



# Information & Communication Technologies

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# CONCEPT OF ICTs

## What are ICTs?

- Information Technology (IT) is the use of any computers, storage, networking and other physical devices, infrastructure and processes to create, process, store, secure and exchange all forms of electronic data.
- The term was first used in the early 1980s to indicate the convergence of computer technology and communication technologies.
- 1990s, the term Information and Communication Technologies (ICTs) was more widely used to replace IT. This was to give a greater emphasis on communication aspect.





# DEFINITION OF ICTs

- Information and Communication Technologies (ICTs) is a broader term for Information Technology (IT), which refers to all communication technologies, including the internet, wireless networks, cell phones, computers, software, middleware, video-conferencing, social networking, and other media applications and services enabling users to access, retrieve, store, transmit, and manipulate information in a digital form.





# DEFINITION OF ICTs CONT'

- ICTs are also used to refer to the convergence of media technology such as audio-visual and telephone networks with computer networks, connected by a unified system of cabling (signal distribution and management) or linking systems.
- However, there is no universally accepted definition of ICTs considering that the concepts, methods and tools involved in ICTs are steadily evolving everyday.





# Uses of ICTs in various sectors Cont'

- ICTs can be used to facilitate public and private sector activities in areas such as:
- Public Administration, (Govt & Civil Society as players) provide functions that that enhance the social, economic and political developments of the citizenry.





# Uses of ICTs in various sectors Cont'

- e-Government, a concept that defines a situation where government activities and public information can be made available using ICTs.
- Transport sector, ICTs are used to improve road, air and rail transportation.
- ICT applications are noticeable in air transport control, monitoring of freight and the day-to-day transport system





# Uses of ICTs in various sectors Cont'

- Health Sector, ICTs are being used to support efficient exchange of information between health professionals and clients.
- They enable transfer of patient records between sites and they can improve clinical effectiveness of care by health professionals-Telemedicine.





# Uses of ICTs in various sectors Cont'

- Special Needs (for the Physically Challenged), ICTs are extremely useful in providing access to communication, education and open up opportunities for them.
- The use of Braille keyboards and printers can help alleviate some common literacy and numeracy problems for visually impaired.





# Uses of ICTs in various sectors Cont'

- Education Sector, ICTs help in facilitating learning and exchange of educational materials.
- ICTs are helping library professionals store and manage academic information.





# Uses of ICTs in various sectors Cont'

- The online learning system is another web-based application that is revolutionizing the learning platform of education. It compliments the traditional face-to face teaching and learning format.
- In the on-line system, students can access class notes, submit assignment and also join a discussion group with other learners.
- However, in order to realise the full benefits of ICTs the education sector there is need for Zambia to:





# Uses of ICTs in various sectors Cont'

- Take a holistic approach towards the development of ICTs in educational plans and policies. This entails:
  - Support for ICT at both the national and individual school level;
  - involving education stakeholders in how to integrate ICT skills in the curriculum,
    - or tap teachers to help develop policy plans..
- Build the capacity of teachers, administrators and other education leaders to use and integrate ICTs in education sector.
- Education leaders should be provided with professional development opportunities so they can engage teachers and together demonstrate a shared commitment to ICTs in education.





# Uses of ICTs in various sectors Cont'

- Share best practices and lessons learned among countries in Africa, and among schools within the country.
- This accumulated knowledge can then be used to inform the development of blueprints and tools to support ICTs in education practices.





# Uses of ICTs in various sectors Cont'

- Forge public-private partnerships (PPPs) and collaboration with tertiary institutions to bring in additional technical and management expertise, as well as financial resources.
- 'Education PPPs' combine the strengths and capabilities of both sides to ensure the sustainability and scalability of ICTs in education initiatives.
- Governments should drive and facilitate partnerships that include attracting private sector investments on a sustained basis, and tap upon the expertise and resources of both private sector and tertiary institutions, with an emphasis on equal access to quality, ICTs-enabled education





# Uses of ICTs in various sectors Cont'

- Mobilize resources for research and evaluation of ICTs in education to spur innovation and scale up its use.
- This includes working with tertiary institutions to act as research centers.
- Government can create incentives for R&D on innovative uses of ICTs in education.
- For instance making software and hardware more affordable and relevant for students.
- Rigorous evaluation studies on ICTs effectiveness can provide evidence-based justification for transforming the education sector to embrace ICT.





# Uses of ICTs in various sectors Cont'

- Agriculture sector, ICTs can be used can be used to impart information directly to farmers and the farming community. (Sharing Knowledge and Improving Access to Information).





# Uses of ICTs in various sectors Cont'

- Travel and Tourism, ICTs have penetrated this sector the Internet in particular. It is used to provide multimedia information about destination to prospective travelers.





# Impact of ICTs on the Libs, Virtual Libs, Digital Hubs and other information centers

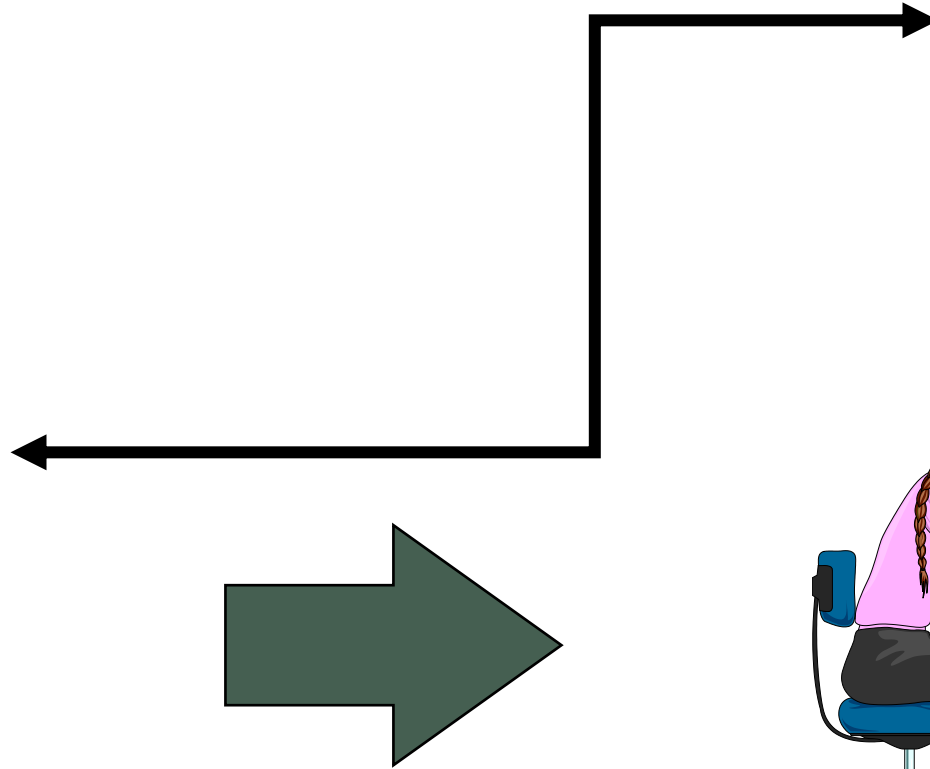
- ICTs have made information creation in digital format possible.
- ICTs have made online access and file transfer possible
- ICTs have made networking and sharing of information resources possible





# Impact of ICTs on the library and other information centers

ICTs have made the transfer of digital information from remote sites possible



**Internet**





# Impact of digital information materials on libraries

- Digital information can be sent in multiple copies simultaneously over information networks in fractions of a minute or even of a second.
- There is no need for users with PCs attached to the network to physically go to the library. They can access information via their PCs.
- Digital information can be cut and pasted from one document into another.
- Digital information may be free or cheaper than print equivalents.
- Digital information often modifies librarians' roles in various ways





# Impact of ICTs on Information Professionals and Educationists

- Need for ICT knowledge
- Need for ICT skill
- Need for ICT tools
- Need for continuous learning in the context of rapidly changing ICT
- Library schools must integrate ICTs into their curricula and short courses to produce graduates who can cope with the changing work environment.





# Perceived roles of Information Professionals in the Information Society

➤ **Creators:** developers and producers of information products and services

➤ **Collectors:** librarians, archivists and records managers

➤ **Communicators:** information workers, extension workers, subject specialists

➤ **Consolidators:** reference librarians, information brokers, analysts





# Trends in the Development of Libraries

Libraries are:

- networked
- stocked with a core collection that is multimedia
  - have access to global information
  - become digital
  - become virtual





# Challenges to Libraries/Information Centres

- Collection development
- Resource sharing through networking
- Faster direct communication among scientists and researchers
- Virtual vs onsite reference service
- Better document delivery systems
- Better abstracting and indexing systems
- Availability of full-text materials on the Internet
- Information management vs collection management



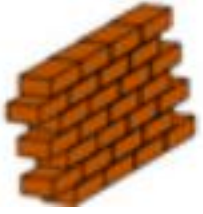


# Effects of these developments on the user community?

- Increases level of technology literacy.
- Increases demand for better and faster access to information.
- Aggravates discrepancies between the information rich and information poor.



# Barriers to Using Tech In The Class Room



**"I believe in face-to-face"**

Only when you are physically present



**"We don't have time"**

Technology lessons” feels like just another thing thrown on the plate of overworked and underpaid educators.





# "This doesn't apply to my subject"

- There are so many ways to rethink and re-conceptualize all of the subjects at school – art, music, P.E., drama, etc – so that they meet the needs of the 21st century learner.
- What is important is that the goal of the learning is identified, and that the teacher uses the best tools available to facilitate the learning of the skills and concepts.



# Areas where ICTs can contribute to EDU, LIS, REC:

- Expanding access
- Promoting efficiency
- Improving the quality of learning
- Enhancing the quality of teaching
- Improving management systems

# WHAT IS THE DIGITAL AGE?



Referred to as the Information Age, a historic period in the 21st century characterized by the rapid shift from traditional industry that the Industrial Revolution brought through industrialization, to an economy based on information technology.

- Time frame in history that the use of digital technology became prevalent and of common use throughout the world. The digital age began in earnest with the widespread use of the Internet.
- The current era where social, economic and political activities are dependent on information and communication technologies. It is also known as the information age or the digital era.





# The Concepts of Digital World and Digital Natives

- The digital age refers to the time-period in which personal computers and other subsequent technologies were introduced to provide users the ability to easily and rapidly transfer information.
- This is the time we're living in is characterised by people's ability to transmit information without restriction and to have access to information in a way that was impossible in the past. It is also called the "informational era..
- An era in human history where a shift process occurs from industrial based to information-based economy using computer and other technology devices as medium of communication.





# Digital World Cont'

- The digital world is basically a the spread of technology which has culminated out of:
- Computers and communications technology most notably the internet which has led to the information revolution
- In the digital world, use of the internet is requirement for one to be called a citizen in the digital world.





# Who is a Digital Native???





# Digital Natives

- A generation of people who have been born and raised in a digital, media-saturated world. The term coined by education consultant “Marc Prensky.”
- People born after 1980 are known as “Digital Natives”
- Use digital technologies to express themselves and relate to others by using sites such as WhatsApp, Facebook, Twitter, WeChat and Myspace.

Who then is a Digital Immigrant?





# Digital Immigrants

- Includes anyone not born in the digital world but have, at some later point in our lives, become fascinated by and adopted many or most aspects of the new technologies.
- The term digital immigrant may also apply to individuals who were born after the spread of digital technology and who were not exposed to it at an early age.





# Digital Immigrants Cont'

- Digital immigrants are also believed to be less quick to pick up new technologies than digital natives.
- A commonly used example is that a digital immigrant may prefer to print out a document to edit it by hand rather than doing onscreen editing.





# Critique

- The classification of people into digital natives and digital immigrants is controversial.
- Some digital immigrants surpass digital natives in tech savvy, but there is a belief that early exposure to technology fundamentally changes the way people learn.



## CHARACTERISTICS OF DIGITAL AGE

- **Operational excellence:** ICTs are the lubricant to a well-designed management information system.
- Therefore ICTs should provide stability and operational excellence to “keep the organizational lights on.”
- It requires that wise steps are taken in consolidation, modernization, automation, integration and optimization for improving its overall digital maturity.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- **Digital proficiency:** The goal of ICTs are about leveraging information and technology to lower costs, improve operations and increase revenue.
- An organisation with digital proficiency can devote more attention to what organizations really care about – leveraging information for gaining insight and putting ICTs to boost technological advantage.
- An organization successful when they realize that one of their greatest strengths will be their multifaceted digital proficiency to scale up and shift from “doing digital” to “being digital.”

## CHARACTERISTICS OF DIGITAL AGE CONT'

- **Innovativeness:** To move up digital maturity, organizations are looking for ICTs to add new innovative methods for management of complexity, improving quality and driving digital transformation.
- The available digital technologies just make innovation easier to do now than in the past – less costly and more easily accessible.
- Innovation can be categorized as breakthrough innovation (push something to the new level), sustainable innovation (better version of products or services), efficiency innovation (process improvement), or “soft innovations” (communication or culture innovation).

## CHARACTERISTICS OF DIGITAL AGE CONT'

- ICTs can drive all sort of innovation to improve business revenue growth and lift organizational maturity.
- Running innovative ICTs requires some kind of rethinking and reinventing the corporate processes and building the business capabilities for managing innovation systematically.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- **Simplicity:** People are complex, organizations are complex and the world is complex.
- Complexity is one of the emerging digital characteristics in the digital era. Imagine the complexity that comes in due to these characteristics such as less structure, more rules and regulations, diversity, volatility, ambiguity, unpredictability, lack of linearity and increased flux, etc.
- There are necessary complexity and unnecessary complication.
- In organizations, complexity both drives innovation and also hinders it.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- The science of ICT management is to simplify unnecessary complexity, manage the full cycle of applications, retire legacy systems; reassess any systems that suck too much resources, energy, or require too much ICT effort, and tighten coordination with vendors and partners, in order to improve organizational responsiveness and maturity.

# CHARACTERISTICS OF DIGITAL AGE CONT'

- **Customer-centricity:** Digital is the age of people-centricity.
- ICTs should shift its focus from inside-out operation driven to outside-in customer-centric for improving its digital maturity.
- Technology is being leveraged every day to enhance customer experiences.
- This can be achieved through engaging and enchanting end customers via digital touch points and tailored experiences,
- Also empowering internal users with efficient tools to improve their productivity and satisfaction, are vital for improving ICT maturity.

# CHARACTERISTICS OF DIGITAL AGE CONT'

- **Adaptability:** Here we look at the digital organization as the self-organized but interlaced and hyper-connected ecosystem.
- Adaptability is the ability of people or systems adapting themselves smoothly and acting fast to changed circumstances.
- Digital means fast-paced changes, continuous disruptions, overwhelming information and shortened knowledge life cycle.
- Success is dependant on how fast and capable they can adapt to changes and overcome upcoming challenges.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- In the ever-changing digital dynamic, individually, people should develop adaptability through openness, be able to seek ways and means of adjusting their perspective and those around them.
- At the organizational level, self-adaptation is faster if made with the full involvement of people in organizational change, starting from relations between people, and improving the changeability of the entire organizational processes.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- The culture of flexibility advocated by effective leadership is about bringing out the best in others, improving quality thinking, exploring diverse viewpoints, fresh knowledge and multiple perspectives in order to gain an in-depth understanding of certain topics or specific problems that occur and develop a structural approach to overcome challenges.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- **Flexibility:** Unlike the closed mechanic system, digital organization are like the living system, spontaneously self-organizes, generates patterns, forms structures, initiates organisational activities and above all, creates novelty over time.
- Loose connections makes it possible to change the component without affecting the entire system, as long as the structure and interface are kept stable.

# CHARACTERISTICS OF DIGITAL AGE CONT'

- **Fit:** People are the very purpose for change; they are often the weakest link in digital transformation as well.
- Organizational fit means more about growth in mindset, value adding or behavioral norms.
- People need to be intentional about how they enter the role, focusing on understanding and respecting people, culture, values and history.
- Failure to do so causes derailment and the perception of poor-fit.

# CHARACTERISTICS OF DIGITAL AGE CONT'

- From the people management perspective, the organizational fit is the good balance of the “misfit” thinking and fitting attitude.
- “Fit” doesn't mean that everyone needs to have the same thought processes, the same personalities, the same preferences, or the same experiences.

# CHARACTERISTICS OF DIGITAL AGE CONT'

- At the ultimate level, organizational fit means to well balance the “desired fit” qualities such as growth mindset, learning agility, positive attitude and accepted behavior, as well as “needed misfit” traits such as independent thinking and creativity.
- “Fit or misfit” is contextual.
- Your thoughts in relation to how UNZA is rolling out the use of ICTs for teaching and learning purposes???????

## CHARACTERISTICS OF DIGITAL AGE CONT'

- In today's digital new normal, culture fit means organizations should proactively seek different ideas and engage in healthy debating and critical thinking with diverse points of view.
- The disruption of ICTs will continue, and ICT skill gap is the reality.
- ICT professionals today need to develop both technical and skills for keeping digital fit.
- It will take a preponderant importance in the coming years to make sustainable ICTs – organizational relationship and build a people-centric organization.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- **Speed:** In traditional organizations, ICTs are perceived by the organisation as slow to change, because ICTs are often in the reactive mode, waiting for the organisation's requests.
- To run a high mature digital organization, ICT have to speed up as a digital catalyst by adapting to changes faster than the rest of organizations.
- More and more organizations expect the consumerization style responsiveness from ICT, because digital dynamic is where the disruption threatens to tear down legacy systems.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- To accelerate the speed, forward-thinking organization separates the exploitation of the existing methods and technologies from the exploration of new ways to do things by leveraging the emergent digital trends.
- ICTs needs to quickly and cost-effectively confirm that the corresponding changes work smoothly to move the business forward, fuel today's fast organizational speed, boost employees' productivity, reduce the cost and delight customers consistently.
- The goals to accelerate ICTs are to achieve strategic responsiveness and improve organizational flexibility.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- **Balance:** The impact of today's emerging technologies, and their integration with other key business elements, seems to be more profound, especially given the concurrent ecosystem changes going on.
- ICTs have to strike the right balance of "old experience," and "new way to do things," develops the next digital practices, not just gets stuck at the best practices, some of which have outdated in the digital era.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- This can only be achieved when ICT professionals provide a reliable secure infrastructure and maintaining a balanced application portfolio, while deploying innovative value addition to organisational processes factoring in cost reduction and revenue growth initiatives.
- Technology as an enabler, regardless of the extent of digitization, is all about planning, funding, designing, building, operating, securing, optimizing and managing digitized data, documents, or messages.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- Digitizing organizational processes and striking the right balance of old and new, physical and virtual, local and global, have become even more critical to today's organizational successes for the long term.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- **Quality:** Quality Management is basically the fundamental purpose of serving customers and meeting or exceeding their expectations.
- The rest of them are the tools, which can be used as the situation warrants. Without human interactions, quality is not possible.
- A degree of quality is in everything people do and experience, quality management is to help them in doing what they are doing better, easier and faster.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- Quality management” is like “change management” in that both appear to be an oxymoron, in which quality and change = process-in motion and management = stabilization and control.
- Quality management needs to be a cross-functional collaborative effort, not something one team does alone in a corner, in order to improve the entire digital organizational quality and maturity.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- **Autonomy:** The high degree of autonomy is the symbol of digital maturity. Running a self-autonomous organization is to improve organizational efficiency, effectiveness, responsiveness and maturity. Self-organizing is a natural human activity, it's also about empowerment and trust. It's about how to build work atmosphere to encourage creativity, autonomy and mastery.

## CHARACTERISTICS OF DIGITAL AGE CONT'

- With autonomy, the team organizes itself on how it will address the problem that has been presented to it.
- The business keeps processes transparent; the manager does not micromanage but inspects and keeps track of what the team is doing.
- Digital management focuses on “why,” and “what,” not “how.” You give the team freedom to do things in their own way, figure out alternative solutions and deliver the best outcome.

# SUMMARY

- Innovative.
- Global.
- Technological.
- Traditional geographical barriers have been removed.
- Multiculturalism.
- Location is no longer an obstacle.



# Intellectual Property

- Intellectual property is the law that deals with the protection of ideas. It has become highly important and cardinal in development and use of ICTs.
- Intellectual property, allows developers of ideas and creative works exclusive rights to works for a period of time. It has four main parts:





# Patents

- These protect inventions of about a period of 20 years.
- An inventor who wants patent protection, must apply to the patents and tread mark office.
- In most cases, when one is applying for patent, it requires the presence of the lawyer, hence the applicant must be ready to fit the expense of the lawyer.





# Copyright

- These protects the expression of an idea and not an idea itself.
- It covers works like books, music, movies, works of art (creative works).





# Trade Marks and Trade Secretes

- These are words or phrases used to identify a product, business, or a services, for the purpose of conducting commerce.
- Most common brands in the world are trade marked
- Coca-Cola , Samsung , Blackberry, Nokia,Toshiba, Iphone.
- Service Marks: This similar to a trade mark but only applies to a service.
- If a trade mark is not registered or pending, it is usually followed by a symbol TM, when registered it has this symbol ®





# Trade Secrets

- Any confidential business information which provides an organisation a competitive edge may be considered a trade secret.
- Trade secrets encompass manufacturing or industrial secrets and commercial secrets.
- The unauthorized use of such information by persons other than the holder is regarded as an unfair practice and a violation of the trade secret.





# Trade Secrets Cont'

- Depending on the legal system, the protection of trade secrets forms part of the general concept of protection against unfair competition or is based on specific provisions or case law on the protection of confidential information.





# Trade Secrets Cont'

- While a final determination of what information constitutes a trade secret will depend on the circumstances of each individual case,
- Clearly unfair practices in respect of secret information include industrial or commercial espionage, breach of contract and breach of confidence.



# TASK

1. How is Zambia coping with Intellectual Property Protection in the under the COVID-19 pandemic?
2. What are the challenges that Zambia is likely to face



# Classification of Computers

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# What is Computer?





- A computer is a machine that manipulates data according to a list of instructions.
- A computer is a device capable of performing computations and making logical decisions at a speed faster than people.
- Computer is an electronic machine which is used for data processing.
- The output which comes after processing data through computer is known as Information.







Accepts **data**

Raw facts, figures, and symbols

Processes data into **information**

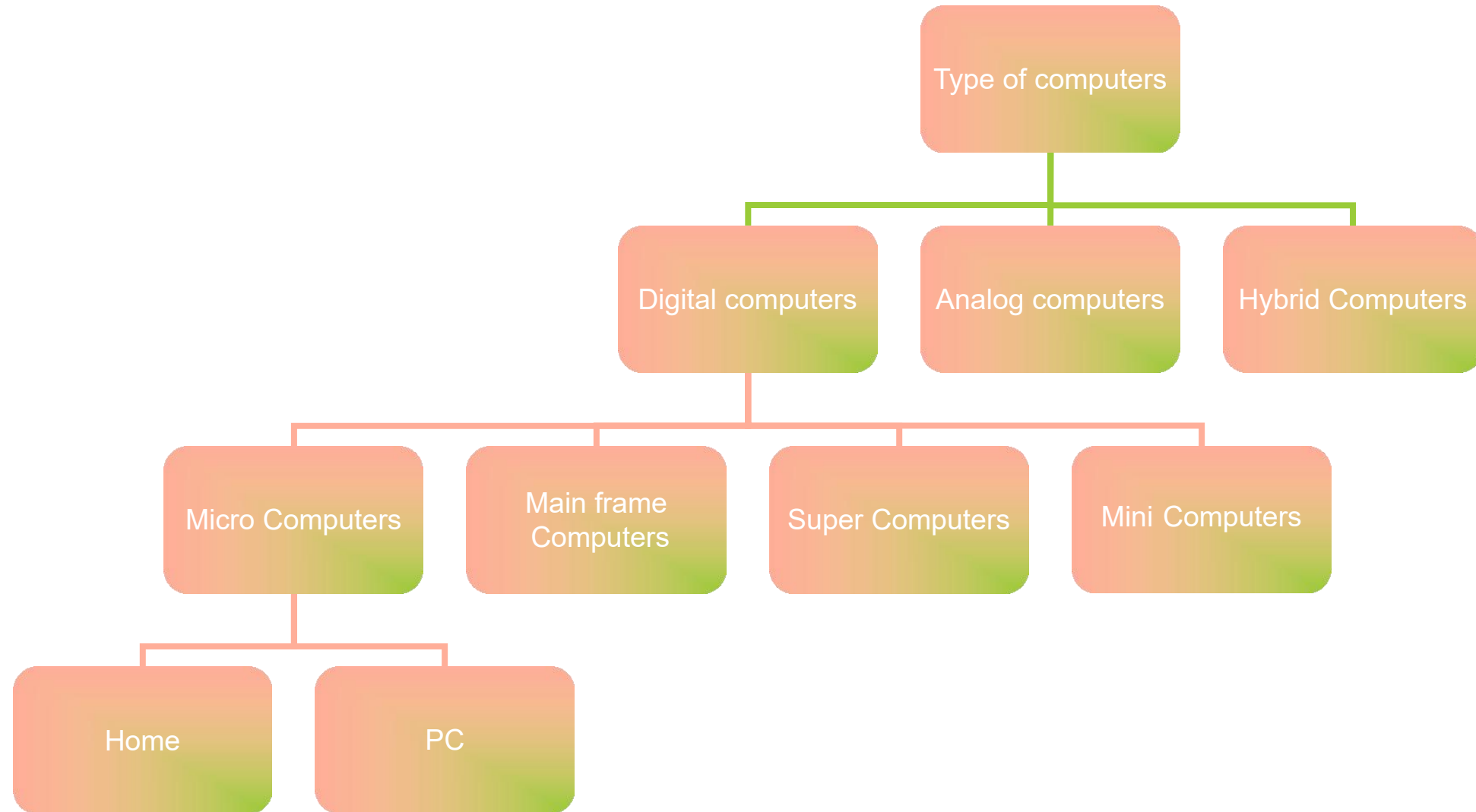
Data that is organized, meaningful, and useful

Produces and stores results





# Types of computers





# Digital Computers

- Uses digits (binary) digits (0, 1) to represent data  
Examples:
- Personal computers such as Laptops and Desktops, etc





# Analog Computers

- Use physical magnitudes as (voltage and pressure) instead of digits Examples:
- Thermometers, voltmeters, speed measuring meters, etc





# Hybrid Computers

- Combination of both the analogue and digital computers

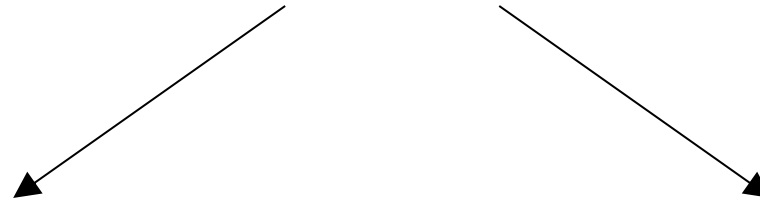
Examples:

- A computer that maintains temperature in a burner of a production plant





# Computers



Special purpose  
computers

General purpose  
computers





# Special purpose computers

- Designed for a special job only
- Examples: Computers used in digital watches, pocket calculators, point of sales, etc





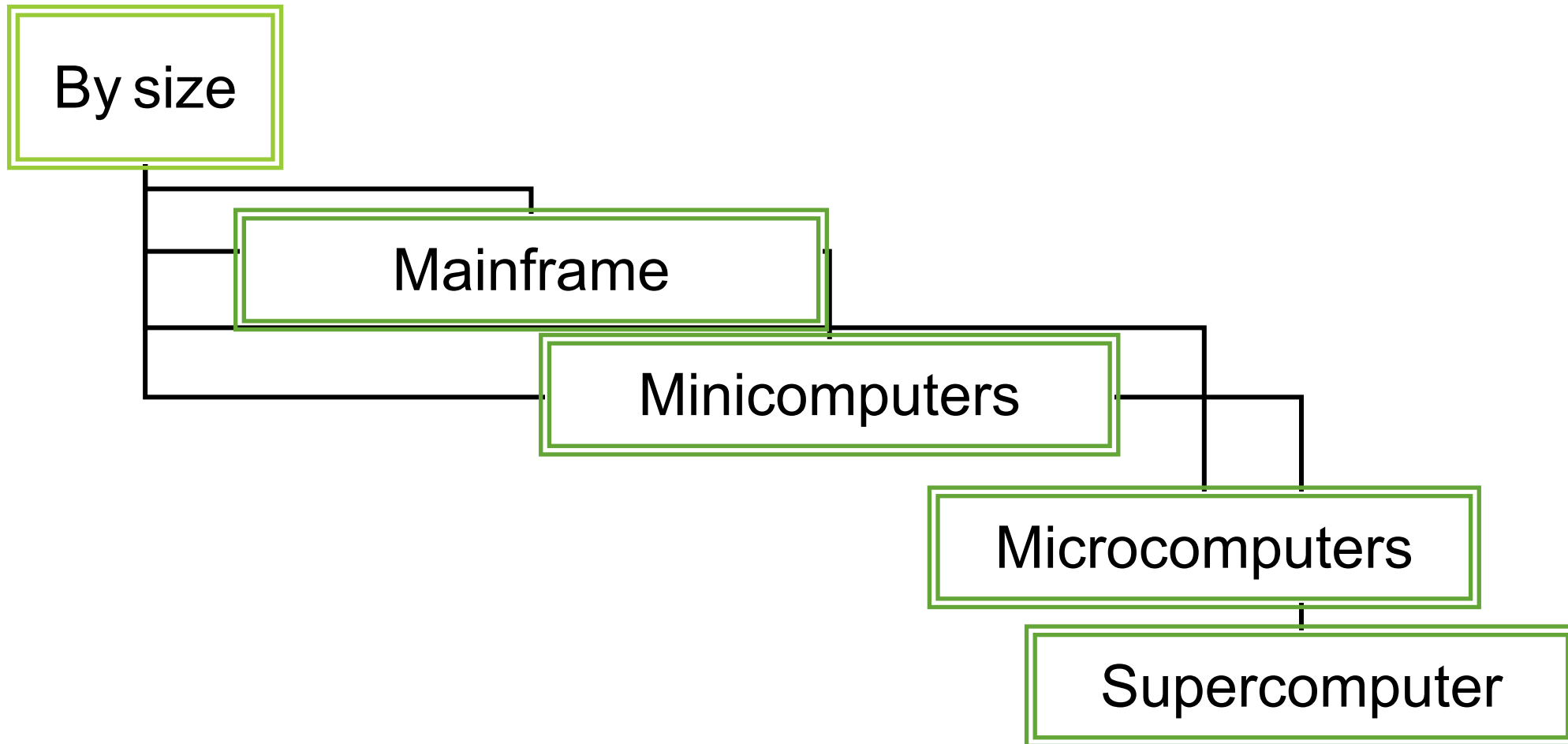
# General Purpose computers

- Design to solve wide variety of problems
- Examples: A personal computer used in an office or at home
- Can a general purpose computer be converted to a special purpose computer ?





# Classifications of computers





# Mainframe computer

- A large computer
- Has enormous input, process, output and storage capacities
- Hundreds of terminals connected
- Hundreds of users can work simultaneously





# Mainframe computer Cont'

- The word “main frame” comes from the metal frames. It is also known as Father computer.
- Application – Host computer, Central data base server





# Mainframe computer Cont'



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# Mini computer

- A computer of medium power compared to Mainframes, but more powerful than micro computers.
- They are generally more powerful and most useful as compared to micro computer
- Mini computer are also known as mid range computer or Child computer
- Application :- Departmental systems, Network Servers, work group system





# Mini computer



<http://www.crystalgraphics.com>





# Micro computers

- A small computer that contains a microprocessor as its central processor. The central processing unit is embedded in a single chip.
- Available for only one user at any time.
- It also known as Grand child Computer
- Examples: personal computers; Laptops, desktops
- Application : - personal computer, Multi user system, offices





# Micro computers



Desktop computer

<https://www.cnet.com/pictures/microcomputers-images/>



# Super computers

- Focused on performing tasks involving intense numerical calculations such as: Weather forecasting, artificial intelligence , nuclear simulations, and complex scientific computations
- A super computer contains a number of CPUs which operate in parallel to make it faster.
- It also known as grand father computer.
- Application – whether forecasting, weapons research and development





# Super computers





# Classification of Digital computers

- Desktop
- Workstation
- Notebook
- Tablet PC
- Handheld computer
- Smart Phone





# Desktop

- The most popular PCs are desktop machines. Early PCs had Intel 8088 microprocessors as their CPU.
- Currently Intel Dual Core is the most popular processor





# Workstation

- Workstations are also desktop machines. They are, however, more powerful providing processor speeds about 10 times that of PCs.
- Most workstations have a large colour video display unit (19 inch monitors).
- Normally they have main memory of around 256 MB to 4 GB and Hard Disk of 80 to 320 GB.





# Workstation





# Notebook

- Laptop PCs (also known as notebook computers) are portable computers weighing around 2 kgs.
- They have a keyboard, flat screen liquid crystal display, and a Pentium or Power PC processor. Colour displays are available.
- They normally run using WINDOWS OS. Laptops come with hard disk (around 40 GB), CDROM and USB ports.





- They should run with batteries and are thus designed to conserve energy by using power efficient chips.
- Many Laptops can be connected to a network and these include wireless networks.





# TASK

- Handheld PC
- Tablet PC
- Smart Phone







# Tablet PC





# Smart Phone





# Generations of Computer

History of computer development is often referred to in reference to the different generations of computing devices.

Each of the generations of computers is characterized by a major technological development that fundamentally changed the way computers operate.

A computer generation is a computer era(period of time).

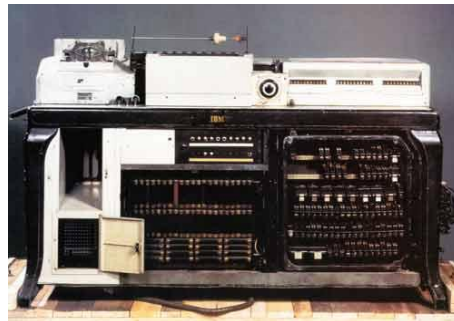




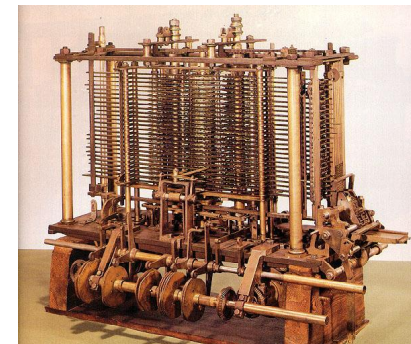
# Generations of Computer

## Zero generation (1642 to 1945)

- Mechanical calculators were developed as computing device.
- These are also known as mechanical computers.
- Used gears and leavers.



Hollerith's Punched-card Machine



Babbage's Analytical Calculator

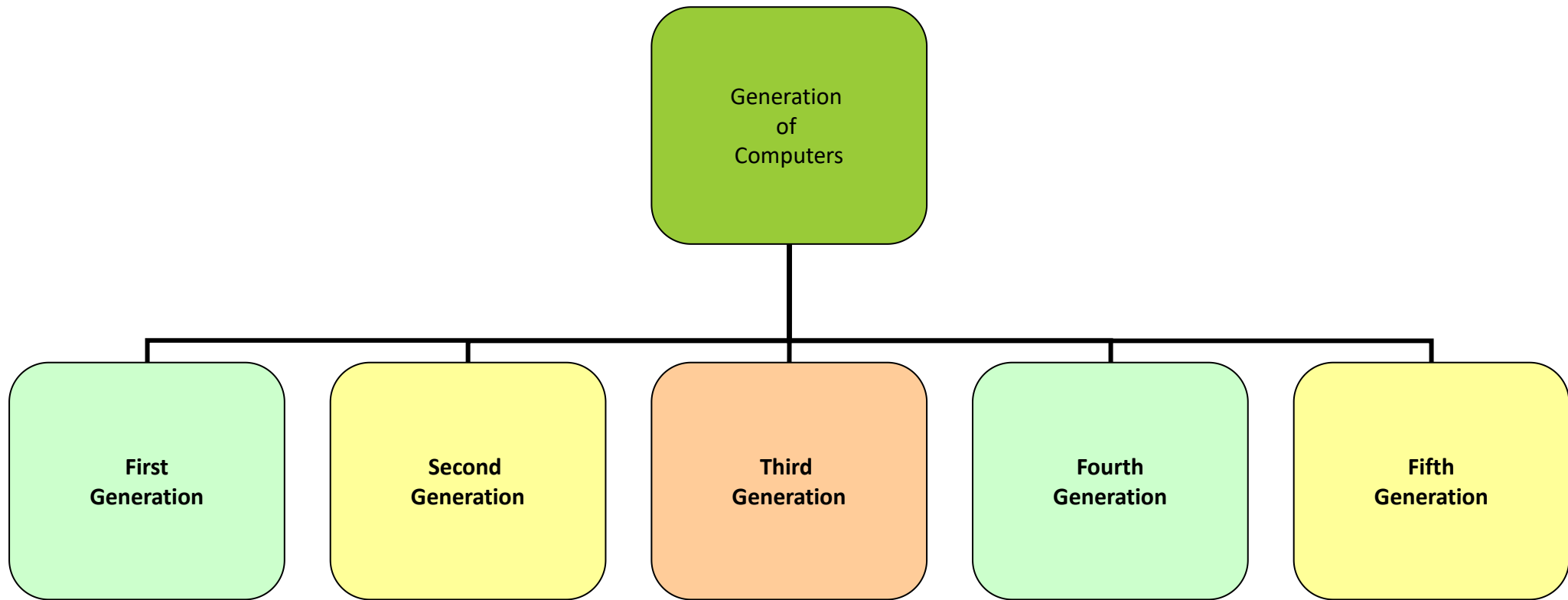




# Electromechanical computers

- An electromechanical computer is a machine with both mechanical and electronic components.
- Main Example of this was the Automatic Sequence Controlled Calculator, usually called the **MARK 1**.

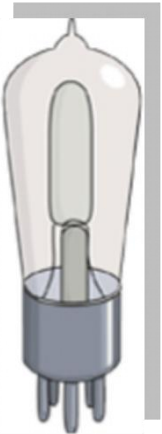


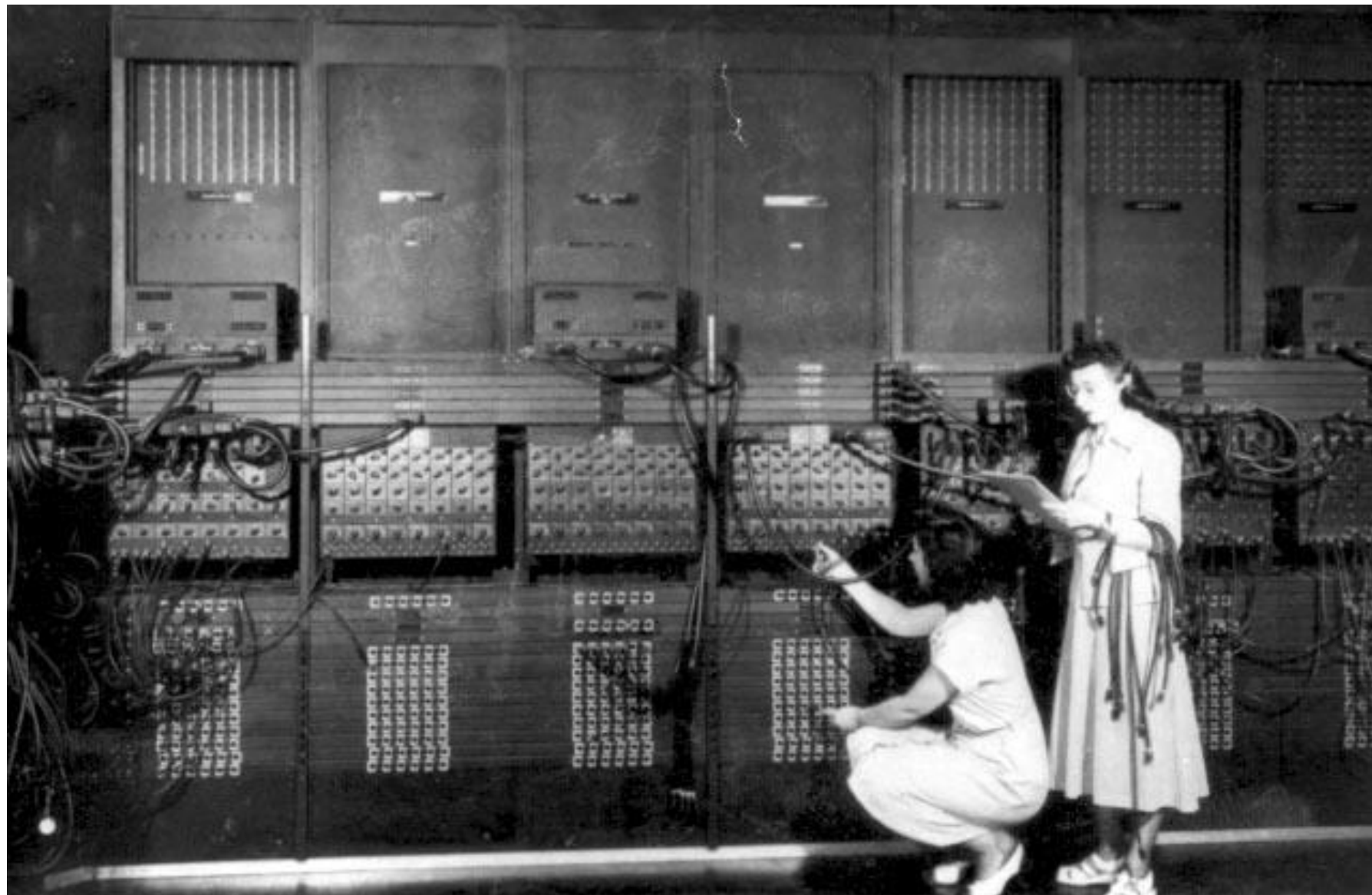




# The First generation 1945-1955

- Vacuum Tubes
  - ✓ Heat
  - ✓ Burnout
- Machine language
- The most famous electronic computer ENAIC (Electronic Numerical Integrator and Calculator )
- It was developed by Mr. J.Presper Eckert and Mr. John Manuchly at University of Pennsylvania.
- Magnetic core memory
- Storage
  - ✓ Punched cards
  - ✓ Tape (1957)





# programming - machine language





# Characteristics of 1<sup>st</sup> Generation Computers

- Computers big and clumsy
- Electricity consumption is high
- Electric failure occurred regularly - computers not very reliable
- Large air conditioners was necessary because the computers generated heat
- *Batch processing*- Non-continuous processing of data, instructions, or materials





# The Second Generation 1955-1965

- In this second generation vacuum tubes was replaced by transistors
  - Smaller
  - No warm-up time
  - Less energy
  - Less heat
  - Faster
  - More reliable





# The Second Generation Cont'

- Storage
  - Removable disk pack (1954)
  - Magnetic tape
- Programming languages
  - Assembly language
  - FORTRAN (1954)
  - COBOL(1959)
- Used primarily by businesses, universities, government



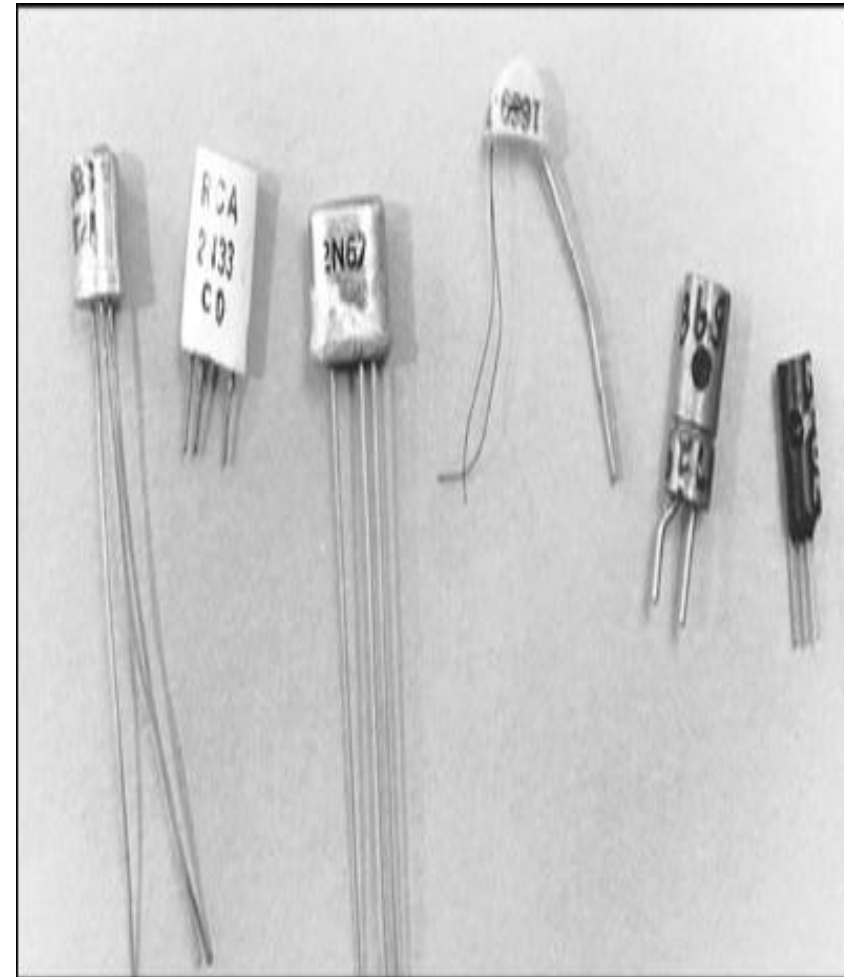


# Characteristics

- Computers became smaller
- Generate less heat
- Electricity consumption lower
- More reliable and faster
- Core memory developed
- Magnetic tapes and disks used
- First operating systems developed
- A new processing method was needed.
- **Time-sharing (processing technique)**



# Transistor





# Third Generation 1964-1971

- Integrated Circuit
  - Electronic circuit on small silicon chip
  - Reliability
  - Compactness
  - Low cost
  - Inexpensive – mass-produced





# Third Generation Cont'

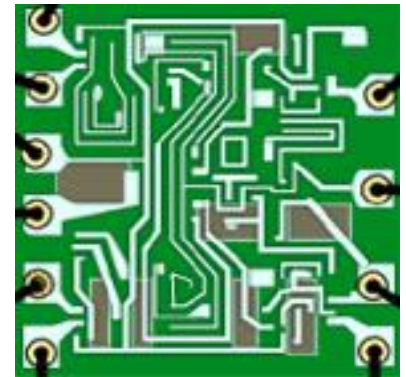
- An integrated circuit consists of thousands of circuits that have been put into a small chip of silicon





# Third Generation Cont'

- Computers smaller, faster and more reliable
- Power consumption lower
- High-level languages appeared (Basic)





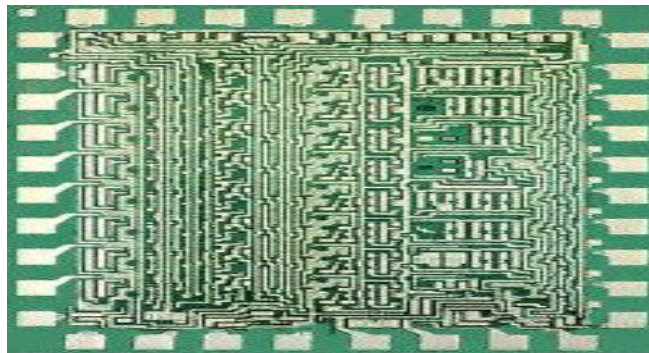
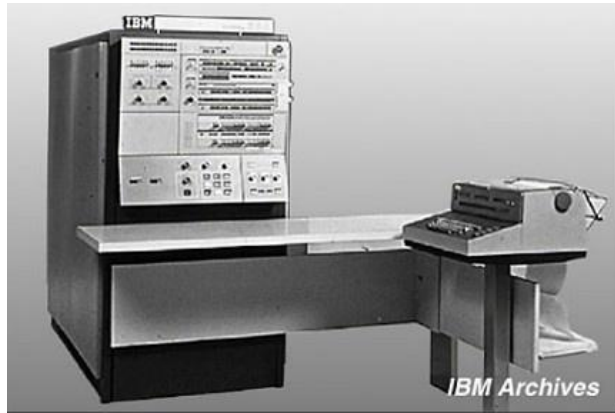
# Third Generation Cont'

- Operating systems were first used in the third generation computers.
- MULTICS (Multiplexed Information and Computing Service) which was an early time-sharing operating system
- Networking was introduced
- Introduction of minicomputers





# Third Generation Cont'



**integrated circuit**

**third generation computer**





# Third Generation Cont'





# Fourth Generation 1972- 1984

- Microprocessor
- Thousands of integrated circuits were built onto a single silicon chip
- The Intel 4004 chip was the first chip to house all the components of the computer processor (1971)





# Fourth Generation Cont'





# Characteristics of Fourth generation computers

- Use of microprocessors - Very large-scale integrated circuits (VLSI)
- Larger capacity to support internal memory
- Increased use of input and output devices
- Data and instructions to be entered directly through the keyboard, the mouse and other handheld devices
- Wide spread use of a variety of computer software





- Designed to allow more than one instruction to be executed at a time (called superscalar)
- Use of parallel processors





# Fifth Generation 1980- Present

- In the fifth generation, the VLSI technology became ULSI (Ultra Large Scale Integration) technology
- Resulting in the production of microprocessor chips having ten million electronic components
- The generation is based on parallel processing hardware and AI (Artificial Intelligence) software





# Fifth Generation Cont'

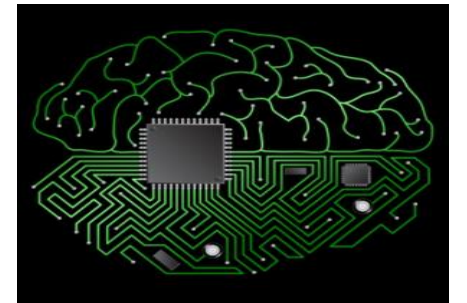
- AI is an emerging branch in computer science
- It interprets means and method of making computers think and behave like human beings
- All the high-level languages like C and C++, Java, .Net etc., are used in this generation





# AI includes:

- Robotics
- Neural Networks
- Game Playing
- Development of expert systems to make decisions in real life situations.
- Natural language understanding and generation





# Key features of fifth generation computers

- ULSI technology
- Development of true artificial intelligence
- Development of Natural language processing
- Advancement in Parallel Processing





# Key features Cont'

- Advancement in Superconductor technology
- More user friendly interfaces with multimedia features
- Availability of very powerful and compact computers at cheaper rate





# Summary of Generations of Computer

	<b>1st generation</b>	<b>2nd generation</b>	<b>3rd generation</b>	<b>4th generation</b>	<b>5th generation</b>
technology	vacuum tubes	transistors	integrated circuits (multiple transistors)	microchips (millions of transistors)	ARTIFICIAL INTELLIGENCE
size	filled whole buildings	filled half a room	smaller, just occupy a small table	SMALLER THAN 3RD GENERATION	PALM OF HAND





# Information Processing Cycle

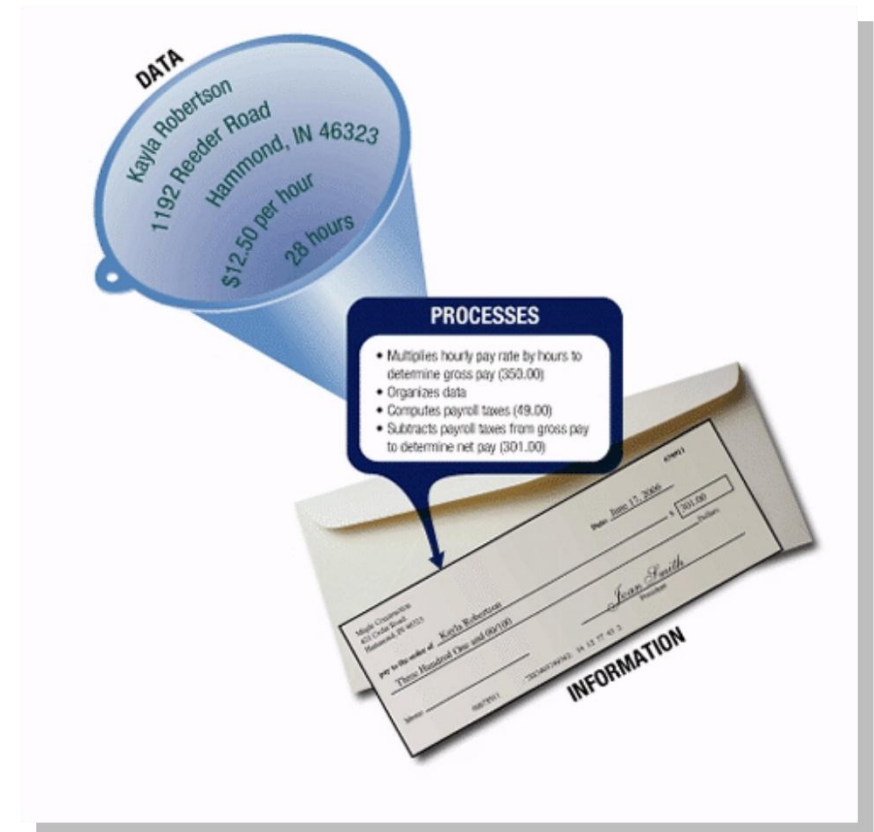
What is the information processing cycle?

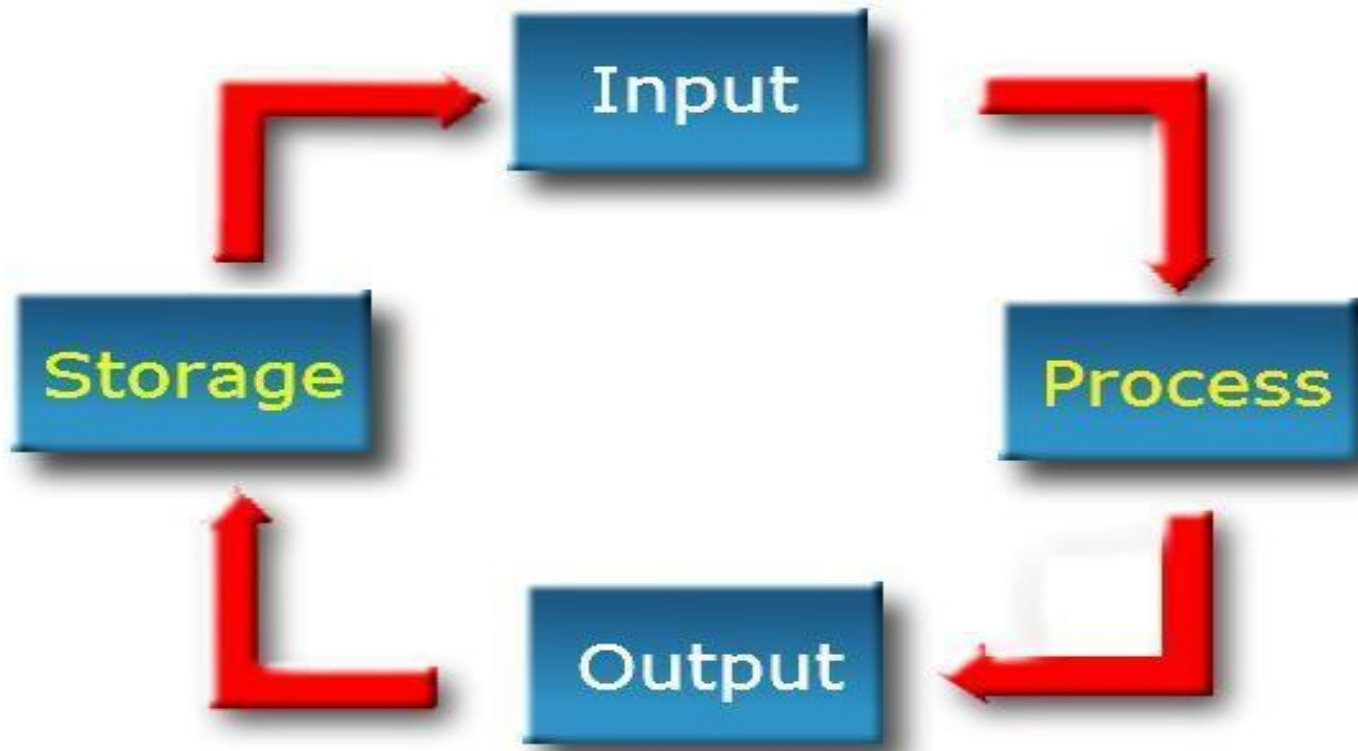




# Information Processing Cycle Cont'

- **Input**
- **Process**
- **Output**
- **Storage**
- **Distribute/Communication**





- Pareesh Phulkar





# Input

- “You first have to get the data in”
- Our brain takes in information from our senses
- Computers need “peripherals” (extra components) to get information in
- Keyboards, mouse, flatbed scanners, bar code readers etc





# KEYBOARD





# MOUSE





# SCANNER





# BARCODE READER





# JOYSTICK





# DIGITAL DATA TABLETS





# PROCESSING

- Next, we need to ‘make sense of’ the data we have
- *performing operations on the data*
- Our brain compares this to what we know and decides whether it is important enough to remember or not
- Computers use the CPU (the main chip inside) to make decisions, do calculations, and organize data



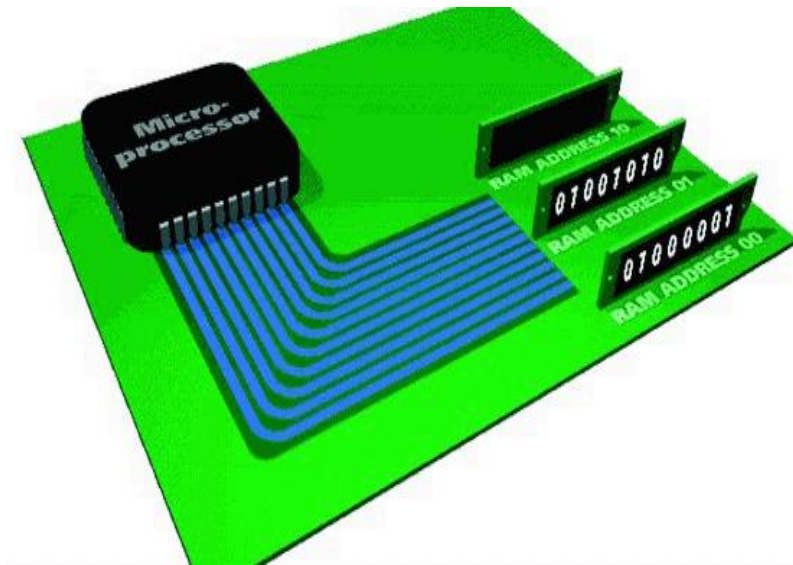
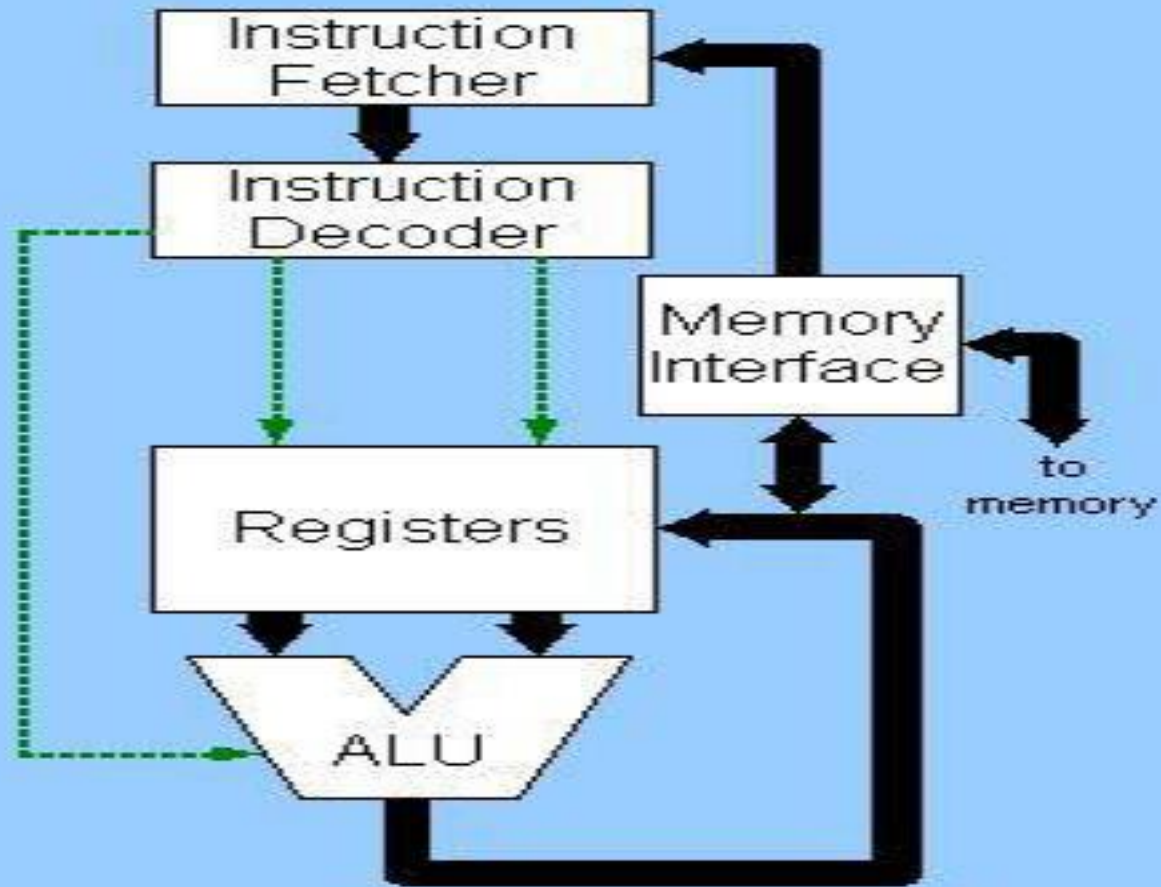


# CENTRAL PROCESSING UNIT (CPU)

- A (CPU), also known as processor, is the key component in a digital computer capable of executing a program
- It interprets computer programme instructions and processes data
- A CPU that is manufactured as a single integrated circuit is usually known as a microprocessor



# CPU CONT'





# OUTPUT

- The next step is to get the results out from the process, and present them in a useable way
- Our brain makes our body respond by talking, moving, or writing
- Computers need “peripherals” to do this
- Monitors, printers, data projectors, speakers, cameras, scanners etc





# OUTPUT CONT'

- Peripheral devices that enable us to view or hear the computer's processed data.
  - Visual output – Text, graphics, and video
  - Audio output – Sounds, music, and synthesized speech





# OUTPUT DEVICES

CRT



Monitor

LCD



Printer



Plotter



Speaker



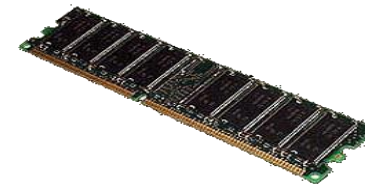


# STORAGE

- **Storage**, also known as **mass media** or **auxiliary storage**, refers to the various media on which a computer system can store data.
- Storage devices hold programs and data in units called **files**



**Hard Drive – storage**



# STORAGE DEVICES



Flash Drive



Portable HD



CD-R



Floppy Disk



PC Card





# IMPORTANCE OF STORAGE?

## ✓ Storage devices:

- Retain data when the computer is turned off
- Are cheaper than memory
- Play an important role during startup
- Are needed for output





# DISTRIBUTE

- Information needs to be communicated (or stored) so it can be used later
- Our brain makes “memories” of the information, and we may write it down to look over later
- Computers use “peripherals” to do this
- Hard drive, CDs or DVDs to burn, Internet (email)





# TAKE HOME TASKS

1. Describe First generation, second generation, third generation computers.
2. Differentiate super computers and mainframe computers.
3. Identify characteristics of fifth generation computers.
4. What is the similarity between mainframes and minicomputers?





*THANK YOU*

*THE END*

