

Critical view of Input Output devices that enable ICT

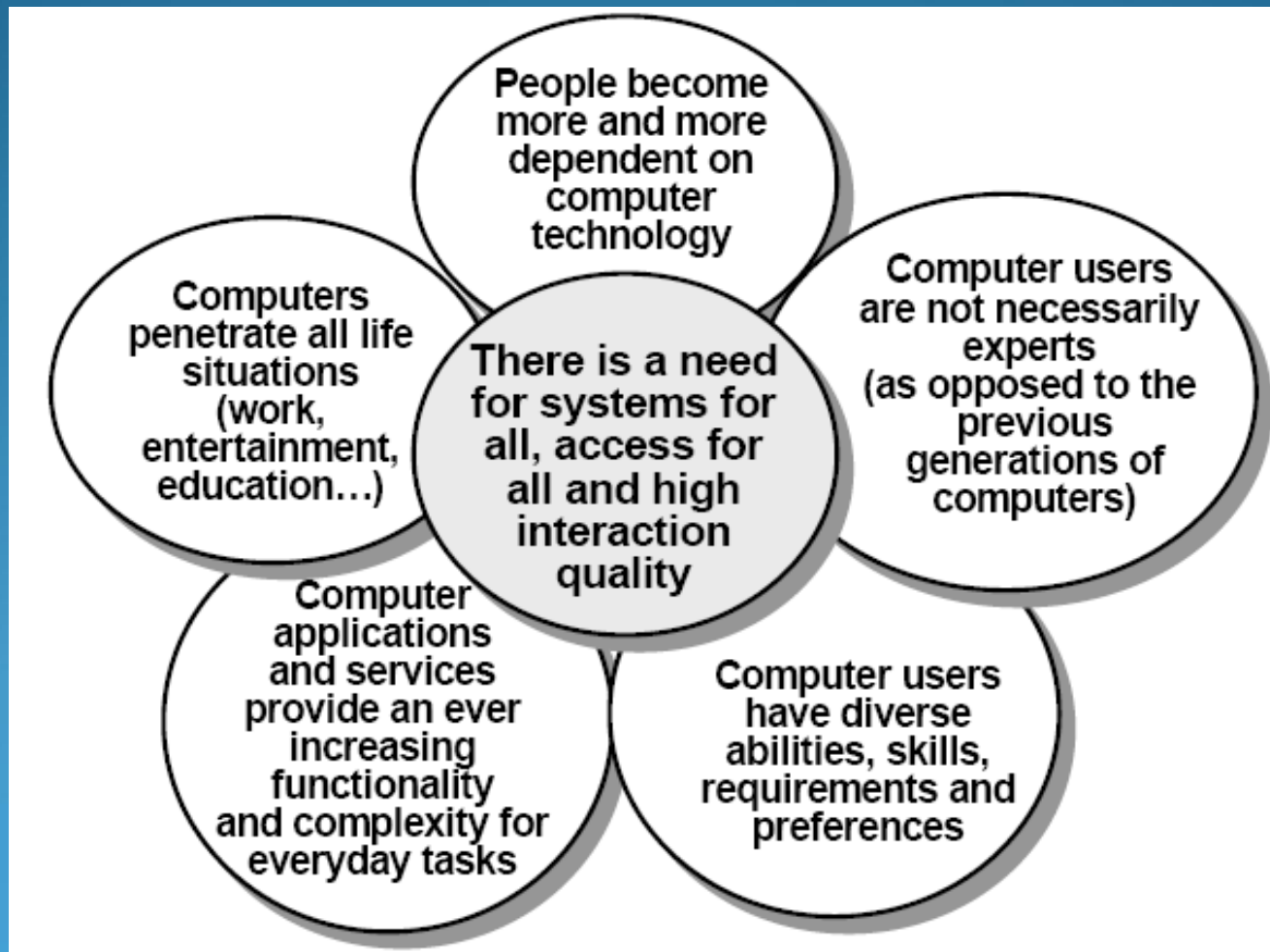
By

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Relevance of I/O devices for ICT?

- **Critical trends towards the emergence of an Information Society**



Types of I/O Devices

- Microphone/speakers
- Touch Screens
- Mouse variants
- Keyboard variants
- Trackers variants
- Mobile devices
- Biometrics
- Bar-coded cards
- Magnetic strip cards
- RFID
- Smartcards
- Specialised Switches
- Digital Image processing
- Sip and Puff switches
- Graphics/Concept Tablet
- Light pen
- Digital camera
- Scanner Variants
- Smart MIMIO boards
- Microsoft surface
- Gloves/Joystick
- Monitors/Projectors
- Printers

Note

The devices have been grouped together based on similarities in technology or usage which ever suited best. Some devices are dual purpose can be used for both input as well as output.

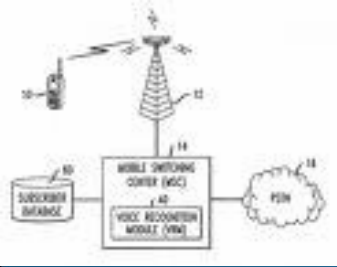
R&D Areas in IC Technologies

- **Human-Computer Interaction**
 - Managing and Interfacing with ICT
 - Includes *Devices* for ICT (like computers/hardware with compelling price/performance)
- **Sensors**
 - Acquire and Convert observations into digital formats
- **Communication**
 - Reach & Richness of networks
- **Databases/Information Systems**
 - Creating knowledge and contextual bases and algorithms for decision-making
- **Controllers/Actuators/Effectors**
 - Effecting change (feedback) in nature and the operating domain

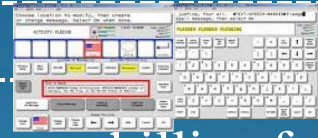
Many ICT R&D areas are inter-disciplinary

SMS with speech to txt

Microphone/speakers

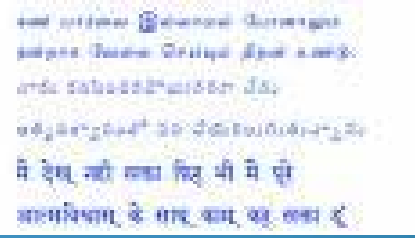


- Can be used for hands free typing-----
- Voice Commands to applications-----
- Softwares for english quite good—Dragon, phillips freespech etc
- Voice input to websites—multilingual possible-----
- Can be used for mobile applications-----



Advantages

- Illiterate people can use-----
- Can listen to text to speech—multilingual-----
- Software's for English are quite advanced



Disadvantages

- Have to train the software-----
- Prone to background noise
- Multilingual speech to text/command software poor
- Special microphones quite expensive-----



Dhvani text to speech



Touch Screens and Touch Monitors

- These devices are the most direct and simple method of computer access and interaction.
- Ideal for students who cannot understand the relationship between the mouse or the keyboard and movement on the screen.
- Instead of using a pointing device such as a mouse, the student can use their finger to point directly to objects on the screen.
- They are also suitable for those who find it hard to manipulate a mouse or other pointing devices.



- Uses:
- Dusty, dirty or wet environments where a keyboard would be damaged
 - Factory floors
- Hazardous environments where there must not be any chance of a spark
 - Petrol stations
 - Chemical plants
- Constricted areas where there is no room for another input device
 - Satellite Navigation system on a car dashboard.
- Hygienic environments where it must be simple to wipe clean
 - Restaurants
 - Surgical theatres
 - Hospitals
- Advantage:
 - Very easy to change what it is controlling by simply changing the software.
 - No moving parts
 - Can use any number of menu levels
 - Can display large text to assist less-sighted people
 - Can easily switch languages.
- Disadvantages:
 - Expensive compared to a standard keyboard or mouse.
 - Has to have specific software to make sense of the input.
 - Can be a problem seeing the screen in bright sunlight.



Multi-mouse and Mouse variants

- Finger Mouse-----



- Hands Free Mouse-----



- Foot Mouse-----



- Air Mouse-----



- **HCID: Handwear Computer Input Device Glove**-----



- Trackball-----

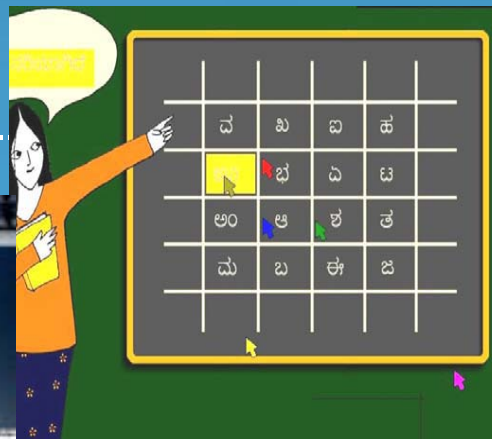


- Multi-mouse

application

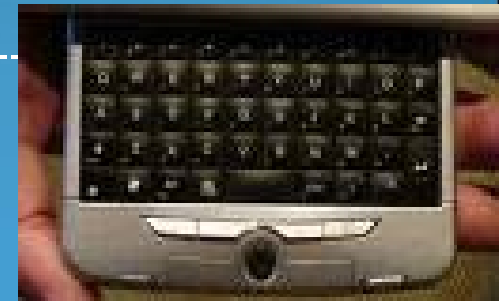
hardware-----

- Pad-----



Keyboards

- A kind of Braille keyboard
- Talking Keyboards
- Virtual keyboard
- Overlay keyboard
- Multi lingual keyboards
- Wireless keyboards
- On screen keyboards
- Flexible keyboard
- Gesture keyboard



Head movement Trackers (Brain Fingers)



- **What it does**
 - Allow you to control your computer totally hands-free. You can control most AAC software, educational software and video games.
- **How it works**
 - Headband/tracking device which detects electrical signals from your facial muscles, eye movements, and brainwaves.
 - The Brainfingers software decodes these signals into virtual fingers or Brainfingers which trigger mouse and keyboard events to control third party software such as Ezkeys, Wivik, Reach, IntelliTools, Dynavox for Windows software, etc.
 - The Cyberlink Solution can include Head-Tracking devices such as SmartNav.

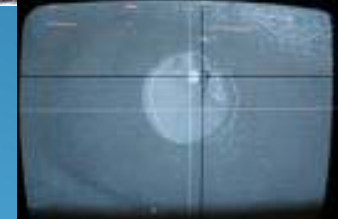
- **Who can use it**

- People with severe and multiple disabilities have success with the Cyberlink Solution.
- Computer access has been achieved by persons with disabilities such as CP, ALS, MD, MS, TBI, and Spinal Cord Injury.



Eye Tracking

- Tracks eye movement for input to computer
- Mouse Cursor control
- Uses digital camera attached to computer
- Advantages
 - No physical contact required
 - Ease of use as no special skills required
- Disadvantages
 - Limited head movement allowed
 - Cameras used are rather expensive
 - Some eqpt very expensive and still experimental
- ICT Uses
 - Use for people with disabilities





Mobile devices

- Cell phones
- PDA and other hand held's-----
- ICT Usage
 - SMS for alerts and solutions
 - Specialised applications for daily use
 - Multilingual Internet
 - Microfinance applications
 - Taking photographs to experts
 - eMail



- **Advanced Video Pack Cameras & Software-----**
SW241-AVK

- **LIVE streaming to your mobile phone**

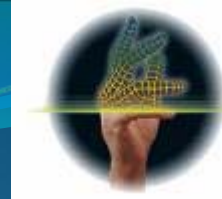
Capture-cam provides you with the software solution that enables you to view your remote CCTV camera through your mobile phone or PDA.



BIOMETRICS

- Biometrics measure and authenticate a person's identity by capturing the uniqueness of an individual's biological characteristics and later performing a match to a database of biometric characteristics.
- Biological characteristics include fingerprints, hand or face geometry, retinal or iris structure, voice or vein patterns, signature dynamics and even DNA sequences.
- Advantages over traditional identification methods.
 - Person to be identified is not necessarily required to carry and present any identification document.
 - Does not depend on the user's memory for critical identification variables like passwords and PIN that can be forgotten, lost or stolen.





- Superior Security:

- Biometric methods do not involve the danger of information exposure associated with PINs and identification cards.
- Unauthorized persons cannot guess or acquire biometric information.

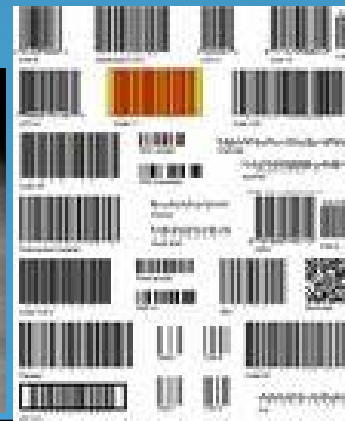
- Increased Convenience:

- Biometric methods do not require an individual to remember passwords or PINs or carry identification cards, nor do they necessitate any particular literacy level or understanding of the system by the individual being identified.



Plastic / Paper Card with Barcode

- The card with barcode option is similar to a simple card with the addition of a barcode printed on the card.
- Cards with barcodes provide quick access to information by simply scanning the card which relays and interprets the information into the barcode scanner.
- Advantages
 - Implementation of barcodes is less expensive than Smart Cards.
- Disadvantages
 - They bear limited read-only data and are incapable of storing more accurate authentication information such as biometric data.
 - Information once encoded using barcodes cannot be updated.
- ICT Usage
 - Voter ID cards
 - Hospital cards
 - Ration coupons





Magnetic Stripe Card

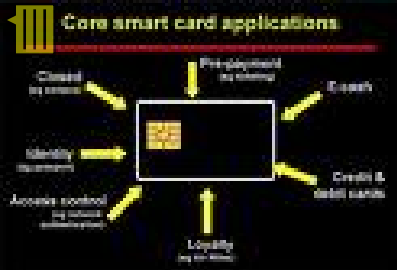


- Magnetic Stripe cards can store identification data and limited personal information on a magnetic stripe embedded within the card. The stripe usually contains identification information.
- The most common application for this type of card is in credit and ATM cards.
- Card secured against loss or theft when combined with a PIN or password.
- Advantages
 - Wide acceptability and the ability to update the stored information.
- Disadvantage
 - It needs to be handled carefully to prevent loss of data.

RADIO FREQUENCY IDENTIFICATION (RFID) TAGS

- **Radio Frequency Identification (RFID)** technology uses radio signals to identify items or individuals automatically.
- Current and potential ICT uses include person identification, security, toll collection, supply-chain management, animal identification.
- Advantage
 - Distribution of Benefits and low cost
- Disadvantages
 - Works over very small distances





Smart Cards



- Smart Card has a microprocessor or memory chip embedded in it that, when coupled with a reader, has the processing power to serve many different applications.
- As an access-control device, smart cards make personal and business data available only to the appropriate users.
- Advantages of smart cards
 - Large memory capacity. This allows each card to be "personalized" for a user by including biometric information such as a fingerprint.
 - Multiple applications can be housed on the same device. Smart Cards provide data portability, security and convenience.

Relevance to ICT

- Loan disbursement in Swayam Krishi sangam project
- Other micro finance
- Mobile Bank interaction
- Voter ID cards
- Ration cards
- Hospital cards
- Social security in the future



Laptop/Mobile readers



Specialised Switches

- BASS SWITCH--Good for foot movement-----



- 5 inch diameter Pressure switch---



- 15 preset pressure positions switch-----



- Spec switches--These allow for a number of events to be activated...-----



- Soft pad, head activated-----



- Extra sensitivity to tiny muscle movements---

- Advantages

- For small children and people with disabilities

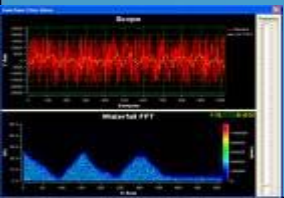


Still experimental

Digital Image processing



- Mouse controlled by moving head around slightly.
- Works by using small reflective disk on to your glasses or forehead then the device locks on to its position. As you move your head around, the device tracks it and sends up-down, left-right input into the computer to control the mouse. There are also two switch inputs available to allow right and left mouse switches to be emulated.
- provide basic head control of the cursor without the installation of any additional software.
- Advantages
 - Allows a person to control the mouse by head movement



Sip and Puff switches



- This kind of switch is excellent for someone with limited mobility. You simply suck or puff down the tube in order to activate a switch. The switch itself is connected to the computer.
- Specific software running on the computer can take this input and act on it in any number of ways.
- Benefits
 - Allows a person who has very limited physical ability to control a computer.



Light Pens

- Light Pens allow users to select objects, items or icon with direct contact to the display monitor.
- Advantages of this type of device is reduced level of eye and hand co-ordination and allows the user to select a specific location on an object, item or image.
- Light pens interact with monitor screens to generate their input. The photocell of the light pen detects the light emanations when it makes contact with the monitor and send the information
- Commands are dependent on the software support.
- Philips light pen-----



Concept Tablet



- The concept tablet is a touch sensitive tablet, similar to the graphics tablet. But instead of a pen, a sheet of plastic with various pictures and graphics is placed on the surface
- Tapping a picture will cause a command to be input into the computer
- Advantages:
 - Can be used to issue specific commands to the computer.
 - Avoids staff having to know the price of everything.
 - Allows software to be controlled with a single touch of the tablet.
- Disadvantage:
 - There has to be the right software running for the command to make sense.
 - Number of commands that can be issued is limited by the size of the device.

Graphics Tablet



Scanners/variants



- Scans and Copies-----
- Can be used as a photocopier or fax machine and is used to turn pictures or documents into an image that the computer can understand.

- Special barcode scanners-----

- Hand held medical scanners-----

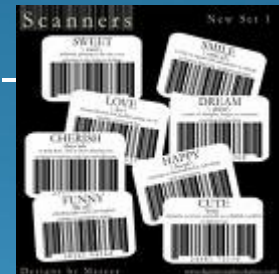
- Biometric Scanners---

- Advantages

- Can be used to scan and send pictures over Internet
- 3D object scanning is possible-----
- cheap

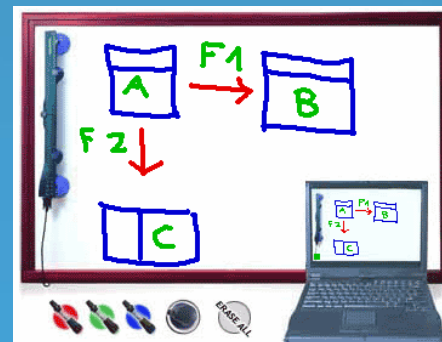
- Disadvantages

- Cheaper ones are Bulky and have slow scan speeds



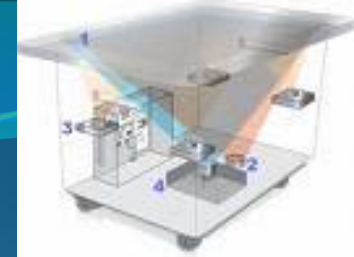
Smart MIMIO Boards

- "MIMIO" – a small device that is attached to a whiteboard. (A "flipchart version" of mimio is also available.) It records all pen and eraser movements and thus can keep a complete record of the whiteboard changes during a session.
- Also comes with special pens with refillable ink.
- Projected whiteboards work even with fingertip or use special inkless pens.
- ICT advantages
 - Teaching session can be recorded and easily reused.
 - Can be used to simultaneously teach in multiple locations
 - Forces students to write legibly
 - Scalable wrt audience.
 - On the move class rooms
 - Mouse mode use possible





Microsoft Surface



- An interactive PC with no keyboard or mouse
- Touch and control with your fingers
- Senses objects placed on the table top
- Blending the virtual and real worlds together.
- Multitouch screen, capable of processing multiple inputs from multiple users.
- Surface can also recognize objects by their shapes or by reading coded "domino" tags (i.e. RFID)
- Microsoft Surface has infrared vision
- Simply by embedding any variety of wireless transceivers, such as Bluetooth, Wi-Fi, RFID, etc. it can sync instantly with any device that touches its surface

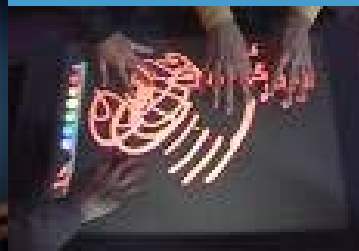


- ICT advantage

- Can be used to teach children interactively
- Substitute to the multi mouse application
- Interactive white boarding
- Does not require any skill set
- Illiterate people can also use



Very expensive at the moment



Haptic gloves, Joystics



- Used to interact with the virtual environment inside the computer.
- Handle real objects just as you would handle them in a real world scenario
- ICT uses
 - Can be used to teach assembling objects-----
 - No mouse or keyboard required
 - Can be used for gestures and teaching sign language
 - Can be used to teach children by manipulating 3D objects
- Constraints
 - Expensive technology
 - Better experience if used with a HMD----





Monitors/projectors



- LCD monitors lightweight, low power consumption
- DLP projectors , small, lightweight, low power and --- extended bulb life.



• ICT advantages

- Low power consumption can run from batteries for long hours-----
- Ideal for class room teaching
- Can be connected to other audio visual devices



pico-projector

• Disadvantages

- Expensive at the moment
- A no of models require stable power supply

Ruggedised DLP projector





shopkeepers

Printers



- Various varieties, lasers, inkjets, thermal, dot-matrix etc
- Can be used to print on variety of media
- ICT advantages

- Receipts—low cost portable thermal models-----

- Information pamphlets printing-----

- Barcode printers-----

- Low-cost local newspaper-----



- Disadvantages

- Cost of running still very high
- Not very robust for use in dusty environment
- Portability still a issue

Thank You

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