

INFS 421

Automation of Information Systems

Introduction to Computer-based Information Systems

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Session Overview

This session is about understanding basic definitions that will assist you to distinguish between some common terms related to Information Technology and its related disciplines. You will be able to understand some computing techniques that may help you communicate with other corporate experts.



Session Outline

The key topics to be covered in the session are as follows:

- Topic One – Definition of Terms
- Topic Two – The role of Information Technology in Business



Topic One

DEFINITION OF TERMS



Definitions

Computer Systems

This refers to the complete computer (physical), software and peripheral devices that are necessary to make the computer function. Computer systems fall into two broad divisions (a) Clients (b) Servers Client machines fall into 3 categories namely low to high, laptop and desktop, work station. Servers range from small to large; low end servers, mid-range servers and main frames



Definitions

TECHNOLOGY

The human species' use of technology began with the conversion of natural resources with simple tools.

Technology in Greek τέχνη (Technos) meaning art, skill. The use of the hand in the making modification, usage and knowledge of tools, machines, techniques, crafts, systems and methods of organization in order to solve a problem, improve a pre-existing solution to a problem, achieve a goal, handle an applied input/output relation or perform a specific function. Can be summed up as THE PRACTICAL USE OF HUMAN KNOWLEDGE



Definitions

INFORMATION TECHNOLOGY (IT)

Definitions of IT abound in literature. These definitions can be categorized according to two (2) schools of thought. The first school defines IT in terms of manual or computer operations



Definitions

INFORMATION TECHNOLOGY (IT) - Definition 1

Information Technology is the acquisition, processing, storage, dissemination and use of information either mechanically or manually. It is not confined to hardware and software, but acknowledges the importance of man and the goals he sets for his technology, the values employed in making these choices the assessment criteria used to decide whether he is controlling and being enriched by it.



Definitions

INFORMATION TECHNOLOGY (IT) - Definition 2

Information technology is the scientific, technological and engineering disciplines, and the management techniques used in information handling and processing, their applications, computers and their interaction with users and machines; and associated social, economic and cultural matters.



Definitions

INFORMATION TECHNOLOGY (IT) - Definition 2

Other definitions for the 2nd school of thought – Information Technology can be also defined as any computer-based system that people use to work with information and support the information and information processing needs of an organization. It includes keyboards, mice, screens, printers, modems, software, operating system etc



Definitions

INFORMATION TECHNOLOGY (IT) - Definition 2

A third definition for the 2nd school of thought is that Information Technology is defined as the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data often used in the context of business or other enterprise.



Topic Two

THE ROLE OF INFORMATION TECHNOLOGY IN BUSINESS



Information Technology in Business

A business uses IT in four ways to support:

- Information processing tasks
- Decision-making tasks
- Shared information through decentralised computing and
- Innovation



Information Technology in Business

Supporting information-processing tasks

- First and foremost, businesses are using IT to support basic information – processing tasks. These tasks range from computing and printing payroll cheques, to creating presentations to setting up Web sites from which customers can order products. As you consider information processing tasks, you can easily categorise various IT tasks according to their purpose. To help you, remember the categories of IT tools, we have created 5Cs of information processing tasks.



Information Technology in Business

These are

- **Capturing information:** at its point of origin with input devices such as mouse, keyboard, bar code reader
- **Conveying information:** in its most useful form with output devices such as screen, printer, monitor etc
- **Creating information:** to obtain new information with the CPU and internal memory (RAM)
- **Cradling information** for use at a later time with storage devices such as hard disk, CD-ROM, DVD etc
- **Communicating information:** to other people or to another location with telecommunications technologies such as modem, satellite and digital pager



Information Technology in Business

Supporting decision making tasks:



when businesses use it to process information such as payroll or a sales order, we refer to it as online transaction processing.

- **Online transaction processing (OLTP)** involves gathering input information, processing that information, and updating existing information to reflect the gathered and processed information.
- Businesses also use IT to support decision – making tasks what we call online analytical processing. **Online analytical processing (OLAP)** is the manipulation of information to support decision making.

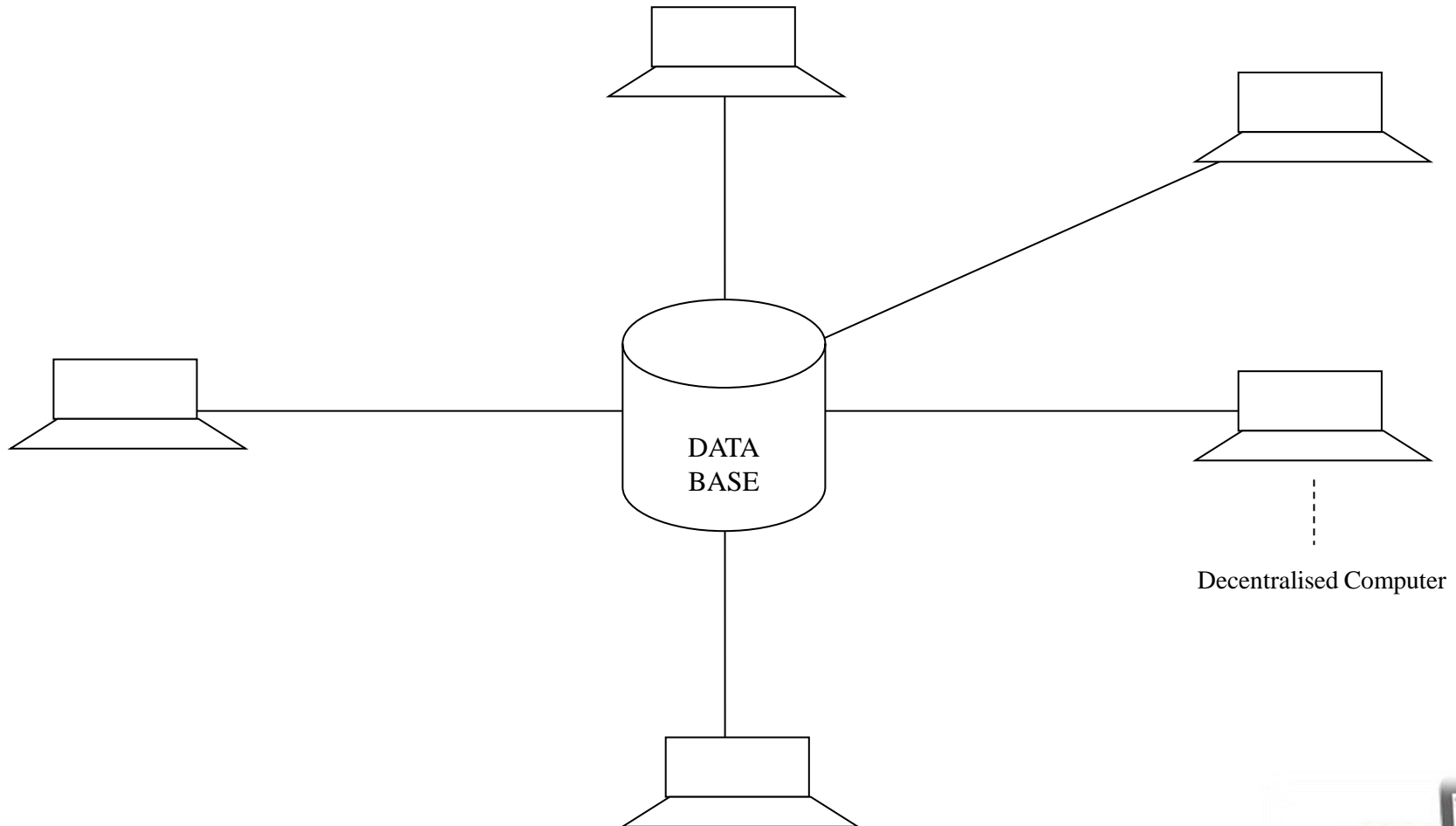
Information Technology in Business

Supporting decision making tasks:

- OLAP can range from performing simple queries on a database to determine which customers have overdue accounts to employing sophisticated artificial intelligence tools such as neural networks and genetic algorithms to solve a complex problem or take advantage of an opportunity.
- So we say that OLTP supports efficiency (doing things the right way – the cheapest, the fastest, and so on) while OLAP supports effectiveness (doing the right things or making the right decisions).



Figure 1.1: Shared Information through Decentralised Computing



Information Technology in Business

Supporting innovation

- IT tools enable innovation. Let us consider FedEx – the first package freight company to offer package delivery software that its customers could use to electronically request package pickup and check the status of packages during delivery in the USA. All the other major package delivery services (including the U.S. Postal service) were forced to quickly develop similar software or risk losing their customer base to a company that provided a more innovative and efficient way to handle information-processing tasks related to delivering packages



Topic Three

THE CONCEPT OF AUTOMATION



Introduction

As you may be aware, the title of this course contains the word Automation. This section therefore discusses the concept of automation by defining the term and then demonstrate the types of automation and their application in business and information centres.

DEFINITION OF AUTOMATION

The term automation was coined around 1946 by the automobile industry to describe the increased use of automatic devices and controls in mechanized production lines. In its most general form automation can be defined as a technology concerned with carrying out a process by means of programmed commands combined with the automatic feedback of data relating to the execution of those commands. The resulting system is capable of operating without human automation.



Automation is derived from the Greek and means self-dedicated. It is also referred to as Industrial Automation or Numerical Control.

It can also be defined as the use of Control Systems such as computers to control industrial machinery and processes i.e. replacing human operators.



The Types of Automation

In industries automation is a step beyond mechanization. Mechanization had its beginning in the Industrial revolution. Mechanization refers to the replacement of human/animal power with mechanical power of some form.

Mechanization provided human operators with machinery to assist them with the physical requirements of work.

Automated replaces mechanization and greatly reduced the need for human sensory and mental requirements as well.



TYPES OF AUTOMATION Cont'd

FIXED AUTOMATION

This is sometimes called **hard automation**. It is a system in which the sequence of processing or assembling is fixed by physical equipment configurations. The programmed commands are in effect contained in the machines the form of gears, wiring and other hardware that is not easily changed over from one type of product to another. This form of automation is characterized by high initial investment and high production rates. Its suitable for products that are made in large volumes. **Fixed automation** is used when the volume of production is very high and therefore it is appropriate to design specialized equipment to process the product effectively and at high production rate. **Example:** Automobile industry, steel rolling, paper production.



Each of the operation in the sequence is usually simple, involving perhaps a plain linear or rotational motion or an uncomplicated combination of two. It is relatively difficult to accommodate changes in the product design. This is called hard automation.

- Advantages:
 1. Low unit cost
 2. Automated material handling
 3. High production rate.
- Disadvantages:
 1. High initial Investment
 2. Relatively inflexible in accommodating product changes

TYPES OF AUTOMATION Cont'd

PROGRAMMABLE AUTOMATION

- This is a form of automation used in the production of batches (or quantities) of products. Products are made in batches ranging from several dozens to several thousand units at a time. For each batch the production equipment must be reprogrammed and converted to accommodate the new product configuration. Example is numerical control tool machine.
- The production equipment is designed to be adaptable to variations in product configuration. Unique products are made in small batches.

The production equipment is designed with the capability to change the sequence of operations to accommodate different product configurations. The operation sequence is controlled by a program, which is a set of instructions coded. So that they can be read and interpreted by the system. New programs can be prepared and entered into the equipment to produce new products.

- **Advantages:**

1. Flexible to deal with design variations.
2. Suitable for batch production.

- **Disadvantages:**

1. High investment in general purpose equipment
2. Lower production rate than fixed automation.

- **Example:** Numerical controlled machine tools, industrial robots and programmable logic controller.

TYPES OF AUTOMATION Cont'd

FLEXIBLE AUTOMATION

- This is an extension of programmable automation. It is a system capable of producing a variety of products with virtually no time lost due to change over from one product to the next. With flexible automation no time is lost due to set-up or re-programming. Batches are also not required and can produce services that are one-of-a-kind. With flexible automation, the variety of products is sufficiently limited that the changeover of the physical set-up of the equipment can be done quickly and automatically.

There is no lost production time while reprogramming the system and altering the physical set up.

Advantages:

1. Continuous production of variable mixtures of product.
2. Flexible to deal with product design variation.

Disadvantages:

1. Medium production rate
2. High investment.
3. High unit cost relative to fixed automation.

A simple example of flexible automation is a robot arm that can be programmed to insert screws, drill holes, sand, weld, insert rivets, and spray paint on objects in an assembly line

TYPES OF AUTOMATION Cont'd

The reprogramming of the equipment is done off line. Accordingly, there is no need to group identical products into batches, instead a mixture of different products can be produced one right after the other. Example is modern production methods of automated factories.

CURRENT APPLICATION OF AUTOMATION

Currently for manufacturing, the purpose of automation has shifted from increasing productivity and reducing costs to broader issues such as increase in quality and also flexibility in the manufacturing process.

For example, in the automobile industry track pistons used to be fixed manually. Then automated machine installation was employed. The error rate of the manual installation was 1 -1.5% but was significantly reduced to 0.00001% with automation.

Another major shift in automation has been the increased emphasis on flexibility and convertibility in the manufacturing process. Manufacturers are increasingly demanding the ability to easily switch from manufacturing product A to manufacturing product B without having to completely rebuild the product line.

AUTOMATION OF INFORMATION SYSTEMS

An operation is commonly described as automated if it is substantially more automatic than its predecessor. Automation today is widely used outside the manufacturing set ups. It is now associated with systems in which there is a significant substitution of mechanicals, electrical or computerized action for human effort and intelligence.

In the information field, Automaton of Information Systems refers to the use of computers and related technologies in carrying out the major functions in an information centre.

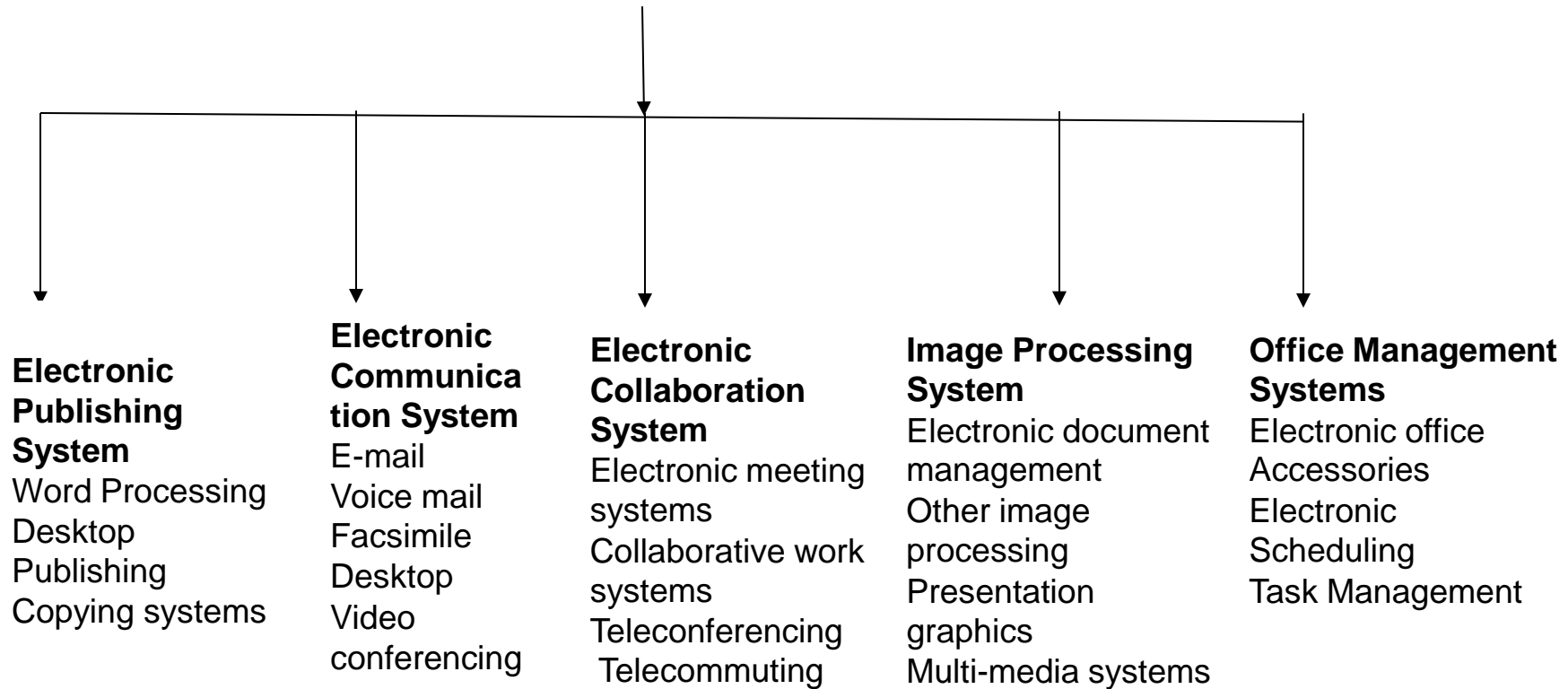
It is also described as the application of computers and computer related technologies to the routine operations and services of an information system. In the context of information system development, the following are the synonyms of automation; mechanization computerization and computer-based

OFFICE AUTOMATION

Another form of automation is Office Automation. Office automation is the use of computer systems to execute a variety of office operations such as electronic publishing; electronic communication; electronic meetings; usage processing and office management. The backbone of office automation is local area network (LAN), which allows users to transmit data mail and even vice across the network.

The following illustrates an Office Automation System.

Office Automation System



Topic Four

INTRODUCTION TO ARTIFICIAL INTELLIGENCE (AI)



Introduction

As you begin to understand some of the key issues in automation, the future of automation which is the field of Artificial intelligence should not be left out in your study of the subject. This is the reason why you have to be introduced to Artificial Intelligence.

ARTIFICIAL INTELLIGENCE (AI)

Artificial intelligence is the intelligence exhibited by machines or software, and the branch of computer science that develops machines and software with intelligence. AI researchers define it as the study and design of a system (intelligent agents) that perceives its environment and takes actions that maximize its chances of success. The aim of AI is to develop computers that can think, as well as see, hear, talk and feel.

The term Artificial Intelligence was coined by John McCarthy at MIT in 1955 and he defined Artificial Intelligence as the Science and engineering of making intelligent machines.

Some AI pioneers included Herbert Simon, Allan O. Newell, Norbert Wiener and Marvin Minsky of MIT

ATTRIBUTES OF INTELLIGENT BEHAVIOUR

Some of the attributes of intelligent behaviour.

AI is attempting to duplicate

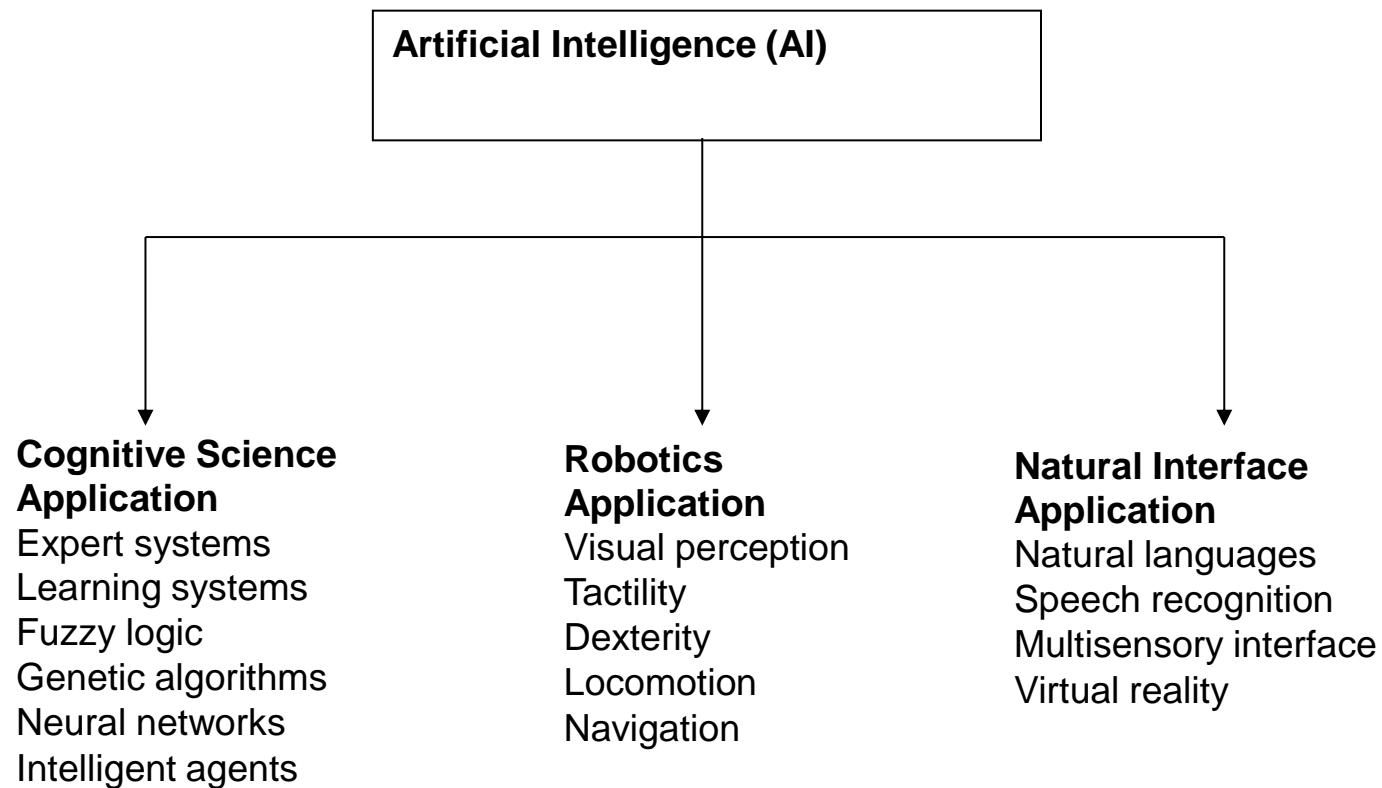
- Thinking and reasoning
- Using reasoning to solve problems
- Learning and understanding from experience
- Acquiring and applying knowledge
- Exhibiting creativity and imagination
- Dealing with complex or perplexing situations
- Recognizing the relative importance of elements in a situation
- Handling ambiguous, incomplete or erroneous

MAJOR DOMAINS OF AI Research and Development

AI research is highly technical and specialized and divided into subfields that are not particularly linked. These divisions are due to social, cultural and technical failures.

Some of the subfields focus on the solution of specific problems, other focus on one of several possible approaches or on the use of a particular tool or towards the accomplishment of particular applications.

The main areas of AI that keep on changing are illustrated below.



Cognitive Sciences: This area of artificial intelligence is based on research in biology, neurology, psychology, mathematics and many allied disciplines. It focuses on how the human brain works and how humans think and learn. The results of such research in human information processing are the basis for the development of a variety of computer-based applications in artificial intelligence.

- **Robotics:** AI, engineering and physiology are the basic disciplines of robotics. This technology produces robot machines with computer intelligence and computer-controlled human like physical capabilities. This area thus include applications designed to give the robots the power of sight or visual perception, touch to tactile capabilities; dexterity or skills in handling and manipulation locomotion, or the physical ability to move over any terrain and navigation or the intelligence to purposely find one's way of to a destination.

Natural Interface: Involves research and development in linguistics, psychology, computer science and other disciplines. This area of AI drives developments in the voice recognition and response technology. The concept involves the natural use of computers by humans. Being able to talk to computers and robots in conversational human languages and have them understand humans easily as humans understand each other.

Topic Five

STRATEGIC USE OF INFORMATION TECHNOLOGY



Introduction

Section 5 is introducing you to a different dimension to information technology application which is based on the competitive strategy concepts

Competitive Strategy Concepts

Business can counter the threats of competitive force that they face by implementing five basic competitive strategies.

- **Cost leadership Strategy:** This is about becoming a low-cost producer of products and services in the industry. Also, a firm can find ways to help its suppliers or customers reduce their costs or to increase the costs of their counterparts.
- **Differentiation Strategy:** This involves developing ways to differentiate a firm's products and services from its competitors or reduce the differentiation advantages of competitors.

- **Innovation Strategy:** This involves finding new ways of doing business by developing unique products and services or entry into unique markets.
- **Growth Strategies:** This is significantly expanding a company's capacity to produce goods and services, expanding into global markets, diversifying into new products or services or integrating into related products and services.
- **Alliance Strategies:** This involves establishing new business linkages and alliance with customers, suppliers, competitors, consultants and other companies.

The question that has to be asked at this point is this. How then can business managers use investments in information technology to directly support a firm's competitive strategy?

The following Figure answers the question

Figure 5.1

How IT is used to implement the 5 basic competitive strategies

Lower Costs	The IT to substantially reduce the cost of business processes. The IT to lower costs of customers or suppliers
Differentiate	Develop new IT features to differentiate products and services The IT features to reduce the differentiation advantages of competitors
Innovate	Create new products and services that induce IT component Develop unique new markets or markets niches with the help of IT
Promote Growth	Use IT to manage regional and global business expansion The IT to diversify and integrate into other products and services
Develop Alliances	Use IT to create virtual organization of business policies Develop inter-enterprise information system niches by internet and extranets that support strategic firms relationship

Examples of how companies used IT to implement competitive strategies for strategic advantage

STRATEGY	COMPANY	STRATEGIC INFORMATION SYSTEM	BUSINESS BENEFITS
Cost Leadership	Ebay.com Buy.com	Online Auctions Online Price Adjustment	Auction set prices Lowest price guarantee
Innovation	Amazon.com	Online free service customer system	Market Leadership
Differentiation	AVNET Marshall	Customer/Supplier e-commerce	Increase in market share
Growth	Wal-Mart	Merchandise ordering by Global satellite network	Market Leadership
Alliance	Wal-Mart/ Procter & Gamble Cisco system	Automation Inventory replenishment by suppliers Virtual Manufacturing alliances	Reduced inventory cost/ Increased sales Agile market leadership

INFS 401

AUTOMATION OF INFORMATION SYSTEMS

HISTORICAL OVERVIEW OF AUTOMATED INFORMATION SYSTEMS

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Historical Overview of Automated Information Systems



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Session Outline

This session will discuss the following topics

- The Environment
- Economics and Co-operation
- The Influence of Consultants
- The Influence of the Computer Revolution
- Influence of International Bodies



OBJECTIVES

By the end of this unit you should be able to:

- Describe how the environment in the early days of computer application influenced the development of automation of information systems
- Trace the origins of co-operation and networking that have re-shaped the way information centres strike alliances
- Indicate how the computer revolution has also assisted in the expansion of automated information systems

Topic One

THE ENVIRONMENT



INTRODUCTION

The first factor that impacted on the development of automation of information systems is the environment in which these systems find themselves. It is referred to as the experimental phase.



Impact of the Environment on Automated Information Systems

The environment was characterised by the use of main frame computers. These main frames were mainly used in research centres, military and academic institutions.

Automation at that time was expensive because the main frame computers were expensive and the information centres could not afford them and had to borrow computer time from parent organisations. For example, academic libraries had to use the main frame computers of the academic institutions of which they were part.

Impact of the Environment on Automated Information Systems Cont'd

The storage mechanism was the tape device which was not ideal for information searches. Access to information on tape was slow and retrieval and processing were cumbersome.

The information centres that used the mainframe computers of their organisations did not have full control over their operations. The processing mode was the batch one which is not convenient for information retrieval. Information systems require on-line processing. Generally, this phase of the development of automated information centres was not successful due to the following reasons:

Impact of the Environment on Automated Information Systems Cont'd

- Computer technology was not adequate
- Information workers were not sufficiently definitive in their requirements of the computer-based system
- Information workers had a low understanding of computer application to information work.

TOPIC Two:

ECONOMICS AND CO-OPERATION



INTRODUCTION

In topic 1 you studied one of the factors that helped to develop automated information systems. Economics and co-operation constitute the second phase.



ECONOMICS

- Automation of information systems from the beginning was expensive therefore, there was the need for cost sharing as one single information centre could not automate its functions alone. Information centres started to co-operate with each other. Co-operation centred around sharing databases, cost of their creation and their accessibility. They therefore made substantial economic gains.
- They also co-operated in retrospective conversion (RECON). Retrospective conversion is about how to capture existing data in the information centre and to convert all the data elements into machine readable forms.



ECONOMICS CONT'D

- **RECON** proved to be a problem for small information centres, the process was expensive and time consuming. These small information centres had to co-operate with big centres in order to use their facilities. Co-operation became the norm. Co-operation required standardisation by adopting similar methods of data capturing, processing and storing and disseminating information.
- Standardisation gave rise to International Standard Book Numbers (ISBN) and International Standard Serial Numbers (ISSN).
- Machine readable catalogues (MARC) came into being and was used widely as a way of having fixed ways of capturing data. Many of the systems operated successfully as compared to the experimental phase because at that time, technology had improved and there was better communication between information professionals and computer personnel.

CO-OPERATION

In view of the many problems associated with the early automation of information systems, co-operation among the information centres became necessary. Many information centres established co-operative systems. The most outstanding and prominent co-operative venture was developed in the USA in 1967. This is the OCLC formerly the Ohio College Library Centre, and now the Online Computer Library Centre. Initially when it was established it was to serve librarians in Ohio only. It however rapidly expanded its services to libraries outside the State and by 1980 its services had reached Europe.

CO-OPERATION cont'd

OCLC is now the biggest co-operative service in the world serving over 5,000 information centres. Other co-operative ventures that emerged were the Research Libraries Information Network (RLIN) and the Washington Library Network (WNL). In the UK there were some co-operative ventures. For example, there is JANET, the Joint Academic Network. This is a network linking university campuses and providing connections to networks worldwide. It provides connection facilities to electronic mail, file transfer, access to the British National Library and serves as a gateway to other international networks.

TOPIC Three:

THE INFLUENCE OF CONSULTANTS

Slide 65



INTRODUCTION

The third factor that helped with the development of automated information systems is the influence of consultants, namely, traditional librarians, system analysts and software publishers.

Influence of Consultants on Automation of Information Centres

The work of consultants also had an effect on the automation of information systems. The consultants were mainly systems analysts, software publishers and some traditional librarians. Some professionals from the computer field such as systems analysts and computer vendors developed products and services tailored towards the needs of information centres. They urged many information centres to automate. Others adopted vigorous sales techniques to market their wares.

Influence of Consultants on Automation of Information Centres Cont'd

By so doing they managed to convince information centres which were not automated to do so though they hardly discussed the initial problems associated with computer-based systems, particularly, difficulties such as cost of conversion, the lack of knowledge of the information professionals requirements for computer systems.

Influence of Consultants on Automation of Information Centres Cont'd

Traditional librarians who had had experiences with computer-based systems also influenced the automation process. They used systems analysis and design methods to help information centres automate. They combined their understanding of the manual processes with their new knowledge in mechanisation to consult for information centres. Most of them did this as a post-retirement occupation.

Influence of Consultants on Automation of Information Centres Cont'd

The third consultants were software publishers who wrote special purpose computer programs and sold them to information centres that had not automated. By so doing they also helped the spread of automation of information centres.

TOPIC Four:

THE INFLUENCE OF THE COMPUTER REVOLUTION



THE EVOLUTION OF THE COMPUTER AGE CONT'D

Modern age of computers spans more than 50 years and is typically broken down into 5 generations. Each generation has been marked by a significant advance in technology. The generations are generally defined as follows:

THE EVOLUTION OF THE COMPUTER AGE CONT'D

Generation	Dates	Hardware
First	1951-1957	Vacuum tubes
Second	1958-1963	Transistors
Third	1964-1969	Integrated circuits
Fourth	1970-1990	Microprocessor (large scale integration)
Fifth	1991-2005 & beyond	Connectivity infrastructure

THE EVOLUTION OF THE COMPUTER AGE CONT'D

These different generations of computers provided the advantages and potential for the improvement of information systems as each generation brought about improvement in information processing. They became well adopted for:

- Text processing
- Preparation of local bibliographies and resource guides
- Improving on-line database searching.

With each generation cost decreased, performance improved, utilisation became easier and the computer industry continued its rapid growth.

THE EVOLUTION OF THE COMPUTER AGE CONT'D

The first generation 1951-1957

- During the first generation, computers used vacuum tubes. The first ones were the electronic digital computers called UNIVAC which were introduced by Dr. John W. Mauchly and Prosper Ekert Jr. The IBM 650 was also invented and between 1951-1953 IBM sold 1000 of them.
- In 1952 Dr. Grace Hopper introduced the A6 compiler (software that converts high level language into instructions that computer can execute). 1957 saw the introduction of first high-level programming language - FORTRAN (formula translator). Vacuum tubes were unreliable and generated a lot of heat.

THE EVOLUTION OF THE COMPUTER AGE CONT'D

The second generation 1958-1963

- This generation began with the first computers built with transistors. Transistors are small devices that transfer electronic signals across a resistor. These new computers were faster, smaller and more reliable than the 1st generation machines. 1960 saw the introduction of first business application programming language-COBOL (Common Business Oriented Language) based on English-like phrases.
- In 1963 there was the introduction of the first computer industry standard character set ASCII (American Standard Code for Information Interchange) that enables computers to exchange information.

THE EVOLUTION OF THE COMPUTER AGE

CONT'D

The third generation 1964-1969

- In 1964, computer manufacturers began replacing transistors with integrated circuits. An integrated circuit (IC) is a complete electronic circuit on a small chip made of silicon (one of the most abundant elements in the earth's crust).
- These computers were more reliable and were more compact than computers made with transistors and they cost less to manufacture. The first mini computers were introduced by Digital Equipment Corporation in 1965. In the same year BASIC programming language was introduced. In 1969 ARPANET was introduced and it also marked the beginning of the Internet.

THE EVOLUTION OF THE COMPUTER AGE CONT'D

Fourth generation 1970-1990

- Many key advances were made during this generation, the most significant being the microprocessor – a specialised chip developed for computer memory and logic. It involved the use of a single chip to create a smaller personal computer. This revolutionised the computer industry. These chips used large scale integration (LSI).

THE EVOLUTION OF THE COMPUTER AGE CONT'D

Fifth generation – age of connectivity 1991-2005 and beyond

- The present generation is referred to as the connected generation because of the industry's massive effort to increase the connectivity of computers. The rapidly expanding Internet, World Wide Web, and intranets have created an information super highway that has enabled both computer professionals and home computer users to communicate with others across the globe. Another development is the advances in artificial intelligence.

TOPIC Five:

THE INFLUENCE OF INTERNATIONAL ACTIVITIES



INTRODUCTION

The last factor that influenced the development of automated information systems are the activities of some international bodies as well as national efforts made by some advanced countries.

INTERNATIONAL ACTIVITIES

During the development of automation of information systems countries such as United States, France, UK, Russia, Canada, Belgium, Japan and Australia took it upon themselves to develop tools that facilitated the easy use of computers in information centres. Other international bodies such as IFLA (International Federation of Library Association, International Standards Organisation (ISO)) helped to advance the course of automation. Their activities were centred primarily on standardisation. For example IFLA assisted with the development of ISBD (The International Standard Bibliographic Description) for monographs and ISO published its standards for bibliographies.

INTERNATIONAL ACTIVITIES CONT'D

In the US, MARC formats were developed and a national programme for co-operation, communication and networking were also put in place. A Federal Library Committee linked all Library resources and made networking and resource sharing easier. In conjunction with OCLC, they connected databases with telecommunications systems that helped with co-operation.

INTERNATIONAL ACTIVITIES CONT'D

They also assisted in doing RECON and also set standards for MARC specifications. In the UK early computerisation of information systems failed in similar circumstances to the early days of automation in the 1960s. However, in 1973 there were some co-operative activities that helped the course. There were two projects that enhanced automation of information systems. These were Birmingham Libraries Co-operative Mechanisation Project (BLCMP) and South-Western Academic Libraries Co-operative Automation Project (SWALCAP).