INFORMATION SYSTEMS

UNIT OUTCOME

Students will be able to:

- know the application of ICT in different sectors;
- understand the components of an information system;
- recognise the application of ICT in different sectors;
- recognise how ICT can change the life of people.

1.1 GENERAL CONCEPTS OF INFORMATION SYSTEMS

When you interact with Information and Communications Technology, you are involved not with a single piece of equipment, but with an ever expanding system of interconnected parts. Let us take a closer look at what information systems are:

What is a Computer?

A computer is an electronic device that can accept, store and process data under the control of a set of instructions.

What is an Information System?

A system is a set of related parts that operate together to perform a specific function. You encounter systems everyday. For example, as you read this, the parts of your circulatory system—heart, lungs and blood vessels, are moving blood and energy through your body.

Information systems, like all other systems, are assembled from parts, or components. What you consider to be the components or the system depends on the scale you choose to examine? For example, on a small scale, a personal computer is a system containing such components as a keyboard, a screen and a system unit. However, to an engineer, this system is assembled from smaller systems called subsystems. On a larger scale, the personal computer is a component plugged into a network of other computers and other devices in the organization. All of these integrated components and systems are
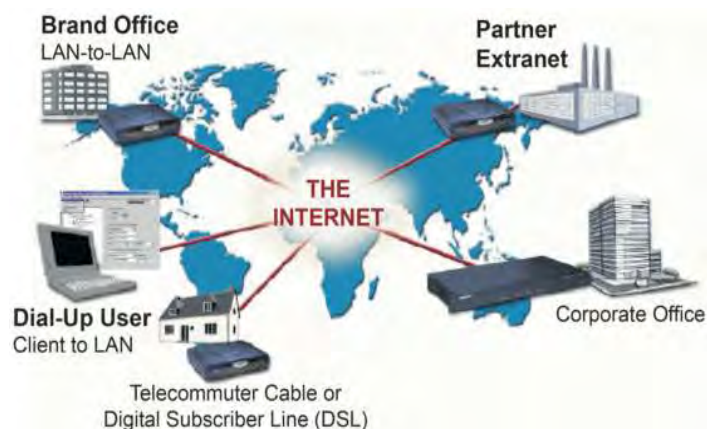

Fig. 1.1: Systems and Subsystems

designed to provide you with the information you need, in the form you need it, when you need it. Figure 1.1 shows systems and subsystems.

People

Information systems have not yet gotten to the point where they can think, plan and react to changing circumstances. So, people work on information systems. The more highly paid jobs are going to people who know how to use ICT to enhance their skills and performance regardless of the field they are in. Only a small minority of these people actually design computers or ICT systems. The vast majority of end-users use computers in their own fields of interest. It is these end-users around whom the entire business of ICT is focused. Figure 1.2 shows people working on computers.

Fig. 1.2: People working on computers

● Some Applications of ICT

At the heart of an organization is information and how it is used. The purpose of an organization is to perform a service or deliver a product. Information—whether computer based or not—has to flow within an organization in such a way that will help managers and the organization achieve their goals. Figure 1.3 shows a network society that shares information.
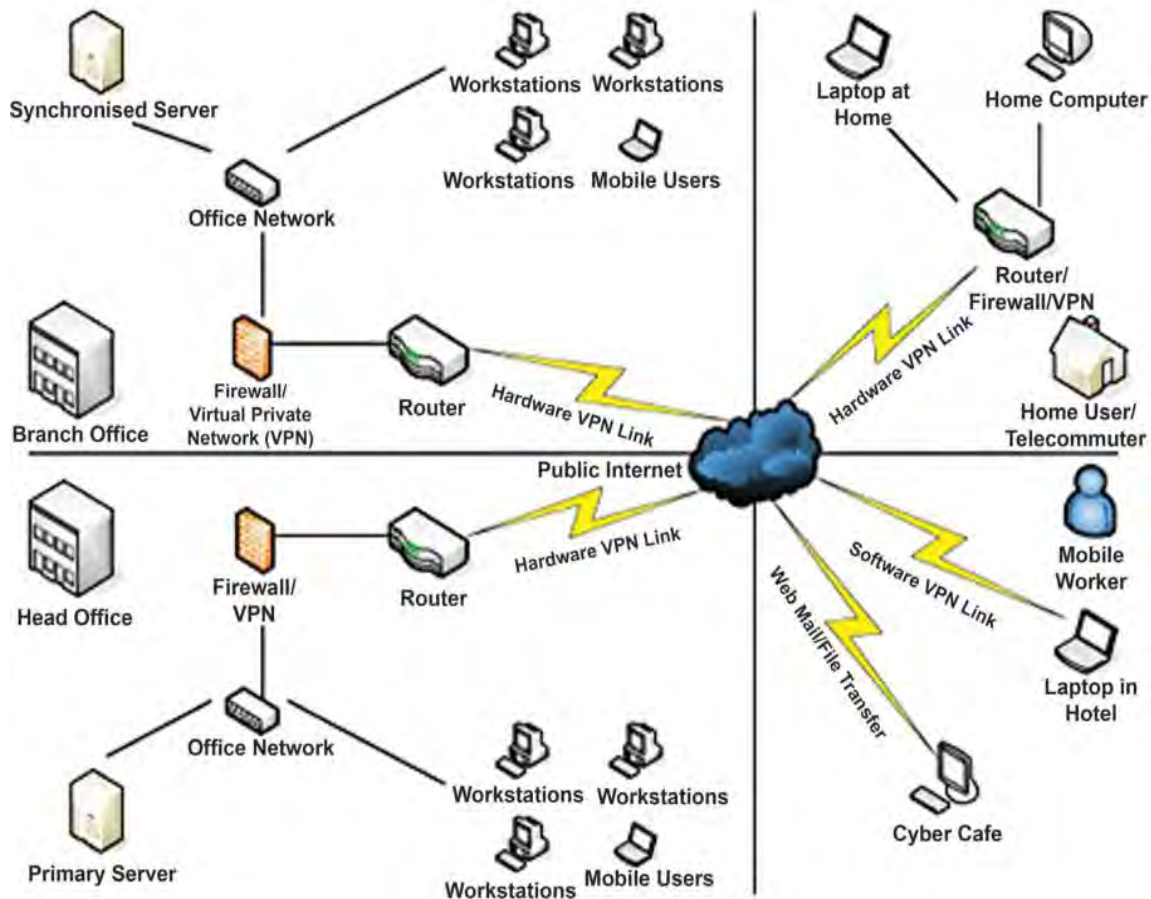

Fig. 1.3: Network society—sharing information

ICT has a large number of applications in different sectors of life. Let us discuss some of these applications:

Home

When your computer is connected to a CD-ROM drive, encyclopaedic information, movies and animations are instantly available. When your computer is connected to the phone line, you can visit your community or other parts of the world. The lines between work, play and education are beginning to disappear as ICT resources once available only at work or school become available at the home (see Fig. 1.4).

Fig. 1.4: Using computer at home

Using the World Wide Web at your home you can research school or work assignments, exchange e-mail, join special interest groups, download files, play games, or make airline reservations.

Sales catalogues are now being computerized and many catalogues are even put on the web so you can do online shopping. With an Internet connection, you can read the newspaper. You can get study material on CD-ROM discs or over the Internet. Home shopping and banking are growing areas of ICT. There are sites through which one can search for new friends while sitting at home. You can make your travel plans, check weather or chat with your friends over the Internet, without moving out of your home.

Office

ICTs are everywhere and offices are using them in newer ways, unthought of even a decade ago (see Fig. 1.5). You could list thousands of these modern uses.

Without computers, the modern offices would almost instantly grind to a halt. Computers have become so deeply embedded in information processing and communications systems that almost no activity would be possible without them. Failure of the telecom and electrical company's computers would shut off those services.

Fig. 1.5: People using computers in office

The ICTs are integrated into offices in the following ways:

(i) Transaction processing   (ii) Home-based workers

(iii) Desktop publishing   (iv) Financial analysis

(v) Product design   (vi) Architectural walk-through

(vii) Factories etc.

Factory

ICTs have a major impact in industries where products are designed and manufactured. Computer-Aided Design (CAD) is used to design and develop products. Computer-Aided Manufacturing (CAM) is used to manufacture them.

Factory floors are becoming increasingly populated by computers used for many purposes including inventory control and planning and process control.

Fig. 1.6: Robot assembling car in a factory

Computers are also used to run robots that create, finish, assemble and test products and their components. Figure 1.6 shows a robot assembling car in a factory.

Transport

In the transport sector, ICT applications are used to improve road, air and rail transportation. ICT applications are noticeable in air traffic control, monitoring of freight and the day-to-day transport system. For example, we can book air tickets or railway tickets online. Pilots are trained on software, which simulates flying.

The air traffic control and rail signals are also among ICT applications. Figure 1.7 shows air traffic and rail managed by computers.

Fig. 1.7: Air Traffic and Rail Managed by Computers

Communications

This has been one of the most recognised uses of the ICTs. Various communication technologies, ranging from broadcasting to telecommunications and to the Internet are playing effective roles in the acquisition and sharing of information. Almost all mobile phones have software embedded in them.

The concepts of the 'information revolution' and 'information society' are driven by enormous advancements in ICTs and their application. The Internet for example, has provided platforms for sharing information in applications such as the e-mail and the World Wide Web.

Satellites are commonly used in ICTs. They may simply relay signals from one point to another, eliminating the need for wires between two locations. They also broadcast TV and even Internet signals that can be picked up even by small dish antennae. Figure 1.8 shows satellite communication.

Fig. 1.8: Satellite Communication

Education/Training

The education sector is arguably one major area in which ICTs are playing a remarkable role. Computers are serving as the best friend to both the teacher and the students. You can find a computer in a classroom, in a library or in a museum. The ability to connect computers and students together over a network such as the Internet opens up fantastic educational opportunities. Figure 1.9 shows the applications of ICT in school education.
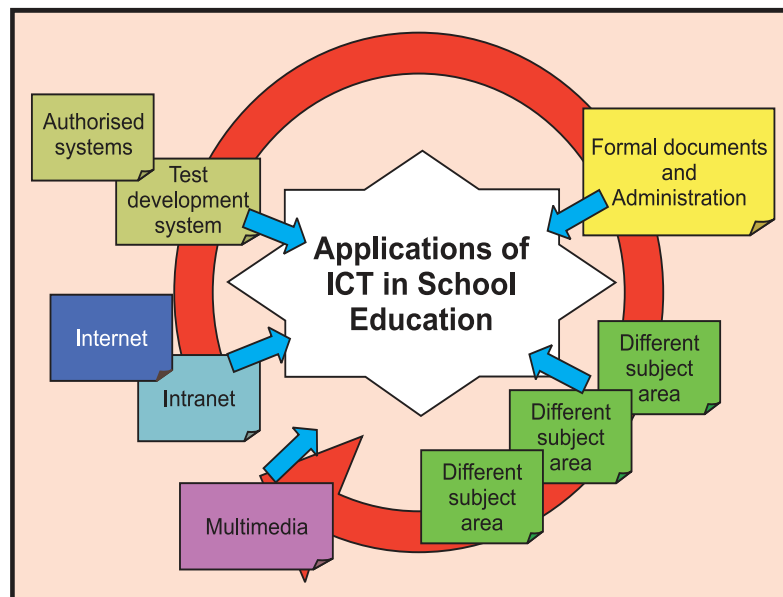
Fig. 1.9: Applications of ICT in School Education

In schools computers are increasingly being used to teach ICT courses like the ones you are taking. For example, this text has ICT application integrated into it. An e-learning software supplements the knowledge you get by studying books. Figure 1.10 shows an online education tutor.

Fig. 1.10: Online Education Tutor

Elementary and secondary schools are using computers to play multimedia educational programs and to teach kids to explore the web for information. We can give online examination and get instant results. We can check our examination results online.

Ministry of Education, Ethiopia is soon going to launch a series of educational programs that will be broadcast on TV channels. In Ethiopia, various universities are developing online certification courses for those people who do not have time or resources to take regular classes. Thus, various ICT tools help in providing education and becoming more knowledgeable as well as more qualified.

Museums use interactive multimedia to educate visitors on topics from science to fine art. Increasingly, these exhibits are being put on the web so you can visit them on your own. ICTs are especially valuable for students with special needs. A computer's voice recognition capabilities and its connection to the Internet make it possible for special education users to participate in learning experiences from which they may have previously been excluded. For example, the Short Message Service (SMS) can be used to send and receive messages by the hearing impaired, the voice activated dialing service can be used by visually impaired.

Training programs in business and various organizations are huge and expensive. To save money and improve performance, companies are using Computer-Based Training (CBT) to train people on procedures and techniques they need to know in their jobs. Training programs in organizations rely heavily on ICT sectors such as video conferencing. Virtual reality is now used to train pilots by putting them into a cockpit simulator where they can experience the sensations associated with various maneuvers as they learn to handle them. Figure 1.11 shows people being trained via video conferencing.

Fig. 1.11: Training via Video Conferencing

Health

ICTs are widely used in the field of medicine. They support efficient exchange of information between health professionals, they enable transfer of patient records between sites and they can improve clinical effectiveness, continuity and quality of care by health professionals. Physicians use ICT to understand the human body and to diagnose disorders.

Several computer controlled machines are being used in modern hospitals. The computer controlled laser machines are used in surgery. The complex surgeries can be performed by smallest possible cuts on the patient body. This is done by operating through a technique, called **Endoscopy.** This involves the use of computers, small cameras and other devices for operating upon the patient (see Fig. 1.12).

The ICTs are also helpful in training doctors for surgery. The surgeries can be performed on computer controlled models or by using virtual reality techniques. These models simulate a real life environment by using computers to perform a particular task.

Fig. 1.12: Doctors using computers in the field of health

🔍 KEY CONCEPTS

➢ A system is a set of related parts that operate together to perform a specific function.

➢ Information systems have not yet gotten to the point where they can think, plan, and react to changing circumstances. So, people work on information systems.

➢ The vast majority of end-users use computers in their own fields of interest.

➢ Some applications of ICT are at Home, Office, Factory, Transport, Communications, Education/Training and Health.

ASSESSMENT 1.1

Fill in the Blanks

1. .... systems, like all other systems, are assembled from parts, or components.
2. ICT has a large number of .... in different sectors of life.
3. The surgeries using laser techniques are operated through a technique called ....
4. Without computers, the modern .... would almost instantly grind to halt.

State Whether True or False

1. A system is not a set of related parts that operate together to perform a specific function.
2. ICTs are everywhere and offices are using them in new ways unthought of even a decade ago.
3. The education sector is not using ICTs.
4. Computers are used to run robots that create, finish, assemble, and test products and their components.
5. ICT applications can be used to improve road, air and rail transportation.

Answer the Following

1. Describe some applications of ICT.

Suggested Activities

1. Identify the applications of ICT.
2. Explain and demonstrate detailed examples of application of ICT in the following areas:
   Home, Office, Factory, Transport, Communications, Education/Training and Health.

Field Trip

Organize a field trip to various places like Cyber Cafes, Universities, Private Colleges or Ethiopian Telecommunication Corporation (ETC) stations to find out and report on:

Applications of ICT.

1.2 TYPES OF INFORMATION SYSTEM IN THE ORGANIZATION

The term 'system' is derived from the Greek word '*system*' (to combine), which means an organized relationship among functioning units or components. A system exists because it is designed to achieve one or more objectives. A system is an orderly arrangement of its components. The components of a system have structure and order. The organization determines the flow of control, communication and the chain of commands.

There are many system concepts which play an important role in understanding the system. The flow of information in an organization is very vital. There are various departments in an organization, depending on the services or products they provide to us. With each department there are three traditional levels of management—top, middle and lower. For making proper decisions—the different levels of managers require the right kind of information at the right time. Information system is a system that provides information

to people in an organization. There are various types of computer-based information systems, which serve different levels of management.

● Definition of System and Characteristics

System

A system is an interrelated set of components with an identifiable boundary working together for some purpose. A system has nine characteristics (see Fig. 1.13).
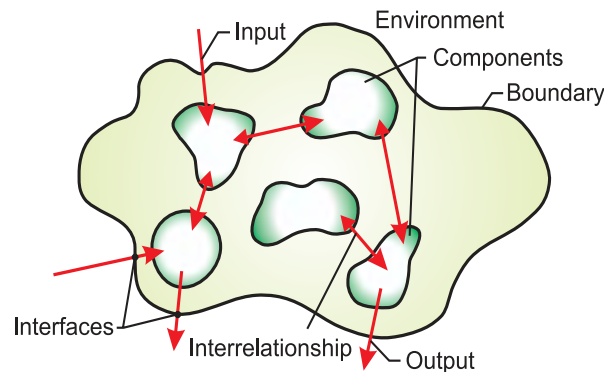

Fig. 1.13: A general Illustration of a System

Characteristics

The system characteristics are discussed below:

1. *Components*: A system is made up of components. A component is either an irreducible part or an aggregate of parts, also known as a subsystem. The simple concept of a component is very powerful. For example, just as with an automobile or a stereo system with proper design, we can repair or upgrade the system by changing individual components without having to make changes throughout the entire system.

2. *Interrelated components*: The components are interrelated, that is, the function of one component is somehow tied to the functions of the other components. For example, the work of one component, such as producing a daily report of customer orders received, may not progress successfully until the work of another component is finished, such as sorting customer orders by date of their receipt.

3. *A boundary*: A system has a boundary within which all of its components are contained and that establishes the limits of a system, separating the system from other systems. Components within the boundary of a system can be changed, whereas things outside the boundary cannot be changed.

4. *A purpose*: All of the components work together to achieve some overall purpose for the larger system: the system's main reason for existing.

5. *An environment*: A system exists within an environment which comprises of everything outside the system's boundary. For example, we might consider the environment of a state university to include the legislature, prospective students, foundations and funding agencies and the news media. Usually the system interacts with its environment, exchanging, in the case of an information system, data and information.

6. *Interfaces*: The points at which the system meets its environment are known as *interfaces*, and there are also interfaces between subsystems. An example of subsystem interface is the clutch subsystem,

which acts as the point of interaction between the engine and transmission subsystems of a car. Special characteristics of interfaces are given below:

Interface Functions

Because an interface exists at the point where a system meets its environment, the interface has several special, important functions. An interface provides:

(*i*) *Security* protecting the system from undesirable elements that may want to infiltrate it;

(*ii*) *Filtering* unwanted data, both the elements leaving the system and entering it;

(*iii*) *Coding and decoding* incoming and outgoing messages;

(*iv*) *Detecting and correcting errors* in its interaction with the environment;

(*v*) *Buffering,* providing a layer of slack between the system and its environment, so that the system and its environment can work on different cycles and at different speeds;

(*vi*) *Summarizing* raw data and transforming them into the level of detail and format required throughout the system (for an input interface) or in the environment (for an output interface).

Because interface functions are critical in communication between system components or a system and its environment, interfaces receive much attention in the design of information systems.

It is the design of good interfaces that allows different systems to work together without being too dependent on each other.

7. *Input*: A system takes input from its environment in order to function. Mammals, for example, take in food, oxygen and water from the environment as input. A system cannot function properly if inputs are inaccurate or faulty.

8. *Output*: Finally, a system returns output to its environment as a result to its functioning and thus achieves its purpose.

9. *Constraints*: A system must face constraints in its functioning because there are limits (in terms of capacity, speed, or capabilities) to what it can do and how it can achieve its purpose within its environment. Some of these constraints are imposed inside the system (*e.g.,* a limited number of staff available), whereas others are imposed by the environment (*e.g.,* due dates or regulations imposed by government or some other agency).

CASE STUDY

A FAST-FOOD RESTAURANT AS A SYSTEM

Now you are familiar with the definition of a system and its nine important characteristics. Let us take an example of a system and use it to illustrate the definition and system's characteristics. Consider a system that is familiar to you: a fast-food restaurant (see Fig. 1.14).

How is a fast-food restaurant a system? Let us take a look at the fictional Hot Spots restaurant in Addis Ababa, Ethiopia. First, it has components, or subsystems. The physical subsystems are: kitchen, dining room, counter, storage, and office.
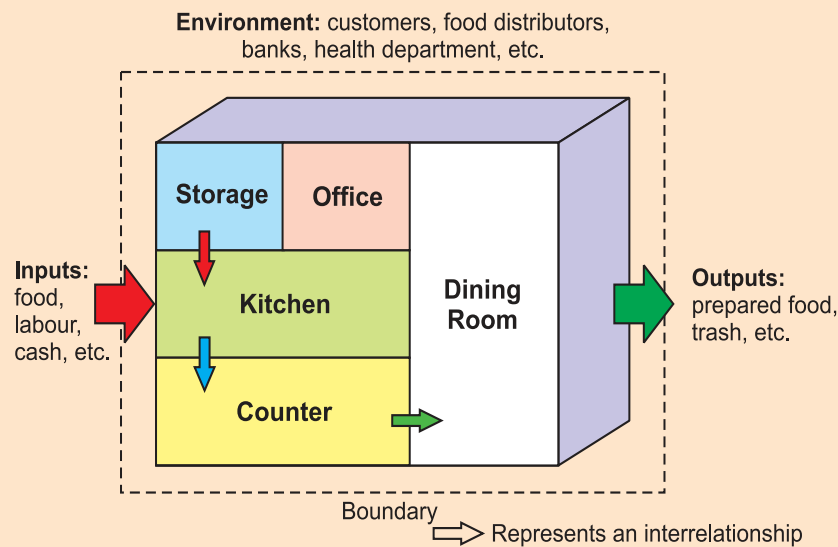
Fig. 1.14: A fast-food restaurant as a system

As you might expect, the subsystems are interrelated and work together to prepare food and deliver it to the customers, one purpose for the restaurant's existence. Food is delivered daily, kept in storage, prepared in the kitchen, sold at the counter, and often eaten in the dining room.

The boundary is represented by its physical walls, and the primary purpose of the restaurant's existence is to make a profit for its owners, Abraham and Yasin Mohamed.

The restaurant's environment consists of those external elements that interact with it, such as customers (many of whom come from nearby Adama University), the local labour supply, food distributors (much of the produce is grown locally), banks, and neighbourhood fast-food competitors.

It has one interface at the counter, where customers place orders, and another at the back door, where food and supplies are delivered. Still another interface is the telephone that managers use regularly to talk with bankers and food distributors.

The restaurant faces several constraints. It is designed for the easy and cost-effective preparation of certain popular foods, such as hamburgers and coffees, which constraints the restaurant in the foods it may offer for sale. Its size and its location in the university neighbourhood constrain how much money it can make on any given day. The Addis Ababa Health Department also imposes constraints, such as rules governing food storage.

Inputs include, but are not limited to, ingredients for the burgers and other food as well as cash and labour. **Outputs** include, but are not limited to, prepared food, bank deposits, and trash.

● Application of Information System Types

The main purpose of a computer-based information system is to provide managers (and various categories of employees) with the appropriate kind of information to help them make decisions. The six types of computer-based information systems which serve different levels of management are:

Transaction Processing Systems (*TPSs*) – For lower managers.

Management Information Systems (*MISs*) and *Decision Support Systems* (*DSSs*) – For middle managers.

Executive Support Systems (*ESSs*) – For top managers.

Office Automation Systems (*OASs*) and *Expert Systems* (*ESs*) – For all levels, including non-management.

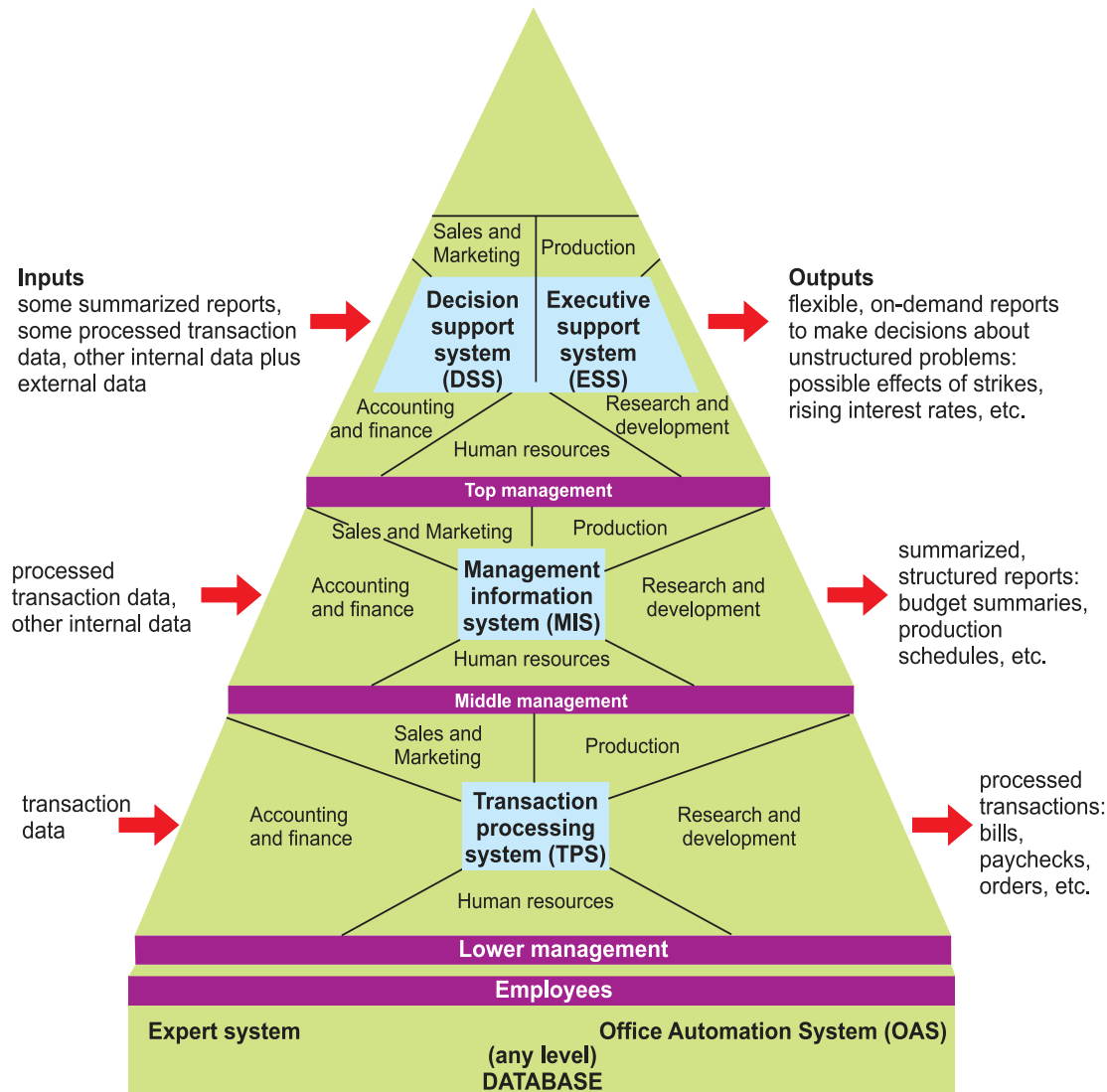Figure 1.15 illustrates these information systems for three levels of management:

Inputs
some summarized reports, some processed transaction data, other internal data plus external data

Outputs
flexible, on-demand reports to make decisions about unstructured problems: possible effects of strikes, rising interest rates, etc.

Sales and Marketing | Production

Decision support system (DSS) | **Executive support system (ESS)**

Accounting and finance | Research and development

Human resources

Top management

Sales and Marketing | Production

processed transaction data, other internal data

Accounting and finance | **Management information system (MIS)** | Research and development

Human resources

summarized, structured reports: budget summaries, production schedules, etc.

Middle management

Sales and Marketing | Production

transaction data

Accounting and finance | **Transaction processing system (TPS)** | Research and development

Human resources

processed transactions: bills, paychecks, orders, etc.

Lower management

Employees

Expert system   **Office Automation System (OAS)**
(any level)
DATABASE

Fig. 1.15: Illustration of six information systems for three levels of management

Let us describe some of these information systems:

1. Transaction Processing Systems (TPSs)

In most organizations, particularly business organizations, most of what goes on consists largely of transactions. *A transaction is a recorded event having to do with routine business activities.* This includes everything concerning the product or service in which the organization is involved: production, distribution, sales, orders. It also includes materials purchased, employees hired, taxes paid etc. These days in most organizations, the bulk of such transactions are recorded in a computer-based information system. These systems tend to have clearly defined inputs and outputs, and there is an emphasis on efficiency and accuracy. Transaction processing systems record data but do little in the way of converting data into information.

A *Transaction Processing System (TPS) is a computer-based information system that keeps track of the transactions needed to conduct business* (see Fig. 1.16).
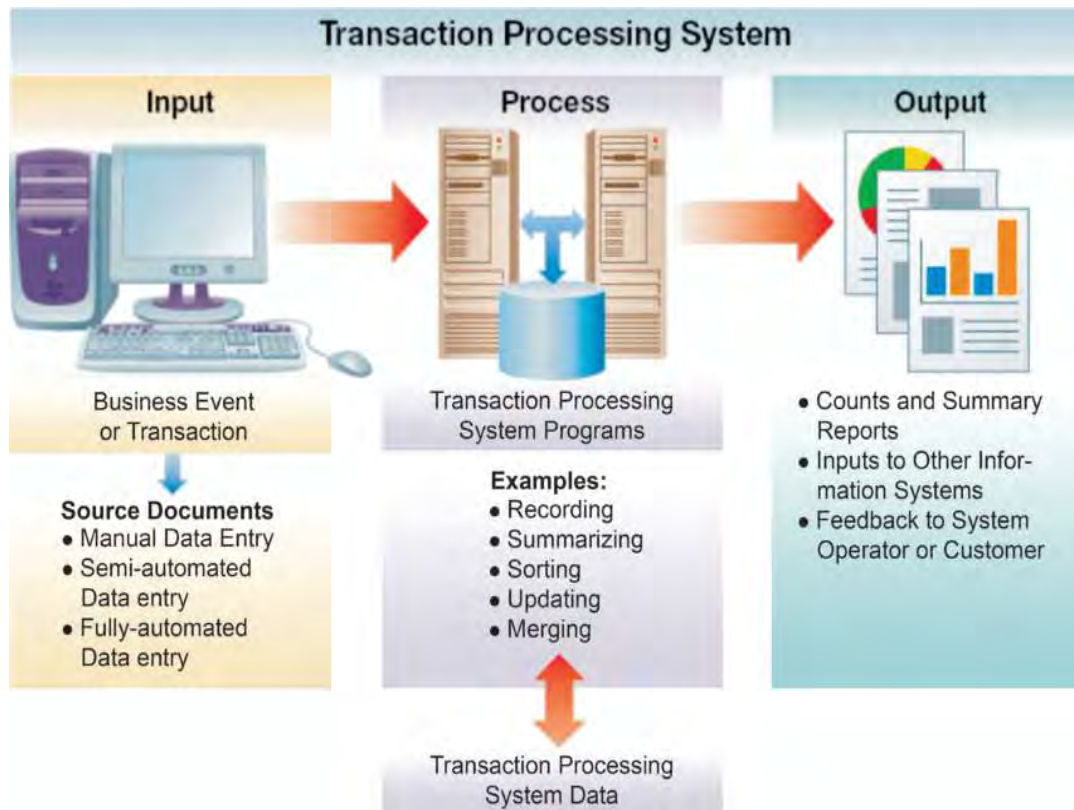
Fig. 1.16: Transaction processing system

Some features of a TPS are given below:

(*i*) Input and output. The inputs to the system are transaction data: bills, orders, inventory levels etc. The output consists of processed transactions: bills, paychecks etc.

(*ii*) For lower managers. Because the TPS deals with day-to-day matters, it is principally of use to supervisory managers. That is, the TPS helps in making tactical decisions. Such systems are not usually helpful to middle or top managers in an organization.

(*iii*) Produces detail reports. A manager at this level typically will receive information in the form of detailed reports. A *detail* report contains specific information about routine activities. For example, the information needed to decide whether to restock inventory.

(*iv*) One TPS for each department. Each department or functional area of an organization—research and development, production, marketing, accounting and finance, and human resources—usually has its own TPS. For example, the accounting and finance TPS handles order processing, accounts receivable, inventory and purchasing, accounts payable, order processing, and payroll.

(*v*) Basis for MIS and DSS. The database of transactions stored in a TPS provides the basis for Management Information Systems and Decision Support Systems, as described next.

2. Management Information Systems (MISs)

A *Management Information System* (*MIS*) *is a computer-based information system that uses data recorded by TPS as input into programs that produce routine reports as output* (see Fig. 1.17).
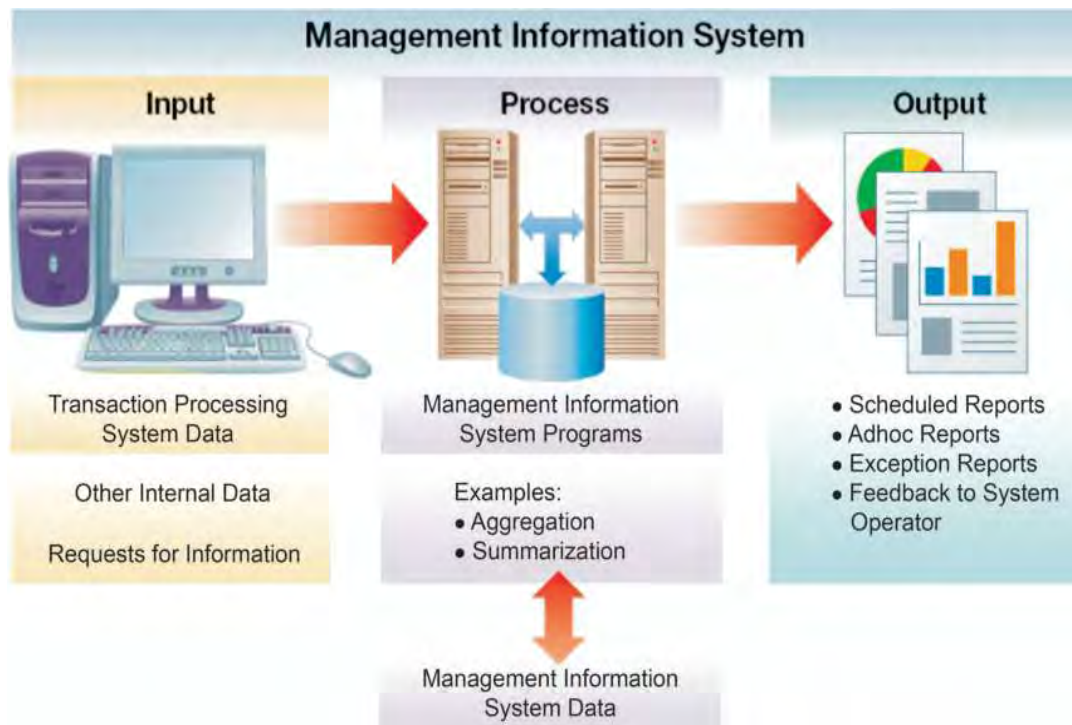
Fig. 1.17: Architecture of a management information system

Some feature of the MIS are given below:

(i) Input and output. Inputs consist of processed transaction data, such as bills, orders, and paychecks, plus other internal data. Outputs consist of summarized, structured reports: budget summaries, production schedules etc.

(ii) For middle managers. The MIS is intended principally to assist middle managers—specifically to help them with tactical decisions. It helps them to spot trends and get an overview of current business activities.

(iii) Draws from all departments. The MIS draws from all five departments or functional areas, not just one.

(iv) Produces several kinds of reports. Managers at this level usually receive information in the form of several kinds of reports: *summary, exception, periodic, demand.*

Summary reports show totals and trends. For example, a report showing total sales by office, by product, and by salesperson, as well as total overall sales.

Exception reports show out-of-the-ordinary data. For example, an inventory report listing only those items of which fewer than 20 are in stock.

Periodic reports are produced on a regular schedule. Such daily, weekly, monthly, quarterly, or annual reports may have sales figures, income statements, or balance sheets. They are usually produced on paper, such as computer printouts.

Demand reports produce information in response to an unscheduled demand. A director of finance might order a demand credit-background report on an unknown customer who wants to place a large order. Demand reports are often produced on a terminal or microcomputer screen, rather than on paper.

3. Decision Support Systems (DSSs)

*A **Decision Support System (DSS)** is a computer-based information system that provides a flexible tool for analysis and helps managers focus on the future* (see Fig. 1.18). Whereas a TPS records data and a MIS summarizes data, a DSS analyzes data. To reach the DSS level of sophistication in information technology, an organization must have established TPS and MIS systems first.
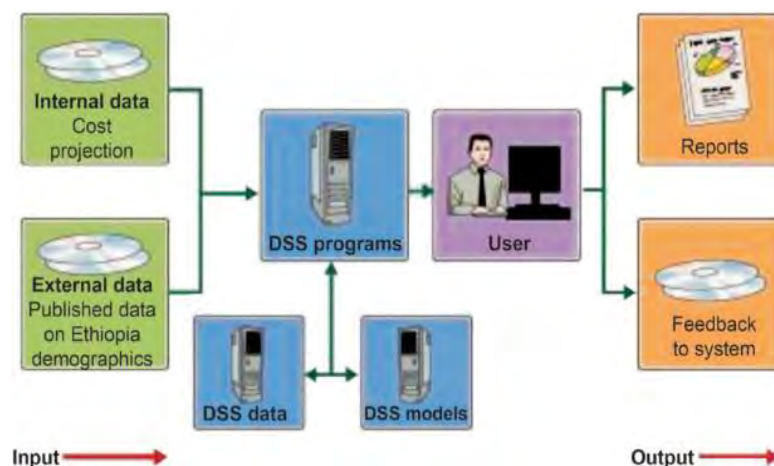

Fig. 1.18: Decision support system

Some features of a DSS are given below:

(*i*) Inputs and outputs. Inputs include internal data—such as summarized reports and processed transaction data—and also data that is external to the organization. External data may be produced by trade associations, marketing research firms, Central Statistical Authority (CSA), Addis Ababa, Ethiopia and other government agencies.

The outputs are demand reports on which a top manager can make decisions about unstructured problems.

(*ii*) Mainly for middle managers. A DSS is intended principally to assist middle managers in making tactical decisions. Questions addressed by the DSS might be, for example, whether interest rates will rise or whether there will be a strike in an important materials-supplying industry.

(*iii*) Produces analytic models. The key attribute of a DSS is that it uses models. *A model is a mathematical representation of a real system*. The *models* use a DSS database, which draws on the TPS and MIS files, as well as external data such as stock reports, government reports, and national and international news. The system is accessed using the DSS software.

The model allows the manager to do a simulation—play a "what-if" game—to reach decisions. Thus, the manager can simulate an aspect of the organization's environment in order to decide how to react to a change in conditions affecting it. By changing the hypothetical inputs to the model, the manager can see how the model's outputs are affected by doing so.

Many DSSs are developed to support the types of decisions faced by managers in specific industries, such as airlines or real estate. Curious how airlines decide how many seats to sell on a flight when so many passengers are in waiting! Wonder how owners of those big apartment complexes set rents and lease terms? Investors in commercial real estate use a DSS called RealPlan to forecast property values up to 40 years into the future, based on income, expense, and cash-flow projections. Ever speculate about how insurance carriers set different rates. Many companies use DSSs called Geographic Information Systems (GISs), such as MapInfo and Atlas GIS, which integrate geographic databases with other business data and display maps.

4. Executive Support Systems (ESSs)

An **Executive Support System (ESS)** is an easy-to-use DSS made especially for top managers; it specifically supports strategic decision making (see Fig. 1.19). An ESS is also known as *Executive Information System* (EIS). It draws on data not only from systems internal to the organization but also from those outside, such as news services or market-research databases.
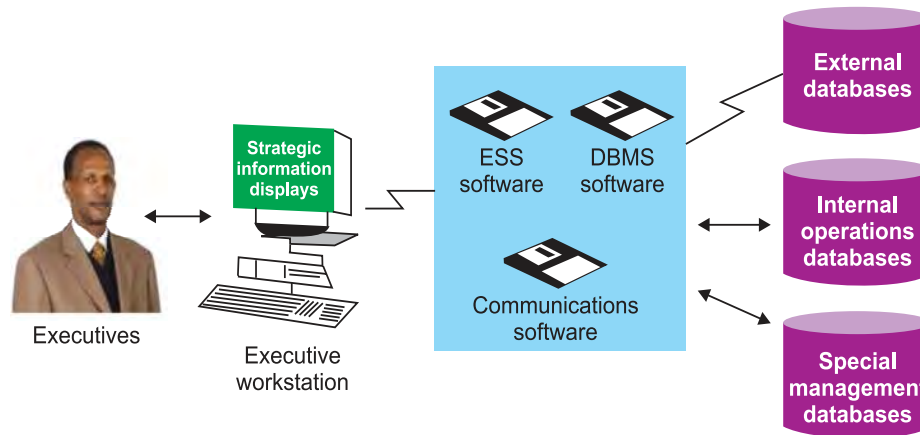

Fig. 1.19: Illustrating components of an ESS

An ESS might allow senior executives to call up predefined reports from their personal computers, whether desktops or laptops. They might, for instance, call up sales figures in many forms—by region, by week, by anticipated year, by projected increases.

An ESS includes capabilities for analyzing data and doing "what-if" scenarios. ESSs also have the capability to browse through summarized information on all aspects of the organization and then zero in on ("drill down" to) detailed areas the manager believes require attention.

5. Office Automation Systems (OASs)

The information systems discussed so far—are designed for managers of various levels. There exist two types of information systems that are intended for workers of all levels, including those who are not managers: *office automation systems* and *expert systems*. Let us discuss the office automation systems.

Office Automation Systems (*OASs*) *combine various technologies to reduce the manual labour required in operating and efficient office environment*. Used throughout all levels of an organization, OAS technologies include fax, voice mail, e-mail, scheduling software, word processing, and desktop publishing, among others (see Fig. 1.20).
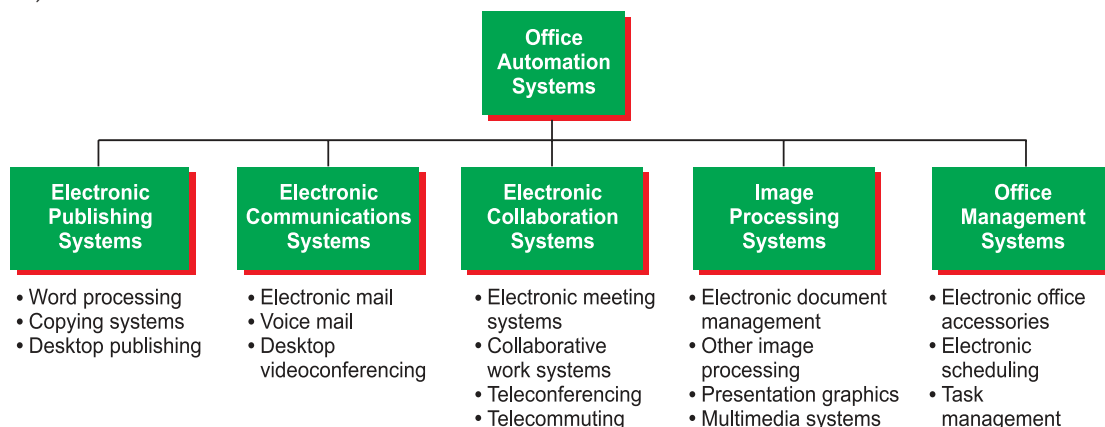

Fig. 1.20: Office automation systems

The backbone of an OAS is a network—LAN, intranet, extranet—that connects everything. All office functions—dictation, typing, filing, copying, fax, microfilm and records management, telephone calls and switchboard operations—are candidates for integration into the network.

ACTIVITY 1.1

DESCRIPTION OF THE TYPES OF INFORMATION SYSTEMS

Students in their class will describe and discuss the types of Information systems.

What is Information System?

A system that is designed to capture, transmit, store, retrieve, manipulate, and or display information used in one or more business processes.

Types of Information Systems

For most businesses, there are a variety of requirements for information. As a result, businesses tend to have several "information systems" operating at the same time. The main kinds of information systems in business are described below:

Information System	Description
Transaction Processing Systems	Transaction Processing Systems ("TPSs") are designed to process routine transactions efficiently and accurately. A business will have several (sometimes many) TPS; for example: - Billing systems to send invoices to customers - Systems to calculate the weekly and monthly payroll and tax payments - Production and purchasing systems to calculate raw material requirements - Stock control systems to process all movements into, within and out of the business.
Management Information Systems	A Management Information System ("MIS") is mainly concerned with internal sources of information. MIS usually takes data from the transaction processing systems and summarizes it into a series of management reports. MIS reports tend to be used by middle management and operational supervisors.
Decision-Support Systems	Decision-Support Systems ("DSSs") are specifically designed to help management make decisions in situations where there is uncertainty about the possible outcomes of those decisions. DSS comprises tools and techniques to help gather relevant information and analyze the options and alternatives. DSS often involves use of complex spreadsheet and databases to create "what-if" models.
Executive Support Systems	An Executive Support System ("ESS") is designed to help senior management make strategic decisions. It gathers, analyses and summarizes the key internal and external information used in the business. A good way to think about an ESS is to imagine the senior management team in an aircraft cockpit—with the instrument panel showing them the status of all the key business activities. ESS typically involves lots of data analysis and modeling tools such as "what-if" analysis to help strategic decision-making.
Office Automation Systems	Office Automation Systems ("OASs") are systems that try to improve the productivity of employees who need to process data and information. Perhaps the best example is the wide range of software systems that exist to improve the productivity of employees working in an office (e.g., Microsoft Office XP) or systems that allow employees to work from home or whilst on the move.

KEY CONCEPTS

➢ Information system is a system that provides information to people in an organization.

➢ A system is an interrelated set of components with an identifiable boundary working together for some purpose.

➢ The major characteristics of a system are:

Components, Interrelated components, A boundary, A purpose, An environment, Interface, Input, Output and Constraints.

➢ The types of information systems are:

Transaction Processing System, Management Information System, Decision Support System, Executive Information System and Office Automation System.

ASSESSMENT 1.2

Fill in the Blanks

1. .... is a system that provides information to people in an organization.
2. A system is made up of ....
3. A .... is a computer-based information system that uses data recorded by TPS as input into programs that produce routine reports as output.
4. A .... is a computer-based information system that provides a flexible tool for analysis and helps managers focus on the future.
5. A .... is an easy-to-use DSS made especially for top managers.

State Whether True or False

1. The flow of information in an organization is not vital.
2. A system must face constraints in its functioning.
3. A Transaction Processing System is a computer-based information system that keeps track of the transactions needed to conduct business.
4. Office Automation System combines various technologies to reduce the manual labour required in operating and efficient office environment.
5. An interface has no special, important functions in a system.

Answer the Following

1. Define the system and give its characteristics.
2. Explain the definition of each type of Information System.
3. Explain the application of each type of Information System.

Suggested Activities

1. Explain the types of Information System.
2. Explain the definition of the types of Information System.
3. Explain the application of all types of Information System, *e.g.*, describe the main advantages and disadvantages of an on-line Airline time table and a printed one.

Field Trip

Organize a field trip to various Business Houses, Universities or Ethiopian Telecommunication Corporation (ETC) stations to find out and report on:

Types of Information Systems.

1.3 IMPACT OF ICT IN EVERYDAY LIFE

The increasing use of technology in all aspects of society makes confident, creative and productive use of ICT an essential skill for life. ICT can be used to find, develop, analyse and present information, as well as to model situations and solve problems. ICT enables rapid access to ideas and experiences from a wide range of people, communities and cultures, and allows pupils to collaborate and exchange information on a wide scale.

According to Minasse Zewdu, citizenship manager at Microsoft East Africa Limited, Ethiopia Branch Office—*If people cannot use ICT devices in their own language and cultural context, it causes a digital device. The establishment of such standards plays a key role in bridging the digital device and making friendly—ICT available to all citizens*.   (*Source*: www.ethiopianreview.com)

ICT acts as a powerful force for change in society and citizens should have an understanding of the social, ethical, legal and economic implications of its use, including how to use ICT safely and responsibly. Increased capability in the use of ICT supports initiative and independent learning, as pupils are able to make informed judgements about when and where to use ICT to enhance their learning and the quality of their work.

Let us describe the impact of ICT in everyday life.

● What is a Digital Device?

A digital device is a device that works with discrete numbers or digits. For example, Digital Computers, Digital Cameras, MP3 Players, Mobile Chargers, Cell Phone, PDA, GSP portables, Mobile VoIP etc. Figure 1.21 shows some digital devices.

Fig. 1.21: Some Digital Devices

● Impact of Using Computers in Offices

Computer has brought many changes in employment, including changes to office equipment, office location, work schedules and the types of work people are seeking. Computer technology not only has solved problems but also has created some, for instance, a certain amount of culture shock as individuals attempt to deal with the new technology. A major role of computer science has been to alleviate problems, mainly by making computer systems cheaper, faster, more reliable, and easier to use.

Computers are forever present in the offices. Computers are helpful because they offer a wide range of functions and services that are not available anywhere else. There are four main uses—word processing, Internet/communications, digital video/audio composition, and desktop publishing. Although one can create a typed paper with a typewriter, the computer has more features to do it with. Internet and communications, digital video and audio composition, and desktop publishing are all features that are only offered on computers. Electronic mail has made it easy to send messages worldwide via computer communication networks (see Fig. 1.22). With these tools human society has progressed exponentially.

Office automation has become the term for linking workstations, printers, database system, and other tools by means of a local area network. An eventual goal of office automation has been termed the *paperless office* (see Fig. 1.23). Although such changes ultimately make office work much more efficient, they have not been without cost in terms of purchasing and frequently upgrading the necessary hardware and software and of training workers to use the new technology.

Fig. 1.22: E-mail—making easy to send messages

Fig. 1.23: Paperless office

The increasing educational opportunities from the use of computers in turn increase the professional job opportunities in offices. There are millions of websites that provides great opportunities to earn a huge amount of cash every month by investing either few Birrs or investing nothing! According to a research almost after every five minutes a person joins the Internet community and almost after every eleven minutes a person joins an online job. A person having a degree of arts or science or even if he/she has no degree or education experience still can earn enough money to live a contended life. So, as opportunities grow more, we might expect 0% poverty rate in the near future.

Technological development also negatively influences the advancement chances of workers in the offices. Most workers want to have a good position and obtain a higher salary. One of the best ways to have a good salary in the past was to gain various kinds of experience and knowledge. When computers were not used in the offices, a worker who started in low-level job had a fair opportunity to change position to a higher level, but they do not have the opportunities now. The experience and knowledge are not valuable anymore because workers having high-skills which are required by employers can start out on the high level jobs. In consequence, employees not having high-skills do not have the chances of advancement even though they have worked for a long time.

There have been many job losses as computers have begun to do more tasks in the offices. For examples:

1. A reduced number of clerical staff, as there is less need for filing.

2. A reduced number of manual workers as we now have robots which can do the work.

● Impact of Mobile Phones

Mobile phones are the easiest and the simplest of the methods to stay connected with others, and moreover they provide a sense of security. Help is just a dial away in the event of emergency. However, the importance of mobile phones is not limited to this only, it goes much beyond this (see Fig. 1.24).

Fig. 1.24: Impact of Mobile in everyday life—an Ethiopian farmer in fields

Positive Effects of Cell Phones

Cell phones are a tool of convenience. Having a cell phone now makes people reachable in almost any location as long as there is good reception. This makes individuals easier to contact. Ease of access is not the only benefit of cell phones today though, as cell phones offer features that have many other benefits.

1. *Cost Options for all Customers*: To reduce the cost of a cell phone purchase, customers can agree to long-term contracts requiring credit checks. For those not wanting long-term contracts or for those who have questionable credit, phones can be purchased with prepaid minutes.
2. *Size*: No longer do you need to worry about the bulky car phones of the 1980s. The average cell phone today is smaller than the size of a checkbook, making it easy to transport.
3. *Conducting Business*: Cell phones make it easier to make business arrangements when you are travelling away from your office by e-mailing or texting business associates.
4. *Internet Access*: Having Internet access on cell phones allows individuals to check items such as airline schedules, sports scores, weather and traffic conditions.
5. *Cameras*: Many cell phones now come with cameras built into the cell phone. This can be very helpful for an individual involved in a car accident that does not have a camera. He or she can take photographs of the damage using his or her cell phone and submit it to the insurance company if needed.

Negative Impact of Mobile Phones

The convenience of mobile phones cannot be denied, but neither can the way they have negatively impacted daily living. Some of the effects can be negated if boundaries are set, such as not answering the phone when running errands, so time is used more efficiently.

1. *Spillover*: The line between work and personal time has practically been eradicated because the phones enable us to be contacted at any time.
2. *Dangerous*: Stories are commonplace of people having an accident because they were distracted while driving and talking on a mobile phone.
3. *Health*: While the topic remains controversial, there are people who believe the microwave radiation the phones emit can cause such problems as cancer and Alzheimer's disease from prolonged use.
4. *Environment*: Wirefly.org reports approximately 100 million mobile phones are replaced annually. If they are not recycled, resources such as glass and metal go to waste, and toxins such as arsenic and lead seep into the ground.
5. *Manners*: People can be inconsiderate when using the phone in public, doing things such as talking during a movie, holding up a line at a store and bumping into others because they are not paying attention to where they are walking.

6. *Addiction*: Reports say that there are teens who become addicted to using the phone and have to be weaned of its usage by parents.

Such is the impact of mobile phones in our life.

● Impact of Satellite Broadcasting

Satellite technology plays an important role in communication globally. The speed of satellite transmission is from 256 KBPS (Kilo Bits Per Second) to 100 MBPS (Mega Bits Per Second). Satellites work by receiving and transmitting radio signals from one earth station to another.

Satellite systems have the advantages of transmission from point to multipoint systems, which means transmissions can be beamed to areas that are geographically dispersed (see Fig. 1.25). Over the years, satellite communication has improved tremendously, especially the expansion of the capacity of transponders. Transponders are the devices that receive signals from the earth and retransmit these signals across stations within its 'footprint'. This expansion of capacity has strengthened the signals emitted by satellite; consequently, satellite-receiving dishes have been reduced considerably in size.

Satellite technology has the potential to beam signals across different countries; this has improved international telephony enormously. It has also improved television signal transmission as well; programmes are transmitted to television operators from one country to another through satellite technology. Over the years satellite transmission for telephony has been considered inappropriate. This is due to the fact that the time taken to beam the signal to space and back to the earth creates a short delay in the exchange of conversations; this also leads to an echo in telephonic conversations.

Fig. 1.25: Satellite Broadcasting

Satellite voice communication, for a long time was out of reach for rural subscribers in developing countries. However, developments over the years have made direct access voice services available on a large scale, even to rural subscribers. For example, these services can be accessed through a briefcase size portable terminal. Perhaps, the most interesting development from this scenario is the development of a fixed cellular system. This system is very beneficial to rural subscribers. This system uses the existing cellular mobile telecommunications system with fixed rural subscribers.

The Ethiopian Telecommunications Corporation (ETC) is trying its best to improve the ICT development. The Ethiopian government has proposed three primary projects:

 (*i*) A government network ('Woredanet')

(*ii*) An education network ('Schoolnet')

(*iii*) An agriculture network ('Agrinet').

As mentioned earlier, Ministry of Education will soon launch educational TV programs that will be broadcast by satellites to the remotest corners of Ethiopia. Similarly, many universities are launching courses using satellite communication. Such advancements in delivering education through satellites will greatly help in reducing illiteracy, alleviating poverty, making the society more information rich, and in integrating the nation.

● Differences between Information Poor and Information Rich Society

It is needless to say that we are now in the **Information Age.** There are huge differences in people's ability to obtain and act on information. Recently, this situation has been affected in different ways by technological waves. The invention of the Internet and the Web, specifically, created both opportunities and threats in terms of people's access to information.

The **Information Age**/Digital Divide separate the information rich and the information poor. The Organization for Economic Co-operation and Development (OECD) defines the digital divide as the difference between individuals, households, businesses and geographic areas with regard to

(*a*) their opportunities to access ICTs, and

(*b*) their use of the Internet for a wide variety of activities.

It is the gap between those who have real access to information and communications technology and who are able to use it effectively, and those who do not have such access. ICT can bridge the gap between information poor and information rich (see Fig. 1.26).

Fig. 1.26: ICT can bridge the gap between Information Poor and Information Rich

The **information rich** have good access to information—especially online, but also through more traditional media such as newspapers, radio, television, and books—and can plan their lives and react to changes in circumstances on the basis of what they know or can find out. The **information poor** do not have such access and are vulnerable to all kinds of pressures.

Although information poor and information rich could be found in all countries, the majority of information poor are in developing countries and information inequalities is a more serious problem in these countries due to several political, economic, educational and cultural factors. And to bridge this gap, information needs to be distributed to the public through mass media.

Lack of access to ICT goods and services poses social and economic disadvantages. More and more, developing countries are recognizing that they cannot compete in the new global market unless they take advantage of the ICT revolution. Countries that do not undertake measures to enhance their ICT infrastructure risk not just being marginalized but also being completely bypassed in the new global order. The experience of a number of countries, like Singapore, Malaysia and Korea, demonstrate that bold actions in bringing their countries into the digital age pay off.

It is striking how quickly the new ICTs (*e.g.*, mobile phones and Internet) have spread across Africa. The greatest development in communication technology in Africa in the 21st century has been in the area of mobile telephony.

The Ethiopian Government is making strong efforts to make ICT as a tool in its strategies of eradicating poverty. It has been also considered that ICT is a vital aid to solve the poverty issues with the effective application of the technology. This is because ICT benefits the poor by providing information that is critical for poverty reduction.

ACTIVITY 1.2

Students will study the following report and then in small groups discuss why mobile phone has been such a successful technology?

Cell phones have become a necessity for many people throughout the world. The ability to keep in touch with family, business associates, and access to e-mail are only a few of the reasons for the increasing importance of cell phones. Today's technically advanced cell phones are capable of not only receiving and placing phone calls, but also storing data, taking pictures, and being used as walkie-talkies, to name just a few of the available options.

When cell phones were first introduced to the public, they were bulky, expensive, and some even required a base unit that had to be transported along with the phone. Good reception was a major problem and in general, early cell phones could only be used in certain locations where the signal was particularly strong. As cell phone technology advanced, the difficulty in using them became less of a problem. Today, cell phone reception has improved greatly due to the use of satellites and wireless services. As cell phones improved and became simple to use, the importance of cell phones increased accordingly.

Fig. 1.27: Mobile Phone—a necessity for most people

Fig. 1.28: Mobile Internet

Fig. 1.29: Cell phone tracking system

Cell phones are the perfect way to stay connected with others and provide the user with a sense of security. In the event of emergency, having a cell phone can allow help to reach you quickly and could possibly save lives. However, the importance of cell phones goes way beyond personal safety. Modern cell phones are capable of Internet access, sending and receiving photos and files, and some cell phones are equipped with Global Positioning System (GPS) technology, allowing for use in most locations around the world and allowing the cell phone to be found or the user located in the event of loss or emergency.

Cell phone reception has become reliable and of high quality due to advances in wireless technology. Wireless service providers offer excellent packages and promotions for cell phone users. Finding a dependable service provider is no longer an issue for cell phone users. The expansion of the wireless service provider industry gives cell phone users a choice and the increased competition has caused a drop in prices of wireless cell phone service. The importance of cell phones goes way beyond the ability to make or receive phone calls. Cell phone users can instantly send data to the home or office, check for important e-mail, use their cell phone as a PDA

or calendar, and store photos which can be easily transferred to a PC or laptop computer.

Cell phone manufacturers have produced a wide range of cell phones, which sell for prices that range from very inexpensive to over thousands of Birr. The available options give users the choice of purchasing a basic cell phone to use simply for making calls, or choosing a complex, technologically advanced cell phone that can perform as many or even more tasks that a home computer. Over the past decade, the increasing importance of cell phones has made them almost a necessity for most people. Even remote and underdeveloped countries have some access to cell phone technology and wireless services.

The importance of cell phones has increased the competition in the wireless service provider industry, making cell phones very affordable and very easy to use. Cell phones have become almost a status symbol in addition to the convenience and security that comes from owning them.

Fig. 1.30: E-mail through Mobile

KEY CONCEPTS

➤ ICT enables rapid access to ideas and experiences from a wide range of people, communities and cultures, and allows pupils to collaborate and exchange information on a wide scale.

➤ A digital device is a device that works with discrete numbers or digits.

➤ Computer has brought many changes in employment, including changes to office equipment, office location, work schedules and the types of work people are seeking.

➤ Mobile phones are the easiest and the simplest of the methods to stay connected with others, and moreover they provide a sense of security.

➤ Satellite technology plays an important role in communication globally.

➤ The Information Age/Digital Divide separate the information rich and the information poor.

REVIEW QUESTIONS

Fill in the Blanks

1. .... can be used to find, develop, analyse and present information, as well as to model situations and solve problems.

2. .... technology plays an important role in communication globally.

3. The .... have good access to information—especially online, but also through more traditional media such as newspapers, radio, television, and books.

State Whether True or False

1. A digital device is a device that does not work with discrete numbers or digits.

2. Computers are forever present in the offices.

3. Mobile phones are the easiest and the simplest of the methods to stay connected with others, and moreover they provide a sense of security.

4. Ministry of Education will not launch educational TV programs that will be broadcast by satellites to the remotest corners of Ethiopia.

Multiple Choice Questions

1. A system is generally assembled from smaller systems called

   (*a*) Subsystems   (*b*) Boundary   (*c*) Thinking   (*d*) None of these

2. Which of the following is/are the application(s) sector(s) of ICT?

   (*a*) Home   (*b*) Office   (*c*) Communications   (*d*) All of these

3. Which of the following is not a characteristic of a system?

   (*a*) Components   (*b*) Purposeless   (*c*) An environment   (*d*) Interfaces

4. Which of the following is trying to improve the ICT development in Ethiopia?

   (*a*) Ethiopian Electric and Light Power Corporation

   (*b*) Ministry of Agriculture

   (*c*) Ethiopian Telecommunications Corporation

   (*d*) Ethiopian Road Authority

Match the Following

Column A	Column B
1. Education/Training	(*a*) 256 KBPS–100 MBPS
2. Executive Support Systems	(*b*) Health
3. Negative impact of mobile phones	(*c*) Online education tutor
4. Speed of satellite transmission	(*d*) For top managers

Answer the Following

1. Describe the impact of ICT in everyday life.

2. What is a digital device? Describe the impact of using computers in offices.

3. Give the differences between information poor and information rich society.

Suggested Activity

Describe the impact of ICT in everyday life, considering the aspects listed.

Field Trip

Organize a field trip to various organizations, offices, mobile shops and Ethiopian Telecommunication Corporation (ETC) stations to find out and report on:

Impact of ICT in everyday life.