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| **2012** |

Namisi’s diary

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| **APPLICATION AREAS OF INFORMATION COMMUNICATION TECHNOLOGY (ICT)** |
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# 

# **UNIT 2**

## **APPLICATION AREAS OF INFORMATION COMMUNICATION TECHNOLOGY (ICT)**

Computers have been applied in society to add value to the information systems.

Information systems is a collection of specific human and machine efforts required to help in decision making process, data processing, and information output and presentation. The application areas where ICT has been used include:

1. Business applications
2. Industrial systems
3. Scientific and research systems
4. Transportation systems
5. Educational systems
6. Entertainment systems
7. Communication systems
8. Virtual reality

### BUSINESS APPLICATIONS

In business, the ICT is further applied in various fields like:

#### Financial systems

The financial systems help organizations manage their finances. They include:

1. Payroll systems
2. Accounting systems
3. Banking systems

##### Payroll systems

They process accurate information about employee’s income including gross payments, deductions and net pay. Payroll systems are designed to produce reports that can be analyzed to meet specific information needs e.g. pay slips and reports to show a breakdown of payroll expenses against production or income level.

##### Accounting systems

Are developed to maintain historical records of financial transactions and produce reports like balance sheets, profit and loss statements, outstanding debts, listing etc.

There are six major business accounting activities/subsystems:

1. Customer order entry and billing

Records incoming customer orders, authorizes delivery of items or services ordered and produces invoices for customers who do not pay in cash basis.

1. Inventory management

Used to keep track of the items in stock and help the management determine which items to record. It helps to have enough stock at all times to meet customer’s needs.

1. General ledger accounting

Used to keep track of how much a business makes and its worthiness by summarizing the financial transactions. It produces reports on income, sources of income, expenses and the net profit and loss earned.

The summery report of these transactions is called ***balance sheet*** and is generated at the end of an accounting period.

1. Accounts receivable

Keeps tracks or records of the amount owed by each customer. It helps to make a follow-up billing the customers for overdue payments.

1. Accounts payable

Keeps track or records of the amount the business owes others e.g. suppliers, transport or tax organizations .It help to produce cheques for payment of these amounts.

1. Cash book

This is used for recording daily cash transactions. It records cash receipts and cash payments. It contains two accounts, cash account and bank account, to record the cash receipts and payments and receipts and payments of cheques respectively.

##### Banking Systems

The computerized banking services include:

1. Processing customers transactions

For transaction such as recording, withdrawals and calculating interests and savings and loans computers are involved. Transaction are entered through terminals , which are connected to a central computer for processing e.g. An ATM offering 24 hours services in cash deposits and withdrawals.

1. Cheque clearing and processing.

The use of special characters on cheques printed using ink contains magnetic particles, can be automatically entered to a computer for cheque processing. They are usually read using the magnetic ink character reader (MICR).

The characters identify the bank in which the cheque is drawn, the customer a/c number, the cheque number and the amount of the cheque.

1. Electrical Funds Transfer (EFT)

This is the movement of money between two different accounts using ICT e.g. when buying goods using credit card, money i.e. electronically transferred from the customers account to the recipients account

1. Internet Banking

It enables users to access to bank accounts through the internet, to query account statements, pay bills and transfer funds electronically. This is also called **e-banking.**

1. Mobile banking

This is also called **e-banking** where an account holder can perform banking transaction using his/her mobile phone. The transaction may include cash transfers, setting bills electronically and performing account queries.

##### Retail Systems

Computers are common in retail stores like supermarkets. They are used for:

1. Stock Control

A computerized stock control is used to track what is in the stock and what needs re-ordering. It helps to reduce the risk of under stocking or overstocking as it causes customer dissatisfaction and ties up valuable space and capital.

1. Point of sale system.

An **electronic POS** is a computer terminal used in retail stores to input and output data at a point where Sales are transacted e.g. at supermarket checkout counter.

It has full facilities of a cash register, direct capture devices e.g. bar code readers, card reader, a monitor and a receipt printer. Items here are identified by one of bar codes.

Transaction at the point of sale terminal may involve:

1. A specially printed label called bar code is attached on the item to be sold or printed on the packaging of the item. The label contains the binary form of the product number.
2. Using the optical scanning devices or handheld scanners, the sales assistant reads the bar codes.

* **Bar codes** are the lines and spaces in width where the binary form of the product number is recorded.

1. The items product number having been scanned is passed to the computer over the telecommunications link. This then brings the records to the computer memory from back storage. The product Number is a key field.
2. Brief description about to the item and the price is printed on customer’s receipt and price added to the running total for the customers.
3. Products balance in stock is then adjusted and its record written back to the backing storage.
4. When all customers’ items have been scanned, a total is printed on the receipt

###### Advantages of POS

1. Fraud is detected and prevented, as the code includes the number of items of the warehouse.
2. Scanning is faster than keying hence shorter ones and fares checkout points.
3. Customer checks his purchases easily as brief description of each item is printed out on his receipt improving customer’s confidence.
4. Few errors.
5. Prices are not to be attached to every item in the room, as the items prices are held in the master records price changes are easier to affect.
6. Reports can be easily purchased concerning matters like slow moving items amount of pilferage e.t.c and their costs are low.

## **Disadvantages of POS**

1. Limited costs of equipment is high
2. Systems, which don’t include actual price on the tag, might be inconvenient t a customer.
3. Could encourage fraud whereby customers ingeniously exchange tags hoodwinking the system at checkpoints.
4. Where there is no electrical system, POS could be rendered useless.

**EFTPOS** – This is the combination of EFT and the POS. Electronic Fund Transfer at point of sale-The customer uses cards issued by banks to pay for goods. The customer a/c is automatically deleted and then credited to the shop’s a/c.



##### Reservation systems

These are the distributed networked systems that are used mainly to make bookings in the areas like airlines, hotels car retail theatres e.t.c. Bookings are made from remote terminals connected to the centralized database. The response is immediately available to the customer giving all the reservation details.

### EDUCATIONAL SYSTEMS

Most educational institutions use computers for administrative tasks e.g. writing memos, compelling reports and accounting. Computers are playing important roles in educational institution in the following ways:

1. Computer Aided Instruction (CAI)
2. Computer Aided Learning (CAL)
3. Electronic Learning (E-Learning)
4. Computer based simulation.
5. Computer Aided Instruction(CAI)

This is the use of computers to learn, drill and practice particular educational principles e.g. learning new concept in foreign language, the learner is presented with concept explanation then given question and answers.

Some CAI make learning more fun as it present learning content through educational games, e.g. typing tutor program.

1. Computer aided learning(CAL)

It present educational material the way a teacher does in a classroom. They have clear graphical presentation like videos clips, demonstrating or explaining difficult concepts.

1. Electronic learning (e-learning)

Lessons and lecturers are presented from a central site and the presentation transmitted to remote conference terminals or display on TV screens. The learner can also access learning material on the internet, sit for online exams and receive results the same way. They don’t the need to go to a college.

1. Computer based simulation

This is the science of representing the behavior of a real life situation using computerized models. For example, for e- learning where the learner is not in the physical contact with the lecturer, simulation software can be used to provide clear illustration about a certain concept. It is mostly used for practical skills like training pilots, drivers and engineers. They are instructed using a virtual environment.



### COMMUNICATION SYSTEM

**Communication** is the distribution of data or information from one party to another. Effective and efficient data communication is achieved by use of high speed electronic devices like computers, cell phones, radio and television.

The integration of computers and telecommunication facilities for communication purposes is called **Information and Communication Technology** **(ICT).**

Example of communication system includes:

1. Facsimile (fax).
2. Radio.
3. Television set.
4. Video conferencing.
5. Telecommuting.
6. Internet.
7. Voice messaging.
8. Facsimile (Fax)

This is a telecommunication device used to send documents through telephones lines. A document is placed in the machine, scanned line. The receiving fax machine converts the analog data into the original softcopy and prints a hard copy.

Sending fax ones the internet, a special modem called fax modem is attached to the sending and receiving computers.

1. Radio

Computers can be used in radio broadcasting station to:

1. Record and manage radio programs meant for broadcasting.
2. Manage the radio transmission and track performance.
3. Automate the running of the selected programs.
4. Create slides, simulated objects and sound effect to prepare advertisement.
5. Download information from internet to prepare programs like international news.
6. Television set

Data and information is transmitted through a TV channel the same way the channel is used to broadcast conversional TV program. The most common type of data transmitted via TV includes:

* + 1. Teletext (ceetax)

This is a computerized service whereby news and other information are provided on TV screen to subscribers. A television is configured using a remote control device. It is a simple type of communication.

* + 1. Video text (View data)

This is a two way communication service (half duplex) over a telephone line or cable television channel. It is an interactive computer information service that transmits text and graphic. A subscriber can communicate with service provider’s data base and information displayed on a TV Screen remotely.

Application areas of videotext

1. Reservation bookings
2. Ordering for goods and services
3. Sending electronic mail.
4. Video conferencing:

This is the using of computers, digitals video cameras, audio capturing equipments and communication networks to enable people in different location to see and talk to one another.

Each participant’s computer is attached with a ***video camera*** (camcorder), ***speakers*** and a ***microphone***. They participate in a virtual conference room as if they were sited in a real conference room. This is mainly used by field reporters when interacting with the newscasters

1. Telecommuting:

This is a situation whereby a person uses a computer and a communication channel to establish a link with a remote office computer. A person can work from home as if he is in the office. It reduces the unnecessary travel to the workplace , thus reducing travelling expenses and stress due to commuting inconvenience like traffic jams.

1. Internet

The internet transmits huge amounts of information inform of words, images and sounds .Some of the services on the internet include:

1. World Wide Web [www]
2. Electronic mail [e-mail]

**Worldwide web (www)**

This is the collection web pages which may be made up text, images, animations, sounds and video held on the web servers. One can access the information using a computer or any other communication devices like a mobile phone. For a mobile phone to access, it must have ***the wireless application protocols (WAP).***

**E-mail**

This is a very fast and efficient means of sending and receiving messages, data, files and graphics. Once you subscribe for internet services through a service provider, you can send and receive mails electronically from anyone connected to internet using a computer or WAP enabled cell phones.

1. Voice Messaging

This is the combination of a telephone and a computer to create a computerized system that allows a message to be sent in human voice without the receiver needing to be present at the same time to receive the message.



### INDUSTRIAL SYSTEMS

This is the application of computers in industrial or manufacturing processes. It has resulted in tremendous improvement in productivity. Industrial plants like motor vehicle manufacturing, chemicals plants refineries and mining plants use computers in many ways like:

1. Computer Aided design and manufacturing - [CAD] and [CAM]
2. Modeling.
3. Simulation.
4. Process control.
5. Computer aided design and computer aided manufacturing

This is the integrated system that allows products that have been designed using design application software to be transmitted into an automated manufacturing system for the product to be manufactured as per computer mode e.g. a motor vehicle engine designed using CAD can be fed to an automated machine which engineers (produces) the required shapes and dimensions as specified.

An application of CAM is the use of ***robots*** to carry out assembly line operations.

A **robot** is a computer controlled device that emulates a human being in carrying out operations that would be hazardous, repetitive and boring to a human being e.g. welding, lifting heavy objects, spraying paints on vehicle bodies and removing red-hot materials from furnaces.

1. Industrial simulation

Simulation allows some activities that would be expensive and dangerous in real life situation to be put under test e.g. a car or plane crash test simulation is done using a virtual model on the computer screen representing the real situation or object.

This helps the manufacturers identify and correct the weaknesses of the design so that they are not carried to the real product. The using of computer models in such circumstances is called **non-destructive testing (NDT).**

1. Process control

This is the use of computers to control an ongoing physical process especially in manufacturing e.g. regulating temperature, pressure, fluid flow e.t.c.

This is mostly used in petroleum refineries, chemical plants and other manufacturing companies to manage machine intensive process.

1. Modeling

Computers’ modeling is 5the creation of electronic representation of object or ideas. The computer models show what something might be when the real thing would be too expensive or difficult to create and visualize.

### SCIENTIFIC AND RESEARCH SYSTEM

In science, research and technology computers are applied in:

1. Weather forecasting.
2. Medical research.
3. Military and space exploration science
4. Weather forecasting.

Weather forecasting techniques have been automated using computerized systems making predictions more accurate and reliable. The large volume of data collected from rainfall, air pressure, humidity, temperature, wind, speed and cloud cover are analyzed, processed and predicted for weather patterns by computers. **Geographical Information Systems (GIS)** are also in weather forecasting.

These are systems (computers) representing geographical data in graphical form by super imposing it on the world map.

**Geographical Positioning Systems (GPS)** are also used for tracking and predicting accurately the storm paths which is very important for the aviation industry.

1. Medical research.

In health care industry computers are used for:

1. Diagnosing patients.
2. Keeping patients records.
3. Keeping patients bills.
4. Keeping Accounts for the industry.
5. Maintaining and controlling the inventory.
6. Calculating the health care statistics.
7. Controlling devices used to help the handicapped e.g. deaf, blind.
8. More specialized computer systems called expert systems may be in a narrow field of specialization like diagnosing patients.
9. For scheduling lab times and operating room times.
10. Automating nurses stations
11. Monitoring intensive care patients. (ICU).
12. Military and space exploration science

Nations have developed strong military bases which are internationally coordinated. Computerized radars are used to coordinate bases. Computer systems are used for research, design, development and control of space ships, aeroplanes and missiles.

### LIBRARY SYSTEMS

Libraries are computerized in some tasks like:

1. Lending systems.
2. Inventory control system.
3. Cataloguing systems.
4. Lending system

They manage issuance and return of borrowed books .All the reading materials e.g. books, magazines e.t.c are given unique numbers for identification. As a person borrows, his/her details and material’s details are recorded and as he/she returns the material, his/her record is updated.

1. Inventory control system

Computers are used to manage stock which includes checking for books currently in shelves and those on high demand and need adding and also those that have become obsolete can be retired to archives.

1. Cataloguing systems

A catalogue is a collection of cards with information about each reading material in a library they can be kept while sorted alphabetically or by title or author name

Computerized catalogues have replaced manual card catalogues which enhance service delivery and efficiency. Every time new material is acquired, they are updated.

### ENTERTAINMENT SYSTEMS

Computers can be used in recreational and entertainment areas such as:

1. Games
2. Music and
3. video
4. Games

3D games (3 dimensional) and DVDs multimedia games are now possible for PCs. These are games that simulate sports like war combat, diving etc. giving the player maximum pleasure in a virtual environment on the screen.

1. Music and video

VCDs and DVDs have become a common feature in the entertainment. In music industry; computers are used in recording, synthesizing, editing and adding special effects to music. In movie industry also, the computers are used to produce highly simulated and animated movies, generate scenes and actors, making the movie interesting.

### TRANSPORTATION SYSTEMS

Three main areas in transportation where computers play part include:

1. Automobile traffic control
2. Air traffic control
3. Shipping control
4. Automobile traffic control

Computers are used to control both human and motor vehicles traffic using a computerized lighting system especially in a busy town. Traffic lights are controlled by a small clock switch or a computer system. Computerized traffic light system has **sensor pads** laid beneath the road that detect the pattern of the traffic flow. The data collected is then sent to a computer system which detects and analyses the traffic flow and builds up a simulated image of the actual scene.

The control signals are then output to the traffic light or motorists through their receiver devices to vary the light timing or redirect traffic.

1. Air traffic control

Airports and airstrips have been computerized and computers are used to monitor air traffic movement, takeoff and landing of crafts. The human control errors and mistakes have been eliminated due to computerized systems.

Computers are also used for air reservations and to direct aircrafts to follow the shortest path between two locations.

1. Shipping control
2. Computers are used to load and offload and docking ships.
3. They handle records with much ease at the ports.
4. They control and guide the paths taken by space ship and water vessels.

### HOME USE

As microcomputers are now days affordable, most people are using computers at home for:

* Preparing domestic budget.
* Entertainment
* Research
* Teaching children some educational concept.

### MARKETING

Computers are being used in a number of ways to enhance marketing. This includes:

1. Electronic commerce or E-business.
2. Electronic presentation
3. Advertising.
4. Electronic Commerce (e-commerce)

This is carrying out business transaction electronically through the internet. The transaction involves buying, selling and promotion. Companies, organisations and individuals have logged for online transactions. The customer only items by visiting suppliers website, selecting items and placing them in a virtual shopping tray.

The website tracks down the whole process and calculates the total bill. Payment is then made through a cheque, credit card or electronic fund transfer. Once the payment is made, the items are shipped to the customer.

**Advantages of e-commerce**

1. Ecommerce allows people to carry out businesses without the barriers of time or distance. One can log on to the Internet at any point of time, be it day or night and purchase or sell anything one desires at a single click of the mouse.
2. The direct cost-of-sale for an order taken from a web site is lower than through traditional means (retail, paper based), as there is no human interaction during the on-line electronic purchase order process. Also, electronic selling virtually eliminates processing errors, as well as being faster and more convenient for the visitor.
3. Ecommerce is ideal for niche products. Customers for such products are usually few. But in the vast market place i.e. the Internet, even niche products could generate viable volumes.
4. Another important benefit of Ecommerce is that it is the cheapest means of doing business.
5. The day-to-day pressures of the marketplace have played their part in reducing the opportunities for companies to invest in improving their competitive position. A mature market, increased competitions have all reduced the amount of money available to invest. If the selling price cannot be increased and the manufactured cost cannot be decreased then the difference can be in the way the business is carried out. Ecommerce has provided the solution by decimating the costs, which are incurred.
6. From the buyer’s perspective also ecommerce offers a lot of tangible advantages.
   1. Reduction in buyer’s sorting out time.
   2. Better buyer decisions
   3. Less time is spent in resolving invoice and order discrepancies.
   4. Increased opportunities for buying alternative products.
7. The strategic benefit of making a business ‘ecommerce enabled’, is that it helps reduce the delivery time, labour cost and the cost incurred in the following areas:
   1. Document preparation
   2. Error detection and correction
   3. Reconciliation
   4. Mail preparation
   5. Telephone calling
   6. Data entry
   7. Overtime
   8. Supervision expenses
8. Operational benefits of e commerce include reducing both the time and personnel required to complete business processes, and reducing strain on other resources. It’s because of all these advantages that one can harness the power of ecommerce and convert a business to e-business by using powerful turnkey [ecommerce solutions](http://www.ecommerceeducation.com/ecommerce_solutions.asp) made available by e-business solution providers.

**Disadvantages of e-commerce**

* + 1. One important disadvantage of e-commerce is that the Internet has still not touched the lives of a great number of people, either due to the lack of knowledge or trust. A large number of people do not use the Internet for any kind of financial transaction. Some people simply refuse to trust the authenticity of completely impersonal business transactions, as in the case of e-commerce. Many people have reservations regarding the requirement to disclose personal and private information for security concerns. Many times, the legitimacy and authenticity of different [e-commerce](http://www.buzzle.com/articles/ecommerce-websites/) sites have also been questioned.
    2. It is not suitable for perishable commodities like food items. People prefer to shop in the conventional way than to use e-commerce for purchasing food products. So e-commerce is not suitable for such business sectors. The time period required for delivering physical products can also be quite significant in case of e-commerce. A lot of phone calls and e-mails may be required till you get your desired products. However, returning the product and getting a refund can be even more troublesome and time consuming than purchasing, in case if you are not satisfied with a particular product.

1. Electronic presentation

Using computers, marketing agents can create exciting presentation concerning the procedures of business and present them to the audience using presentation software. It adds value to traditional marketing techniques as they are attractive.

1. Advertising

It is possible to create advertisement materials and video clips using simulation, presenting and animation software and then display them on billboards, broadcast over a television or place them on the internet.

### VIRTUAL OR ARTIFICIAL REALITY

This is a condition in which a person becomes psychologically immersed in an artificial environment generated by a computer system. Other terms used instead of virtual reality are:

* Cyberspace
* Virtual worlds.
* Virtual environment.

To achieve this effect, some interactive sensory equipment is used namely:

1. Head mounted display/ head gear
2. Gloves
3. Body suit
4. Virtual reality software

***(1) Head mounted display (HMD)/ head gear***

A head gear is made up of two tiny display screens and sound systems that channel images and sounds from the source to the eyes and ears thus presenting a stereo 3-D sound effect in the virtual world. The weaver of the head gear is able to look around in the virtual environment.

A boom – Is an alternative to uncomfortable head gear. Screen, optical and sound systems are housed in a box. The user looks into the box through the two screens to see the virtual world.

***(2) Gloves.***

They are worn on the hands allowing the user to navigate through the virtual world and interact with virtual objects. The gloves have a sensor that collect data about the movement of the hands and relays the data into the system. They give the wearer a sense of touch in the virtual world.

***(3) Body suit***

It’s made of conductor wires wound in a rubber suit. The wires sense the body movement and relay the data into the virtual reality system which in turn adjusts to the position of the user in the virtual reality world

***(4) Virtual reality software***

This software gives the wearer of the sensory devices an interactive virtual sensory experience that makes him/ her feel as if he/ she is in a real world.

**Application of virtual reality**

1. They are used to represent any three dimensional objects or ideas that are either real or abstract. Real objects include buildings, landscapes, underwater ship wrecks etc.
2. Entertainment.
3. Training in areas such as medicine, military, equipment operations, design evaluation, assembly of sequence etc.

### LAW ENFORCEMENT SYSTEMS

Immediate and accurate information is very crucial in crime detection; biometric analysis using computers is used in this area which involves the study, measurement and analysis of human biological characteristics.

The biometric devices attached to the computers are used to identify people by recognizing one or more specific attributes like finger, lips, facial features e.t.c.