks like project management, decision analysis, or business planning.
11.3 Components of DSS

Traditionally, academics and MIS staffs have discussed building Decision Support Systems in terms of four major components:

1. The user interface
2. The database
3. The models and analytical tools and
4. The DSS architecture and network

This traditional list of components remains useful because it identifies similarities and differences between categories or types of DSS. The DSS framework is primarily based on the different emphases placed on DSS components when systems are actually constructed.

Data-Driven, Document-Driven and Knowledge-Driven DSS need specialized database components. A Model-Driven DSS may use a simple flat-file database with fewer than 1,000 records, but the model component is very important. Experience and some empirical evidence indicate that design and implementation issues vary for Data-Driven, Document-Driven, Model-Driven and Knowledge-Driven DSS.

Multi-participant systems like Group and Inter-Organizational DSS also create complex implementation issues. For instance, when implementing a Data-Driven DSS a designer should be especially concerned about the user's interest in applying the DSS in unanticipated or novel situations. Despite the significant differences created by the specific task and scope of a DSS, all Decision Support Systems have similar technical components and share a common purpose, supporting decision-making.

A Data-Driven DSS database is a collection of current and historical structured data from a number of sources that have been organized for easy access and analysis.

We are expanding the data component to include unstructured documents in Document-Driven DSS and “knowledge” in the form of rules or frames in Knowledge-Driven DSS. Supporting management decision-making means that computerized tools are used to make sense of the structured
data or documents in a database. Mathematical and analytical models are the major component of a Model-Driven DSS. Each Model-Driven DSS has a specific set of purposes and hence different models are needed and used. Choosing appropriate models is a key design issue. Also, the software used for creating specific models needs to manage needed data and the user interface. In Model-Driven DSS the values of key variables or parameters are changed, often repeatedly, to reflect potential changes in supply, production, the economy, sales, the marketplace, costs, and/or other environmental and internal factors. Information from the models is then analysed and evaluated by the decision-maker. Knowledge-Driven DSS use special models for processing rules or identifying relationships in data. The DSS architecture and networking design component refers to how hardware is organized, how software and data are distributed in the system, and how components of the system are integrated and connected. A major issue today is whether DSS should be available using a Web browser on a company intranet and also available on the Global Internet. Networking is the key driver of Communications-Driven DSS.

Figure 11.1 Overview of a DSS (Source: http://studynam.com)

The DSS software system must be easy to use and adaptable to the needs of each executive. A well-built DSS uses the models that the text
describes. You’ve probably used statistical models in other classes to
determine the mean, median, or deviations of data. These statistical
models are the basis of data mining. The What-If decisions most
commonly made by executives use sensitivity analysis to help them
predict what effect their decisions will have on the organization.
Executives don’t make decisions based solely on intuition. The more
information they have, the more they experiment with different outcomes
in a safe mode, the better their decisions. That’s the benefit of the models
used in the software tools.

**ITQ**

**Question**
The data source of the Data-Driven DSS is solely from current data.
True or false

**Feedback**
A Data-Driven DSS database is a collection of current and historical
structured data from a number of sources that have been organized for
easy access and analysis. Hence, the statement is false.

### 11.4 Web-Based DSS

Of course, no discussion would be complete without information about
how companies are using the Internet and the Web in the customer DSS
decision-making process. The following figure shows an Internet CDSS
(Customer Decision-Support System).
Figure 11.2 Customer decision support on the Internet
(Source: http://studynama.com)

Here’s an example: You decide to purchase a new home and use the Web to search real estate sites. You find the perfect house in a good neighbourhood but it seems a little pricey. You don’t know the down payment you’ll need. You also need to find out how much your monthly payments will be based on the interest rate you can get. Luckily the real estate Web site has several helpful calculators (customer decision support systems) you can use to determine the down payment, current interest rates available, and the monthly payment. Some customer decision support systems will even provide an amortization schedule. You can make your decision about the purchase of the home or know instantly that you need to find another house.

ITQ

Question:
Data-driven DSS came before model-Driven DSS, true or false?

Feedback:
The first generic type of Decision Support System is a Data-Driven DSS.

Study Session Summary

In this study session, you examined the Decision Support System. Under which you examined the usefulness of the DSS to managers. You also highlighted the different types of DSS. You concluded the session by highlighting the components of DSS and explaining the web-based DSS.

Assessment

SAQ 11.1 (tests learning outcome 11.1)
Define DSS

SAQ 11.2 (tests learning outcome 11.2)
List the types of DSS

SAQ 11.3 (tests learning outcome 11.3)
List the components of DSS
Bibliography

Operational Information Systems

Introduction

In this study session, you will examine the nature of the operational information system. Thereafter, you will discuss the operational accounting and financial information system. As well, you will look at the operational marketing system. You will end the session by exploring the operational production information system and the operational human resources system.

Learning Outcomes

When you have studied this session, you should be able to:

12.1 describe the nature of operational information systems
12.2 discuss operational accounting and financial information system
12.3 explain operational marketing information systems
12.4 discuss operational production information systems
12.5 examine operational human resources information systems

12.1 The Nature of Operational Information Systems

Operational information systems primarily produce routine, repetitive, descriptive, expected, and objective data that describe past activities. The information they produce is usually detailed, highly structured, accurate, derived from internal sources, and produced regularily. To some, these systems may appear to represent pure drudgery for employees who must complete them. However, the application of information systems technology to operational information systems has reduced this drudgery to a great extent and provided managers with a number of major advantages.

12.1.1 Management Advantages of OIS

Automating operational information systems usually increases the efficiency of these systems; they typically run faster and require fewer personnel and other business resources than manual systems.
Organizations that automate operational information systems usually receive several benefits for their efforts. These benefits include:

1. Reduced Cost
2. Increased Speed
3. Increased Accuracy
4. Increased Customer Service
5. Increased Data for Decision Making

12.2 Operational Accounting and Financial Information Systems

Typically, the first applications that organizations computerize are operational-level financial accounting systems. Operational financial accounting information systems are typically task oriented. They focus on processing financial transactions to produce the routine, repetitive information outputs that every organization finds necessary. These outputs include pay checks, checks to vendors, customer invoices, purchase orders, stock reports, and other regular forms and reports. Let’s briefly examine some of the important components of Operational Finance and Accounting Systems and their benefits in the following paragraphs.

12.2.1 Financial Accounting Systems

The heart of an organization’s operational financial information system is its financial accounting system. A computerized financial accounting system is composed of a series of software modules or subsystems that may be used separately or in an integrated fashion. The system modules typically include:

1. General ledger
2. Fixed assets
3. Sales order processing
4. Accounts receivable
5. Accounts payable
6. Inventory control
7. Purchase order processing
8. Payroll

When these computerized financial accounting systems are integrated, each system receives data as input from some systems and provides information as output to other systems.

Importance to Decision Making

The fact that operational financial accounting systems are predominantly routine and repetitive in nature does not mean that they do not contribute
to decisions that are important to the organization. For example, the accounts receivable system may routinely process credit information about customers, which may include comparing the balance of customer accounts to customer credit limits. Though this comparison might seem trivial, it is essential to a common decision faced by the sales force: Should the customer be allowed to make this purchase on credit? Organizations that can provide online credit information to salespeople reduce the risk of incurring bad debts, which lowers their cost of operations.

12.2.2 General Ledger System

General Ledger System provides managers with periodic accounting reports and statements such as the income statement and balance sheet.

12.2.3 Fixed Asset System

Fixed Assets System maintains records of equipment, property, and other long-term assets that an organization owns. The records include the original cost of the assets, their depreciation rates, the accumulated depreciation to date, and the book value of the assets, or the original cost less accumulated depreciation.

12.2.4 Sales Order Processing System

Sales Order Processing System or order-entry system, routinely records sales orders and also provides data to other systems that fill those orders, maintain inventory levels, and bill the customer. This system provides sales tax data to the general ledger system for posting to taxing agency accounts, stock data to the inventory system for updating inventory balances, and sales data to the accounts receivable system for posting to customer accounts.

12.2.5 Accounts Receivables System

Accounts Receivables System allows you to enter, update, and delete customer information such as sales made on account, credit terms, cash payments received, credit memorandums, and account balances. Inputs to the accounts receivable system include sales invoices, credit memorandums, and cash received from customers. Typical outputs of this system are monthly customer statements of account and a schedule of accounts receivable listing each account and its balance.

12.2.6 Accounts Payable System

Accounts Payable System processes much the same routine, repetitive information as the accounts receivable system, except that in this case the information is about the organization’s creditors rather than about its customers.
12.2.7 Inventory Control System

Inventory Control System provides input to the general ledger system and receives input from the purchase order and the sales order systems. The basic purpose of the system is to keep track of inventory levels and inventory costs. The system maintains information about each stock item, such as stock numbers and stock descriptions, receipts and issues of stock, stock damage, and stock balances.

12.2.8 Purchase Order Processing System

Purchase Order Processing System processes purchase orders and tracks which purchase orders have been filled, which stock items ordered are on backorder, which stock items have been damaged or do not meet the specifications of the original order, and which orders are still on order and when those orders are expected to arrive. The purchase order system provides information to the accounts payable and inventory systems. The system produces a variety of reports, including a list of all stock on backorder and an open-order report that lists all purchase orders not yet received and their expected arrival dates.

12.2.9 Payroll System

Payroll System processes wage and salary information such as payments to employees; deductions from employee pay checks; and payments to federal, state, and other taxing agencies for taxes used. The payroll system produces such report as the weekly payroll summary report, overtime reports, and checks for payroll taxes owed to taxing agencies.

<table>
<thead>
<tr>
<th>ITQ</th>
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<tbody>
<tr>
<td><strong>Question</strong></td>
</tr>
<tr>
<td>Pay checks are examples of outputs in a financial operating system. True or false?</td>
</tr>
<tr>
<td><strong>Feedback</strong></td>
</tr>
<tr>
<td>The outputs of financial operating system include pay checks, checks to vendors, customer invoices, purchase orders, stock reports, and other regular forms and reports.</td>
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12.3 Operational Marketing Information Systems

The marketing function occurs in all organizations, including profit and not-for-profit, manufacturing, agricultural, financial, educational, and service organizations. The basic goal of the marketing function in any organization is to satisfy the needs and wants of its customers. To achieve
that goal, marketing personnel engage in activities such as planning and developing new products; advertising, promoting, selling, storing, and distributing goods and services; providing financing and credit to customers’ and conducting market research.

Operational marketing information systems include systems such as sales systems, advertising systems, sales promotion systems, warehousing systems, and pricing systems. The systems collect data that describe marketing operations, process those data, and make marketing information available to marketing managers to help them make decisions. To be effective, marketing information systems must be coordinated with other organizational information systems, such as purchasing systems, production systems, inventory systems, accounts receivable systems, credit systems, and order-entry systems.

Computer information systems have been widely applied to operational-level marketing tasks. Information technology has increased the productivity of sales people; helped firms manage customers better, locate prospective customers, customize marketing efforts to specific groups and individuals, and reduce costs; and vastly widened the reach of many organizations in terms of the geographic territory they serve. Computer technology applied to operational-level marketing systems also captures data useful for tactical and strategic decisions. Let’s briefly examine some of the important components of Operational Marketing Systems and their benefits in the following paragraphs **Sales Force Automation Systems** are designed to increase the productivity of salespeople. Bread-and-butter sales activities usually include identifying potential or prospective customers, contacting customers, calling on customers, making sales pitches, closing the sale, and following up on sales. Typically, automating a sales force involves equipping salespeople with notebook computers and software to support their activities **Prospect information systems**: Locating potential customers are often a time-consuming and frustrating part of the salesperson’s work. The sources of information used to obtain sales leads are diverse and may include other customers, other vendors who sell supporting or ancillary products, newspaper notices, telephone directories, and customer inquiries. Searching directories and other customer lists may take a lot of time and yield few actual customers.

**Contact management systems**: Provide information to the sales force pertaining to customers, their product or service preferences, sales history data, and a historical record of sales calls and/or visits. One output of these systems may be a call report showing the number of sales calls made by a salesperson categorized by size of organization, previous sales, or some other characteristic, and the number or amount of sales made per customer, per visit, and/or per category.
Other sales force automation systems: May also provide support for many other routine, repetitive salesperson activities, for example, travel expense reports, appointment calendars, telephone and address roledexes, sales letter creation and distribution, e-mail, and fax. Internet access may also be provided so that salespeople can keep current on business news at any hour, especially news about the industry, competitors, and customers.

Telemarketing systems: Usually include support for the automatic dialling of parties and/or delivering voice messages to the answering party under the control of a computer system.

Some systems allow you to make notes about the calls, to generate follow-up letters, and to view a customer file while a call to that customer is in progress.

Direct Mail Advertising Systems: Many organizations generate sales by mailing sales brochures and catalogues directly to customers using direct mail advertising systems. To distribute sales documents rapidly to large numbers of potential customers, most marketing departments maintain customer mailing lists that are used for mass mailings. The lists may be drawn from customer files; accounts receivable records; prospect files; commercial databases of households, businesses, and organizations; or they can be purchased from other firms.

Point of Sale System: Systems provide immediate updates to sales and inventory systems and allow firms to monitor sales trends minute by minute. They also allow firms to capture customer data and preferences and add the information to their data warehouses.

Delivery Tracking and Routine Systems: Customers like to receive their merchandise on time. In a manual system, customers called in to a customer representative to check on the delivery of their merchandise. The customer rep would then have to call the delivery vehicle driver who uses a cell phone to tell the rep where he or she is and how soon the merchandise might be delivered. That process took time, frequently frustrated the customer, and cost the firm money to support.

Electronic Shopping and Advertising: Firms have been able to advertise and customers to shop via TV; radio, and the telephone for many years. The computer age, however, has made other avenues for shopping and advertising available, the most dramatic of which is clearly the Internet.

Virtual shopping: When people view, select, and purchase products and services from a store in another location using electronic means, they are virtually shopping at that store.

Virtual shopping, or electronic shopping, allows organizations to present information about goods and services to potential customers who are connected to their electronic “store.”
Selecting and buying goods using an electronic kiosk (described in the next section), from an organization’s Internet site, and from a “virtual mall” of Internet Web “stores” are all examples of virtual or electronic shopping.

**ITQ**

**Question**

Online order of goods is an example of virtual shopping. True or false?

**Feedback**

True! When people view, select, and purchase products and services from a store in another location using electronic means, they are virtually shopping at that store.

### 12.4 Operational Production Information Systems

Operational production systems are diverse; they include continuous flow production, mass production, job order production, and project production. In addition, operational production systems include the production of services as well as hard goods. The purpose of the production system is to acquire the raw materials and purchased parts; test the materials for quality; acquire the appropriate human resources, work space, and equipment; schedule the materials, human resources, space, and equipment; fabricate the products or services; test the product or service outputs; and monitor and control the use and costs of the resources involved.

Let’s briefly examine some of the important components of Operational Production Systems and their benefits:

1. Purchasing Systems:
2. Receiving Systems:
3. Quality Control Systems
4. Shipping Systems:
5. Cost Accounting Systems
6. Materials management systems
7. Inventory Control System
8. Automated Material Handling Systems
9. Computer Aided Design and Manufacturing
10. Image Management Systems
11. Material Selection Systems
12. Shop-Floor Scheduling
12.5 Operational Human Resource Information Systems

Human resource departments are responsible for many facets of human resource management, including recruiting, assessment, selection, placement, training, performance appraisal, compensation and benefit management, promotion, termination, occupational health and safety, employee services, complaints with legal constraints, helping managers with human resource problems, and providing top management with information for strategic planning. Operational Human Resource Information Systems provide managers with data to support the routine, repetitive human resource decisions that occur regularly in the management of organisation’s human resources. There are many operational level human resource information systems including systems that help managers keep track of the organisation’s positions and employees, conduct performance evaluation, provide alternative or flexible scheduling, recruit new employees, place employees, train employees, relocate employees, terminate employees, provide employment benefits and provide reports to governmental agencies. Let us see some of the important sub systems of operational human resource information systems and their benefits as follows:

1. Position Control Systems
2. Employee Information Systems
3. Performance Management Systems
4. Government Reporting Systems
5. Applicant Selection and Placement Systems
6. Training Systems

ITQ

Question

The operational production systems deal with single entity. True or false?

Feedback

Operational production systems are diverse; they include continuous flow production, mass production, job order production, and project production.
Study Session Summary

In this study session, you looked at the operational information system. In doing so, you examined the nature and features of the operation information system. Subsequently, you discussed the operational accounting and financial information system. Likewise, you described the operational marketing information system. You ended the session by describing the operational production information system and the operational human resource information system.

Assessment

SAQ 12.1 (tests learning objective 12. 1)
Highlight some of the benefits of operational information systems management

SAQ 12.2 (tests learning objective 12.2)
List four financial accounting systems that you know

SAQ 12.3 (tests learning objective 12. 3)
List four components of the operational production system

Bibliography

Study Session 13

Computer Security

Introduction

In this study session, you will be discussing the computer security. You will begin by highlighting the threats to information. Under which you will discuss security categories and threats to users. Thereafter, you will analyse how to stop a virus. In doing this, you will attempt how to avoid phishing attack. You will end the session with a discussion on security controls and how to secure an e-commerce server.

Learning Outcomes

When you have studied this session, you should be able to:

13.1 identify threats to information
13.2 explain how to stop a virus from a computer system

Terminology

<table>
<thead>
<tr>
<th>Virus</th>
<th>A computer virus is a type of malicious software program (&quot;malware&quot;) that, when executed, replicates by reproducing itself (copying its own source code) or infecting other computer programs by modifying them</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spyware</td>
<td>Spyware is software that aims to gather information about a person or organization without their knowledge and that may send such information to another entity without the consumer's consent, or that asserts control over a computer without the consumer's knowledge.</td>
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13.1 Threats to information

Let us start by highlighting some of the threats to information. These threats are:

1. Accidents & Disasters
2. Employees & Consultants
3. Business Partnerships
4. Outside Attackers
5. Viruses & Spyware
6. Direct attacks & Scripts
A virus always multiplies by copying its own source code. True or false?

Feedback

Though a computer virus replicates by reproducing itself (copying its own source code), it also replicates by infecting other computer programs by modifying them. So the statement is True.

13.1.1 Security Categories

Below are some of the security categories:

1. Physical attack & disasters
2. Backup--off-site
3. Physical facilities
   i. Cold/Shell site
   ii. Hot site
   iii. Disaster tests
   iv. Personal computers
4. Continuous backup
5. Behavioural
   i. Users give away passwords
   ii. Users can make mistakes
   iii. Employees can go bad
6. Logical
   i. Unauthorized disclosure
   ii. Unauthorized modification
   iii. Unauthorized withholding, Denial of Service
7. Confidentiality, Integrity, Accessibility (CIA)

13.1.2 Threats to Users

Let us now consider some of the threats of computer security to the users. These threats are:

1. Attacker takes over computer
   i. Virus/Trojan
   ii. Phishing
   iii. Unpatched computer/known holes
   iv. Intercepted wireless data
2. Bad outcomes
   i. Lost passwords, impersonation, lost money
   ii. Stolen credit cards, lost money
   iii. Zombie machine, attacks others
   iv. Commits crimes blamed on you
13.2 Stopping a Virus

Below are some of the ways of stopping a virus.

1. Backup your data!
2. Never run applications unless you are certain they are safe.
3. Never open executable attachments sent over the Internet—regardless of who mailed them.
4. Antivirus software
   i. Scans every file looking for known bad signatures
   ii. Needs constant updating
   iii. Rarely catches current viruses
   iv. Can interfere with other programs
   v. Can be expensive
   vi. Can usually remove a known virus

**ITQ**

**Question**
Antivirus software are employed in stopping virus because of its effectiveness in removing an unknown virus. True or false?

**Feedback**
Though an antivirus is useful in stopping virus attack, it is only effective for a known virus.

13.2.1 Avoiding Phishing Attack

How do you avoid the Phishing attack? Below are some of the methods one can use in avoiding it:

1. Never give your login username and password to anyone. Systems people do not need it.
2. Be extremely cautious about bank sites and avoid clicking any links that are sent by e-mail.
3. Always double-check the URL of the site and the browser security settings.

13.2.2 Security Controls

The security controls for these attacks include:

1. Access Control
   i. Ownership of data
   ii. Read, Write, Execute, Delete, Change Permission, Take Ownership

2. Security Monitoring
   i. Access logs
   ii. Violations
   iii. Lock-outs
13.2.3 Securing E-Commerce servers

After all we have been discussing, we should ask ourselves one question; how can e-commerce server be secured? Below is a list of what should be done:

1. Install and maintain a firewall configuration to protect cardholder data.
2. Do not use vendor-supplied defaults for passwords.
3. Protect stored cardholder data.
4. Encrypt transmission of cardholder data across open, public networks.
5. Use and regularly update anti-virus software.
6. Develop and maintain secure systems and applications.
7. Restrict access to cardholder data by business need to know.
8. Assign a unique id to each person with computer access.
9. Restrict physical access to cardholder data.
10. Track and monitor all access to network resources and cardholder data.
11. Regularly test security systems and processes.
12. Maintain a policy that addresses information security.

**ITQ**

**Question**
Ownership of data is a form of access control, true or false?

**Feedback**
True

**Study Session Summary**

In this study session, you examined the threats to information and threats to users. Thereafter, you highlighted how to stop a virus in a computer system. This led you to a discussion on how to avoid the Phishing attacks. The session came to an end with a description of security controls and how to secure an e-commerce server.
Assessment

SAQ 13.1 (Tests Learning objective 13.1)
1. List the threats to information that you know of
2. List the physical facilities available for security attacks
3. List the two categories of threat to a user

SAQ 13.2 (Tests Learning objective 13.2)
1. How can one stop a virus?
2. How will you avoid phishing attack?
3. Security control is divided into _______ and _______
4. List any two precautions to be taken when securing E-Commerce servers

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Notes on Self Assessment Questions

SAQ 1.1
False. Goals are the guide to planning and prosecution of the business course.

SAQ 1.2
1. We noted that information has a great impact on decision making. Thus, the value of information can be measured by “the impact of the decisions that result from its use”.
2. The characteristics of good information include
   i. Accuracy
   ii. Relevance
   iii. Timeliness
   iv. Economical
   v. Completeness

SAQ 1.3
1. I don’t know how you just defined system, but your definition should note that a system is a set of elements joined together for a common objective.
2. The central goal of an MIS is Decision making.

SAQ 2.1
In describing a system, note that a system is a group of interrelated components working together toward a common goal by accepting inputs and producing outputs in an organized transformation process.

SAQ 2.2
1) Input
2) Processing
3) Output
4) Feedback and
5) Control

SAQ 2.3
A subsystem of system functions to achieve the common objective of the system. In the case of information system, it provides the business system with the necessary information needed in decision making and planning for the achievement of the set goals.
SAQ 2.4
1. Marketing system
2. Service system
3. Administrative system

SAQ 2.5
1. Abstraction
2. Divide and Conquer
3. Cohesion and Coupling
4. Hierarchical ordering
5. Information hiding

SAQ 2.6
Information systems are categorized based on
1. The mode of processing
2. The system objectives,
3. The nature of interaction of the system with its environment.

SAQ 2.7
The levels of operation include:
1. Operational
2. Tactical
3. Strategic

SAQ 3.1
In defining MIS remember that MIS is an organized collection of people, procedures, software, databases, and devices used to provide routine information to managers and decision makers

SAQ 3.2
The classes of computers according to capabilities include:
1. Super Computers
2. Main frame Computers
3. Mini Computers
4. Micro Computers
SAQ 3.3
The server system is where some of the data, applications software, and other instructions that network users need in order to communicate with and process transactions on the network are stored while the client computer is the node on the network that users need in order to access and process transactions and data through the network.

SAQ 3.4
One can choose to define Network in his own terms, nevertheless the basics is that network is a specific kind of relationship joining a particular group of people, objects, or events.

SAQ 3.5
1. IT influences the nature, punctuality and detail level of the information shared by Enterprises
2. IT reduces the transaction costs, while it provides a better management of the risks

SAQ 3.6
An IOS allows to obtain operative advantages, such as:
1. Reducing paper-work and manual operations;
2. Reducing the stock levels;
3. Accelerating the product and material flow;
4. Standardizing of procedures;
5. Accelerating the flow of information about changes on the demand;

SAQ 4.1
1. Planning> Analysis> Design> Implementation> Support
2. The “Feasibility Report” and the proposed alternatives help in preparing the costs and benefits System Development Life Cycle and it contains
   i. A preamble
   ii. A goal statement
   iii. A brief description of the present system
   iv. Proposed alternatives in details
3. The two components of a system design are:
   i. logical design
   ii. physical design activity

SAQ 4.2
1. The development of a system design involves the following stages:
i. Acquiring hardware and software, if necessary
ii. Database design
iii. Developing system processes
iv. Coding and testing each module

2. Testing process of a system should focus on both:
   i. The internal logic of the system/software, ensuring that all statements have been tested;
   ii. The external functions, by conducting tests to find errors and ensuring that the defined input will actually produce the required results

3. Whatever you think it is, the central theme is that at this phase of system development life cycle in which the system is put into production to be used by the end users.

4. Maintenance is necessary to eliminate the errors in the working system during its working life and to tune the system to any variation in its working environment.

SAQ 5.1

1. The major challenges in MIS implementation are:
   i. Quantity, content and context of information - how much information and exactly what should it describe.
   iii. Availability of information - frequency, contemporariness, on-demand or routine, periodic or occasional, one-time info or repetitive in nature and so on
   iv. Accuracy of information.
   v. Reliability of information.

2. MIS design and development process has to address the following issues successfully:
   i. Synchronization in understanding of management, processes and IT among the users as well as the developers.
   ii. Understanding of the information needs of managers from different functional areas and combining these needs into a single integrated system.
   iii. Creating a unified MIS covering the entire organization will lead to a more economical, faster and more integrated system, however it will increase in design complexity manifold.
   iv. The MIS has to be interacting with the complex environment comprising all other sub-systems in the overall information system of the organization. So, it is extremely necessary to understand and define the requirements of MIS in the context of the organization.
It should keep pace with changes in environment, changing demands of the customers and growing competition. And so others.

SAQ 5.2

1. The process of information requirement analysis involves:
   i. Defining the underlying organisational sub system
   ii. Development of the subsystem matrix
   iii. Defining and evaluating the information requirement for the organisational subsystem

2. The categories of technology available for information system include:
   i. Devices
   ii. Data centre systems
   iii. Enterprise software
   iv. IT service
   v. Telecom service

3. System testing should cover the following areas:
   i. Purpose
   ii. 2. Definition
   iii. Test inputs
   iv. Detailed specification of test procedure
   v. Details of expected outputs

SAQ 6.1

1. Some of the challenges of data management are:
   i. Political resistance
   ii. Cost of running the services
   iii. Lack of trained personals

2. Data hierarchy in traditional file management system include:
   i. Database
   ii. File
   iii. Record
   iv. Field
   v. Byte
   vi. Bit

SAQ 6.2

1. The component systems of DBMS include:
   i. Database definition system
   ii. Database manipulation system
   iii. Data dictionary
SAQ 6.3

1. Recent database trends include the growth of distributed databases and the emergence of object-oriented and hypermedia databases.

2. Web browsers are far easier to use than most of the query languages associated with the other programs on mainframe computer systems. That’s why many companies are starting to link their databases to a Web-like browser.

SAQ 6.4

1. The functional units of any data management system will include:
   i. Data administration
   ii. Database technology and management
   iii. Data planning and modelling methodology
   iv. Users

SAQ 6.5

1. The database environment and example of each are highlighted below:
   i. Bank: Date, time, amount of transactions made
   ii. School: Age, exam scores, school attendance

2. Database applications are divided into five categories: from a single user on a personal databases, to workgroup, departmental, enterprise, and Internet/Intranet/Extranet databases.

SAQ 7.1

1. ERP is an integrated, real-time, cross-functional enterprise application, an enterprise-wide transaction framework that supports all the internal business processes of a company.

2. The areas where ERP can be relevant include:
   i. Business integration and automated data update
   ii. Linkage between all core business processes and easy flow of integration
   iii. Flexibility in business operations and more agility to the company
   iv. Better analysis and planning capabilities
   v. Critical decision-making
   vi. Competitive advantage

3. ERP has the following features
   i. Accommodates variety
   ii. Seamless integration
   iii. Resource management
   iv. Integration management information
v. Supply chain management
vi. Integration data model

4. The merits of ERP include:
   i. Reduction of lead time
   ii. Reduction of cycle time
   iii. Better customer satisfaction

While the demerits include:
   i. Expense and time in implementation
   ii. Difficulty in integration with other system
   iii. Risk of implementation failure

SAQ 7.2
1. The relevance of ERP has been found the following areas
   o Finance: Financial accounting, Managerial accounting, treasury management, asset management, budget control, costing, and enterprise control.
   o Logistics: Production planning, material management, plant maintenance, project management, events management, etc.
   o Human resource: Personnel management, training and development, etc.
   o Supply Chain: Inventory control, purchase and order control, supplier scheduling, planning,
   o Work flow: Integrate the entire organization with the flexible assignment of tasks and responsibility to locations, position, jobs,

SAQ 8.1
1. An end user is a person who uses a computer as part of their daily life or daily work, but is not interested in computers as such.
2. Specifically, the practice of users developing their own information systems, is often but not always with the support of professional systems developers.

SAQ 8.2
1. The major advantages attributed to EUC include:
   i. Enhanced productivity of professional and white-collar workers.
   ii. Overcoming the shortage of DP professionals.
   iii. Provision of user-friendly and responsive systems.
   iv. Overcoming the implementation problems by transferring this process to the user.
SAQ 8.3
1. There are two major types of user development tools and they are
   i. application packages
   ii. fourth generation languages

SAQ 8.4
1. The models of end user tools are quite many. They include:
   i. On-line terminal for specific information provision;
   ii. On-line terminal for general information provision (e.g. a terminal to an on-line database such as LEXIS);
   iii. On-line terminal used as part of a self-organising group activity, either via a terminal to a mainframe or through a LAN (e.g. diary management, document preparation)
   iv. On-line terminal which is being used as part of a wider corporate system, such as the manager’s terminal in one store of a department store chain or an order entry terminal in an on-line transaction processing system such as a booking system;
   v. APC which is being used for an individual’s own work, which may (at some times) be used as a terminal in any of the above ways (the manager in the department store may be doing spreadsheet work as well as reconciling the days takings) - this is the conventional client/server situation.

SAQ 8.5
1. An Information Centre is both a place (often known as the “help-desk”) and a group of people from which information can be sourced

SAQ 9.1
1. The breakup of the AT&T monopoly along with the growth in personal computers led to the revolution in telecommunication.
2. Information superhighway includes the internet and many networks developed by private corporations and public entities which provide the people with overflow of information

SAQ 9.2
1. The two categories of electronic signals are:
   i. Analogue
   ii. Digital.
SAQ 9.3

1. The enterprise network operations can be managed in the following ways:
   i. Managing the changes. These include reengineering the business processes taking place behind the scenes and the organizational changes affecting the people.
   ii. Training the people. Include both the Information Technology staff and the end users in your plan.
   iii. Managing data as a vital organizational resource. Determine your organization’s vital data, who will be responsible for them, who will have access, and how you will determine accuracy and viability.
   iv. Planning for the future. Hopefully your business will grow and so too should your network. Too often managers allow the network to lag behind the rest of the business; don’t be one of them.

SAQ 10.1

1. A transaction is defined as an exchange between two or more business entities. Transaction processing systems (TPS) are cross-functional information systems that process data resulting from the occurrence of business transactions.

2. Transaction could external or internal.

SAQ 10.2

1. The characteristics of Transaction Processing System are:
   i. A TPS records internal and external transactions for a company. It is a repository of data that is frequently accessed by other system.
   ii. A TPS performs routine, repetitive tasks. It is mostly used by lower-level managers to make operational decisions.
   iii. Transactions can be recorded in batch mode or online. In batch mode, the files are updated periodically; in online mode, each transaction is recorded as it occurs.
   iv. There are six steps in processing a transaction. They are data entry, data validation, data processing and revalidation, storage, output generation, and query support.

SAQ 11.1

1. Decision Support Systems (DSS) are a class of computerized information systems that support decision-making activities. DSS are interactive computer-based systems and subsystems intended to help decision makers use communications technologies, data, documents, knowledge and/or models to successfully complete decision process tasks.
SAQ 11.2
1. The types of DSS are:
   i. Data driven DSS
   ii. Model driven DSS
   iii. Knowledge driven DSS
   iv. Communication driven DSS
   v. Document driven DSS

SAQ 11.3
1. Decision Support Systems in terms of four major components include:
   i. The user interface
   ii. The database
   iii. The models and analytical tools and
   iv. The DSS architecture and network

SAQ 12.1
1. Organizations that automate operational information systems usually receive several benefits for their efforts:
   i. Reduced Cost
   ii. Increased Speed
   iii. Increased Accuracy
   iv. Increased Customer Service
   v. Increased Data for Decision Making

SAQ 12.2
1. Examples of financial accounting systems will include:
   i. General ledger
   ii. Fixed assets
   iii. Sales order processing
   iv. Accounts receivable
   v. Accounts payable

SAQ 12.3
1. Some of the important components of Operational Production Systems are:
   i. Purchasing Systems:
   ii. Receiving Systems:
   iii. Quality Control Systems
   iv. Shipping Systems:
   v. Cost Accounting Systems
   vi. Materials management systems
SAQ 13.1
1. Threats to information may include:
   i. Accidents & Disasters
   ii. Employees & Consultants
   iii. Business Partnerships
   iv. Outside Attackers
2. Physical facilities will include
   i. Cold/Shell site
   ii. Hot site
   iii. Disaster tests
   iv. Personal computers
3. The categories of threats to a user include;
   i. Bad outcome
   ii. Attacker taking over the computer

SAQ 13.2
1. Stopping a virus will entail:
   i. Backup your data!
   ii. Never run applications unless you are certain they are safe.
   iii. Never open executable attachments sent over the Internet-regardless of who mailed them.
   iv. Antivirus software
2. To avoid phishing attack:
   i. Never give your login username and password to anyone. Systems people do not need it.
   ii. Be extremely cautious about bank sites and avoid clicking any links that are sent by e-mail.
   iii. Always double-check the URL of the site and the browser security settings.
3. Access control and security monitoring
4. Below are some of the precautions that must be taken in securing an e-commerce server:
   i. Install and maintain a firewall configuration to protect cardholder data.
   ii. Do not use vendor-supplied defaults for passwords.