- Irene Owendo
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- INFORMATION TECHNOLOGY FOR STATISTICS
- Topic summary
- 1.Role of IT and computers in todays society
- Information technology - is the use of computers,software,networks and other digital
- technologies to manage,process,store,and transmit information.
- Roles of IT
- a)In education
- Students are taught computer skills and asked to incorporate into their daily work assignment
- b)In business
- Enables mopre efficient operations by allowing workers to do a wider variety of work
- c)In industries
- Enables personnel management,product design and manufacturing to shipping
- d)In government
- Enables tallying of people (populatiom)
- Calculation and filling returns done via the internet (taxation)
- Calculating trajectory of mixiles (military)
- e)Healthcare
- Manages schedules,maintain patients records,and perform billing
- f)marketing
- Enables businesses show products online
- g)Entertainment
- There are online videos sports and internet games
- 2.Fundamentals of computer operations
- It describes how a computer processes information and executes tasks
- a)Input
- Gets data into the computer
- Devices used include;keyboard, sensors,and network interfaces
- b)Processing
- It manipulates,calculate,and transform input data based on instructions.
- Components involved are:
- *CPU -executes instructions,performs arithmetic operations
- *Memory -temporarily holds data and instructions the CPU needs
- *ALU(Arithmetic logic unit) -part of the cpu that handles math and logical comparisons
- c)Output
- Presents the processed data to the user or another system.
- Devices used:
- *monitor,speaker,printers -display/produce human readable output
- *network interfaces -send data to other devices
- *storage devices -save data for future use
- d)Storage
- Retains data and programs even when the computer is off
- *primary storage -volatile,temporary,fast access for active data
- *secondary storage -non-volatile,persistent storage for files,OS,and apps
- e)Control unit

- Manages and coordinates the sequence of operation
- * It directs data flow between components
- *Controls instruction execution timing and sequence
- Input devices=feed data
- cpu=process the data
- output=presenr results
- storage=holds the data
- 3.Basics of computer hardware and software
- Hardware
- Refers to the physical components of a computer system
- a)CPU
- Executes instructions,performs calculations,and manages data flow
- Key specs: core,clock speed,cache size(e.g Intel core i5, AMD Ryzen 7)
- b)Memory(RAM)
- Temporary storage for data and instructions the cpu needs while working
- c)Storage devices
- Holds data and software persistently, even when the computer is off
- *Hard disk drive(HDD)
- Spinning disks.mechanical,larger capacity,slower
- *Solid state drive(SDD)
- Flash memory,no moving parts,faster and more durable
- *NVMe SSD
- High-speed SSDs using NVMe protocol
- d)Motherboard
- Main circuit board connecting all hardware components and manages data flow
- Key features include:cpu sockets,RAM slots, expansion slots, USB e.t.c
- e)Power supply unit
- Converts AC power to DC powerand supplies the power to the motherboard
- f)Input devices
- Sends data to the computer
- g)Output devices
- Presents processed data
- h)Expansion cards
- Adds extra functionality e.g graphics card,network card,and sound card
- Software
- Refers to the programs,apps and instructions that tell the hardware what to do
- a)System software
- Manages the hardware and provides a base for running apps
- *operating system(OS)
- Core software that manages hardware, files and apps
- *device drivers
- Specialized software that lrts the OS communicate with specific hardware
- *utilities
- Helps manage the system
- b)Application software
- Programs designedfor users to perform specific tasks
- * Productivity software
- Processors,spreadsheets,presentations

- *creative software
- Photo editing,video editing,graphic design
- *web browsers
- Access online content
- *games
- Entertainment software
- c)Firmware
- Software embedded in a hardware device
- Critical for hardware initialization
- #
- Hardware needs software to function:the OS tells the CPU,RAM,and other hardwares how to
- work and manage tasks
- Softwarerelirs on hardware to execute:apps run using the cpu,memory,and storage
- 4.Data files
- It involves creating structured files to store data in a format that is readable and usable by
- software or humans.
- a)CSV (comma-separated values)
- A plain text values separated by commas
- Good for tabula data e.g;
- Name,age,course,grade
- Tracy,19,finanial engineering,A
- *STRUCTURE
- First line, column headers
- Each subsequent line a record
- Use commas to separate values;if a value contains a comma,enclose it in quotes
- (e.g “Alvin,Asingo”,19,financial engineering,A)
- *creation
- Open a text editor,type the data following the CSV structure,and save with a.csv extension
- b)JSON(Javascript object notation)
- Key values pairs,structured in objects
- Good for hierarchical data
- *STRUCTURE
- Data is in{} with key value pair
- Multiple values are in array separated by commas
- It requires double quotes around keys and string values
- No commas afterthe last element in an object
- {
- “‘Name’’:”otieno frank”.
- “Age”:”19”,
- “Course”:”financial engineering”,
- “grade”:”A”
- },
-]
- After creation save with a .json extension
- c)Plain textfile(TXT)

- Simple line by line text
- Has one record per line separated by commas
- After creation save with a.txt extension
- E.g
- Name: Mary Kelcy, Age:19, Course:Financial engineering
- **constructing data files
- a)use the same structure for all records ,pick a delimiter and stick to it
- b)include headers to to describe fields
- c)wrap fields with commas or quotes in double quotes.use proper escaping for special chars
- d)validateJSON/XMLwith tools to check syntax
- e)save text files with UTF-8 encoding for international characters
- 5.Means of disk storage
- Disk storage refers to data storage technologies that use disks or plattersto store digital data
- a) Hard Disk Drive
- Uses spinning magnetic disks and mechanical read/write heads
- Data is stored magnetically on the platters;the read headsmoves across the spinning disk to
- access data
- **characteristics
- *capacity-high(500gb-16tb)
- *speed-slower than SSDs
- *cost-generally cheaper per GB than SSDs for large capacities
- *durability-susceptible tro mechanical failure,shock,and wear over time
- **use cases;bulk storage/often as secondary storage

b)Solid State Drive(SSD)
Uses flash memory
Data is stored in interconnected flash memory chips
**characteristics
*capacity -medium to high(128GB-8TB)
*speed -much faster than HDDs
*cost -more expensive per GB than HDDs
*durability -resistant to physical shock, faster and more durable than HDDs
c)Hybrid Disk(SSHD-solid state hybrid drive)
Combinesa traditional HDD with a small amount of SSD cache
Frequently accessed data is stored on the SSD part for faster access bulk data goes to the HDD part
**characteristics
Capacity-like HDDs with a small SSD cache
Speed-faster than pure HDDsfor frequently accessed files
Cost-cheaper than pure SSD but more expensivethan HDDs
Balancing cost and speed good for laptops needing moderate performancewuthout paying for
full SSD
d)Optical Disks(CD,DVD,Blu-ray)
Use laser read optical media, data is stored as tiny pits and lands on the disk surface

A laser readsthe reflection pattern of the disc surface to retrieve data
**characteristics
Capacity -CD 700MB
-DVD4.7GB-9GB
-Blu-ray25GB
Speed -much slower than HDDs/SSDs
Cost - cheap per disk
Durability-prone to scratches,degradation over time
Software distribution movie/videodistribution
e)External/portable disk drive
Usually HDDs or SSDs in an external enclosure,connected via USB or thunderbolt
**characteristics
Portability-designed for mobility;ofter rugged or compact
capacity/speed-can be HDD or SSD
connection-USB3.0,USB-C Thunderbolt
Used for transferring data between computers
6.Data files and file management
Data file are computer files that store data in a structured or unstructured format
Types of data files
a)structured data files
Data organized with a defined scheme
b)semi-structured data files
Data in mixed structure and unstructuredelements
c)unstructured data files
No pre-defined structure
Common data file formats
CSV(students.csv)
JSON(data.json)
Texts(log.txt)
File management
Involves organizing,storing,retrieving,and manipulating data files on a computers storage systems
a)file organisation
Files are stored in directories and subdirectories
Use meaningful names
Some OSs allow tagging files for better searchability
b)file operation
Make a new file
View the file
Modify the file content
Duplicate a file
c)file access control
controls who can read ,write ,or execute files
d)file compression and archiving
Saves space or bundle multiple files
e)file backup and versioning
Protects against data loss
f)file integrity and encryption

Verifies file authenticity
protects sensitive data
BINARY COMPUTER STORAGE FOMAT
Bits and Bytes
Bit-the smallest unit
Byte-a group of 8 bits
A computer stores its data in bits
A word is a group of bytes
word=4bytes
1024bytes=1 KB
1024KB=1MB
1024MB=1GB
1024GB=1TB
1024TB=1PB
1024PB=1EB
1024EB=1ZB
1024ZB=1YB