

Department of Business Administration (BBA)

Government Arts College (Autonomous), Coimbatore -641018

Core Paper : MANAGEMENT INFORMATION SYSTEM (Subject Code – I8BBA62C)

Semester VI

Unit I

Introduction to information system (IS) - Data and Information - Classification of Information- Importance of Information System - Information Quality - Types of Information System - Components of Information System - Information System Resources - Activities. Computer Concepts: Hardware - Software - Database Management System (DBMS) - Functions –Benefits - Data Storage and Retrieval.

Unit II

Management Information System (MIS) - Meaning -Definition - MIS Characteristics - MIS Structures - Importance of MIS. Information System for Business -Marketing Information System - Human Resource Information System - Production / Manufacturing Information System - Finance Information System - Inventory Control System -Accounting Information System.

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Unit V

Telecommunication revolution - Introduction to Email, Internet, and Teleconferencing, WWW Architecture - E Commerce, Models B to B, B to C, C to B, Electronic Data Interchange (EDI) - EDI Applications in business - Electronic payments.

Text Books:

1. Aman Jindal - Management Information System,2010, Kalyani Publishers.
2. C.S.V Murthy - Management Information System -2013 , Himalaya Publishers.

Reference Books:

1. James A. O' Brien - Management Information System , 2000, Tata Mc Graw Hill Publications.
2. Jawadekar — Management Information System — Text& Cases, 2012 , TMH.

UNIT I

SUBJECT NAME	SUBJECT CODE	SEMESTER	PREPARED BY
Management Information System	I8BBA62C	VI	Dr.K.Karthikai, Assistant professor in BBA

Introduction to Information System (IS)

Data and Information

Data- The word data is the Latin plural of “datum”. Data refers to facts usually collected as the result of experience, observation or experiment, or processes within a computer system, or premises. Data may consist of numbers, words, or images, particularly as measurements or observations of a set of variables.

Information - Information is processed data, which has been placed in a meaningful and useful context for an end user. Data is subjected to a “value-added” process (data processing or information processing). Information is data that has been processed into a form that is meaningful to the recipient and is of real or perceived value in current or prospective actions or decisions.

Difference between DATA and INFORMATION

Data	Information
Data refers to details, facts about any event.	Information refers to only those events which are concerned with entity.
Data is generally disorganised and disintegrated in the form.	Information is properly arranged, classified and organised.
Data is in raw form.	Information is in finished form.
Data can't be understood or made use of by the users.	Information is understood and used by the users.
Data does not depend upon information.	Information is understood and used by the users.

Example. Names, quantities, and dollar amounts recorded on sales forms represent data about sales transactions. However, a sales manager may not regard these as information. Only after such facts are properly organized and manipulated can meaningful sales information be furnished, specifying, for example, the amount sales by product type, sales territory, or salesperson.

CLASSIFICATION OF THE INFORMATION

The information can be classified in a number of ways in the following manner:

Action versus no-action information – The information which induces action is called an action information. The information which communicates only the status of a situation is a no-action information. ‘No stock’ report calling a purchase action is an action information but the stock ledger showing the store transactions and the stock balances is a No-action information,

Recurring versus non-recurring information - The information generated at regular intervals is a recurring information. The monthly sales reports, the stock statements, the trial balance, etc. are recurring information. The financial analysis or the report on the market research study is a non- recurring information.

Internal versus external information - The information generated through the internal sources of the organisation is termed as an internal information, while the information generated through the Government reports, the industry surveys, etc. is termed as an external information, as the sources of the data are outside the organisation. The action information, the recurring information and the internal information are the prime areas for computerisation and they contribute qualitatively to the MIS.

The information can also be classified as under, **in terms of its application.**

Planning information - Certain standards, norms and specifications are used in the planning of any activity, Hence, such information is called the planning information. The time standards, the operational standards, the design standards are the examples of the Planning Information.

Control information- Reporting the status of an activity through a feedback mechanism is called the control information. When such information shows a deviation from the goal or the objective, it will induce a decision or an action leading to control.

Knowledge information - A collection of information through the library reports and the research studies to build up a knowledge base as a information source for decision making is known as knowledge information. Such a collection is not directly connected to decision making, but the need of knowledge is perceived as a power or strength of the organisation. The information can also be classified **based on its usage**. When the information is used by everybody in the organisation, it is called the **organisation information**. When the information has a multiple use and application, it is called the **database information**. When the information is used in the operations of a business it is called the **functional or the operational information**.

Employee and pay-roll information is organisation information used by a number of people in a number of ways. The material specifications, or the supplier information is database information stored for multiple users. Such information may need security or an access control. Information like sales, or production statistics is functional, meeting the operational needs of these functions.

IMPORTANCE OF INFORMATION SYSTEM

Information systems have become a vital component of successful business firms and other organisations. They thus constitute an essential field of study in business administration and management. That's why most business majors must take a course in information systems. People who intend to be a manager, entrepreneur, or business professional, it is just as important to have a basic understanding of information systems as it is to understand any other functional area in business.

Information System Resources and Technologies - An information system is an organized combination of people, hardware, software, communications networks and data resources that collects, transforms, and disseminates information in an organisation. People have relied on information systems to communicate with each other using a variety of physical devices (hardware), Information processing instructions (software), communications channels (networks), and stored data (data resources) since the dawn of civilization. Computer-based information systems that use computer hardware and software, telecommunications networks, computer-based data management techniques and other forms of information technology (IT) to transform data resources into a variety of information products.

An End User Perspective - Anyone who uses an information system or the information it produces is an end user. This usually applies to most people in an organisation, as distinguished from the smaller number of people who are information system specialists, such as systems analysts or professional computer programmers. A managerial enduser is a manager, entrepreneur, or managerial level professional who personally uses information systems. So most managers are managerial end users . Businesses and other organisations need people who can use networked computer workstations to enhance their own personal productivity and the productivity of their work groups, departments, and organisations.

An Enterprise Perspective - Information systems play a vital role in business success of an enterprise. Information technology can provide the information a business needs for efficient operations effective management, and competitive advantage. However, if information systems do not properly support the strategic objectives, business Operations or management

needs of an enterprise, they can seriously damage its prospects for survival and success. So the proper management of information systems is a major challenge for managers.

Thus the information systems function represents : (a) A major functional area of business that is as important to business success as the functions of accounting, finance, operations management, marketing, and human resource management.

(b) A major part of resource of an enterprise and its cost of doing business, thus posing a major resource management challenge.

(c) An important factor affecting operational efficiency, employee productivity and morale, and customer service and satisfaction.

(d) A major source of information and support needed to promote effective decision making by managers. ,

(e) An important ingredient in developing competitive products and services that give an organisation a strategic advantage in the global marketplace.

(f) A vital, dynamic, and challenging career opportunity for millions of men and women.

A Global Society Perspective - We are living in a global information society, with a global economy that is increasingly dependent on the creation, management, and distribution of information resources. So information is a basic resource in today's society. People in many nations no longer live in agricultural societies, composed primarily of farmers, or even industrial societies, where a majority of the workforce consists of factory workers. Instead, the workforce in many nations consists primarily of farmers in service occupations or knowledge workers, that is, people who spend most of their workday creating, using and distributing information.

Knowledge workers include executives, managers and supervisors ; professionals such as accountants, engineers, scientists, stockbrokers, and teachers ; and staff personnel such as secretaries and clerical office personnel. Most of them are end users who make their living using information systems to create, distribute, manage, and use information resources. Thus, information systems help them manage the human, financial, material, energy, and other resources involved in their work responsibilities.

“Information and information systems, then, are valuable resources for knowledge workers, their organisations, and society. A major challenge for our global information society is to manage its information resources to benefit all members of society while meeting the strategic goals of organisations and nations. This means, for example, using information systems to find more efficient, profitable, and socially responsible ways of using the world's limited supplies of material, energy, and other resources. Since the information systems of so

many organisations are interconnected by local, regional, and global telecommunications networks, knowledge workers can now access and distribute information and manage resources all over the world. For these reasons, information systems play an increasingly vital role in our global economy.

INFORMATION QUALITY

Quality of information refers to its fitness for use, or its reliability. Some of the attributes of information, which influence the quality of information are discussed as follows :

Timeliness - Timeliness means that information must reach the recipients within the prescribed time-frame, For effective decision-making, information must reach the decision-maker at the right time, ie. recipients must get information when they need it. Delays, of whatever nature, destroy the value of information. Timely information can ensure correct executive action at an early stage. The expected losses could be eliminated/minimised and gains maximised by proper management of operations,

Accuracy – Accuracy is another key-attribute of management information. It means that information is free from mistakes and errors, is clear and accurately reflects the meaning of data on which it is based. It conveys an accurate picture to the recipient, who may require a presentation in graphical rather than tabular form. Accuracy also means that the information is free from bias. Wrong information given to management would result in wrong decisions.

Relevance – Relevance is yet another key-attribute of management information. Information is said to be relevant if it answers specifically for the recipient what, why, where, when, who and why? In other words, the MIS should serve reports to managers which are useful and the information helps them make decisions. However, what is relevant information for one recipient is not necessarily relevant for another.

Adequacy – Adequacy means information must be sufficient in quantity, ie. MIS must provide reports containing information which is required in the deciding processes of decision-making. The report should not give inadequate or for that matter, more than adequate information, which may create a difficult situation for the decision-maker. Whereas inadequacy of information leads to a crisis, information overload results in chaos.

Completeness - The information which is provided to a manager must be complete and should meet all his needs. Incomplete information may result in wrong decisions and thus may prove costly to the organisation. In extraordinary situations, where providing complete information is not feasible for one reason or the other, the manager must be informed of this fact, so that due care in this regard may be taken.

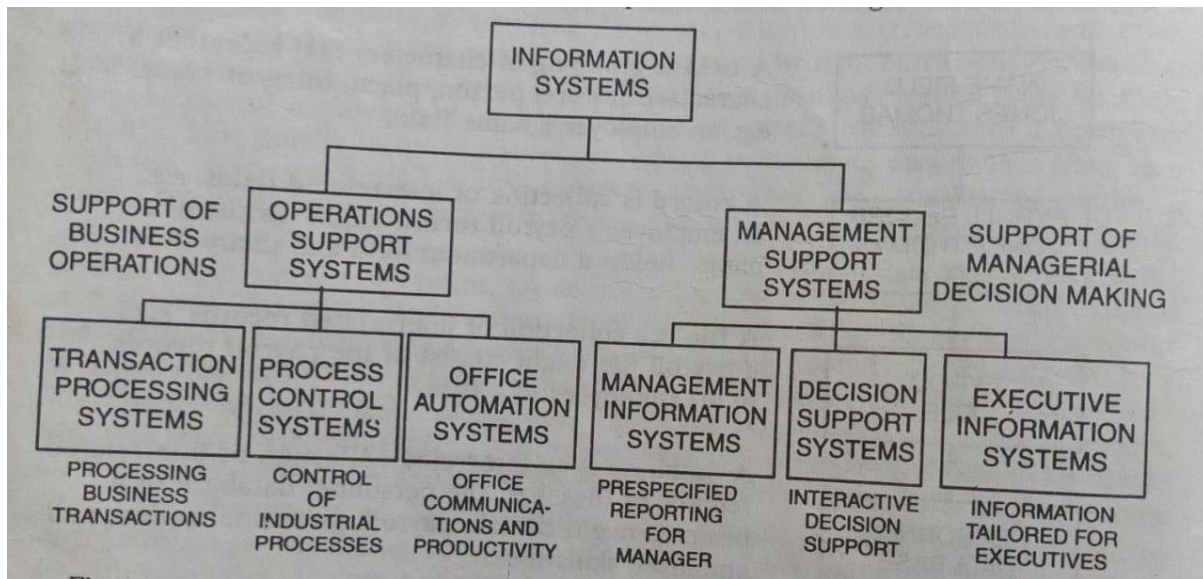
Explicitness – A report is said to be of good quality if it does not require further analysis by the recipient for decision-making. On the other hand, a poor quality report requires further analysis or processing of its contents. Therefore, explicitness is a prominent attribute of management information procured through the MIS of an organisation. Thus, the reports should be such that a manager does not waste any time on the processing of the report, rather he should be able to extract the required information directly.

Exception-based – Today, more and more organisations are being run on the principle of management by exception. Top managers need only exception reports regarding the performance of the organisation, Exception reporting principle states that only those items of information which will be of particular interest to a manager are reported. Usually, these items indicate that normal operations have gone awry. This approach results in saving precious time of the top management and enables the managers to devote more time in pursuit of alternatives for the growth of the organisation. If reports do not follow the exception reporting principle, these will provide even those details which are not required by managers and thus a lot of their time would be wasted in sifting useful information, and as a result, they will not be able to spend much time on other important activities of the organisation.

Quality- A utility approach to determine the quality of information considering four types of utilities of information, which may facilitate or retard its use.

- (i) **Form utility.** In order to be of greater value, the form of information should closely match the requirements of the user.
- (ii) **Time utility.** Information, if available when needed, has a greater value.
- (iii) **Place utility.** The value of information will be more if it can be accessed or delivered easily.
- (iv) **Possession utility,** The person who had the information influences its value by controlling its dissemination to others in the organisation.

TYPES OF INFORMATION SYSTEM



The types of Information Systems maybe:

- (A) **Operations support systems** - support the information processing requirements of the day-to-day operations of a business, as well as some lower-level operations management functions.
- (B) **Management support system**- support the decision-making needs of strategic (top) management, tactical (middle) management, and operating (supervisory) management.

(A) Operations support system

It produces a variety of information products for external and internal use. The role of a business firm's operations support systems is to efficiently process business transactions, control industrial processes, support office communications and productivity, and update corporate databases.

(a) **Transaction processing systems.** They are an important example of Operations support systems that record and process data resulting from business transactions. They process transactions in two basic ways. In batch processing, transactions data is accumulated over a period of time and processed periodically. In real time (or online) processing, data is processed immediately after a transaction occurs, For example, point-of-sale (POS) systems at many retail stores use electronic cash register terminals to electronically capture and transmit sales data over telecommunications links to regional computer centres for immediate (real-time) or, nightly (batch) processing,

(b) Process control systems. They monitor and control physical processes. For example, a petroleum refinery uses electronic sensors linked to computers to continually monitor chemical processes and make instant (real-time) adjustments that control the refinery process.

(c) Office automation system. It enhances office communications and, productivity. For example, a corporation may use word processing for office correspondence, electronic mail to send and receive electronic messages, and teleconferencing to hold electronic meetings.

(B) Management support system -When information systems focus on providing information and support for effective decision making by managers, they are called management support systems. Providing information and support for decision making by all levels of management, (from top executives to middle managers to supervisors) is a complex task. Conceptually, several major types of information systems support a variety of managerial end user responsibilities:

(a) Management information systems. They provide information in the form of reports and displays to managers. For example, sales managers may use their computer workstations to get instantaneous displays about the sales results of their products and to access weekly sales analysis reports that evaluate sales made by each salesperson.

(b) Decision support systems give direct computer support to managers during the decision-making process. For example, advertising managers may use an electronic spreadsheet package to do what-if analysis as they test the impact of alternative advertising budgets on the forecasted sales of new products.

© Executive information systems. They provide critical information in easy-to-use displays to top and middle management. For example, top executives may use touch screen terminals to instantly view text and graphics displays that highlight key areas of organisational and competitive performance.

Other classifications of information systems. Several other categories of information systems that support either operations or management applications are:

(a) Expert systems can provide expert advice for operational chores like equipment diagnostics, or managerial decisions such as Joan portfolio management.

(b) End user computing systems that provide hardware, software, data, and network resources for direct hands-on computing by end users for either operational or managerial applications.

(c) **Business information systems.** Information systems that focus on operational & managerial applications in support of basic business functions such as accounting or marketing are known as business information system,

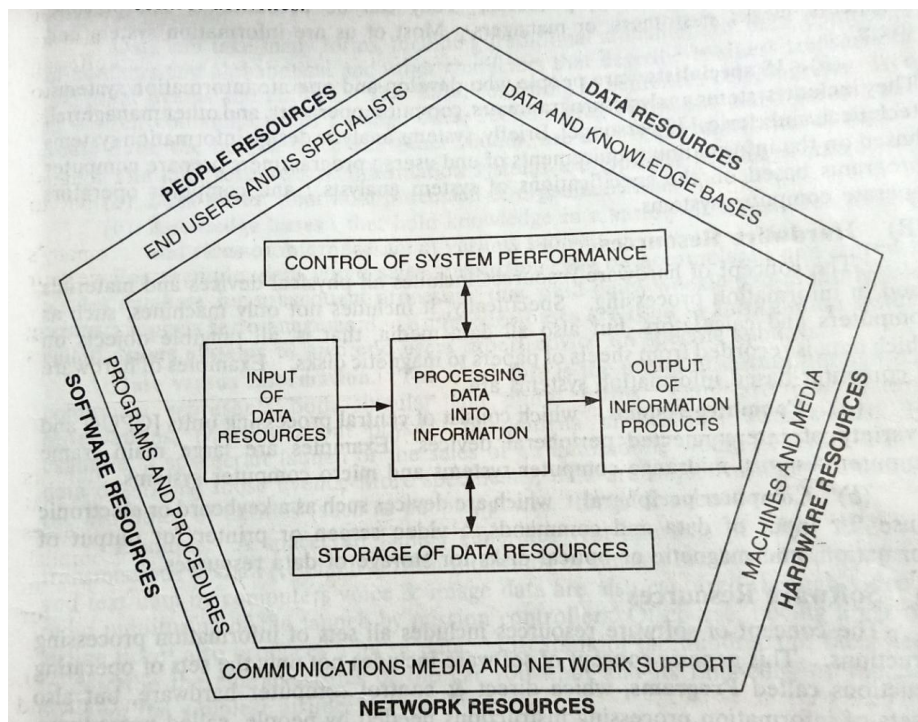
(d) **Strategic information systems** apply information technology to a firm's products, services, or business processes to help it gain a strategic advantage over its competitors.

Characteristics of Information- Information as a corporate resource has the following characteristics: **Timeliness, Appropriateness, Accuracy, Conciseness, Frequency, Understand ability, Relevance, Complete, Current and Economical.**

COMPONENTS OF AN INFORMATION SYSTEM

An information system uses the resources of people (end users and IS specialists), hardware (machines and media), software (programs and procedures), data (data and knowledge bases), and networks (communications media and network support) to perform input, processing, output, storage, and control activities that convert data resources into information products. This information system model highlights the relationships among the components and activities of Information. It provides a framework that emphasizes four major concepts that can be applied to all types of information systems :

Components of an Information System



1. People, hardware, software, data, and networks are five basic resources of information systems,
2. People resources include end users and IS specialists, hardware resources consist of machines and media, software resources include both programs and procedures, data resources can include data and knowledge bases, and network resources can include communications media and network support.
3. Data resources are transformed by information processing activities into a variety of information products for end users.
4. Information processing consists of input, processing, output, storage, and control activities.

INFORMATION SYSTEM RESOURCES

Our basic IS model shows that an information system consists of five major resources, people, hardware, software, data and networks

(A) People Resources- People are required for the operation of all information systems.

These People resources include end users and IS specialists :

(a) Endusers (also called users or client) are people who use an information system or the information it produces. They can be accountants, salespersons engineers, clerks, customers, or managers. Most of us are information system end users.

(b) IS specialists are people who develop and operate information systems. They include systems analysts, programmers, computer operators, and other managerial technical, and clerical IS personnel. Briefly, systems analysts design information system, based on the information requirements of end users ; programmers prepare compute, programs based on the specifications of system analysts ; and computer operators operate computer systems.

(B) Hardware Resources

The concept of hardware resources includes all physical devices and materials used in information processing. Specifically, it includes not only machines, such as computers and calculators, but also all data media, that is, all tangible objects on which data is recorded from sheets of papers to magnetic disks. Examples of hardware in computer-based information systems are :

(a) Computer systems, which consist of central processing units [CPUs] and a variety of interconnected peripheral devices. Examples are large main frame computer systems, midrange computer systems and microcomputer systems.

(b) Computer peripheral, which are devices such as a keyboard or electronic mouse for input of data and commands, a video screen or printer for output of information, and magnetic or optical disks for storage of data resources.

(C) Software Resources

The concept of software resources includes all sets of information processing instructions. This generic concept of software includes not only the sets of operating instructions called Programs, which direct & control computer hardware, but also the sets of information processing instructions needed by people, called procedures, So even information systems that don't use computers have a software resource component. The following are examples of software resources :

(a) Software system, such as an operating system program, which controls and supports the operations of a computer system.

(b) Application software, which are programs that direct processing for a particular use of computers by end users. Examples are a sales analysis program, a payroll program, and a word processing program,

(c) Procedures, which are operating instructions for the people who will use an information system. Examples are instructions for filling out a paper form or using a software package.

(C) Data Resources

Data is more than the raw material of information systems. The concept of data resources has been broadened by manager and information systems professionals. They realize that data constitutes a valuable organisational resource. Thus, data should be viewed as data resources that must be managed effectively to benefit all end users in an organisation. Data can take many forms, including traditional alphanumeric data, composed of numbers and alphabetical and other characters that describe business transactions and other events and entities. **Text data**, consisting of sentences & paragraphs used in written communications ; **Image data**, such as graphic shapes and figures ; and **audio data**, the human voice and other sounds, are also important forms of data.

The data resources of information systems are typically organized into :

(a) **Data bases** that hold processed & organized data. (b) **Knowledge bases** that hold knowledge in a variety of forms such as facts and rules of inference about various subjects, For example, data about sales transaction may be accumulated and stored in a sales database for subsequent processing that yield daily, weekly and monthly sales

analysis reports for management. Knowledge bases are used by information systems called **expert systems** to give end users expert advice on specific subjects.

(E) Network Resources Telecommunications networks have become essential to the Successful operations of modern organisations and their computer-based information systems Telecommunications networks consist of computers, end user terminals communications processors, and other devices interconnected by communications media and controlled by communications software. Network resources include :

- (a) Communications media,** Examples include twisted-pair wire, Coaxial cable, fibre-optic cable, microwave systems, and communications satellite systems,
- (b) Network support.** This generic category includes all of the people, hardware, software and data resources that directly support the operation and use of a communications network. Examples' include communications processors such eg. modems and internetwork processors, and communications control software such as network operating systems and internet access packages.

INFORMATION SYSTEM ACTIVITIES

The information system activities are:

- (a) Input of Data, Resources.** Data about business transactions and other events must be captured and prepared for processing by data entry activities such as recording and editing. End users typically record data about transactions on some type of physical medium such as a paper form, or enter it directly into a computer system. This usually includes a variety of editing activities to ensure that they have recorded data correctly. Once entered, data may be transferred onto a machine-readable medium such as magnetic disk or tape, until needed for processing.
- (b) Processing of Data into Information.** Data is typically manipulated by such activities as calculating, comparing, sorting, classifying, and summarizing. These activities organize, analyse, and manipulate data, thus converting them into information for end users. The quality of any data stored in an information system must also be maintained by a continual process of correcting and updating activities.
- (c) Output of Information Products,** Information in various forms is transmitted to end users and made available to them in the output activity, The goal of information systems is the production of appropriate information products for end users. Common information products are video displays, paper documents, and audio responses that provide us with messages, forms, reports, listings, graphics displays, and so on. We

routinely use the information provided by these products as we work in organisations and live in society.

(d) Storage of Data Resources Storage is the information system activity in which data and information are retained in an organized manner for later use. For example, just as written text material is organized into words, sentences, paragraphs, and documents, stored data is commonly organized into fields, records, files, and databases. This facilitates its later use in processing or its retrieval as output when needed by users of a system.

(e) Control of System Performance. An information system should Produce feedback about its input, processing output, and storage activities. This feedback must be monitored and evaluated to determine if the system is meeting established performance standards. Then appropriate system activities must be adjusted so that proper information products are produced for end users

Business examples of the basic activities of information systems :

(a) Input. Optical scanning of bar-coded tags on merchandise.

(b) Processing. Calculating employee pay, taxes, and other payroll deduction,

(c) Output. Producing reports and displays about sales performance.

(d) Storage. Maintaining records on customers, employees, and products,

(e) Control. Generating audible signals to indicate proper entry of sales data.

COMPUTER CONCEPTS

Meaning and Definition of Computers

The word “computer” comes from the word “compute”, which means to calculate. A computer may be defined as a device, which operates upon data which comes in various shapes and sizes, depending upon the type of computer application.

The activity of processing data using a computer is called data processing, Data processing consists of three sub activities :1) Capturing input data 2) Manipulating data, and 3) Managing output results.

Basic Computing Elements Computer is called a system because it is integrated process consisting of Hardware, Firmware, Software, Data, People and Procedure. Five elements of computing process 1) **Hardware:** Physical or tangible components of computer i.e. those that can be touched are hardware. 2) **Software:** Intangible components of computer constitute software i.e. those parts that cannot be touched are softwares. Softwares, also known as programs, consists of organized set of instructions for controlling the computer. 3) **Data:** It is

a collection of characters and numbers that can be processed by computer. Data consist of text, numbers, sounds, and images that the computer can manipulate. **4) Liveware (People):** All input as well as Input specifications are given by the people and output is given to them. **5) Procedure:** It is the activity of manipulating data by computer to produce information.

Advantages of Computer

- 1) **Efficient and Wide Range of Computing:** Computer can do calculations from simple arithmetic calculations to comparisons to high level scientific and engineering calculations. Even the accuracy, reliability, and efficiency are multiplied in comparison to humans,
- 2) **Networking:** Provides sharing of resources like devices, files, save overheads like money and time, This ranges from connectivity of computers from few kilometers to the coverage of even entire world, Internetworking provides various other advantages like that of communication, banking, and commerce via the network only.
- 3) **Security:** Users cannot see other users' files unlike by the use of passwords and other security means.
- 4) **Durability of data:** The files stored on a standalone system can be kept safely for longer durations by keeping the backup of data on storage devices, And in case of networked systems a file server easily to back up all the data.
- 5) **Ease of Handling of Data:** A computer allows a person fo manipulate data easily and quickly, create text documents, edit them, print them, manipulate images and print them.
- 6) **Magnificent Educational Tool:** Good software can also help learners develop their understanding of cause and effect, higher order problem solving, procedural thinking and creative expression.

Disadvantages of Computer

- 1) **Dependent on User:** The computer is dependent on the user who gives the instructions, cannot work by itself.
- 2) **Cannot Correct the Errors:** Computer cannot correct the errors by itself.
- 3) **Cannot interact with the user:** The computer is a machine and cannot interact with the user.
- 4) **Power Supply:** Regular power supply is major requirement for computer.
- 5) **Productivity:** It has been observed that computers have sometimes take much longer time In performing the task as compare to the manual work.

5) Reasoning: Computers still lack many of the mental capabilities.

The generation of computer is divided into

- 1) First Generation
- 2) Second Generation
- 3) Third Generation
- 4) Fourth Generation
- 5) Fifth Generation computers.

Classification of Computers .

There are two basic classifications:

1) Technical Classification: Computers can be classified on the basis of technique used

i) Analog Computers ii) Digital Computers iii) Hybrid Computers

2) Commercial Classifications Computer can be categorised based on their size and design.

Modern computers can vary in size ranging from the one that fills the entire room to a size that is small enough to fit the nail of thumb with room to spare,

1) Mainframe Computer i) Mini Computers iii) Workstation iv) Microcomputers
v) Super Computer vi) Personal Computer

Analog Computers - Analog computers operate by measuring continuously changing physical quantities like pressure, temperature etc, and converts them to numeric values.

Digital Computers – Digital computer is an electronic machine that accepts a stream of symbols as its input, stores them, processes them according to precise rules and produces meaningful output.

Hybrid Computers - Hybrid Computers that exhibit features of analog computers and digital computers. The digital component normally serves as the controller and provides logical operations, while the analog component normally serves as a solver of differential equations. In this computer some calculations are done in the analog portion of the computer and some are done in the digital portion of it.

Mainframe Computers - Mainframes (often referred to as “big iron”) are powerful computers used mainly by large organizations for critical applications, typically bulk data processing such as census, industry and consumer statistics, enterprise resource planning, and financial transaction processing. The mainframe computers can maintain large databases that can be accessed by remote users with a simple terminal.

Mini Computers - A minicomputer is a small digital computer, which normally is able to process and store less data than a mainframe but more than a microcomputer, while doing so less rapidly than a mainframe but more rapidly than a microcomputer. It is about the size of a

two drawer filing cabinet. Generally, it is used as desktop devices that are often connected to a mainframe in order to perform the auxiliary operations.

Workstations - Workstation is a high-end microcomputer designed for technical or scientific application, Intended primarily to be used by one person at a time, they are commonly connected local area network and run multi-user operating systems. The term workstation has been used to refer to a mainframe computer terminal or a PC connected to a network.

Microcomputer – Microcomputer is a computer with a microprocessor as physically small compared to mainframe and minicomputers. Many Microcomputers equipped with a keyboard and screen for input and output) are also personal computers,

Personal Computers - Personal computer (PC) is any general-purpose computer whose size, capabilities, and operated original sales price make it useful for individuals, and which is intended to be directly by an end-user with no intervening computer operator. PCs include any type of computer that is used in a "personal" manner.

COMPUTER HARDWARE

The term computer hardware refers to the physical components of a computer, namely:

1) Input Devices, 2) Output Devices, 3) Memory Devices(Primary and Secondary storage), 4)Processor / Central Processing Unit, 5) Communication ‘Technologies telecommunication, networking intranet extranet and internet.

Input Devices - The foremost task of a computer is to accept data. An input device is used to accomplish this task. An input device is used to enter the data and instructions into the computer. Hence, input unit links external environment with the computer system by allowing data and instruction to enter the computer system before any computations can be performed. Regardless of their form, data and instructions are transformed into the binary codes that the computer is designed to accept.

Some of the input devices include, 1) Keyboard 2) Mouse. 3) Trackball 4) Touch Screen 5) Stylus 6) Joystick 7) Optical Scanners 8) Other Devices: i) Voice Recognition System (VRS) (ii) Sensors

Output Devices - The output unit supplies information and results of computation to the outside world. Thus it links the computer with the external environment. As computers work with binary code, the results produced are also in the binary form. A special interface called output interfaces, attached to the output unit converts the information in binary form

to human acceptable (readable) form. Output interfaces are designed to match the unique physical or electrical characteristics of output devices (terminals, printers, etc.) to the requirements of the external environment. An output device is any machine capable of representing information from a computer. Output devices include display screens, loudspeakers, printers, plotters, etc. Input devices can be classified as: 1) Monitors, 2): Printer, 3) Plotter, 4) Sound Cards and Speakers

Memory Devices - The memory of a computer system is designed to store data and instructions that are entered into the computer system through input unit before the actual processing starts. Similarly, it also stores the intermediate results produced by the computer for on-going processing. The results produced by the computer after processing is also stored before being passed on to the output unit.

Secondary Storage - The computer provides the capability to handle huge amounts of data which are store, secondary storage devices. A few these physical storage devices are listed below:1) Magnetic Tape, 2) Hard Disk Drive (HDD), 3) Compact Disk, 4) Digital Video Disk, 5) Pen Drive

Central Processing Unit (CPU) / Processor-The central processing unit (CPU) is the “brain” of any computer system. It has a built in set of instruction, which it can execute, The kind of instructions present in the instruction set determines what the computer can do. The CPU is also responsible for activating and controlling the operation of other units of the computer system. Hence no other single component of a computer determines its overall performance as much as the CPU. CPU also called Processor.

COMPUTER SOFTWARE

Software refers to a program that makes the computer to do something meaningful. It is the planned, step-by-step instructions required to turn data into information. A set of instructions that performs a particular task is called program, or software. The instructions in the program direct the computer to perform the processing on the input data and produce the results at the output. ‘Software’ is a general term that is used to describe any single program or a group of programs. Computer software is typically classified into two major types of programs

1. **Application Software.** Application software describes the programs that are written for or by users to apply the computer to a specific task. Software for processing an order or generating a mailing list is application software. Programmers who write application software are called application programmers

2. **System Software.** System software is a set of generalized programs that manage the resources of the computer, such as the central processor, communication links, and peripheral devices. Programmers who write system software are called system programmers.

APPLICATION SOFTWARE

Application software consists of the programs that are written for or BY user fo apply the computer to a specific task. These programs are called application because they direct the processing required for a particular use, or application, that end users want accomplished. Application software consists of a variety of programs which can be further divided into two categories.

General Purpose Programs – These are the programs that perform common information processing jobs for users. Various examples of general purpose programs are word processing programs, spreadsheet programs, database management programs, graphics programs and integrated packages. 1. Word processing systems is automatic document formatting 2. Electronic Spreadsheet Packages. Electronic spreadsheet packages provides computerized versions of traditional financial modeling tools such as the accountant’s tlumnar pad, pencil, and calculator. 3, Database Management Programs. While spreadsheet programs are powerful tools for manipulating quantitative data, data management software is more suitable for creating and manipulating lists and for combining information from different files. (i) Database Development (ii) Database Interrogation. (iit) Database Maintenance. (iv) Application Development. 4,Graphics Packages. Graphic packages convert numeric data into graphics displays such as line charts, bar graphs, and pie charts. 5. Integrated Software Packages. Integrated software packages combine the functions of the most important microcomputer software packages, such as word processing, spread sheets, graphics, and data management.

Application Specific Programs - There are thousands of application software packages available to support specific application of end users. Major categories of such application-specific programs are - 1. Business Application Programs - These are the programs that accomplish the information processing tasks of important business functions or industry requirements. 2. Scientific Application Programs. These are the programs that perform information processing tasks for the natural, physical, social, and behavioural sciences; and for mathematics, engineering, and all other areas involved in scientific research,

experimentation, and development. 3. Other Application Programs. There are so many other application areas of computers that we lump them all into this category. Computer applications in education, medicine, law enforcement, entertainment, music, and so on. Some specific examples are computer-assisted instruction programs in education, video game programs in entertainment, and computer-generated music and art programs.

SYSTEM SOFTWARE - System software consists of programs that manage and support a computer system and its information processing activities. We can group such programs into three major functional categories.

System Management Programs. These are the programs that manage the hardware, software, and data resources of the computer system during its execution of the various information processing jobs of users. These programs are further classified into operating systems, operating environments, database management system and telecommunications software.

System Support Programs - System support programs are a category of software that performs routine support functions for the users of a computer system. Utility programs are an example of this category. They perform miscellaneous housekeeping and file conversion functions. For example, sort programs are important utility programs that perform the sorting operations on data required in many information processing applications, Utility programs also clear primary storage, load programs, record the contents of primary storage, and convert files of data from one storage medium to another, such as from tape to disk. Many of the operating system commands used with microcomputers and other computer systems provide users with utility programs and routines for a variety of chores.

Other system support programs include performance monitors and security control software. Performance monitors are programs that monitor the performance and usage of computer systems to help its efficient use. Security control software monitors utilization, log ons, passwords, and various authorization procedures to prevent unauthorized access to a network.

System Development Programs - These are the programs that help the users to develop information system programs and procedures and prepare user programs for computer processing. Major development programs are language translators, programs tools, and computer-aided software engineering packages.

Client/Server Architecture - Client/server architecture is an application design approach that results in the decomposition of an information system into a small number of server

functions, executing on one or more hardware platforms, that provide commonly used services to a larger number of client functions, executing on one or more different but interconnected hardware platforms, that perform more narrowly defined work in reliance of the common services provided by the server functions.”

DATABASE MANAGEMENT SYSTEM

Data are a vital organisational resource that needs to be managed like other important business assets. Most organisations could not survive or succeed without quality data about their internal operations and external environment. That’s why organisations and their managers need to practice data resource management, Data resource management is a managerial activity that applies information systems technology and management tools to the task of managing an organisation’s data resources to meet the information needs of business users.

Levels of Data - A hierarchy of several levels of data has been devised that differentiate between different groupings, or elements of data. Data may be logically organised into characters, fields, records, files, and databases, just as writing can be organised in letters, words, sentences, paragraphs, and documents.

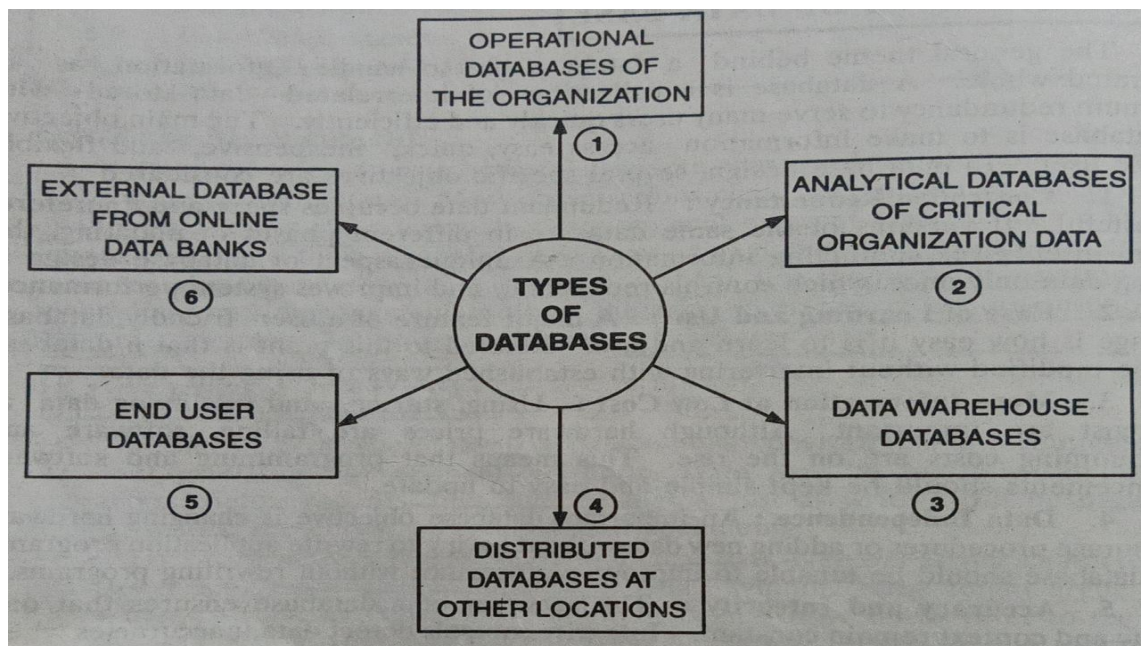
OBJECTIVES OF DATA BASE

A database is a collection of interrelated data stored with minimum redundancy to serve many users quickly and efficiently. The main objective of database is to make information access easy, quick, inexpensive, and flexible for the user. In data base design, several specific objectives are considered :

- 1. Controlled Redundancy** - Redundant data occupies space and, therefore, is wasteful. If versions of the same data are in different phases of updating, the system often gives conflicting information. A unique aspect of database design is storing data only once, which controls redundancy and improves system performance.
- 2. Ease of Learning and Use:** A major feature of a user friendly database package is how easy it is to learn and use. Related to this point is that a database can be modified without interfering with established ways of using the data.
- 3. More Information at Low Cost :** Using, storing, and modifying data at low cost are important. Although hardware prices are falling, software and Programming costs are on the rise. This means that programming and software’ enhancements should be kept simple and easy to update.

4. **Data Independence** : An important database objective is changing hardware and storage procedures or adding new data without having to rewrite application programs. The database should be tuneable to improve performance without rewriting programs
5. **Accuracy and Integrity**: The accuracy of a database ensures that data quality and context remain constant. Integrity controls detect data inaccuracies where they occur.
6. **Privacy and Security**: For data to remain private, security measures must be taken to prevent unauthorised access. Database security means that data that are protected from various forms of destruction users must be positively identified and their actions monitored.
7. **Shared**: In multi-user applications, it is expected that the database is designed such that the data can be shared or accessed by different users. The sharing of data is possible only if the database is integrated.
8. **Recovery from Failure**: With multiuser access to a database, the system must recover quickly after it is down with no loss of transactions. This objective also helps maintain data accuracy and integrity.
9. **Performance** : This objective emphasises response time to inquiries suitable to the use of the data. How satisfactory the response time is depends on the nature of the user-database dialogue.

TYPES OF DATABASES



The growth of distributed processing, end user computing, and decision support and executive information systems have caused the development of several major types

of databases. The six major types of databases that may be found in computer-using organisations are –

1. **Operational Databases** : These databases store detailed data needed to support the operations of the entire organisation. Examples are customer database, personnel database, inventory database and other database containing data generated by business operations.
2. **Analytical Databases** : These databases store data and information extracted from selected operational and external databases, They consist of summarized data and information most needed by an organisation's managers and other end users.
3. **Data Warehouse Databases:** A data warehouse stores data from current and previous years that has been extracted from the various operational and management databases of an organisation. It is a central source of data that has been standardized and integrated so it can be used by managers and other end user professionals throughout gn organisation. For example, a major use of data warehouse databases is pattern processing, where operational data are processed to identify key factors and trends in historical patterns of business activity.
- 4.**Distributed Databases:** These are databases of local work groups and departments at regional offices, branch offices, manufacturing plants, and other work sites.
5. **End user Databases** : These databases consist of a variety of data files developed by end users at their workstations. Users may have their own electronic copies of documents they generated with word processing packages or received by electronic mail.
6. **External Databases** : Access to external online databases or data banks is available for a fee from commercial information services, or without charge from many sources on the internet. Data are available in the form of statistics on economic and demographic activity from statistical data banks or you can receive abstracts from hundreds of newspapers, magazines, and other periodicals from bibliographic data banks.

DATABASE MANAGEMENT SYSTEM

A database management system (DBMS) is simply the software that permits an organisation to centralize data, manage them efficiently, and provide access to the stored data by application programs. The DBMS acts as an interface between application and physical data files. When program calls for a data item, the DBMS finds this item in the database and

presents it to the application program. A DBMS has 3 components: 1. A data definition language 2. A Data manipulation language 3. A data dictionary

FUNCTIONS OF DATABASE MANAGEMENT SYSTEM

A database management system performs the following functions :

- 1. Organises data :** Data are organised or structured according to the specifications of the data definition language. These specifications are introduced by the database administrator at the time the database is established, and may be reintroduced as the database configuration changes. Data are organised in the manner most suitable to each application.
- 2. Integrates data:** Data are interrelated or linked together at the elements (named field of data) level and can, therefore, be assembled in many combinations during execution of a particular application program. The database management system is the vehicle used to collect, combine, and return a portion of the available data to the user.
- 3. Separates data:** A database management system serves as a filter between application programs and their associated data. It separates application logic from the input/output logic needed to calculate addresses, follow chains or links, block/unblock data, locate records, and select data elements.
- 4. Controls data:** A database management system appears to an application programmer to be an extension of the operating system software. As it receives data storage requests from host programs, it controls how and where data are physically stored. On data retrievals, it locates and returns requested elements of data to the programs.
- 5. Retrieves data :** A record of data can be obtained via a database Management system :Serially (in its physically stored sequence) , Sequentially, according to the value of a user-specified key , Randomly by address ,Randomly by key, By structural link All or any portion of data record can be returned to the user.
- 6. Protects data:** A database management system protects and secures both the content of a database and the relationships of data elements. Data are protected against access by unauthorized users, physical damage, operating system failure, simultaneous updating, and certain interruptions initiated by a host program.

BENEFITS OF DATABASE MANAGEMENT SYSTEM

There are many benefits to be derived from installing a database management system. Some of more tangible ones are :

- 1. Reduced Programming Costs :** Because many of the input/output (file, definition and file maintenance) routines normally coded by the programmers are now handled

through the data base management system, the amount of time and money spent writing an application program is reduced.

2. **Reduced Development and Implementation Time:** Because programmers spend less time writing applications, the amount of time required to implement new applications is reduced.
3. **Reduced Program and File Maintenance Costs :** Nearly 60 percent of total programming cost is spent on maintenance. Database management systems reduce this expenditure by performing file maintenance in a more convenient and more efficient manner. Program maintenance is also reduced because the volatile areas of programs, input/output, and file descriptions are handled via the database management system.
4. **Reduced Data Redundancy:** Redundant data items cost money in storage space, programmer time, and time maintenance. With a database management System, data items need be recorded only once and are available for everyone to use. Programmers do not spend time coding file descriptions that contain the same data elements found in other files, since each element of data is maintained by a single source.
5. **Increased Flexibility :** Database management systems make the data processing organisation more flexible and enable it to respond more quickly to the expanding needs of the business. Unique reporting requirements are more adequately met, because special files do not have to be created or redesigned, and programming changes are minimized.

DATA STORAGE AND RETRIEVAL

Data storage and retrieval are two important driving forces behind data management. Data is not stored in a random fashion but is organised for efficient retrieval. There are many methods of organising data. Before deciding about the method of storage organisations, it is important for managers to know how the data is likely to be accessed by users. There are four common methods of organising files —

1. **Sequential Organisation:** It simply means storing and sorting in physical, contiguous blocks within files on tape or disk. Records are also in sequence within each block. To access a record, previous records within the block are scanned. Thus sequential record design is best suited for “get next” activities, reading one record after another without a search delay. In a Sequential organisation, records can be added only at the end of the file. It is not possible to insert a record in the middle of the file without rewriting the file.

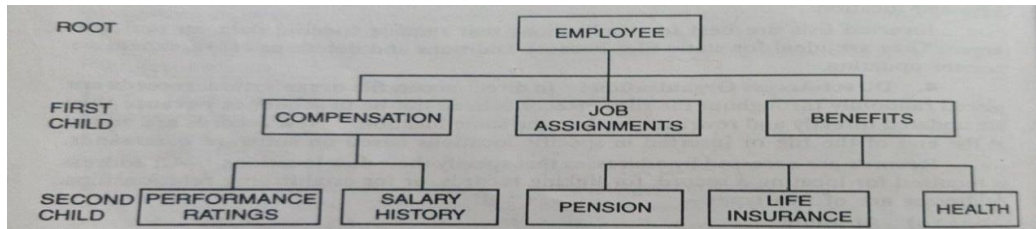
2. **Indexed-Sequential Organisation** : Like sequential organisation, keyed sequential organisation stores data in physically contiguous blocks. The difference is the use of indexes to locate records. To understand this method, we need to distinguish on three areas in disk storage. Prime area, overflows area, and index area.
 - (a) **Prime area** contains file records by key or ID numbers. All records are initially stored in the prime area.
 - (b) **The overflow area** contains records added to the file that cannot be placed in logical sequence in the prime area.
 - (c) **The index area** is more like a data dictionary. It contains keys of records and their locations on the disk. A pointer associated with each key in an address that tells the system where to find a record. The primary drawback is the extra storage space required for the index. It also takes longer to search the index for data access or retrieval.
3. **Inverted List Organisation**: Like the indexed-sequential storage method, the inverted list organisation maintains an index. The two methods differ, however, in the index level and record storage. The indexed-sequential method has a multiple index for a given key, whereas the inverted list method has a single index for each key type. In an inverted list, records are not necessarily stored in a particular sequence. They are placed in the data storage area, but indexes are updated for the record keys and location.
4. **Direct-Access Organisation**: In direct-access file organisation, records are placed randomly throughout the file. Records need not be in sequence because they are updated directly and rewritten back in the same location. New records are added at the end of the file or inserted in specific locations based on software commands. Records are accessed by addresses that specify their disk locations. An address is required for locating a record, for linking records, or for establishing relationships. Addresses are of two types
 - a) Absolute
 - b) Relative
 - a) Absolute address represents the physical location of the record.
 - b) A relative address gives a record location relative to the beginning of the file.

DESIGNING DATABASES

There are many ways of organising data and representing relationships among data in a database. Conventional DBMSs use one of the three principal logical database models for keeping track of entities, attributes, and relationships. The three principal logical database **models** are hierarchical, network, and relational.

1. Hierarchical Data Model: The earliest DBMSs were hierarchical, The hierarchical data model presents data to users in a treelike structure.

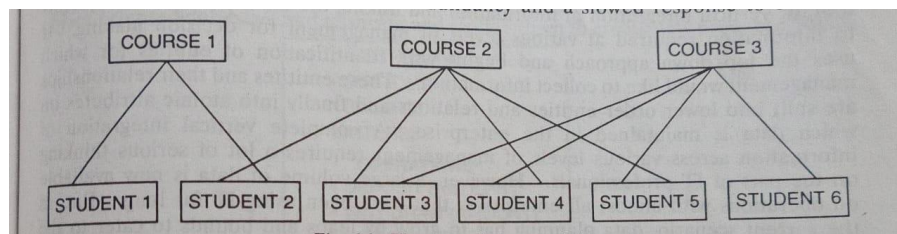
Hierarchical Database



Each record looks like an organisation chart with one top-level segment, called the root. An upper segment is connected logically to a lower segment in a parent-child relationship. A parent segment can have more than one child, but a child can have only one parent.

2. Network Data Model : The network data model is a variation of the hierarchical data model. Databases can be translated from hierarchical to network and vice versa in order to optimize processing speed and convenience. Network Structures depict data logically as many-to-many relationships.

Network Data Model



In other words, parents can have multiple children and a child can have more than one parent. A typical many-to-many relationship in which network DBMS excels in performance is the student-course relationship. Eg. There are many courses in a university and many students. A student takes many courses and course has many students.

3. Relational Data Model : The relational data model, the most recent of these three database models, overcomes some of the limitations of the other two models. The relational model represents all data in the database as simple two dimensional tables called relations. A relational database model with two tables representing some of the relationships among departmental and employee records.

Relational structure

Department Table				Employee Table				
Dept. no.	D name	D loc	D mgr	Emp. no.	E name	E title	E salary	Dept no.
Dept. A				Emp. 1				Dept. A
Dept. B				Emp. 2				Dept. A
Dept. C				Emp. 3				Dept. B
				Emp. 4				Dept. B
				Emp. 5				Dept. C
				Emp. 6				Dept. A

Other tables, or relations, for this organisation's database might represent the data element relationships among projects, divisions, product lines and so on. Packages based on the relational model can link data elements from various tables to provide information to users. For example, a DBMS package could retrieve and display an employee's name and salary from the employee table and the name of his department from the department table, by using their common department number field (Dept. no.) to link or join the two tables.