

Information and Communication Technology

In this chapter you will learn:

- how to identify data and information
- what a system is
- the systems we come across in our day to day activities
- characteristics of quality information
- Information and Communication Technology
- applications of Information and Communication Technology
- evolution of the computer

1.1 Data and Information

The numbers, words, images and symbols that do not have meaning, when standing alone are called data. We can get meaningful information by arranging and processing data, we can use them to make decisions too.

Example 1

It will be difficult to get an idea about the subjects and marks if names and marks are written separately on term test results.

Ravi 78, 90, 79, 67, 76, 98 Rizwan 87, 70, 80, 75, 80, 80 Krishan 76, 78, 67, 80, 79, 76

But these names and marks can be tabulated as follows:

Name	Language	Mathematics	Science	History	Health	English
Ravi	78	90	79	67	76	78
Krishan	76	78	67	80	79	76
Rizwan	87	70	80	75	80	80

This table shows some information about the marks of students. However, in order to arrive at some meaningful conclusion, this may not be sufficient:

Marks that were tabulated can be subjected to calculation.

Name	Language	Maths	Science	History	Health	English	Total	Average	Rank
Ravi	78	90	79	67	76	78	468	78	2
Krishan	76	78	67	80	79	76	456	76	3
Rizwan	87	70	80	75	80	80	472	78.66	1

In this table, name and subjects such as language, maths are data and total, average and rank are information.

You can see that the teacher is able to get the required information using this table (i.e. the total score of each student, their average scores, individual skill of each student, the rank etc). The information gathered in this manner is useful for the teacher to make important decisions.

Example 2

To identify the difference between data and information, let us consider the following Figures;

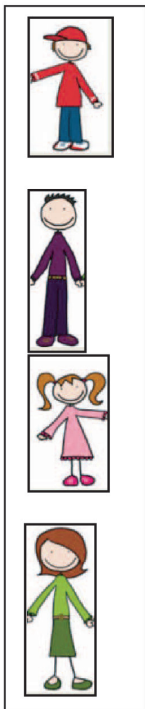


Figure 1.1 - Human figures

When we take each image separately, it does not convey a meaning. But when properly arranged as on the right hand side, one can understand that these are the members of one family.

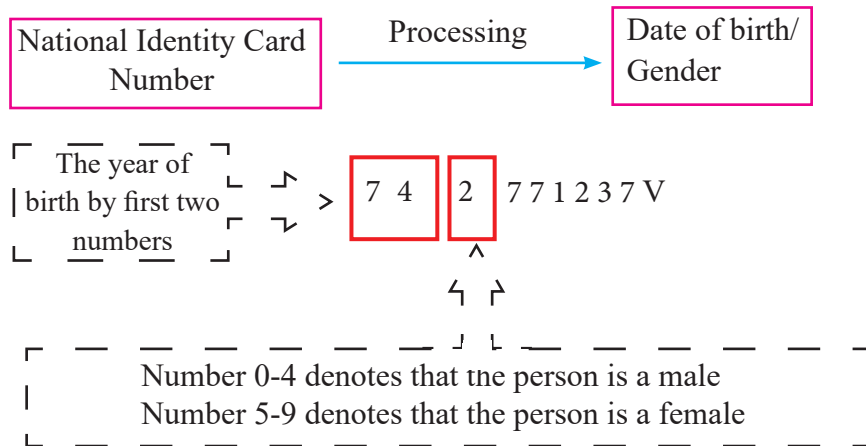


Figure 1.2 - A family

Example 3

Analyzing National Identity Card number

Take a look at the numbers in a National Identity Card. At once it looks as if it is just a number. But when you analyze it, you can obtain some meaningful information. When the NIC number is given one could find the person's age and gender.



Activity



Provide five other examples for data and information.

1.2 Information System

Once, man used to process data using a pen, pencil or other devices. But today the computer has become man's data processor. A system is a combination of components that work together to fulfil a task.

Submitting data for processing is called "Input" and the result we get after processing is called "Output." We can call the collection of all these components above an "Information System."

Storing data is an important task in an information system. In some occasions, both input and stored data are used to obtain information.

Hence the purpose of a system is to receive data, process and store them and provide the results when required.

According to the figure 1.3 a computer processes the data that we input, according to the commands and provide us with the required information in the desired form. Therefore, we call the computer is an 'Information System'.

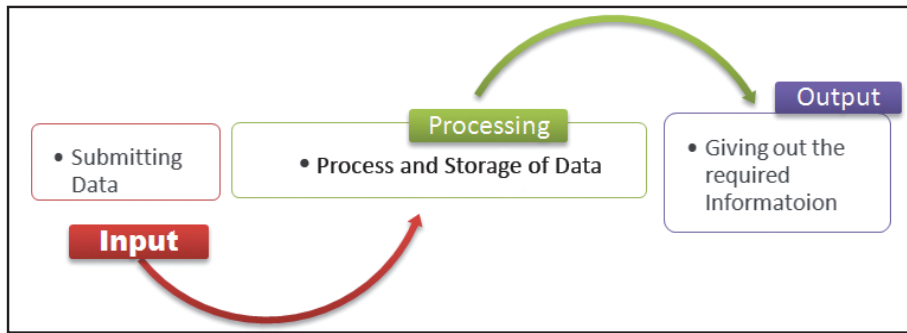


Figure 1.3 - Function of an Information System

We use many such systems in our day today activities. Let us consider some of the examples:

Example 1 - ATM Automatic Teller Machine

When the bank ATM card is inserted to the ATM machine, data is processed and information regarding the account is given.

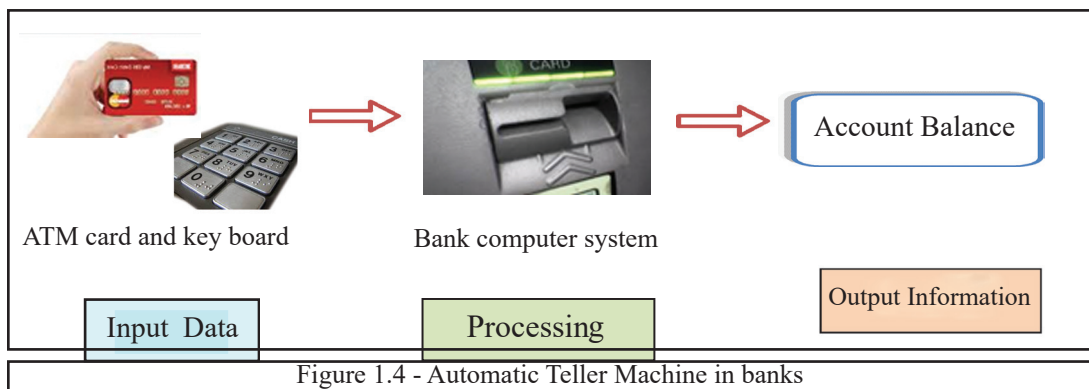


Figure 1.4 - Automatic Teller Machine in banks

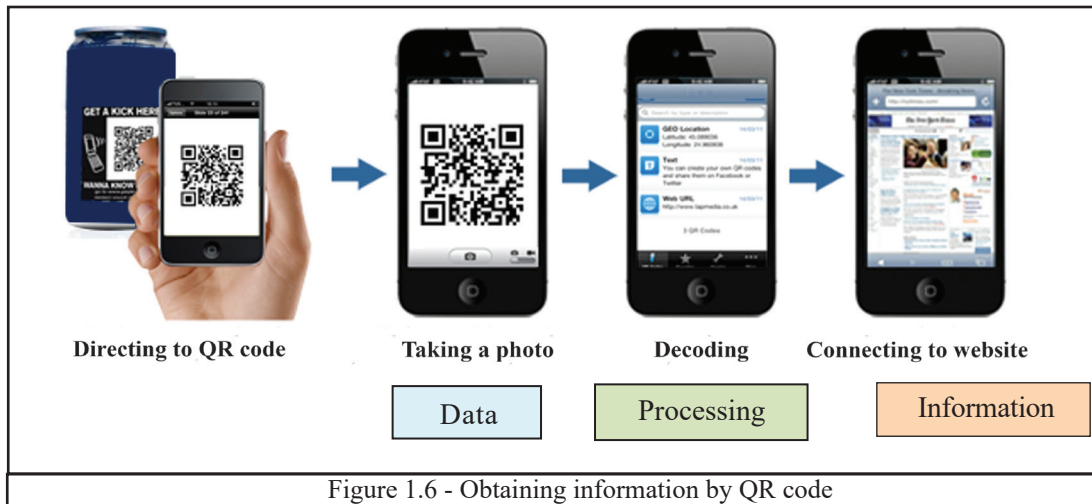
Example 2 - Fingerprint reader to record the attendance of an organization



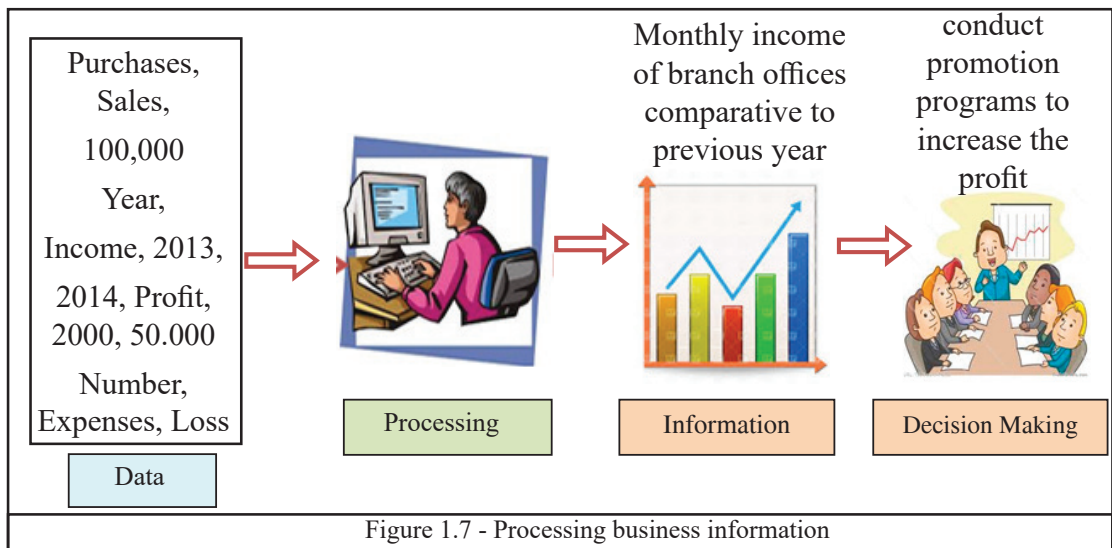
Figure 1.5 - Finger Print Reader

Example 3 - QR Code used to find information

After scanning the QR code by a smartphone and connecting to the internet, more information can be obtained from the website of the relevant item. QR code is used in newspapers, magazines and selling items.



Example 4 - Processing business information



Activity



Observe Images 1 and 2 below:

(A)



This is an image you could see on the items we buy at the market. This is called Barcode. This barcode is scanned at the cashier by a Barcode Reader. Observe how the bar code is used in different occasions.

Image 1

(B)



This image is seen at the back page of some books you buy. This is called ISBN Code.

Image 2

Meet the librarian and find out what information you can obtain by taking ISBN number as the input.

A computer or computerized equipment is used to process the data and we make decisions based on the information we get as output.

We understand that we can get information by processing data and this information can be used to arrive at decisions. However, not all information is suitable for making decisions. Information obtained should be of good quality. There are many characteristics of quality information. A few of them are given below:

Quality of information	Example
a) Relevancy 	It is not needed to submit all the academic information from Grade 1 onwards, when the requirement is to submit only the highest educational qualification.
b) Completeness 	Taking information from only a small group of people in order to arrive at the PCI (Per Capita Income) of a country is not sufficient. Incomplete information could lead to drawing wrong conclusions.
c) Accuracy 	If a doctor gets wrong information about the patient's health, it could be harmful to the patient.
d) Timeliness 	The information must always be updated. Today's weather report may not be suitable to decide on tomorrow's weather.
e) Cost Effectiveness 	If an organization spends money more than the profits to collect some information in order to increase profits, it would be a business loss to the organization.

Activity



Write another example for the above (a) - (e).

1.3 Information and Communication Technology

We learnt that we can get information by processing data and that information can be used to make decisions and arrive at conclusions. When we exchange the information among different people or among different systems, it is called communication of information.

Humans have been processing and exchanging information since ancient times. But he had to face many difficulties and obstacles in data communication. But today it has become an easy task with the advancement of technology.

Today, technology is used in various ways to convert data into information and to share them. This is called Information and Communication Technology (ICT).

1.4 Applications of Information and Communication Technology

Today, you could hardly come across any person who does not use information and communication technology in day to day activities. Some examples are illustrated below:

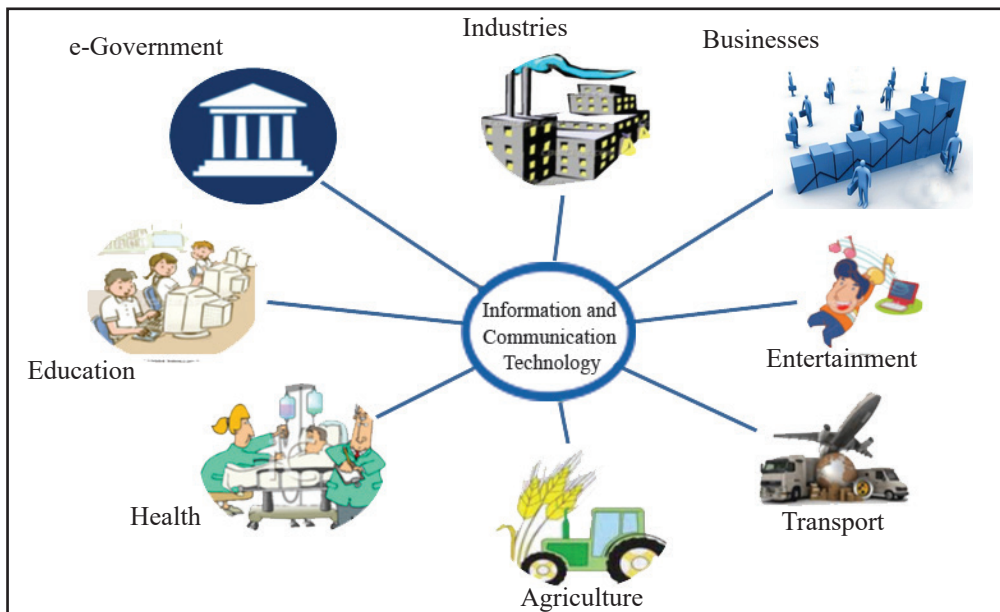


Figure 1.8 - Applications of Information and Communication Technology

1.4.1 e - Government

When a government communicates with its citizens, companies, Government and Non-Government Organizations and with other Governments (of different countries) using ICT, it is called e-Government.

There are numerous websites such as official web portal of the government of Sri Lanka, Government Information Center, ICTA (Information Communication Technology Agency) etc for e-Government activities. The difficulties in communicating with the Government and obtaining Government information have been overcome by these.

E-Government Services (<http://www.gov.lk/>)

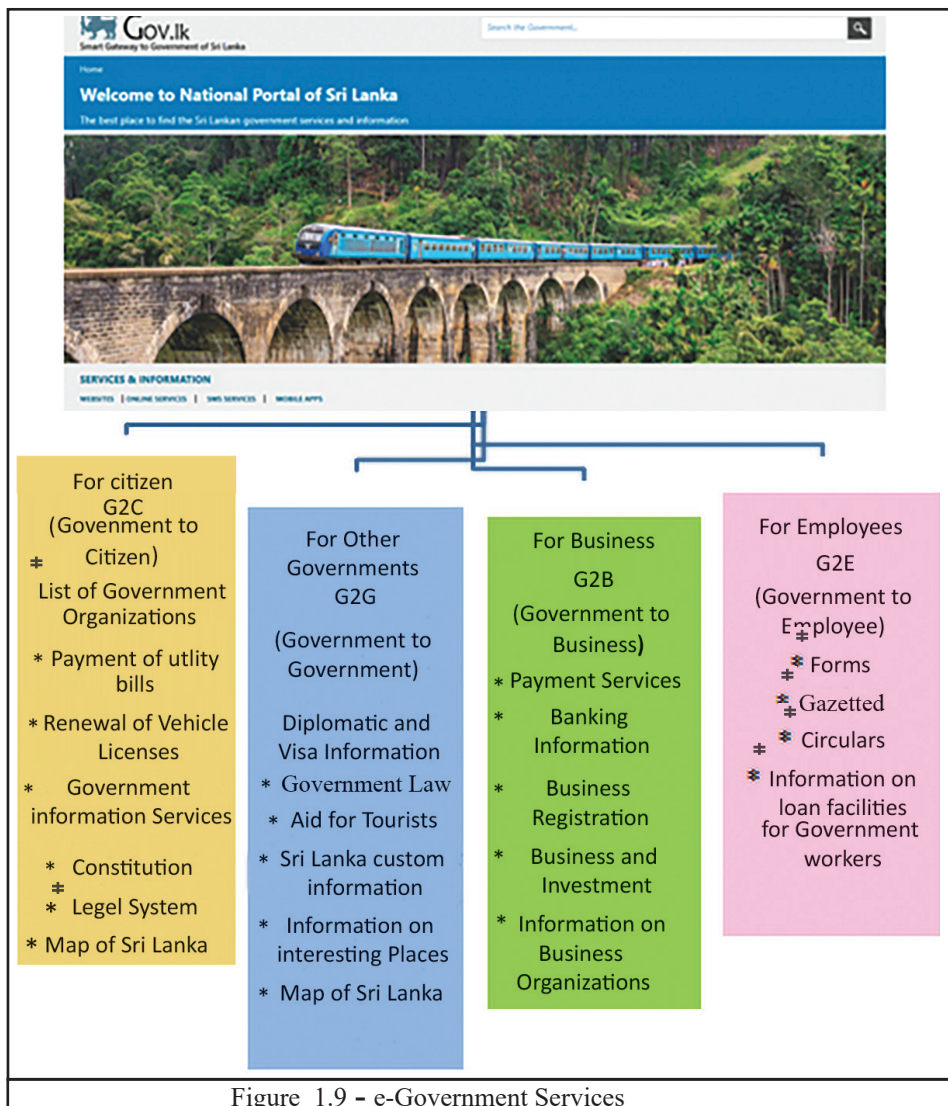


Figure 1.9 - e-Government Services

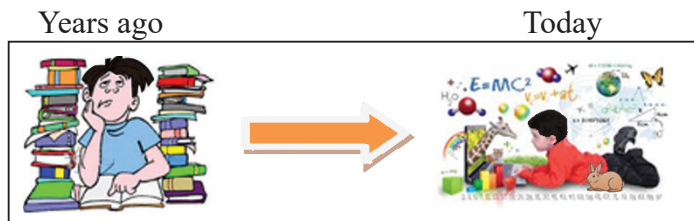
Activity



1. Visit the Government web sites such as the official web portal of Government of Sri Lanka, Government Information Center, ICTA (Information Communication Technology Agency) etc. Make a list of the valuable information and the services you could obtain as a citizen of Sri Lanka.
2. Make a list of e-government services that are provided by other countries mentioned below.

Eg - Malaysia, Singapore, England

1.4.2 Applications in the field of education



Days are gone when we were stuck among piles of books in order to collect the required information. Today you have the luxury to see and gain knowledge about the entire world at your own convenience, due to all the advancements of ICT.

There are many ways as to how ICT helps you in your education. Let us look at some of them:

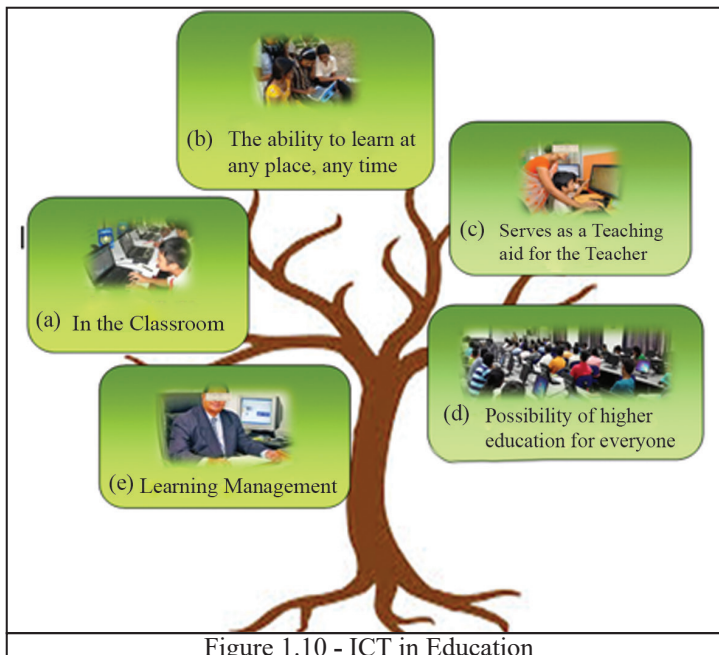


Figure 1.10 - ICT in Education

a) In the classroom

There are many ways the computer and the internet are used for education in the classroom:

- For presentations
- Videos on experiments
- Creation of images and video
- Desktop publishing of magazines, letters and documents
- Educational games (Edutainment)
- Learning using the CD-ROM media
- Gathering educational information on the internet
- Learning Management System.



Figure 1.11 - Computer in the Classroom

b) Education - any where anytime

If you have a computer with internet connection, you can study while at home or any other convenient place. For this, you can use the following educational websites to do self study and improve your knowledge within your pace.

- www.e-thaksalawa.moe.gov.lk

You can contact with a teacher/trainer via internet. This is called WBT (Web based Training). While you can do further studies using WBT, it helps in minimizing the difficulties of travelling and related expenses also. At the same time, it helps save time and money.



Figure 1.12 - Education Anywhere any time

Activity



- Visit the Websites mentioned above and list the areas which you can use to enhance your knowledge.
- List three advantages compared to traditional teaching methods in studying Science, Mathematics and ICT by visiting G.C.E. (O/L) section on BBC Bitsize.

c) Serves as a teaching aid for the teacher

ICT can be used mostly as a teaching aid in schools.

- Using pictures, animations and audio-visuals to explain subjects that are difficult to explain verbally.
- To make the lessons interesting using electronic presentations.
- To organize lessons using the computer.
- To obtain information relevant to the subjects.



Figure 1.13 - ICT as a teaching aid

d) Learning Management System (LMS)

In many countries it has become a common practice to use a Learning Management System to manage school systems and higher education system. We need an internet connection to link with the LMS. A person has to register himself/herself on the official website to access LMS of a school or any other educational institution. According to the picture 1.14, teachers and students can get many services from LMS.

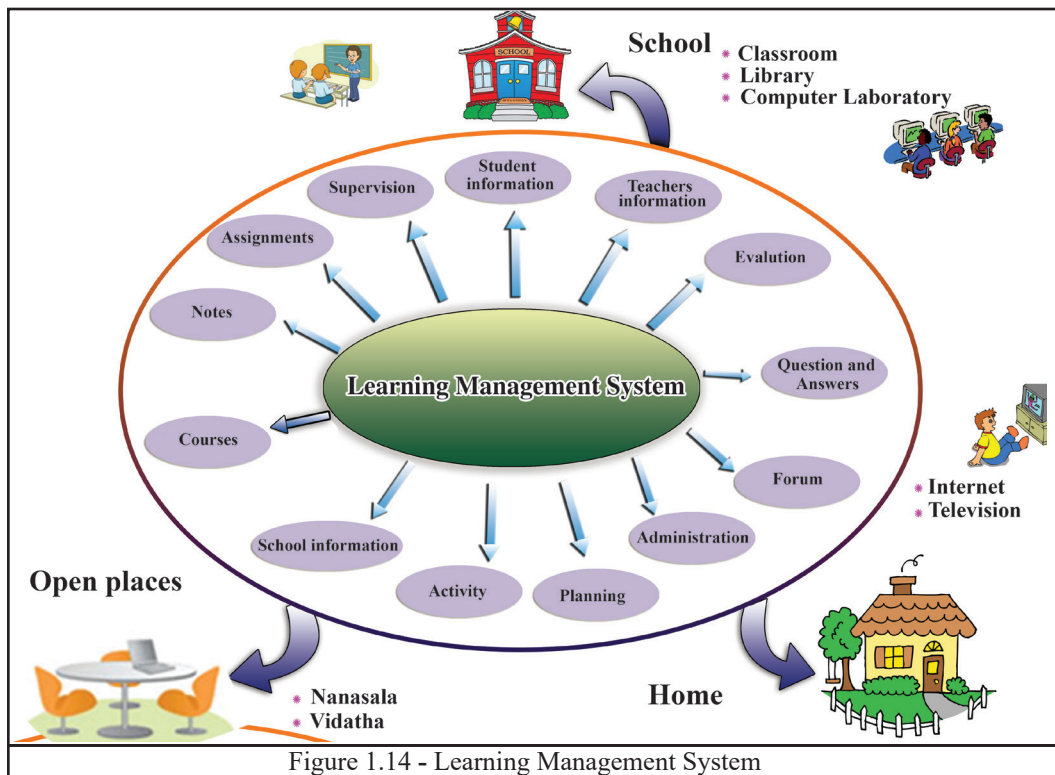


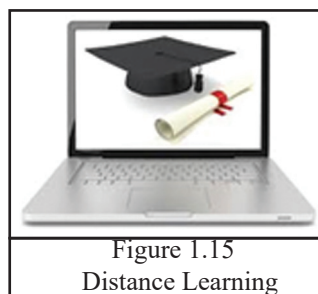
Figure 1.14 - Learning Management System

Some services provided by Learning Management System.

For a Student	For school Management
The ability to use the learning units at anytime and anywhere at school, at home or any other convenient place.	The ability to add quality learning materials
The ability to upload the assignments completed at home	Supervision of activities and publishing of results
The ability to submit queries, getting replies and submitting comments through Forums	The ability to maintain updated information of the students, teachers and school
Ability to participate in the co-curricular activities via video.	Submitting questions, getting replies and providing comments through Forums
The parents can monitor the progress of their children from home.	Sharing necessary information with parents, school development committee, and other school officials via e-mail.

e) Higher education for everyone

With the development of ICT, today a person from any country can connect with a university or any other learning center of his choice and pursue higher education at a considerably low cost. This is called Online Distance Learning.



Features of Distance Learning:

- Within a flexible time frame, provide the facility to learn
- Digital library facility on joining a course.
- Online assignments and quizzes.
- Contact with a teacher online.
- Easy to obtain teacher consultations.

1.4.3 ICT in Health Sector

Many complex processors in the medical field have been made significantly simpler through the use of modern equipment.



There are surgical devices with cameras which can record the surgical procedures while surgery is carried out.



Devices and appliances which are used in the practical training of doctors and nurses.



Devices used to analyse store and print medical records.

Figure 1.16 - Modern Health Equipment

There are plenty of areas where ICT is used in the health sector for our well-being. Let us consider some of them.

1. Use of ICT in diagnosis

Today, there are numerous high tech machines which help us in the diagnosis and treatment of diseases. Diseases can be diagnosed at the early stages and the patients can be given treatment accordingly. Some examples of these machines are:

Example 1 - CAT - Computerized Axial Tomography Machine

Using this machine three dimensional (3D) images of different parts of the body can be made. These images are helpful in the diagnosis of diseases.



Figure 1.17 - CAT Machine



Figure 1.18 - 3D Image

Example 2 - MRI (Magnetic Resonance Imaging Machine)

This machine can create digitalized images of internal organs of the body by using strong magnetic fields and radio waves. These images are very helpful in the detection and deciding on treatment of diseases.



Figure 1.19 - MRI Machine

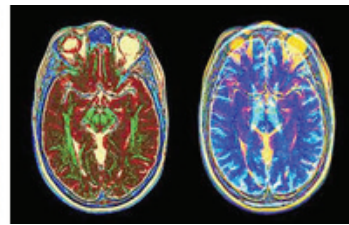


Figure 1.20 - Detailed Images

Example 3 - ECG - Electrocardiogram Machine

This machine is used to monitor the heart beat. When the heart pumps blood to different parts of the body some electrical impulses are produced. This machine records the electrical impulses.



Figure 1.21 - ECG Machine



Figure 1.22 - ECG Graph

Example 4 - Cardiac Screening Machine

This machine displays the physiology of the heart and it displays the movements inside the heart. Through this machine it is possible to diagnose problems of the heart such as thinning of veins and then recommend treatment.

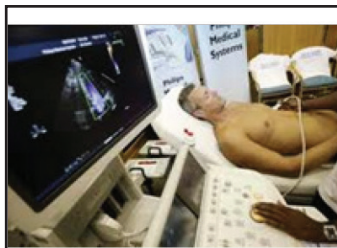


Figure 1.23 - Cardiac Screening Machine

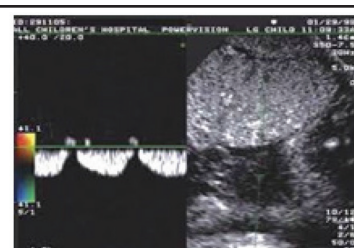


Figure 1.24 - Cardiac Screening Display

Example 5 - EEG (Electro-encephalography)

This machine is used to record the activities of the brain. The small electrical probes attached to the head receive the electrical impulses of the brain and display them on a computer screen. This device can retrieve the data in both states where a patient is awake or asleep.



Figure 1.25 - EEG Machine

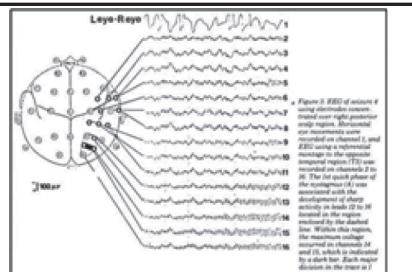


Figure 1.26 - EEG Display

Example 6 - Blood Sugar Testing Machine

This device would analyze a sample of blood and determine the blood glucose level.



Figure 1.27 - Blood Test

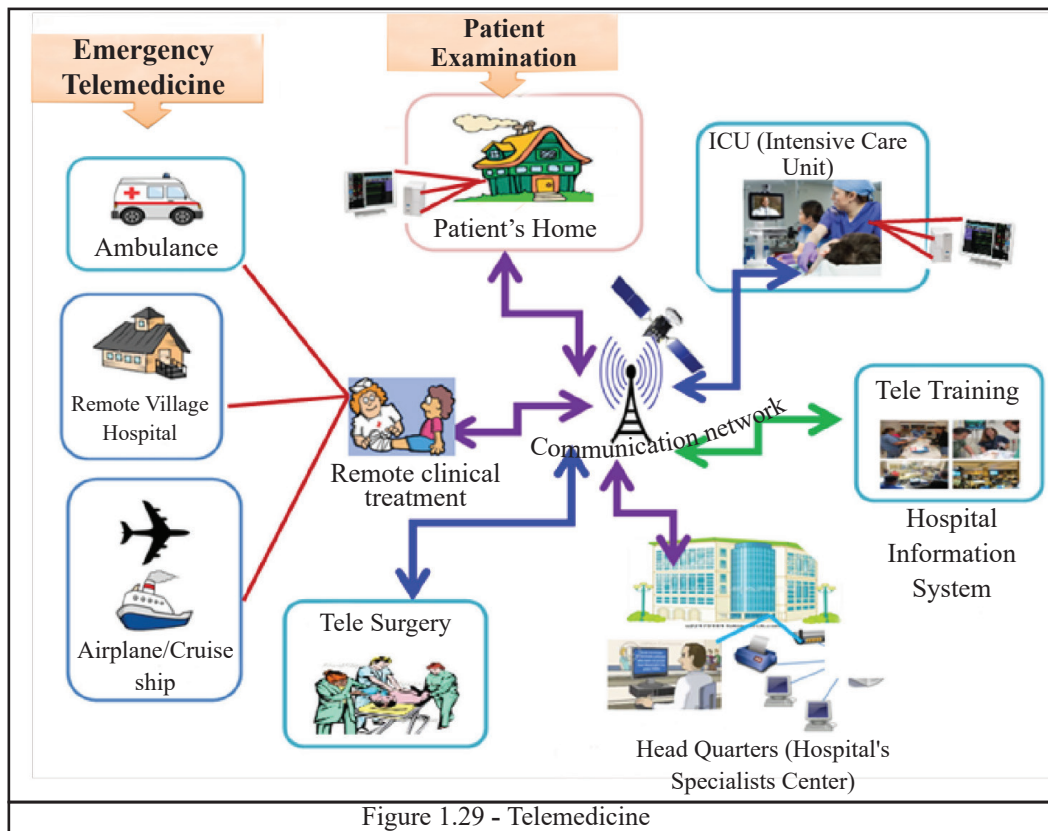
Example 7 - Blood Pressure Measuring Machine

Wrist-based blood pressure testing machines simplify the process of monitoring blood pressure.



Figure 1.28 - Measuring Blood Pressure

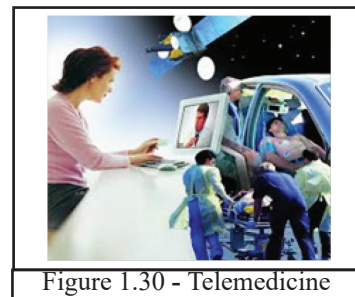
2. Telemedicine



The use of Information Communication Technology to examine and to provide healthcare to a patient who is far away from the hospital is called Telemedicine. This is made possible by remotely connecting the patient with hospital's specialist unit or specialist doctors. Telemedicine has several advantages such as:

Example 1 - Emergency Telemedicine

Emergency telemedicine is the process of providing emergency care by a trained person in consultation with a specialist in a hospital via telecommunication network and treating the patient when he (who lives in a remote village or flying in a plane or cruising in a ship) can not reach a hospital.



Example 2 - Home health medicine

Keeping the patient at home and monitoring his/her condition using networked home monitoring system. The home monitoring of the health condition helps to decide when to transfer the patient to hospital.

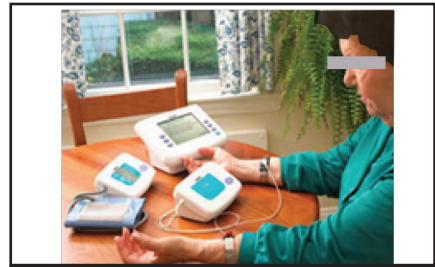


Figure 1.31 - Home Health Medicine

Example 3 - Telemedicine Consultation

Seeking medical consultation of a specialist at the Emergency Treatment Unit (ETU) when he/she is not physically available in hospital.



Figure 1.32 - Medical Consultation

Example 4 - Telesurgery (Remote Surgery)

Remote surgery is the ability of a doctor to perform surgery on a patient in consultation with a specialist (who is not physically present at the same location but in a far away town or abroad) by the use of Telecommunication Technologies.



Figure 1.33 - Telesurgery

Example 5 - Medical Teletraining

Specialists' consultation and training can be used to obtain the services of a medical professional at a remote place by the use of telecommunication technologies. In training hospital staff, specialist consultation and training from a resource person in a foreign country or town can be attended, using telecommunication technologies in a nearby training centre.



Figure 1.34 - Medical Teletraining

1.4.4 ICT in Agricultural Industry

ICT has created a new revolution in the field of agriculture. Today ICT is extensively used in agriculture, animal husbandry and fisheries industries.

ICT for farming:

A range of automatic machines are available today to ease the work of the farmer who worked hard in the field. These machines not only ease the work of a farmer but also enables him to produce high quality yields.

Below are some of the machines used for agriculture in developed as well as developing countries.

Example 1 - Meteorological Devices

These devices are helpful in assessing the weather, climatic changes, rainfall, wind direction etc. Such data are useful in deciding on the crop cultivation and harvesting times.



Figure 1.35 - Meteorological Devices

Example 2 - Automated Insect Control Devices

With the help of this device we can minimize the harmful effects caused by insects. It displays on screen the direction and the density of insect population, its growth and movement.

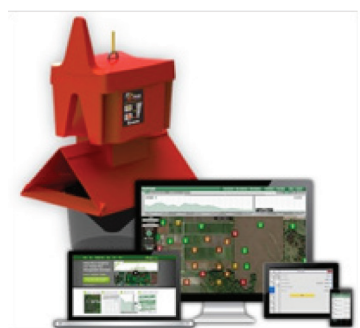


Figure 1.36 - Automated Insect Control Devices

Example 3 - Field conditions measuring devices

These devices help in measuring various parameters such as fertility and humidity levels of soil which aid in the determination of cultivation activities.



Figure 1.37 - Field conditions measuring devices

Example 4 - Drip irrigation

These devices control the supply of water as per the data fed. Wastage of water and destruction of crops due to lack of water supply are minimized by the use of these devices.



Figure 1.38 - Automated Water Supply Systems

Example 5 - Automatic Weed remover

This machine helps remove unwanted plants from fields or gardens with little human effort. It works automatically to identify and remove weeds, making farming and gardening easier and faster.



Figure 1.39 - Automatic Weed Remover

Example 6 - Seedlings planter using Robotics

These robotic machines are used in large fields to carry seedlings across the field and to plant them in an orderly manner.



Figure 1.40 - Seedlings planter using Robotics

Example 7 - Crop harvesting using Robots

Robotic machines are used to monitor plant growth levels, record them and harvesting in large scale farm lands. These machines help us overcome difficulties in managing large farm lands.



Figure 1.41 - Crop harvesting using Robots

Example 8 - Greenhouse

The Greenhouse is the best solution to protect crops from natural disasters (too much sun shine, rain, heat, cold, pests, epidemics etc). ICT is used to control light, moisture and air inside the greenhouse. Hence, farmers are able to make high quality products of rare crops to the market.

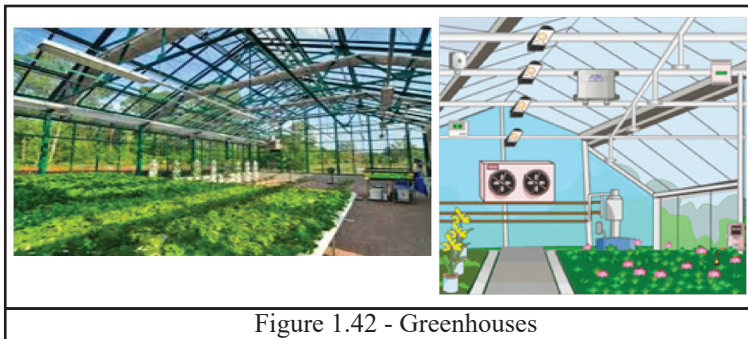


Figure 1.42 - Greenhouses

1.4.5 ICT in management of farmhouse

Example 1 - RFID – Radio Frequency Identification Device

The RFID help in identifying and counting the number of animals and also in locating the animals in a large area.



Figure 1.43 - Radio Frequency Identification Device

Example 2 - Automated milking and examination of cows

This automated machine is helpful in monitoring the health status of the cows, milking and the quality of milk.



Figure 1.44 - Automated milking and examination of cows

Example 3 - For Security (Closed Circuit TV CCTV)

CCTV is employed to protect farm from the animals and thieves. When the cameras are connected by Wi-Fi (Wireless Fidelity) the farm can be monitored far away from the farm.

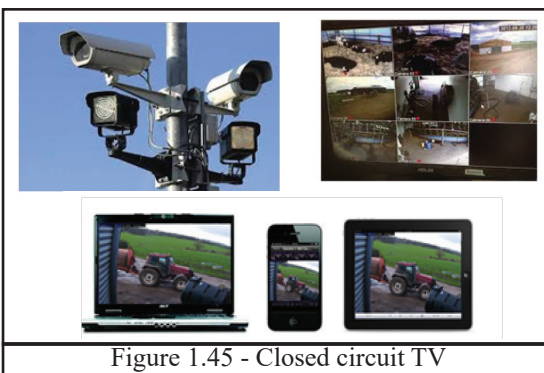


Figure 1.45 - Closed circuit TV

Example 4 - Farm Management

Today's farmer use various computer applications in portable computers such as laptops, tabs, smart phones to keep track of information on their farm; to calculate profits and losses, to save employees salary details etc. Using this portable devices with internet connectivity, they are capable of monitoring the market rates, get updated on latest business information and exchange information.



Figure 1.46 - Computer in Managing the Farm

1.4.6 In Fishing Industry

Sensors are placed in different parts of the sea. These sensors convey information on fish concentration in the sea to the computers in fishing trawlers via internet.

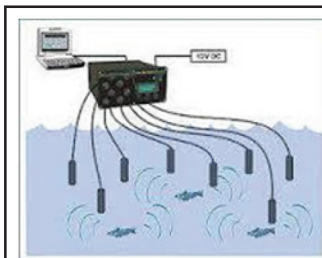


Figure 1.47 - Sensors under sea

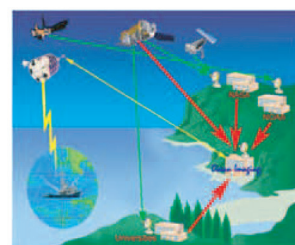


Figure 1.48 - Transfer of information

1.4.7 ICT in Manufacturing Industry and Business

ICT is used in manufacturing high quality products and reduce the cost of production by minimizing the use of human labour in many industries and businesses. Since high quality products are manufactured at low cost, people can buy good quality products at a relatively low price.

Let us see how technology is used in manufacturing;

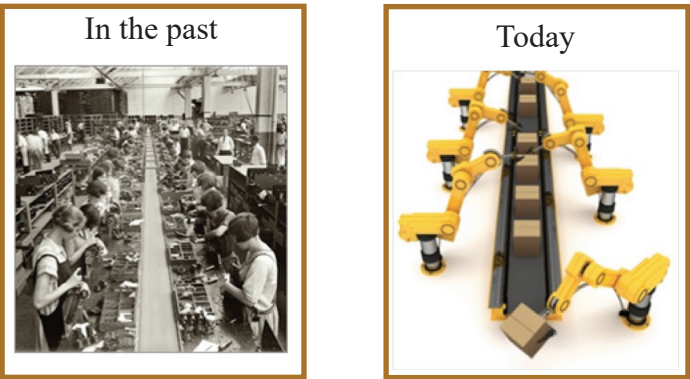


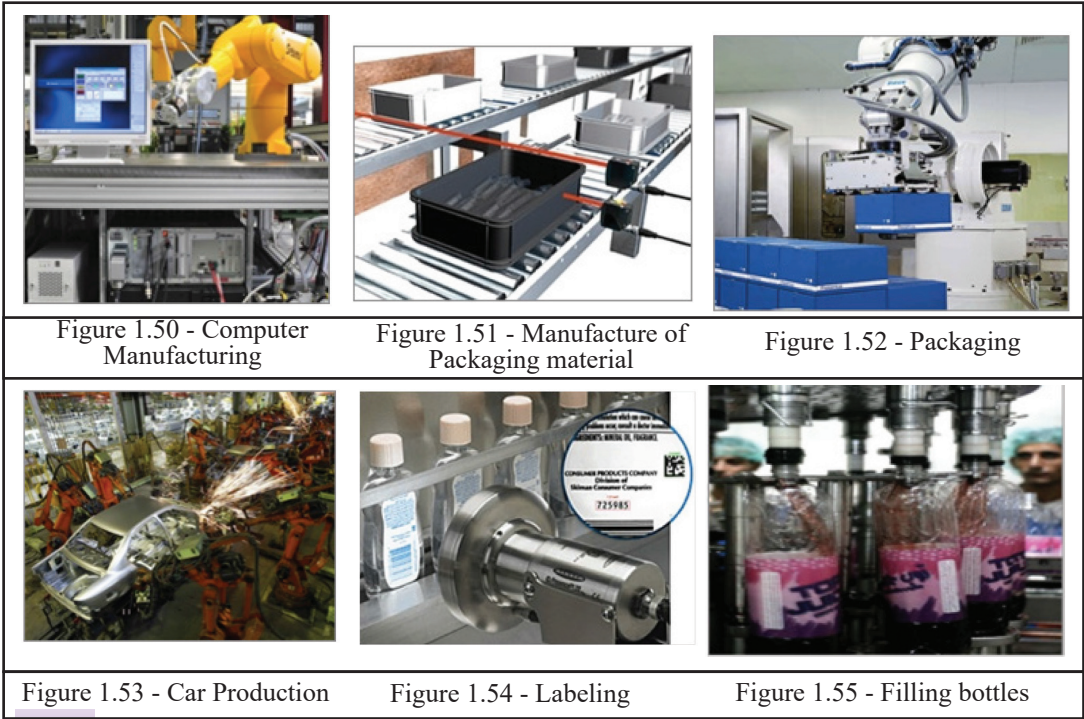
Figure 1.49 - Use of ICT in industry

In the past decades a high level of human labour was needed in the manufacturing industry. Today most of the work performed by the human hands are performed by robots.

Uses of robots;

24 hour service, Never get tired, Efficiency, Accuracy, Hygiene

Following pictures show how robotic technology is used in production



Example 1 - Video Conferencing

This technology has enabled different business communities who are geographically separated to convene face to face meetings while in at their own premises. The advantages of this technology include the following. Convening at a special venue is unnecessary and saves time, effort and cost spend on travelling.

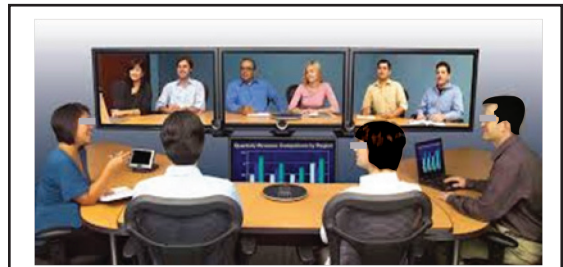


Figure 1.56 - Video Conferencing

Example 2 - Human Resource Management

The administration of employee activities has become an easy task due to finger print scanner (used to register attendance) and Card Reader (Identity Management). These devices help in recording the time of employees moving in and moving out of the office premises, preparing salaries accordingly, keeping records of leave taken etc. Today, the above devices are used not only in the private sector but also in the public sector in Sri Lanka.



Figure 1.57 - Finger Print Scanner

Figure 1.58 - Card Reader

Example 3 - e-Banking System

e-Banking has helped both the business community and all of us to do convenient banking. They are:

- The ability to withdraw cash anytime anywhere at ATM (Automatic Teller Machines) points.
- Since banks are connected via internet, inter banking or transactional activities are made possible even within Sri Lanka or abroad.
- When you are registered in a banking network, it gives one the opportunity to pay utility bills, inter-banking transactions, checking the account balance, using mobile phones.



Figure 1.59 - e-banking System

Example 4 - Online Shopping

Online shopping known as electronic commerce which allows foreign or local company to sell its products or services and the ability for a consumer to buy goods and services via internet. A buyer can order goods or services of his/her choice from a convenient place. The advantages of online shopping include:

- One can select any global commercial organization which is on the internet.
- Open 24 hours.
- Ability to see things and order at one's convenient place.
- The ability to pay using the electronic payment methods such as credit cards.
- Home delivery of goods or services, thus saving time, transport cost and avoid unnecessary travel related exhaustion.



Figure 1.60 - Online Shopping

1.4.8 ICT in Transport

We can quote some of the systems which are used to enhance the road traffic by minimizing traffic jams.

Example 1 - Closed Circuit TV (CCTV)

This system which uses the CCTV (Closed Circuit TV) is helpful in monitoring the road traffic, accidents, illegal activities and take appropriate actions accordingly.

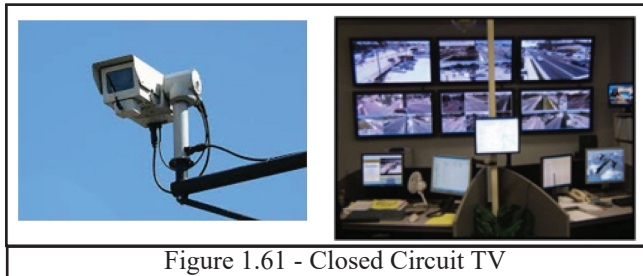


Figure 1.61 - Closed Circuit TV

Example 2 -Traffic Light Control System

These automated lights are positioned at road junctions. These lights help in minimizing accidents by controlling the vehicle traffic and pedestrians.



Figure 1.62 - Traffic Lights Control System

Example 3 - Parking identification placard

This is an entrance pass which is stuck on the windshield of a vehicle. When the vehicle comes close to the gate of the parking space, the sensors read the placard and only open the gates if the vehicle is already pre-registered. Due to its quick processing ability, this automated system also helps to avoid building up of traffic at the gate.

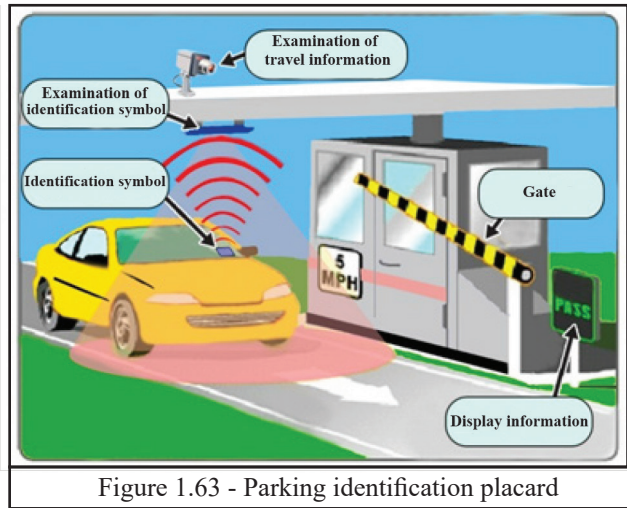


Figure 1.63 - Parking identification placard

Activity



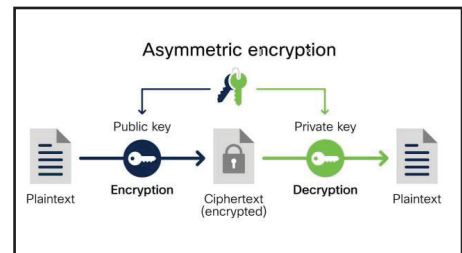
Observe three instances where ICT is used in business and manufacturing and write a report.

1.4.9 ICT in Security.

Information and Communication Technology plays an important role in the security of a country. Modern security systems heavily rely on ICT to ensure national security, quick decision-making, and effective response to threats. That means,

1. Communication and Coordination

Secure communication networks enable the armed forces, intelligence agencies, and government authorities to coordinate operations, and encryption methods are used in data communication.



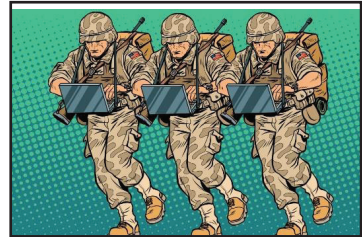
2. Observations and Information Gathering

Satellites, drones, radar systems, and CCTV networks are used to monitor enemy attacks and identify threats.

Data analysis is used to identify patterns of terrorist or cyber attacks.

3. Cyber Security

Cyber security is used to protect national infrastructure such as military systems, power grids, banking systems, and transportation from cyber attacks. Cyber forces and security units are used to fight digital wars.



4. Modern Weapons

The use of smart weapons, missile defense systems, and automatic drones.

Artificial Intelligence is used to improve accuracy, reduce risk, and enhance combat readiness.



5. Decision Support Systems

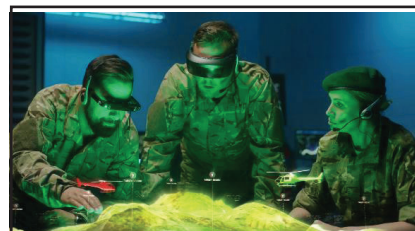
Real-time data visualization helps military leaders to plan strategies effectively.

Accurate data analysis for faster decision-making has become easier for Command and control centers.

6. Training and Simulation

Virtual Reality (VR) and simulation technologies allow soldiers to train in a natural environment without any physical risk.

This also saves cost and time when preparing for complex combat scenarios.



7. Border and Homeland Security

Biometric devices, surveillance drones, and ICT-enabled monitoring devices protect borders. Information and Communication Technology assists in preventing smuggling, illegal immigration, and invasion.



1.4.10 ICT in Media and Communication

Information and Communication Technology has completely transformed the media industry by changing how information is created, distributed, and consumed. Let's identify a few examples.

1. Information Gathering and Production

Journalists use ICT tools (computers, cameras, mobile devices, drones) to quickly gather and report news.

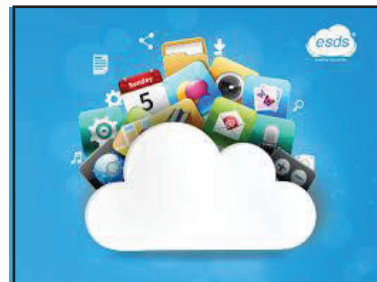
Digital editing software has made it possible to produce high-quality output for newspapers, TV programs, films, and online contents.



2. Storage and Preservation

Media organizations use databases, cloud storage, and digital libraries (e-libraries) to store vast amounts of information.

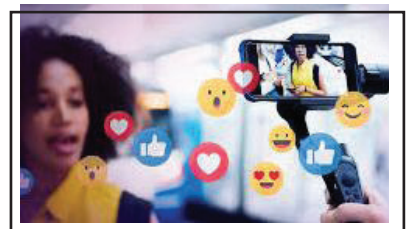
This makes easier to access old newspapers, TV programs, and documentaries.



3. Content Distribution

Information can be distributed on a massive scale through television, radio, newspapers, websites, and mobile apps.

Live streaming, podcasts, and social media have made instant global access possible.



4. Interactive Media

Social media (Facebook, X/Twitter, YouTube, TikTok, Instagram) allows two-way communication between media organizations and the audience. This enables viewers to instantly comment, share, and respond.



5. Advertising and Marketing

ICT tools enable the activation of targeted advertisements based on user data. Companies use online ads and digital campaigns to reach the global audience at a low cost.



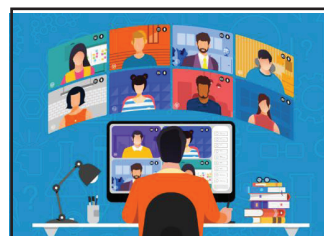
6. Multimedia Integration

Text, images, audio, video, and animation can be integrated for a more attractive presentation.

Examples: interactive news, websites, or online magazines.

7. Training and skill Development

ICT tools, online courses, webinars, and simulations help train journalists, filmmakers, and media professionals. This leads to the creation of high-quality productions.



1.4.11 ICT in Environmental Protection

Information and Communication Technology plays a critical role in protecting and managing the environment. It helps monitor the environment, mitigate damage, and find sustainable solutions.

Let's consider a few examples.

1. Environmental Monitoring

Satellites, sensors, and drones gather data on air pollution, deforestation, water quality, and wildlife.

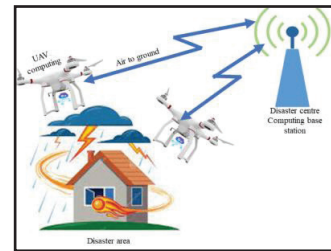
Information and Communication Technology helps monitor climate changes, global warming, and the use of natural resources.



2. Disaster Management

ICT applications are used as early warning systems for disasters such as tsunamis, floods, earthquakes, and cyclones.

Lives can be saved by using mobile alert systems, apps, and communication networks to report accidents during emergencies.



3. Awareness and Education

Information Communication Technology spreads awareness about recycling, conservation, and sustainable living through online campaigns, e-learning, and social media.

Digital platforms connect global communities for environmental activities.

4. Reducing Carbon Footprint

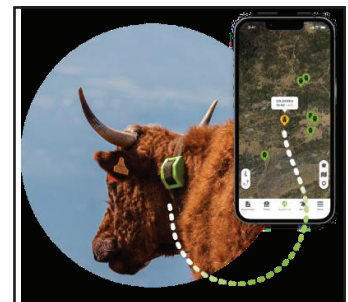
Remote work, online meetings, and digital communication reduce travel, save fuel, and decrease emissions.

Paperless systems reduce deforestation.



5. Wildlife and Biodiversity Protection

ICT tools like GPS belts and drones monitor endangered animals. This helps prevent poaching and track relocation patterns.



6. Green Technology Development

Information Communication Technology supports innovation in renewable power (solar, wind, hydropower).

AI and IoT (Internet of Things) help create environmentally friendly smart cities.



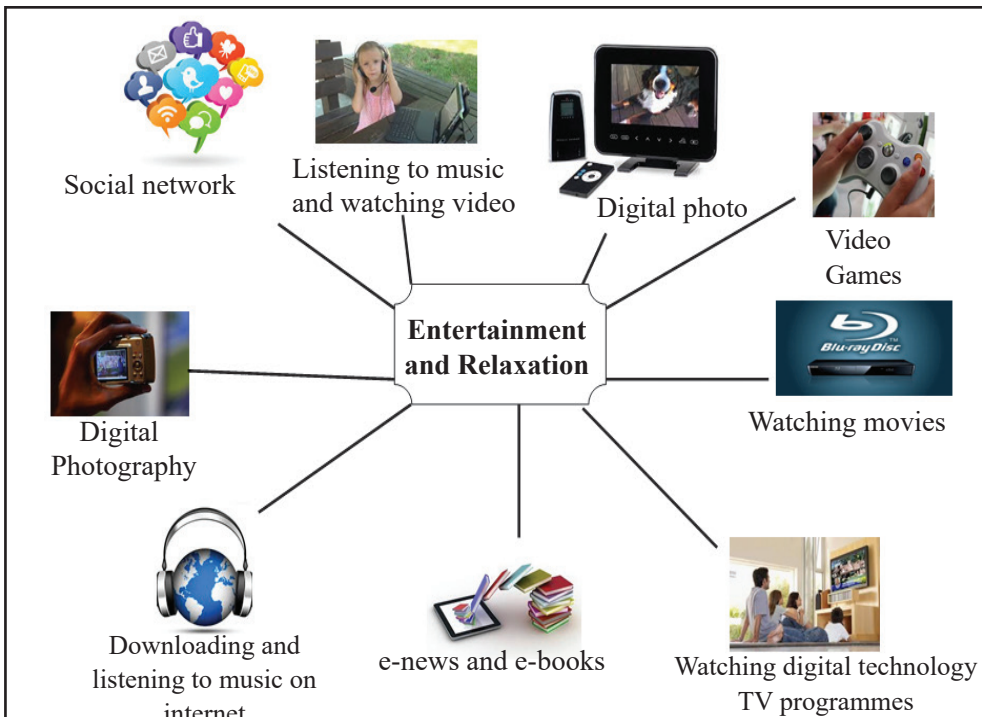


Figure 1.64 - ICT in Entertainment

In day - to - day life, there are instances where you use computer systems by knowing or unknowing. For example, a modern car consists of a lot of computer systems. Moreover, a modern ticketing machine in a bus, washing machine, indicating the distance that can be travelled by the existing fuel in a vehicle can be cited as examples.

1.5 Demerits of ICT

Not only does ICT help us as enabler to perform our day today activities, it has become a close companion also. However, if you associate this companion in an undue manner it may bringforth undesirable effects to you as well to the entire society. The following are some of them.

- Addiction – A student or any other person who immerses himself/herself in the excessive use of computer or who plays games on internet without a limit, may lose the track of education and/or end up with ailments such as sore eyes, back pain, headache etc.
- Building unsuitable friendships through social media.
- When the computer is infected by virus due to improper use of internet, it may not function properly or go out of order.
- Mental disorders may affect a person causing harm to himself/herself and to society by visiting improper websites.
- Publishing of distorted photographs and videos of individuals affecting their personal lives.
- Obesity due to less exercise
- isolation
- violating copyrights

There is an opinion that ICT has negative impacts on human society due to issues mentioned above. But we have understood that the systems made by ICT make most of man's usual work easy. Therefore, it is our responsibility to use ICT in a responsible manner.

1.6 Evolution of the Computer

By now you would have understood that computers assist us in converting data into information. Even though at present, there are automated computer systems, the computer too has undergone a similar evolution process as human beings and has reached the advanced stage today.

The computer was born in the attempt to make an adding machine. In order to add numbers, a device called Abacus was invented around 5000 years ago.

In due course many new inventions were made. The followings are few of them:

- In 1642, Blaise Pascal invented a machine called the Adding Machine. This was the world's first ever mathematical machine.
- In 1674, Gottfried Wilhelm Von Leibnitz improved the machine invented by Pascal. With these improvements the machine was able to perform multiplication and division too.
- A French Scientist named Joseph Jacquard invented a mechanical loom using Punch Card System.
- Charles Babbage started to make his Analytical Engine using the Punch Card System concept. This machine was based on the concepts input, process, output and store. Since this concept helped in the development of the computer, Charles Babbage is called the father of computing.
- Madam Ada Augusta Lovelace is considered as the first programmer since she tried to write programmes for the Analytical Engine.
- In the year 1944, a man named Howard Aiken invented the machine called Automatic Sequence Control Calculator at the Harvard University with the assistance of his companions and IBM Company. This was named MARK 1.
- Quantum Technology - In a standard computer, data operates in two states: 0 or 1. This is known as the two-state (or binary) model. However, Quantum Technology (Qubit) can represent several states simultaneously.



Figure 1.65 - The Abacus

All the versions of early computers were mechanical in nature. From the time when the computers became automated they were categorized into various 'Generations' as below:

Generations	Major Hardware Technology	Software Used	Characteristics	Systems invented
First Generation Computers 1940-1956	• Vacuum Tubes • Punch Cards are used for input, process, output and storage of data	• Machine language • Assembly language • Stored Program Concept	• High Heat Generation • Slow in processing • Large in size • Not Portable • Consumes a lot of electricity • Expensive	ENIAC EDVAC EDSAC UNIVAC IBM 701
Second Generation Computers 1956-1963	• Transistors • Tape • Floppy Disk, Tape for Secondary Storage	• High-level Programming language • Use of Assembly Language	• Smaller in size. • Less heat Generation • Low power consumption • Comparatively faster than the first generation • Expensive	• Honey well 400 • IBM7030 • C D C 1604 • UNIVAC • LARC

Generations	Major Hardware Technology	Software Used	Characteristics	Systems invented
Third Generation Computers (1964-1975)	• Integrated Circuits (IC) • High capacity disks for secondary storage • Keyboard and mouse for data input	• birth of Operating Systems (OS) • Well developed Programming languages • high level computer languages for coding	• Smaller in size • Less heat Generation • Comparatively faster than the second generation • Expensive • Low power consumption	• IBM-360/370 • PDP-8 • PDP-11 • CDC 6600
Fourth Generation Computers (1975-1989)	• LSIC (Large Scale Integrated Circuits) and VLSIC (Very Large Scale Integrated Circuits) • Microprocessor • Quantum Technology • Palm Tops • High Capacity hard disks • Floppy disk • Optical disk • Personal computers (PC) • Faster computer networks	• OS with GUI (Graphical User Interface) • UNIX OS	• Very small size • Portable • Upgradable	• IBM PC • Apple II

Generation	Major Hardware Technology	Software Used	Characteristics	Systems invented
Fifth Generation Computers (1989 to present)	•ULSI (Ultra Large Scale Integration) •Very High Capacity Hard disks and optical disks •Internet	•Operating Systems with GUI (Graphical user Interface) •Internet and multi-media applications •Voice recognition based on AI (Artificial Intelligence) •Character recognition •Hand-writing recognition systems	•Portable •Less Expensive •Smaller in size •Easy operation •High reliability •High efficiency	•IBM notebooks •Pentium PCs •SUN workstations

Activity



Find information on computer history and make a report as a group activity.

Summary

- Images, words, numbers or symbols which do not convey a meaning when standing alone are called data.
- Information is obtained by processing data. Information is used to make decisions.
- Computer is a system.
- Computers and computer based systems are used to process data.
- Providing data is called 'input' while extracting information is called 'output'
- Quality of information is important, (relevancy, completeness, accuracy, timeliness, low cost)
- Data input, processing and data output are components of a system.
- Technology is used to exchange the processed data. This is called ICT.
- Applications of ICT have made man's life easy. There are many applications such as e-Government, education, health, agriculture, business, transport, entertainment etc.
- The advent of computing dates back to 5000 years. Computing is categorized into many generations from the period of automation.