

Input And Output Device

Unit II

Input and Output Devices

- Input and output devices are essential components of a computer system. They facilitate interaction between the user and the computer by allowing data to be entered and results to be displayed or produced.

Input Devices

- Input devices are hardware components used to send data and control signals to a computer system. They enable users to interact with the system by providing raw data or commands for processing.

Types of Input Devices

Keyboard

- Primary input device for text entry.
- Features keys for letters, numbers, and special characters.

Mouse

- Pointing device used to interact with the graphical user interface (GUI).
- Types: Optical mouse, trackball.

Touchscreen

- Combines input and display functions, allowing users to interact directly by touching the screen.

Microphone

- Captures sound for voice commands, recording, or communication.

Scanner

- Converts physical documents and images into digital formats.
- Types: Flatbed scanner, handheld scanner.

Types of Input Devices

Joystick/Game Controller

- Used primarily for gaming or control in simulations.

Camera (Webcam/Digital Camera)

- Captures images or videos for online communication or photography.

Sensors

- Capture environmental data (e.g., temperature, motion, light).

Biometric Devices

- Capture unique physical traits such as fingerprints, retina scans, or facial recognition for authentication.

Stylus

- Used for drawing or handwriting on devices like tablets or graphic tablets.

Output Devices

- Output devices are hardware components that receive processed data from the computer and convert it into human-readable forms or physical results.

Types of Output Devices

Monitor (Display Screen)

- Displays visual information.
- Types: LCD, LED, OLED.
- Features: Resolution, refresh rate.

Printer

- Produces physical copies of digital documents or images.
- Types: Inkjet: Suitable for high-quality color printing.
- Laser: Faster and more economical for text-heavy documents.
- 3D Printer: Creates three-dimensional objects.

Speakers

- Produce audio output for multimedia applications or communication.

Headphones/Earphones

- Provide personalized audio output.

Types of Output Devices

Projector

- Projects visual content onto a large surface like a screen or wall.

Plotter

- Used for producing large-scale designs, such as architectural plans and engineering drawings.

Haptic Devices

- Provide tactile feedback (e.g., vibration or force) in response to actions, commonly used in gaming and simulations.

Braille Display

- Converts text into braille for visually impaired users.

Comparison of Input and Output Devices

Aspect	Input Devices	Output Devices
Purpose	Send data to the computer	Receive data from the computer
Examples	Keyboard, Mouse, Scanner	Monitor, Printer, Speakers
User Interaction	Enables user to control the system	Displays or produces results

Keyboard, Mouse, Trackball, Joystick.

Already done in slide 4 to 5

Types of Monitor, video Standards, VGA, SVGA, Types of Screen

Already done in slide 7 to 8

Printers and Their Types

- Printers are output devices that transform digital documents or images into physical copies on paper or other materials. Based on technology, functionality, and usage, printers are categorized into several types.

Types of Printers Based on Technology

Inkjet Printers

Technology: Spray fine droplets of liquid ink directly onto paper.

Advantages:

- High-quality color printing.
- Ideal for photo printing.

Disadvantages:

- Slower than laser printers.
- High cost of ink cartridges.

Common Uses:

- Home and small office setups.

Laser Printers

Technology: Use a laser beam to create an electrostatic image on a drum, which attracts toner particles.

Advantages:

- Fast and efficient for high-volume printing.
- Sharp text quality.

Disadvantages:

- Higher initial cost.
- Not ideal for high-quality color images.

Common Uses:

- Offices, schools, and bulk document printing.

Dot Matrix Printers

Technology: Print by striking pins against an ink ribbon, forming characters as dots.

Advantages:

- Durable and reliable for multi-part forms.
- Low operating costs.

Disadvantages:

- Noisy and slow.
- Low-quality print output.

Common Uses:

- Printing receipts, invoices, and reports.

Thermal Printers

Technology: Use heat to produce images on specially treated paper or via thermal ribbons.

Advantages:

- Quiet operation.
- Compact and portable.

Disadvantages:

- Limited to specific paper types.
- Fades over time.

Common Uses:

- Point-of-sale (POS) systems, barcode labels, and receipts.

3D Printers

Technology: Build three-dimensional objects layer by layer using materials like plastic, resin, or metal.

Advantages:

- Enables prototyping and custom object creation.
- Wide range of material options.

Disadvantages:

- Slow and expensive.
- Requires expertise to operate effectively.

Common Uses:

- Prototyping, manufacturing, and medical device creation.

Types of Printers Based on Functionality

A. Single-Function Printers

- Perform only printing tasks.
- Simple and cost-effective for basic printing needs.

B. Multi-Function Printers (All-in-One)

- Combine printing, scanning, copying, and sometimes faxing.
- Ideal for offices or users needing versatility.

Types of Printers Based on Connectivity

A. Wired Printers

- Connect via USB or Ethernet.
- Stable connection, suitable for local setups.

B. Wireless Printers

- Connect via Wi-Fi, Bluetooth, or cloud printing.
- Allow printing from multiple devices and remote locations.

Types of Printers Based on Output

A. Monochrome Printers

- Print only in black and white.
- Suitable for text-heavy documents.

B. Colour Printers

- Print in full color using CMYK inks (Cyan, Magenta, Yellow, Black).
- Ideal for images and graphics.

Comparison Table of Printer Types

Type	Technology	Advantages	Disadvantages	Uses
Inkjet Printer	Liquid Ink Spray	High-quality images, photo printing	Slower, high ink cost	Home, photo printing
Laser Printer	Laser and Toner	Fast, cost-effective for bulk printing	High initial cost	Office, schools
Dot Matrix Printer	Impact Printing	Durable, low cost	Noisy, poor quality	Invoices, receipts
Thermal Printer	Heat-based	Quiet, portable	Fades over time, limited paper types	POS, barcodes
3D Printer	Additive Manufacturing	Custom object creation	Expensive, slow	Prototyping, manufacturing

Audio/Video Input and Output: Display and Sound Devices

- Audio and video input and output devices are key components of multimedia systems, enabling the capture, processing, and presentation of sound and visual data. They are integral to entertainment, communication, education, and professional tasks.

Audio Input Devices

Audio input devices capture sound signals and send them to the computer for processing.

Microphone

- Captures voice or other sounds.
- Used for communication, recording, and voice commands.
- Types: Dynamic, Condenser, USB microphones.

Digital Audio Recorders

- Standalone devices for high-quality audio recording.

Musical Instruments (MIDI Devices)

- Connects musical instruments like keyboards to the computer for music production.

Headset Microphones

- Combines headphones and a microphone for telecommunication and gaming.

Audio Output Devices

Audio output devices convert digital audio signals into sound waves that humans can hear.

Speakers

- Deliver sound for entertainment, notifications, or communication.
- Available in mono, stereo, or surround sound configurations.

Headphones/Earphones

- Provide personal sound output for music, gaming, or professional use.

Soundbars

- Compact external speakers designed for enhancing TV audio quality.

Home Theatre Systems

- Multichannel audio systems for immersive sound experiences.

Video Input Devices

Video input devices capture moving images and feed them into the computer system.

Webcam

- Captures live video for online meetings, streaming, and surveillance.

Digital Cameras/Camcorders

- High-resolution image and video capture devices.

Video Capture Cards

- Convert analogy video signals into digital formats for editing and streaming.

Document Cameras

- Used in education and business to display documents or objects on a screen.

Video Output Devices

Video output devices present visual data to the user.

Monitors/Displays

1. Primary video output devices for computers.
2. Types:
 1. **LCD (Liquid Crystal Display):** Standard displays.
 2. **LED (Light Emitting Diode):** Energy-efficient and vibrant colors.
 3. **OLED (Organic LED):** Higher contrast and better viewing angles.
 4. **Touchscreen Monitors:** Combine display and input functionalities.

Projectors

1. Display images or videos on large surfaces like walls or screens.

VR Headsets

1. Provide immersive virtual reality experiences by delivering video output directly to the eyes.

Televisions

1. Used for entertainment or as extended displays for computing systems.

Combined Audio/Video Devices

Some devices serve as both audio and video input/output units.

Smartphones/Tablets

1. Capture and playback audio and video.

Cameras with Built-in Mics

1. Used for vlogging, streaming, or professional recording.

Smart TVs

1. Deliver video output while integrating audio output systems.

Sound Processing and Display Enhancement

To enhance the user experience, systems often integrate audio and video processing technologies

For Audio

- **Sound Cards:** Improve audio quality for playback and recording.
- **Equalizers:** Adjust frequency levels for better sound output.
- **Noise Cancellations:** Reduces unwanted ambient noise.

For Video

- **Graphics Cards (GPUs):** Enhance video rendering, essential for gaming and video editing.
- **HDR (High Dynamic Range):** Improves color and contrast in displays.

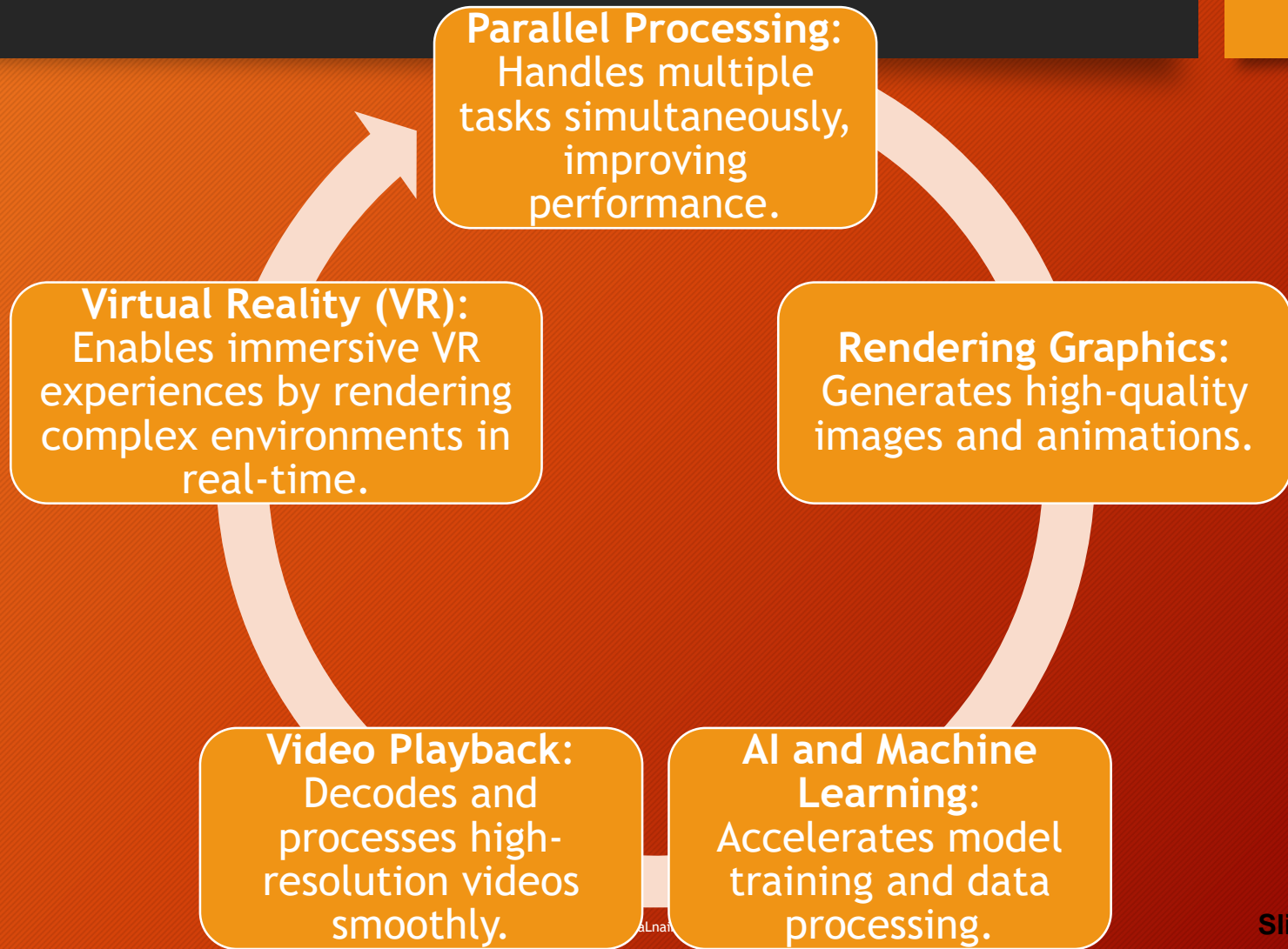
Comparison of Audio and Video Devices

Aspect	Audio Devices	Video Devices
Input Devices	Microphone, MIDI Devices	Webcam, Camcorder, Capture Cards
Output Devices	Speakers, Headphones, Soundbars	Monitors, Projectors, VR Headsets
Usage	Music, Calls, Gaming, Recording	Movies, Games, Presentations

Graphical Processing Unit (GPU) and Ports

- A GPU is a dedicated hardware component designed for parallel processing to accelerate rendering and computational tasks.
- A **Graphical Processing Unit (GPU)** is a specialized processor that handles rendering graphics, images, videos, and animations. It is critical for high-performance tasks like gaming, video editing, 3D modeling, and artificial intelligence (AI) computations. **Ports**, on the other hand, are physical interfaces that connect GPUs to display devices and other peripherals.

Key Features of GPUs



Types of GPUs

Integrated GPU

Built into the CPU (Central Processing Unit).

1. Shares system memory.
2. Suitable for general tasks like streaming and basic gaming.
3. Examples: Intel UHD Graphics, AMD Radeon Vega.

Dedicated GPU

A standalone hardware unit with its own memory (VRAM).

1. High-performance, designed for advanced tasks like gaming and 3D rendering.
2. Examples: NVIDIA GeForce, AMD Radeon.

External GPU (eGPU)

Connected to a computer externally (usually via Thunderbolt).

1. Enhances graphical performance for laptops and compact systems.

Ports on GPUs

- GPU ports are crucial for connecting display devices and transferring video signals. Modern GPUs come with various types of ports to accommodate different display standards.

Common GPU Ports

HDMI (High-Definition Multimedia Interface)

Transfers high-definition video and audio signals.

Supports 4K, 8K resolutions, and HDR (High Dynamic Range).

Widely used for TVs, monitors, and gaming consoles.

DisplayPort

Designed for high-performance displays.

Supports resolutions up to 8K, high refresh rates, and multiple monitors via daisy-chaining.

Commonly used in gaming and professional setups.

DVI (Digital Visual Interface)

Transfers video signals (digital and analog).

Supports resolutions up to 2560x1600.

Becoming less common in modern GPUs.

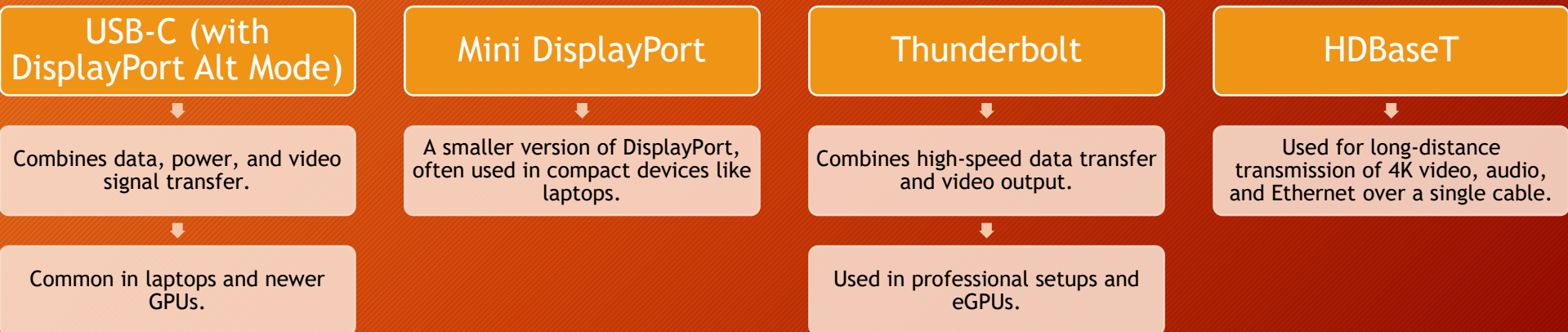
VGA (Video Graphics Array)

Analog video connection.

Limited to lower resolutions and refresh rates.

Obsolete in most modern GPUs.

Common GPU Ports



Hard Drives, Discs, and Cards: Overview and Types

Hard Drives

- A hard drive is a data storage device that uses spinning disks or solid-state memory to store and retrieve digital data.

Types of Hard Drives

- **HDD (Hard Disk Drive)**
 - **Technology:** Magnetic storage with spinning platters and a read/write head.
 - **Capacity:** Typically ranges from 500GB to 20TB.
 - **Speed:** Slower than SSDs due to mechanical parts (read/write speed of 100-200 MB/s).
 - **Advantages:**
 - Affordable for large storage.
 - Long lifespan for archiving.
 - **Disadvantages:**
 - Slower performance.
 - Fragile and prone to mechanical failure.

Types of Hard Drives

- **SSD (Solid-State Drive)**
 - **Technology:** Flash memory with no moving parts.
 - **Capacity:** Typically ranges from 120GB to 8TB.
 - **Speed:** Fast read/write speeds (500-7000 MB/s for NVMe).
 - **Advantages:**
 - Faster performance.
 - More durable and energy-efficient.
 - **Disadvantages:**
 - Higher cost per GB.
 - **Types of SSDs:**
 - **SATA SSDs:** Slower but more affordable.
 - **NVMe SSDs:** Faster and connected via PCIe interface.

Types of Hard Drives

- **Hybrid Drives (SSHD)**
 - **Technology:** Combines HDD and SSD features (small SSD cache + HDD storage).
 - **Advantages:**
 - Better performance than HDD.
 - Cost-effective for moderate speed and storage needs.
 - **Disadvantages:**
 - Not as fast as full SSDs.

Discs

- Discs are optical storage devices used to store data using laser technology

Types of Discs

CD (Compact Disc)

- **Capacity:** 700MB.
- **Usage:** Audio, software distribution, and data backup.
- **Speed:** Slower read/write speeds compared to modern storage.

DVD (Digital Versatile Disc)

- **Capacity:** 4.7GB (single layer) or 8.5GB (dual layer).
- **Usage:** Movies, software, and data storage.
- **Advantages:** Higher capacity than CDs.

Blu-ray Disc

- **Capacity:** 25GB (single layer) or 50GB (dual layer).
- **Usage:** High-definition video and data storage.
- **Advantages:** High-quality video support, long-term durability.

Mini Discs

- Smaller CDs or DVDs used for portable devices.

Cards

- Cards are compact, portable storage devices using flash memory technology.

Types of Cards

SD (Secure Digital) Cards

- **Capacity:** Up to 2TB (standard sizes: SD, miniSD, microSD).
- **Usage:** Smartphones, cameras, and portable devices.
- **Speed Classifications:** Class 2, 4, 6, 10, UHS (Ultra High Speed).

CF (CompactFlash) Cards

- **Capacity:** Up to 512GB.
- **Usage:** Professional cameras and high-performance devices.

MicroSD Cards

- **Capacity:** Up to 1TB.
- **Usage:** Small devices like smartphones and action cameras.
- **Advantages:** Compact size, affordable.

Memory Sticks

- Proprietary format by Sony for cameras and gaming consoles.

CFast and XQD Cards

- **Usage:** High-speed and high-capacity requirements in professional cameras.

Comparison of Storage Devices

Feature	HDD	SSD	Discs	Cards
Capacity	Up to 20TB	Up to 8TB	Up to 50GB	Up to 2TB
Speed	100-200 MB/s	500-7000 MB/s	~10 MB/s	~100 MB/s
Durability	Prone to failure	More durable	Susceptible to scratches	Compact but fragile
Portability	Limited	Portable	Portable	Highly portable
Cost per GB	Low	High	Low	Moderate
Usage	Bulk storage	Fast access	Archiving	Portable devices

Applications

Hard Drives:

- Data backup, gaming systems, and desktop storage.

Discs:

- Media distribution, archival storage.

Cards:

- Mobile devices, cameras, drones, and portable gaming consoles.

E-Accessible options

- **E-accessibility** refers to the design and implementation of digital technologies to ensure that people with disabilities or special needs can use electronic devices, websites, and applications effectively. This includes accommodations for visual, auditory, motor, and cognitive impairments.

Accessibility Features in Devices

A. Operating Systems

- Modern operating systems offer built-in accessibility tools:
- **Windows:** Narrator, Magnifier, Speech Recognition, High Contrast Mode.
- **macOS:** VoiceOver, Zoom, Dictation, AssistiveTouch.
- **Linux:** Orca Screen Reader, On-Screen Keyboard, Compiz Magnifier.
- **Mobile:**
 - Android: TalkBack, Accessibility Menu, Switch Access.
 - iOS: VoiceOver, Magnifier, AssistiveTouch.

Accessibility Features in Devices

B Hardware Options

- **Input Devices**
 - **Ergonomic Keyboards:** Reduce strain for people with motor impairments.
 - **Braille Keyboards:** Allow visually impaired users to input text.
 - **Adaptive Mice:** Trackballs, joysticks, or touch-sensitive devices.
 - **Switch Controls:** Buttons or sensors for users with limited mobility.
- **Output Devices**
 - **Braille Displays:** Convert screen text into Braille characters.
 - **Haptic Feedback Devices:** Use vibrations to provide sensory feedback.

Accessibility in Software & Applications

A. Assistive Technologies

Screen Readers

- Read text on a screen aloud.
- Examples: JAWS, NVDA, Apple VoiceOver, ChromeVox.

Text-to-Speech (TTS)

- Converts written text into spoken words.
- Integrated into e-books, web browsers, and learning tools.

Speech Recognition

- Enables voice commands for typing and navigation.
- Examples: Dragon NaturallySpeaking, Google Voice Typing.

Screen Magnifiers

- Zoom in on parts of the screen for users with low vision.

Accessibility in Software & Applications

B. Accessibility in Web Design

WCAG (Web Content Accessibility Guidelines)

- Standards for making web content accessible.
- Includes features like alternative text (alt text), keyboard navigation, and captions.

Accessible PDFs and Documents

- Structured headings, alt text for images, and tagged elements for screen readers.

Accessibility Features in Specific Domains

A. E-Learning

- **Captioned Videos:** Provide subtitles for lectures.
- **Descriptive Audio:** Narrate visuals in multimedia content.
- **Accessible Learning Management Systems (LMS):** Platforms like Moodle and Canvas with WCAG compliance.

B. Workplace

- **Virtual Meeting Tools:** Closed captions in Zoom, Google Meet, or Microsoft Teams.
- **Digital Signage:** Text-to-speech and visual aids for notifications.

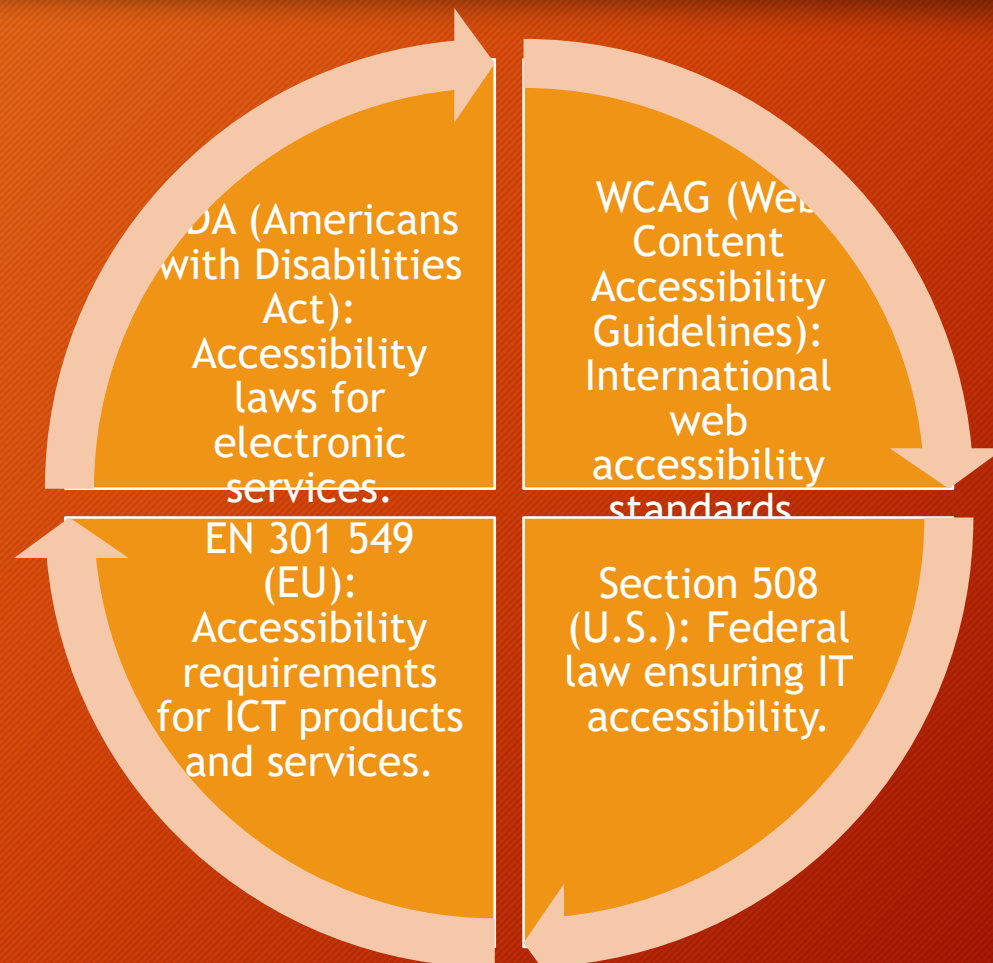
C. Gaming

- **Adaptive Controllers:** Xbox Adaptive Controller.
- **Colorblind Modes:** Alternate color schemes for visibility.

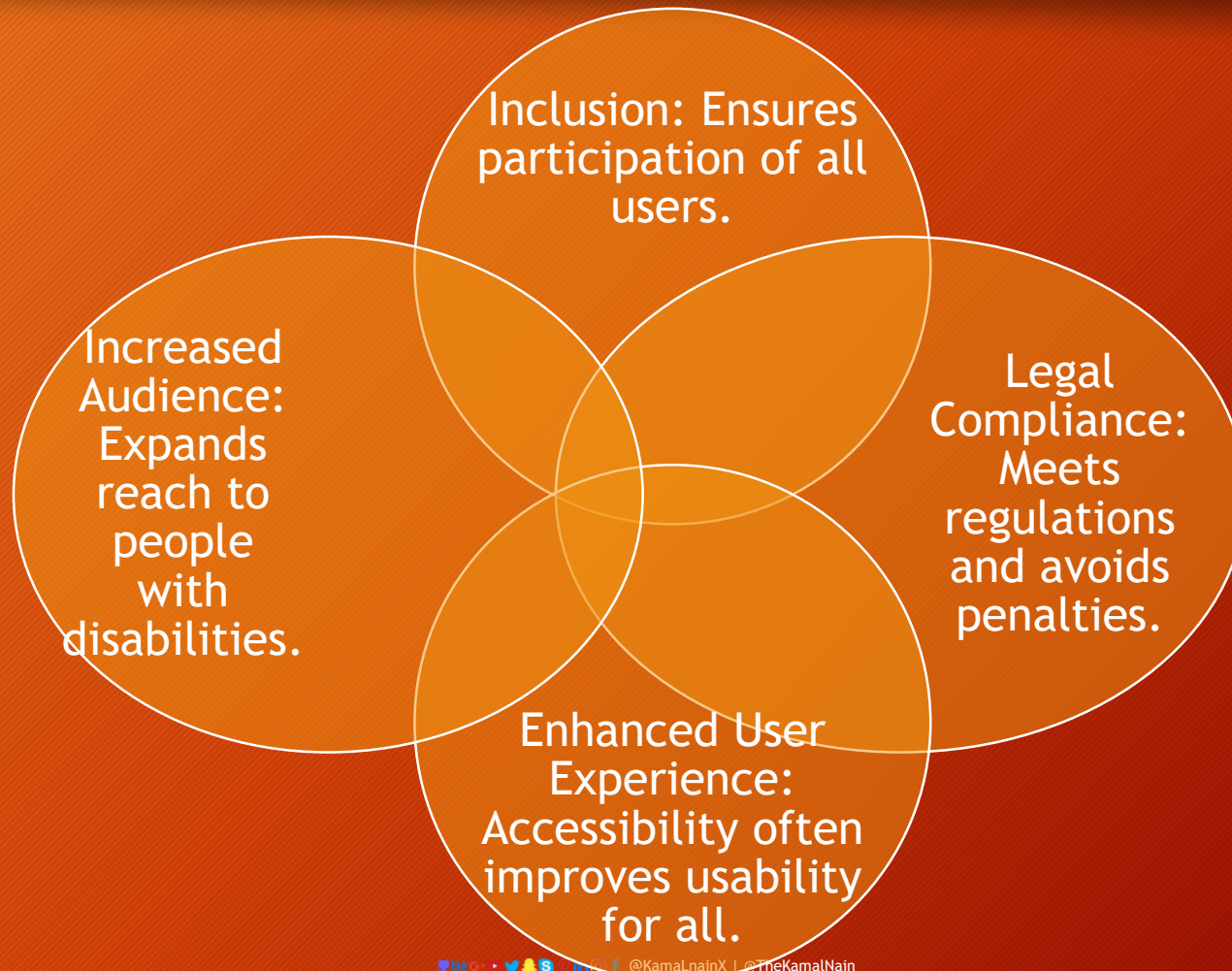
Key E-Accessible Technologies

Category	Technology	Purpose
Visual Impairments	Screen Readers, Braille Displays	Reading and navigation.
Hearing Impairments	Captions, Visual Alerts	Information delivery through visuals.
Motor Impairments	Voice Commands, Switch Controls	Input and navigation assistance.
Cognitive Impairments	Simplified Interfaces, Text-to-Speech	Ease of use and comprehension.

Global Standards for E-Accessibility



Benefits of E-Accessibility



Examples of E-Accessible Options

Platform/Tool

Accessibility Feature

YouTube

Auto-generated captions, playback speed.

Microsoft Office

Accessibility Checker, Read Aloud.

Google Chrome

Screen Reader extensions, High Contrast.

Zoom/Google Meet

Live captions, keyboard shortcuts.

Adobe Acrobat

Tagging and alt text for PDFs.