# CHAPTER 7
# Contemporary Technologies

## Multimedia

The word **'Multimedia'** is a combination of two words, **'Multi' and 'Media'.** Multi means many and media means material through which something can be transmitted or send. Multimedia combined all the media elements like text and graphics to make the information more effective and attractive.

Multimedia technology applies interactive computer elements, such as graphics, text, video, sound, and animation, to deliver a message.

Multimedia technology refers to interactive, computer-based applications that allow people to communicate ideas and information with digital and print elements. Professionals in the field use computer software to develop and manage online graphics and content. The work that media technology specialists produce is used in various media, such as training programs, web pages, and news sites.

Multimedia can be defined as any application that combines text with graphics, animation, audio, video, and/or virtual reality. A computer system is a combination of equipment (hardware), processes and programs (software), and people organized to perform a function. Combining these definitions, a business multimedia system includes equipment, programs, and people organized for the purposes of communication, data storage and retrieval systems (multimedia databases and electronic filing systems), information security, and Internet use (Web pages and electronic-business applications).

Within organizations, multimedia systems are used in all forms of information systems from transaction processing systems to executive decision support systems. These systems also can be found across industries such as accounting, banking, communications, education, entertainment, insurance, manufacturing, medical, retailing, and real estate. Anywhere there is a need for combining text, pictures, sounds, and animation, multimedia systems are found.Multimedia products may be created and run on the commonly used computer environments.

**Multimedia System**

A Multimedia System is a system capable of processing multimedia data and applications. It is characterized by the processing, storage, generation, manipulation and rendition of Multimedia information.

**Capture devices**
-- Video Camera, Video Recorder, Audio Microphone, Keyboards, mice, graphics tablets, 3D input devices, tactile sensors, VR devices.
Digitizing/Sampling Hardware

**Storage Devices**
-- Hard disks, CD-ROMs, Jaz/Zip drives, DVD, *etc*

**Communication Networks**
-- Ethernet, Token Ring, FDDI, ATM, Intranets, Internets.

**Computer Systems**
-- Multimedia Desktop machines, Workstations, MPEG/VIDEO/DSP Hardware

**Display Devices**
-- CD-quality speakers, HDTV,SVGA, Hi-Res monitors, Colour printers *etc.*

# Components of Multimedia

The various components of multimedia are **Text, Audio, Graphics, Video and Animation.** All these components work together to represent information in an effective and easy manner.

**1) Text:** Text is the most common medium of representing the information. In multimedia, text is mostly use for titles, headlines, menu etc. The most commonly used software for viewing text files are *Microsoft Word, Notepad, Word pad etc.* Mostly the text files are formatted with, DOC, TXT etc. extension.

**2) Audio:** In multimedia audio means related with recording, playing etc. Audio is an important components of multimedia because this component increase the understandability and improves the clarity of the concept. Audio includes speech, music etc. The commonly used software for playing audio files are:
*i) Quick Time*
*ii) Real player*
*iii) Windows Media Player*

**3)Graphics:** Every multimedia presentation is based on graphics. The used of graphics in multimedia makes the concept more effective and presentable. The commonly used software for viewing graphics are *windows Picture, Internet Explorer etc.* The commonly used graphics editing software is Adobe Photoshop through which graphics can be edited easily and can be make effective and attractive.

**4) Video**: Video means moving pictures with sound. It is the best way to communicate with each other. In multimedia it is used to makes the information more presentable and it saves a large amount of time. The commonly used software for viewing videos are:
*i) Quick Time*
*ii) Window Media Player*
*iii) Real Player*

**5)Animation:** In computer animation is used to make changes to the images so that the sequence of the images appears to be moving pictures. An animated sequence shows a number of frames per second to produce an effect of motion in the user's eye. Some of the commonly used software for viewing animation are:
*i) Internet Explorer*
*ii) Windows Pictures*
*iii) Fax Viewer*

# Application of multimedia

Nowadays the application of Multimedia are observed in various fields such as Education, Entertainment, Business and so on. To communicate the message in the form of picture, sound, video, animation is the primary role of multimedia. Some of the application of multimedia are as follows:

1)Multimedia in Education: Multimedia is becoming popular in the field of education. It is commonly used to prepare study material for the students and also provide them proper understanding of different subjects. Nowadays Edutainment, a combination of Education and Entertainment has become very popular. This system provides learning as well as provides entertainment to the user.

2) Multimedia in Entertainment: Computer graphics techniques are now commonly use in making movies and games. this increase the growth of multimedia.

i) Movies: Multimedia used in movies gives a special audio and video effect. Today multimedia has totally changed the art of making movies in the world. Difficult effect, action are only possible through multimedia.

ii) Games: Multimedia used in games by using computer graphics, animation, videos have changed the gaming experience. Presently, games provides fast action, 3-D effects and high quality sound effects which is only possible through multimedia.

3) Multimedia in Business: Today multimedia is used in every aspect of business. These are some of the applications:

i)Videoconferencing: This system enables to communicate using audio and video between two different locations through their computers. When the information is sent across the world, this technology provides cost benefits to the business which saves their time, energy and money.

ii) <u>Marketing and advertisement</u>: Nowadays different advertisement and marketing ideas about any product on television and internet is possible with multimedia.

# Desirable Features for a Multimedia System

**Very High Processing Power**
-- Needed to deal with large data processing and real time delivery of media. Special hardware commonplace.

**Multimedia Capable File System**
-- Needed to deliver real-time media -- *e.g.* Video/Audio Streaming. Special Hardware/Software needed *e.g* RAID technology.

**Data Representations/File Formats that support multimedia**
-- Data representations/file formats should be easy to handle yet allow for compression/decompression in real-time.

**Efficient and High I/O**
-- Input and output to the file subsystem needs to be efficient and fast. Needs to allow for real-time recording as well as playback of data. *e.g.* Direct to Disk recording systems.

**Special Operating System**
-- to allow access to file system and process data efficiently and quickly. Needs to support direct transfers to disk, real-time scheduling, fast interrupt processing, I/O streaming *etc.*

**Storage and Memory**
-- large storage units (of the order of 50 -100 Gb or more) and large memory (50 -100 Mb or more). Large Caches also required and frequently of Level 2 and 3 hierarchy for efficient management.

**Network Support**
-- Client-server systems common as distributed systems common.

**Software Tools**
-- User friendly tools needed to handle media, design and develop applications, deliver media.

# Applications of Multimedia

- ➢ World Wide Web
- ➢ Hypermedia courseware
- ➢ Video conferencing
- ➢ Video-on-demand
- ➢ Interactive TV
- ➢ Groupware
- ➢ Home shopping
- ➢ Games

- ➢ Virtual reality
- ➢ Digital video editing and production systems
- ➢ Multimedia Database systems

# E-Commerce and E-business

E-commerce refers to online transactions, buying and selling of goods and/or services over the internet.

E-business covers online transactions, but also extends to all Internets based interactions with business partners, suppliers and customers.

**Advantages of e-commerce:**

- ➢ It makes buying selling procedure faster, as well as easy to find products.
- ➢ It makes buying/selling possible 24/7.
- ➢ There are no theoretical geographical limitations hence more reach to customers.
- ➢ It reduces operational costs and provides better quality of services.
- ➢ It does not require physical company set ups.
- ➢ It is easy to start and manage a business.

**Disadvantages of e-commerce:**

- ➢ Any one, good or bad can easily start a business. And there are many bad sites which eat up customer's money.
- ➢ There is no guarantee of product quality.
- ➢ Mechanical failures can cause unpredictable effects on the total processes.
- ➢ As there is minimum chance of direct customer to company interactions, customer loyalty is always on a check.
- ➢ There are many hackers who look for opportunities and thus an ecommerce site, service payment gateways all are always prone attack.

Typically, E-commerce business models can be divided into six major types, such as:
- Business-to-Business (B2B)
- Business-to-Consumer (B2C)
- Consumer-to-Consumer (C2C)
- Consumer-to-Business (C2B)
- Business-to-Administration (B2A)
- Consumer-to-Administration (C2A)

**Business-to-Business (B2B):** This kind of ecommerce consists of all the electronic transactions and dealings related to the goods and services. These basically are conducted between companies and include conventional wholesalers and producers dealing with retailers.

**Business-to-Consumer (B2C):** The Business-to-Consumer ecommerce is related to the transactions and relationship between businesses and the end customers. This is mainly to do with the retail

ecommerce trade that takes place online. With the inception of the internet, B2C ecommerce has evolved to a great extent. Today, we find scores of electronic shopping sites and virtual stores on the web, that sell myriad products, ranging from computers, fashion items to even necessities.
In this case, the customer has more info about the products in the form of informative content and there is also a chance to buy products at cheaper rates. Most times, quick delivery of the order is also maintained.

**Consumer-to-Consumer (C2C):** This consists of electronic transactions of products and services between two customers. These are mainly conducted through a third party that provides an online platform for these transactions. Sites, where old items are bought and sold, are examples of C2C eCommerce.

**Consumer-to-Business (C2B):** In this, a complete reversal of the selling and buying process takes place. This is very relevant for crowdsourcing projects. In this case, individuals make their items or services and sell them to companies. Some examples are proposals for company site or logo, royalty free photographs, design elements and so on.

**Business-to-Administration (B2A):** In this kind of eCommerce transaction, there are dealings between companies and public administration. It encompasses different services, such as social security, fiscal measures, legal documents, employment and so on.

**Consumer-to-Administration (C2A):** In this eCommerce model, electronic transactions are carried between individuals and public administration. Some examples are distance learning, information sharing, electronic tax filing, and so on.

The main objective of both the B2A and C2A types of eCommerce is to increase flexibility, efficiency, and transparency in public administration.

# E-learning

E-learning is a new concept of delivering digital contents in learner oriented environment using information and communication technology (ICT). Delivery of the digital content is the main characteristic of e-learning.

**INTRODUCTION:**

E-learning is an abbreviation of the term electronic learning. Electronic learning in its literal meaning stands for the type of learning carried out, facilitated or supported by some or the other electronic gadgets, media or resources. Judging in this sense, the learning facilitated by the use of an electronic media or means like microphones and listening devices or audio and visual tapes can be termed as e-learning.

In this sense, e-learning calls for the services of the advance electronic information and communication media and means like teleconferencing, video-conferencing and computer based conferencing, e-mail, live chat, surfing on the Internet and Web browsing, online reference libraries, video games, customized e-learning courses etc.

**Advantages of e-learning:**
- ➢ It maintains the consistency of content.

- ➢ It is easy for customization.
- ➢ There is no any geographical limitation for learning.
- ➢ It is quite favorable for learner as it can happen at any time and anywhere.
- ➢ It reduces or eliminates travel costs to attend learning events.
- ➢ It reduces or eliminates need for classroom/instructor infrastructure.


**Disadvantages of e-learning:**

- ➢ Learners with low motivation or bad study habits may fall behind
- ➢ Without the routine structures of a traditional class, students may get lost or confused about course activities and deadlines
- ➢ Students may feel isolated from the instructor and classmates
- ➢ Instructor may not always be available when students are studying or need help
- ➢ Slow Internet connections or older computers may make accessing course materials frustrating
- ➢ Managing computer files and online learning software can sometimes seem complex for students with beginner-level computer skills
- ➢ Hands-on or lab work is difficult to simulate in a virtual classroom.


## NATURE AND CHARACTERISTICS OF E-LEARNING

- •Empowered by digital technology: E-learning is pedagogy empowered by digital technology.

- •Computer enhanced learning: E-learning is a term which is used to refer computer enhanced learning.

- •Technology enhanced learning: E-learning includes all types of technology enhanced learning (TEL), where technology is used to support the learning process.

- •Online learning: Use of e-learning is generally confined to "on-line learning" carried out through the Internet or Web-based technology, with no face-to-face interaction.

# E-governance

E-governance is the application of electronic means to improve the interaction between government and citizens; and to increase the administrative effectiveness and efficiency in the internal government operations.

Despite the government of Nepal has positively giving attention towards the development of ICTs and subsequent implementing e-governance, a number of issues has yet addressed. Some of the challenges for successful implementation of e-governance are presented as:

- ➢ Information transparency
- ➢ Legal issues
- ➢ Resources availability
- ➢ Infrastructure including connectivity in rural area
- ➢ Capacity and awareness
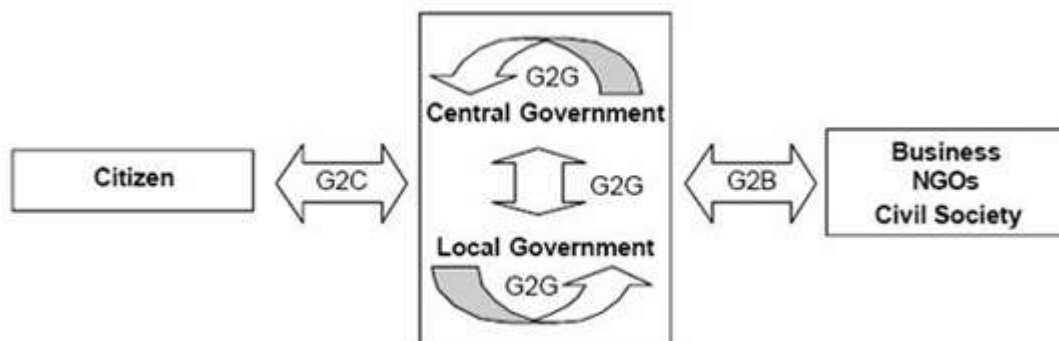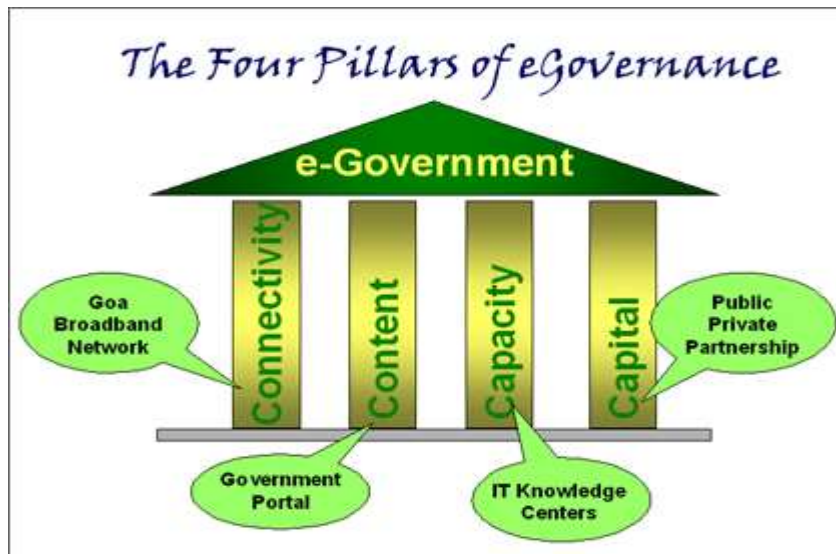- ➢ Political will and government action





Figure: E-governance Model

| E- governance benefits | E- governance barriers |
|---|---|
| - Improve delivery of services to citizens.<br>- Improve interface with business and industries.<br>- Empower citizen thought access to knowledge and information.<br>- Make the working of government more efficient and effective.<br>- More transparency.<br>- Greater convenience.<br>- Smoother flow of information.<br>- More collaboration with other agencies.<br>- Quick finalization of citizen business.<br>- Less corruption.<br>- Revenue growth and Cost reduction.<br>- On-line Access to information.<br>- Availabilities of government 24 / 7.<br>- On-line Application submission and processing. | - Resistant to change.<br>- Lack of public awareness.<br>- Public fear and skepticism.<br>- Telecommunication services.<br>- Internet services.<br>- IT staff and department.<br>- Hardware and Software.<br>- Service design.<br>- Website design.<br>- Lack of privacy and security. |

# E-Banking

**Online banking**, also known as **internet banking**, is an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transactions through the financial institution's website. The online banking system will typically connect to or be part of the core banking system operated by a bank and is in contrast to branch banking which was the traditional way customers accessed banking services.

Internet banking software provides personal and corporate banking services offering features such as viewing account balances, obtaining statements, checking recent transaction and making payments. Access is usually through a secure web site using a username and password, but security is a key consideration in internet banking and many banks also offer two factor authentication using a (security token).

# Various Forms of E Banking

### AUTOMATED TELLER MACHINES (ATM):

An automated teller machine or automatic teller machine (ATM) is an electronic computerized telecommunications device that allows a financial institution's customers to directly use a secure method of communication to access their bank accounts, order or make cash withdrawals (or cash advances using a credit card) and check their account balances without the need for a human bank teller.

## TELE BANKING:

By dialing the given Telebanking number through a landline or a mobile from anywhere, the customer can access his account and by following the user-friendly menu, entire banking can be done through Interactive Voice Response (IVR) system.

Undertaking a host of banking related services including financial transactions from the convenience of customers chosen place anywhere across the GLOBE and any time of date and night has now been made possible by introducing on-line Telebanking services. By dialing the given Telebanking number through a landline or a mobile from anywhere, the customer can access his account and by following the user-friendly menu, entire banking can be done through Interactive Voice Response (IVR) system. With sufficient numbers of hunting lines made available, customer call will hardly fail. The system is bi-lingual and has following facilities offered

- Automatic balance voice out for the default account.

- Balance inquiry and transaction inquiry in all

- Inquiry of all term deposit account

- Statement of account by Fax, e-mail or ordinary mail.

- Cheque book request

- Stop payment which is on-line and instantaneous

- Transfer of funds with CBS which is automatic and instantaneous

- Utility Bill Payments

- Renewal of term deposit which is automatic and instantaneous

- Voice out of last five transactions.

## SMART CARD:

A smart card usually contains an embedded 8-bit microprocessor (a kind of computer chip). The microprocessor is under a contact pad on one side of the card. Think of the microprocessor as replacing the usual magnetic stripe present on a credit card or debit card.

The microprocessor on the smart card is there for security. The host computer and card reader actually "talk" to the microprocessor. The microprocessor enforces access to the data on the card.

The chips in these cards are capable of many kinds of transactions.

**DEBIT CARD:**
Debit cards are also known as check cards. Debit cards look like credit cards or ATM (automated teller machine) cards, but operate like cash or a personal check. Debit cards are different from credit cards. While a credit card is a way to "pay later," a debit card is a way to "pay now." When you use a debit card, your money is quickly deducted from your checking or savings account.

**E-CHEQUE:**
- An E-Cheque is the electronic version or representation of paper cheque.
- The Information and Legal Framework on the E-Cheque is the same as that of the paper cheque's.
- It can now be used in place of paper cheques to do any and all remote transactions.
- An E-cheque work the same way a cheque does, the cheque writer "writes" the e-Cheque using one of many types of electronic devices and "gives" the e-Cheque to the payee electronically. The payee "deposits" the Electronic Cheque receives credit, and the payee's bank "clears" the e-Cheque to the paying bank. The paying bank validates the e-Cheque and then "charges" the check writer's account for the check



**Online Banking**

**Advantages**
- Decreased cost of paper and postage
- Storing all statements online instead of keeping a paper copy
- Convenience
- Paying bills online
- Ability to access account anytime
- No waiting for a monthly statement

**Disadvantages**
- Not as personal
- Not able to access without technology
- Decrease in safety features
- Increase in risk for fraud

## E-medicine

E-medicine refers to an approach that provides medical services whenever and wherever required using information and communication technology.

With the help of this approach, even small number of doctors can provide medical service to large number of people scattered in different locations. The people of rural areas who are unable to get service of doctors can be benefitted from this approach. The patients share his/her medical problems to the doctors. This approach is now getting more popularity among the doctors too. They can post their experiences and issues in the online discussion forum. Without good facility of information and communication technology, e-medicine cannot be effective. This is the problem facing in the developing countries like Nepal.

# Hypermedia

Hypermedia is an extension to what is known as hypertext, or the ability to open new Web pages by clicking text links on a Web browser. Hypermedia extends upon this by allowing the user to click images, movies, graphics and other media apart from text to create a nonlinear network of information. The term was coined by Fred Nelson in 1965.

Hypermedia allows links to be embedded in multimedia elements like images and videos. You can tell if something is hypermedia by hovering the mouse cursor over the image or video - if the element is hypermedia, the cursor changes, usually into a small hand.

Although the Internet is the best example of the use of hypermedia, there is a lot of software that makes use of both hypermedia and hypertext. A lot of word processing, spreadsheet and presentation software like Microsoft Office allow hypermedia and hypertext to be embedded into the documents created. For example, in Microsoft Word, users can add hyperlinks to any word and even add links to pictures. Microsoft PowerPoint has the same feature for hypermedia.

## Advantages

- One of the major advantages of hypermedia is the ability to quickly follow associations and look up related material.

- References can be traced both back-wards and forward in a way which can be difficult and time consuming with printed media. In addition, the user can annotate the material and create new references.

- Information can also be structured in a variety of ways. Multiple organizations of the same material allow for specialized structures for different user categories. (Conklin 1986, 1987).

- The student can browse the material and find new information as she explores a subject area.

- hypermedia systems is usually considered as fun to use.

## Disadvantages

- Ease of browsing might increase the risk that the learner skips through the material much to hasty, and thus get a shallow and fragmented conception of the subject.

- The risk of getting disoriented can result in confusion rather than understanding, especially if the user jumps around between different nodes in a more or less random manner.

- Using a hypermedia system involves a certain cognitive overhead . The problems is that the user has to interact with the system in order to accomplish anything, which can be more or less complex.

## Components of Hypermedia

### Hypermedia program consist of:

A database of information.

Multiple media (text, graphics, audio, video) to present the information.

Multiple methods of moving from one piece to another (e.g. hyperlinks, menus, buttons, maps, word search commands, indexes, etc).

## Hypermedia applications :

- Hypermedia applications are consist of compound objects including multimedia objects
- An authoring application may use existing multimedia objects or call upon a media editor to create new objects
- Its primary role is to structure multimedia documents or databases records by coordinating the actions of media editors and combining them with existing objects.
- The authoring application does not manipulates the media directly

## Geographical Information System

A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. The key word to this technology is **Geography** – this means that some portion of the data is spatial. In other words, data that is in some way referenced to locations on the earth.

Coupled with this data is usually tabular data known as attribute data. Attribute data can be generally defined as additional information about each of the spatial features. An example of this would be schools. The actual location of the schools is the spatial data. Additional data such as the school name, level of education taught, student capacity would make up the attribute data.

It is the partnership of these two data types that enables GIS to be such an effective problem solving tool through spatial analysis.

GIS is more than just software. People and methods are combined with geospatial software and tools, to enable spatial analysis, manage large datasets, and display information in a map/graphical form.

GIS can be used as tool in both problem solving and decision making processes, as well as for visualization of data in a spatial environment. Geospatial data can be analyzed to determine (1) the location of features and relationships to other features, (2) where the most and/or least of some feature exists, (3) the density of features in a given space, (4) what is happening inside an area of interest (AOI), (5) what is happening

nearby some feature or phenomenon, and (6) and how a specific area has changed over time (and in what way).

# Applications of GIS

- ➢ GIS in Mapping:
- ➢ Telecom and Network services:
- ➢ Accident Analysis and Hot Spot Analysis
- ➢ Urban Planning:
- ➢ Transportation Planning
- ➢ Environmental Impact Analysis
- ➢ Agricultural Applications
- ➢ Disaster Management and Mitigation
- ➢ Landslide Hazard Zonation using GIS
- ➢ Natural Resources Management:   etc.

# Components of GIS

A working GIS integrates five key components: hardware, software, data, people, and methods.



**Hardware**
Hardware is the computer on which a GIS operates. Today, GIS software runs on a wide range of hardware types, from centralized computer servers to desktop computers used in stand-alone or networked configurations.

**Software**
GIS software provides the functions and tools needed to store, analyze, and display geographic information. Key software components are

- • Tools for the input and manipulation of geographic information

- A database management system (DBMS)

- Tools that support geographic query, analysis, and visualization

- A graphical user interface (GUI) for easy access to tools

### Data

Possibly the most important component of a GIS is the data. Geographic data and related tabular data can be collected in-house or purchased from a commercial data provider. A GIS will integrate spatial data with other data resources and can even use a DBMS, used by most organizations to organize and maintain their data, to manage spatial data.

### People

GIS technology is of limited value without the people who manage the system and develop plans for applying it to real-world problems. GIS users range from technical specialists who design and maintain the system to those who use it to help them perform their everyday work.

### Methods

A successful GIS operates according to a well-designed plan and business rules, which are the models and operating practices unique to each organization.

# Virtual reality

Virtual reality is a new computational paradigm that redefines the interface between human and computer becomes a significant and universal technology and subsequently penetrates applications for education and learning.

- Virtual Reality (VR) is the use of computer technology to create a simulated environment.
- Virtual Reality's most immediately-recognizable component is the head-mounted display (HMD). Human beings are visual creatures, and display technology is often the single biggest difference between immersive Virtual Reality systems and traditional user interfaces.
- Major players in Virtual Reality include HTC Vive, Oculus Rift and PlayStation VR (PSVR)

## Application fields of Virtual reality

**Virtual Reality in the Military**: A virtual reality simulation enables them to do so but without the risk of death or a serious injury. They can re-enact a particular scenario, for example engagement with an enemy in an environment in which they experience this but without the real world risks.

**Virtual Reality in Education**: Education is another area which has adopted virtual reality for teaching and learning situations. The advantage of this is that it enables large groups of students to interact with each other as well as within a three dimensional environment.

**Virtual Reality in Healthcare**: Healthcare is one of the biggest adopters of virtual reality which encompasses surgery simulation, phobia treatment, robotic surgery and skills training.

**Virtual Reality in Business**: Many businesses have embraced virtual reality as a cost effective way of developing a product or service. For example it enables them to test a prototype without having to develop several versions of this which can be time consuming and expensive.

**Virtual Reality in Engineering**: Virtual reality engineering includes the use of 3D modelling tools and visualization techniques as part of the design process. This technology enables engineers to view their project in 3D and gain a greater understanding of how it works. Plus they can spot any flaws or potential risks before implementation.

**Virtual Reality and Scientific Visualization**: Virtual reality is being increasingly used in the field of scientific visualization. This field is based upon using computer graphics to express complex ideas and scientific concepts, for example molecular models or statistical results.

**Virtual Reality Programming Languages**: For virtual reality to be truly effective, it must have a good sense of realism. Just on its own this is a technical challenge and, as such, virtual reality is highly demanding on many resources. From hardware performance to the intellectual ability of the implementer of the system, how these are managed are a massive issue.

## Augmented Reality (AR)

**Augmented reality** (**AR**) is an interactive experience of a real-world environment where the objects that reside in the real-world are "augmented" by computer-generated perceptual information.

The primary value of augmented reality is that it brings components of the digital world into a person's perception of the real world, and does so not as a simple display of data, but through the integration of immersive sensations that are perceived as natural parts of an environment.

The first functional AR systems that provided immersive mixed reality experiences for users were invented in the early 1990s, starting with the [Virtual Fixtures](#) system developed at the U.S. Air Force's [Armstrong Laboratory](#) in 1992. The first commercial augmented reality experiences were used largely in the entertainment and gaming businesses, but now other industries are also getting interested about AR's possibilities for example in knowledge sharing, educating, managing the information flood and organizing distant meetings. Augmented reality is also transforming the world of education, where content may be accessed by scanning or viewing an image with a mobile device or by bringing immersive, marker less AR experiences to the classroom. Another example is an AR helmet for construction workers which display information about the construction sites.

# Applications of AR

## 1. Medical Training

From operating MRI equipment to performing complex surgeries, AR tech holds the potential to boost the depth and effectiveness of medical training in many areas. Students at the Cleveland

Clinic at Case Western Reserve University, for example, will now learn anatomy [utilizing an AR headset](#) allowing them to delve into the human body in an interactive 3D format.

## 2. Retail

In today's physical retail environment, shoppers are using their smartphones more than ever to compare prices or look up additional information on products they're browsing. World famous motorcycle brand Harley Davidson is one great instance of a brand making the most of this trend, by [developing an an AR app](#)that shoppers can use in-store. Users can view a motorcycle they might be interesting in buying in the showroom, and customize it using the app to see which colors and features they might like.

## 3. Repair & Maintenance

One of the biggest industrial use cases of AR is for repair and maintenance of complex equipment. Whether it's a car motor or an MRI machine, repair and maintenance staff are beginning to use AR headsets and glasses while they perform their jobs to provide them with useful information on the spot, suggest potential fixes, and point out potential trouble areas. This use case will only continue to get stronger as machine-to-machine IoT technology grows and can feed information directly to AR headsets.

## 4. Design & Modeling

From interior design to architecture and construction, AR is helping professionals visualize their final products during the creative process. Use of headsets enables architects, engineers, and design professionals [step directly into their buildings](#) and spaces to see how their designs might look, and even make virtual on the spot changes. Urban planners can even model how entire city layouts might look using AR headset visualization. Any design or modeling jobs that involve spatial relationships are a perfect use case for AR tech.

## 5. Business Logistics

AR presents a variety of opportunities to increase efficiency and cost savings across many areas of business logistics. This includes transportation, warehousing, and route-optimization. Shipping company DHL has already implemented smart AR glasses in some of its warehouses, where lenses display to workers the shortest route within a warehouse to locate and pick a certain item that needs to be shipping. Providing workers with more efficient ways to go about their job is one of the best ROI use cases in today's business environment.

## 6. Tourism Industry

Technology has gone a long way towards advancing the tourism industry in recent years, from review sites like Trip Advisor to informative website like Lonely Planet. But AR presents a huge opportunity for travel brands and agents to give potential tourists an even more immersive experience before they travel. Imagine taking a virtual "Walkabout" Australia before on AR glasses before booking a ticket to Sydney, or a leisurely stroll around Paris to see what museums or cafes you might like to visit. AR promises to make selling trips, travel, and vacations a whole lot easier in the future.

## 7. Classroom Education

While technology like tablets have become widespread in many schools and classrooms, teachers and educators are now ramping up student's learning experience with AR. The Aurasma app, for example, is already being used in classrooms so that students can view their classes via a smartphone or tablet for a more rich learning environment. Students learning about astronomy might see a full map of the solar system, or those in a music class might be able to see musical notes in real time as they learn to play an instrument.

## 8. Field Service

Whether it's something as small as an air conditioner, or as large as a wind turbine, every day field service technicians get dispatched to repair a piece of mission critical equipment that needs to get up and running as soon as possible. Today, these technicians can arrive on-site with AR glasses or headsets and view whatever they're repairing to more quickly diagnose - and fix - the problem. And instead of having to thumb through a repair manual, technicians can go about their business hands-free to get in and out faster than ever.

## 9. Entertainment Properties

In the entertainment industry, it's all about building a strong relationship with your branded characters and the audience. Properties like Harry Potter are immensely successful because readers of the books and watchers of the movies feel like they know the characters, and are hungry for additional content. Entertainment brands are now seeing AR as a great marketing opportunity to build deeper bonds between their characters and audience. As a matter of fact, the makers of AR sensation Pokémon Go are soon planning to release a Harry Potter-themed AR game that fans can interact with day in and day out.

## 10. Public Safety

In the event of an emergency today, people will immediately reach for their smartphone to find out what's going on, where to go, and whether their loved ones are safe. Moreover, first responders arrive on the scene of a fire or earthquake trying to figure out who needs help, and the best way to get them to safety. AR is showing promise in solving both pieces of the public safety puzzle. First responders wearing AR glasses can be alerted to danger areas, and show in real-time individuals that need assistance while enabling to still be aware of their surroundings. For those in need, geolocation enabled AR can show them directions, and the best route to, safe zones and areas with firefighters or medics.

## Artificial Intelligence

Artificial intelligence is a branch of computer science that aims to create intelligent machines. It has become an essential part of the technology industry.

Research associated with artificial intelligence is highly technical and specialized. The core problems of artificial intelligence include programming computers for certain traits such as:

- Knowledge
- Reasoning
- Problem solving
- Perception
- Learning
- Planning
- Ability to manipulate and move objects

Knowledge engineering is a core part of AI research. Machines can often act and react like humans only if they have abundant information relating to the world. Artificial intelligence must have access to objects, categories, properties and relations between all of them to implement knowledge engineering. Initiating common sense, reasoning and problem-solving power in machines is a difficult and tedious task.

Machine learning is also a core part of AI. Learning without any kind of supervision requires an ability to identify patterns in streams of inputs, whereas learning with adequate supervision involves classification and numerical regressions. Classification determines the category an object belongs to and regression deals with obtaining a set of numerical input or output examples, thereby discovering functions enabling the generation of suitable outputs from respective inputs. Mathematical analysis of machine learning algorithms and their performance is a well-defined branch of theoretical computer science often referred to as computational learning theory.

Machine perception deals with the capability to use sensory inputs to deduce the different aspects of the world, while computer vision is the power to analyze visual inputs with a few sub-problems such as facial, object and gesture recognition.

Robotics is also a major field related to AI. Robots require intelligence to handle tasks such as object manipulation and navigation, along with sub-problems of localization, motion planning and mapping.

## Categories of AI

| Thinking Humanly | Thinking Rationally |
|---|---|
| "The exciting new effort to make computers think … *machines with minds*, in the full and literal sense." (Haugeland, 1985)<br><br>"[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning …" (Bellman, 1978) | "The study of mental faculties through the use of computational models." (Charniak and McDermott, 1985)<br><br>"The study of the computations that make it possible to perceive, reason, and act." (Winston, 1992) |
| **Acting Humanly** | **Acting Rationally** |
| "The art of creating machines that perform functions that require intelligence when performed by people." (Kurzweil, 1990)<br><br>"The study of how to make computers do things at which, at the moment, people are better." (Rich and Knight, 1991) | "Computational Intelligence is the study of the design of intelligent agents." (Poole *et al.*, 1998)<br><br>"AI …is concerned with intelligent behavior in artifacts." (Nilsson, 1998) |

# Applications of AI

AI has been dominant in various fields such as −

- **Gaming** − AI plays crucial role in strategic games such as chess, poker, tic-tac-toe, etc., where machine can think of large number of possible positions based on heuristic knowledge.

- **Natural Language Processing** − It is possible to interact with the computer that understands natural language spoken by humans.

- **Expert Systems** – There are some applications which integrate machine, software, and special information to impart reasoning and advising. They provide explanation and advice to the users.

- **Vision Systems** – These systems understand, interpret, and comprehend visual input on the computer. For example,

  - A spying aeroplane takes photographs, which are used to figure out spatial information or map of the areas.

  - Doctors use clinical expert system to diagnose the patient.

  - Police use computer software that can recognize the face of criminal with the stored portrait made by forensic artist.

- **Speech Recognition** – Some intelligent systems are capable of hearing and comprehending the language in terms of sentences and their meanings while a human talks to it. It can handle different accents, slang words, noise in the background, change in human's noise due to cold, etc.

- **Handwriting Recognition** – The handwriting recognition software reads the text written on paper by a pen or on screen by a stylus. It can recognize the shapes of the letters and convert it into editable text.

- **Intelligent Robots** – Robots are able to perform the tasks given by a human. They have sensors to detect physical data from the real world such as light, heat, temperature, movement, sound, bump, and pressure. They have efficient processors, multiple sensors and huge memory, to exhibit intelligence. In addition, they are capable of learning from their mistakes and they can adapt to the new environment.

## AI applications

Artificial intelligence has made its way into a number of areas. Here are six examples.

- **AI in healthcare**. The biggest bets are on improving patient outcomes and reducing costs. Companies are applying machine learning to make better

and faster diagnoses than humans. One of the best known healthcare technologies is IBM Watson. It understands natural language and is capable of responding to questions asked of it. The system mines patient data and other available data sources to form a hypothesis, which it then presents with a confidence scoring schema. Other AI applications include chatbots, a computer program used online to answer questions and assist customers, to help schedule follow-up appointments or aid patients through the billing process, and virtual health assistants that provide basic medical feedback.

- **AI in business**. Robotic process automation is being applied to highly repetitive tasks normally performed by humans. Machine learning algorithms are being integrated into analytics and CRM platforms to uncover information on how to better serve customers. Chatbots have been incorporated into websites to provide immediate service to customers. Automation of job positions has also become a talking point among academics and IT analysts.

- **AI in education**. AI can automate grading, giving educators more time. AI can assess students and adapt to their needs, helping them work at their own pace. AI tutors can provide additional support to students, ensuring they stay on track. AI could change where and how students learn, perhaps even replacing some teachers.

- **AI in finance**. AI in personal finance applications, such as Mint or Turbo Tax, is disrupting financial institutions. Applications such as these collect personal data and provide financial advice. Other programs, such as IBM Watson, have been applied to the process of buying a home. Today, software performs much of the trading on Wall Street.

- **AI in law**. The discovery process, sifting through of documents, in law is often overwhelming for humans. Automating this process is a more efficient use of time. Startups are also building question-and-answer

computer assistants that can sift programmed-to-answer questions by examining the taxonomy and ontology associated with a database.

- **AI in manufacturing**. This is an area that has been at the forefront of incorporating robots into the workflow. Industrial robots used to perform single tasks and were separated from human workers, but as the technology advanced that changed.

## Areas of AI
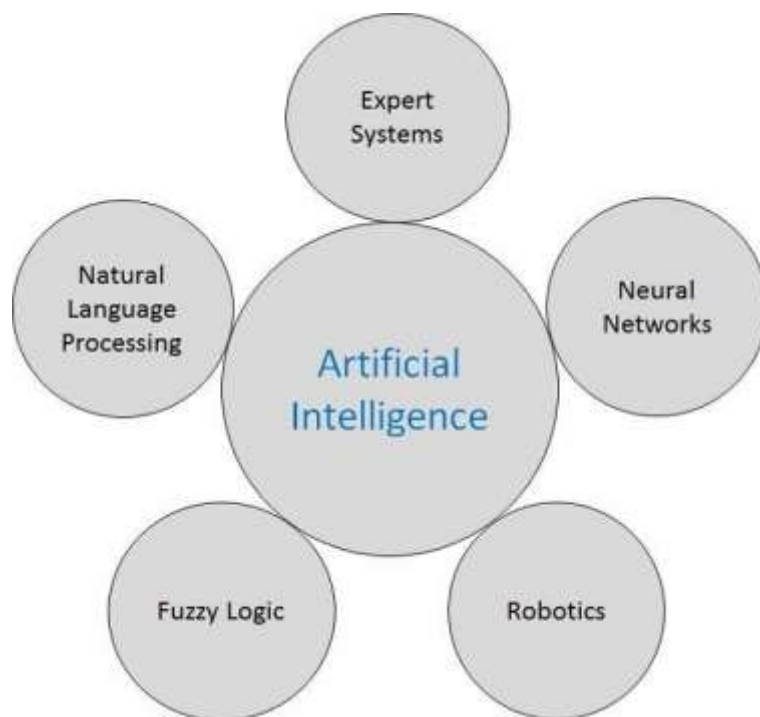


| Sn. | Research Areas | Real Life Application |
|---|---|---|
| 1 | **Expert Systems**<br><br>Examples − Flight-tracking systems, Clinical systems. |  |

| 2 | **Natural Language Processing**<br><br>Examples: Google Now feature, speech recognition, Automatic voice output. |  |
|---|---|---|
| 3 | **Neural Networks**<br><br>Examples − Pattern recognition systems such as face recognition, character recognition, handwriting recognition. |  |
| 4 | **Robotics**<br><br>Examples − Industrial robots for moving, spraying, painting, precision checking, drilling, cleaning, coating, carving, etc. |  |
| 5 | **Fuzzy Logic Systems**<br><br>Examples − Consumer electronics, automobiles, etc. |  |
| 6 | **Game Playing** |  |

# Goals of AI

- **To Create Expert Systems** – The systems which exhibit intelligent behavior, learn, demonstrate, explain, and advice its users.

- **To Implement Human Intelligence in Machines** – Creating systems that understand, think, learn, and behave like humans.



## Main Goals of AI

- The central goals of AI are for computers to have:
  - Reasoning
  - Knowledge
  - Planning
  - Learning
  - Natural language processing
  - Perception
  - Ability to move or manipulate objects
- In simpler terms the goal is to create a computer that is as intelligent and functionable as a human being.

# Ambient Intelligence



### INTRODUCTION

- Ambient Intelligence (AmI) is an emerging discipline that brings intelligence to our every – day environments and make those environments sensitive to us.
- Ambient Intelligence is a network of hidden intelligent interfaces that recognize our presence and mould our environment to our immediate needs.

- Human Centric technologies that are:
    - Embedded
    - Context Aware
    - Personalized
    - Adaptive
    - Anticipatory

Many networked devices are integrated into the environment
these devices can recognize you and your situational context
They can be tailored to your needs
They can change in response to you
They can anticipate your desires without

## TECHNOLOGIES

- Ambient Intelligence builds on three recent key technologies:
    - **Ubiquitous Computing** means integration of microprocessors into everyday objects
    - **Ubiquitous Communication** enables these objects to communicate with each other and the user by means of ad-hoc and wireless networking.
    - An **Intelligent User Interface** enables the inhabitants of the AmI environment to control and interact with the environment in a natural (voice, gestures) and personalized way (preferences, context).

## Robotics

Robot comes from the Czech word "robota" which means "forced work or labor." We use the word "Robot" today to mean any man-made machine that can perform work or other actions normally performed by humans, either automatically or by remote control. Robotics is the science and study of robots.

**Robotics**, Design, construction, and use of machines (robots) to perform tasks done traditionally by human beings. Robots are widely used in such industries as automobile manufacture to perform simple repetitive tasks, and in industries where work must be performed in environments hazardous to humans. Many aspects of robotics involve artificial intelligence; robots may be equipped with the equivalent of human senses such as vision, touch, and the ability to sense temperature. Some are even capable of simple decision making, and current robotics research is geared toward devising robots with a degree of self-sufficiency that will permit mobility and decision-making in an unstructured environment. Today's industrial robots do not resemble human beings; a robot in human form is called an android.

## Laws of Robotics

**Laws of [Robotics](#)** are a set of laws, rules, or principles, which are intended as a fundamental framework to underpin the behavior of [robots](#) designed to have a degree of [autonomy](#). Robots of this degree of complexity do not yet exist, but they have been widely anticipated in [science fiction](#), [films](#) and are a topic of active [research and development](#) in the fields of [robotics](#) and [artificial intelligence](#).

### Isaac Asimov's purposed "Three Laws of Robotics" and later added the "zeroth law"

*Law 0: A robot may not injure humanity, or, by inaction, allow humanity to come to harm.*

*Law 1: A robot may not injure a human being or, through inaction, allow a human being to come to harm.*

*Law 2: A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.*

*Law 3: A robot must protect its own existence as long as such protection does not conflict with the* First or Second Laws.[1]

# Components of robot

A robot generally consists of 5 basic components:

## 1. Controller

Every robot is connected to a computer controller, which regulates the components of the arm and keeps them working together. The controller also allows the robot to be networked to other systems, so that it may work together with other machines, processes, or robots. Almost all robots are pre-programmed using "teaching" devices or offline software programs. In the future, controllers with artificial intelligence (AI) could allow robots to think on their own, even program themselves. This could make robots more self-reliant and independent.

## 2. Arm

The arm is the part of the robot that positions the end-effector and sensors to do their pre-programmed business. Many are built to resemble human arms, and have shoulders, elbows, wrists, even fingers. Each joint is said to give the robot 1 degree of freedom. A simple robot arm with 3 degrees of freedom could move in 3 ways: up and down, left and right, forward and backward. Most working robots today have 6

degrees of freedom to allow them to reach any possible point in space within its work envelope. The human arm has 7.

### 3. Drive

The links (the sections between the joints) are moved into their desired position by the drive. Typically, a drive is powered by pneumatic or hydraulic pressure, or electricity.

### 4. End-Effector

The end-effector could be thought of as the "hand" on the end of the robotic arm. There are many possible end-effectors including a gripper, a vacuum pump, tweezers, scalpel, blowtorch, welder, spray gun, or just about anything that helps it do its job. Some robots can change end-effectors, and be reprogrammed for a different set of tasks.

### 5. Sensor

The sensor sends information, in the form of electronic signals back to the controller. Sensors also give the robot controller information about its surroundings and lets it know the exact position of the arm, or the state of the world around it. One of the more exciting areas of sensor development is occurring in the field of computer vision and object recognition. Robot sensors can detect infrared radiation to "see" in the dark.
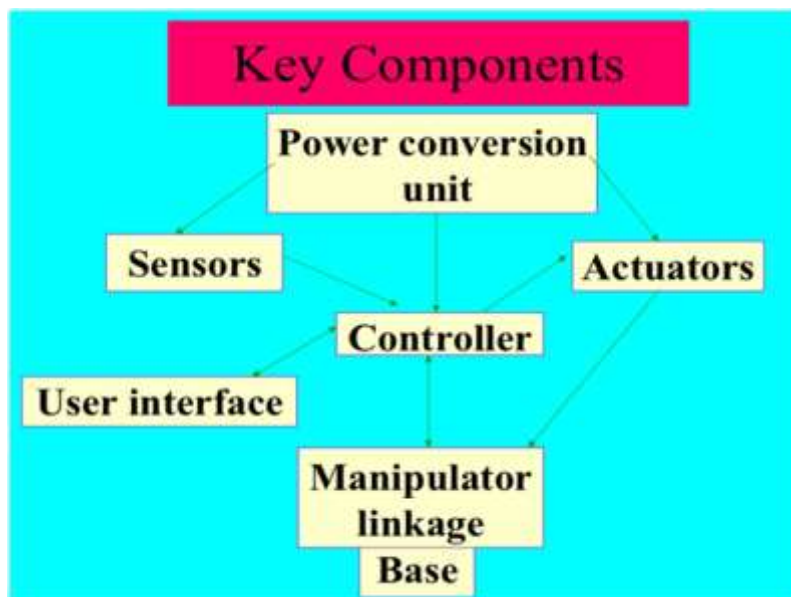
# Applications/classification of robotics

Currently, robots perform a number of different jobs in numerous fields and the amount of tasks delegated to robots is rising progressively. The best way to split robots into types is a partition by their application.

1. **Industrial robots** – These robots bring into play in an industrialized manufacturing atmosphere. Typically these are articulated arms particularly created for applications like- material handling, painting, welding and others. If we evaluate merely by application then this sort of robots can also consist of some automatically guided automobiles and other robots.

2. **Domestic or household robots** – Robots which are used at home. This sort of robots consists of numerous different gears for example- robotic pool cleaners, robotic sweepers, robotic vacuum cleaners, robotic sewer cleaners and other robots that can perform different household tasks. Also, a number of scrutiny and tele-presence robots can also be considered as domestic robots if brought into play in that sort of environment.

3. **Medical robots** – Robots employed in medicine and medicinal institutes. First & foremost surgical treatment robots. Also, a number of robotic directed automobiles and perhaps lifting supporters.

4. **Service robots** – Robots that cannot be classed into any other types by practice. These could be various data collecting robots, robots prepared to exhibit technologies, robots employed for research, etc.

5. **Military robots** – Robots brought into play in military & armed forces. This sort of robots consist of bomb discarding robots, various shipping robots, exploration drones. Often robots at the start produced for military and armed forces purposes can be employed in law enforcement, exploration and salvage and other associated fields.

6. **Entertainment robots** – These types of robots are employed for entertainment. This is an extremely wide-ranging category. It begins with model robots such as robosapien or the running photo frames and concludes with real heavy weights like articulated robot arms employed as movement simulators.

**7. Space robots** – I would like to distinct out robots employed in space as a split apart type. This type of robots would consist of the robots employed on Canadarm that was brought into play in space Shuttles, the International Space Station, together with Mars explorers and other robots employed in space exploration & other activities.

**8. Hobby and competition robots** – Robots that is created by students. Sumo-bots, Line followers, robots prepared merely for learning, fun and robots prepared for contests.

## Impact of Robotics in human life

**Positive Impacts:**

Robots can provide a wide variety of benefits to society. The most prominent benefit of robots is that they allow physical tasks to be performed at a greater speed than humans could reasonably achieve, and that tasks can be performed by robots that are beyond the reasonable physical capabilities of humans. For example, in manufacturing, mechanized processes allow production to take place at a great speed, with little human effort required. This allows for the low-cost mass-production of goods. These manufacturing processes allow for great precision, and can allow products of a very high quality to be produced.

**Negative Impacts:**

As they are out to use to do common tasks, Humans are increasingly becoming lazy, and thus their health is adversely affected. Also, as robots become more and more autonomous, the chances that they commit a mistake are very high. These mistakes can lead to serious problems if unchecked. Also, as self-learning Robots evolve, they may make decisions that are harmful to Human beings. From another perspective, If the robots are not self-learning, they will do jobs only which they are programmed for. Updating their functions will thus require more expertise.

## Bit Coin

**Bit Coin** is a cryptocurrency, a form of electronic cash. It is a decentralized digital currency without a central bank or single administrator that can be sent from user to user on the peer-to-peer bit coin network without the need for intermediaries.

Transactions are verified by network nodes through cryptography and recorded in a public distributed ledger called a blockchain. Bitcoin was invented by an unknown person or group of people using the name Satoshi Nakamoto and released as open-source software in 2009.Bitcoins are created as a reward for a process known as mining. They can be exchanged for other currencies, products, and services. Research produced by the University of Cambridge estimates that in 2017, there were 2.9 to 5.8 million unique users using a cryptocurrency wallet, most of them using bitcoin.

Bitcoin uses peer-to-peer technology to operate with no central authority or banks; managing transactions and the issuing of bitcoins is carried out collectively by the network. **Bitcoin is open-source; its design is public, nobody owns or controls Bitcoin and everyone can take part**.

Through many of its unique properties, Bitcoin allows exciting uses that could not be covered by any previous payment system.

Bitcoin has been criticized for its use in illegal transactions, its high electricity consumption, price volatility, thefts from exchanges, and the possibility that bitcoin is an economic bubble.Bitcoin has also been used as an investment, although several regulatory agencies have issued investor alerts about bitcoin.

## Features of Bit Coin

### Features of Bitcoin

❖ Decentralized
❖ Open Source
❖ Peer to Peer
❖ Easy to use
❖ Unregulated (that is changing slowly)
❖ Anonymous yet Transparent
❖ Fast but irreversible transfers

**How does one acquire bitcoins?**
➢ As payment for goods or services.
➢ Purchase bitcoins at a Bitcoin exchange.
➢ Exchange bitcoins with someone near you.
➢ Earn bitcoins through competitive mining.

### Features of Bitcoin

- All-electronic
- Provable value
- Fast transactions
- Low-cost transactions
- Divisible down to 0.00000001 BTC
- No third-party trust required
- Uncontrollable (Decentralized)
- Irreversible trades
- No double-spending
- Some anonymity (pseudonymity)
- Inflation resistant
- Deflationary (Maximum of 21M issued)
- International
- Widely accepted as a currency