Introduction to Information and Communication Technologies

Chapter 5
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Agenda

- Input Device
  - Keyboard
  - Pointing Devices
  - Scanning Devices
  - Audio and Video input Devices
- Output Devices
  - Display Devices
  - Printing Devices
- Storage Devices
  - Magnetic Discs
  - Optical Discs
  - Tape
  - Cards

Input Devices

- An **input device** is any hardware component that allows users to enter data and instructions into a computer.
- Two of the more widely used input devices are the keyboard and the Pointing device.
- Most computers include a keyboard or keyboarding capabilities.
- The mouse is a **pointing device** because it allows a user to control a pointer on the screen.
- In a graphical user interface, a **pointer** is a small symbol on the screen whose location and shape change as a user moves a pointing device.
- A pointing device can select text, graphics, and other objects; and click buttons, icons, links, and menu commands.

Keyboard

- A **keyboard** is an input device that contains keys users press to enter data and instructions into a computer.
- All computer keyboards have a typing area that includes the letters of the alphabet, numbers, punctuation marks, and other basic keys. Many desktop computer keyboards also have a numeric keypad on the right side of the keyboard.
- Keyboards with media control buttons allow you to run and control your media player program, access the computer's CD/DVD drive, and adjust speaker volume.
- Desktop computer keyboards often attach via a cable to a serial port, a keyboard port, or a USB port on the system unit. Some keyboards, however, do not have any wires connecting the keyboard to the system unit.

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Pointing Devices

- A **mouse** is a pointing device that fits comfortably under the palm of your hand. With a mouse, users control the movement of the pointer. A mouse connects to a computer in several ways.
- A **mechanical mouse**, which was the first type of mouse used with personal computers, has a rubber or metal ball on its underside. Electronic circuits in the mouse translate the movement of the mouse into signals the computer can process.
- An **optical mouse** uses devices that emit and sense light to detect the mouse's movement. Some use optical sensors, and others use a laser.
- An **air mouse** is a newer type of motion-sensing mouse that, in addition to the typical buttons, allows you to control objects, media players, and slide shows by moving the mouse in predetermined directions through the air.

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Pointing Devices

- A **trackball** is a stationary pointing device with a ball on its top or side. To move the pointer using a trackball, you rotate the ball with your thumb, fingers, or the palm of your hand. In addition to the ball, a trackball usually has one or more buttons that work just like mouse buttons.

- A **touchpad** is a small, flat, rectangular pointing device that is sensitive to pressure and motion. To move the pointer using a touchpad, slide your fingertip across the surface of the pad. Some touchpads have one or more buttons around the edge of the pad that work like mouse buttons. On most touchpads, you also can tap the pad's surface to imitate mouse operations such as clicking. Touchpads are found most often on notebook computers.

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Pointing Devices

- A **pointing stick** is a pressure-sensitive pointing device shaped like a pencil eraser that is positioned between keys on a keyboard. To move the pointer using a pointing stick, you push the pointing stick with a finger. The pointer on the screen moves in the direction you push the pointing stick. By pressing buttons below the keyboard, users can click and perform other mouse-type operations with a pointing stick.

- A **touch screen** is a touch-sensitive display device. Users can interact with these devices by touching areas of the screen. Because touch screens require a lot of arm movements, you do not enter large amounts of data using a touch screen. Instead, users touch words, pictures, numbers, letters, or locations identified on the screen. Kiosks, which are freestanding computers, often have touch screens. Many handheld game consoles also have touch screens.

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Pointing Devices

- Mobile users often enter data and instructions with a pen-type device. With **pen input**, users write, draw, and tap on a flat surface to enter input. The surface may be a monitor, a screen, a special type of paper, or a graphics tablet. Two devices used for pen input are the stylus and digital pen.

- A **stylus** is a small metal or plastic device that looks like a tiny ink pen but uses pressure instead of ink.

- A **digital pen**, which is slightly larger than a stylus, is available in two forms: some are pressure sensitive; others have built-in digital cameras.

- A **graphics tablet** is a flat, rectangular, electronic, plastic board. Architects, mapmakers, designers, artists, and home users create drawings and sketches by using a pressure-sensitive pen on a graphics tablet

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Pointing Devices

- Video games and computer games use a **game controller** as the input device that directs movements and actions of on-screen objects.

- A **gamepad**, which is held with both hands, controls the movement and actions of players or objects in video games or computer games. On the gamepad, users press buttons with their thumbs or move sticks in various directions to trigger events.

- A **joystick** is a handheld vertical lever mounted on a base. You move the lever in different directions and press buttons to control the actions of the simulated vehicle or player.

- A **wheel** is a steering-wheel-type input device that you turn to simulate driving a car, truck, or other vehicle.

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Scanning Devices

- An optical scanner, usually called a **scanner**, is a light-sensing input device that reads printed text and graphics and then translates the results into a form the computer can process.

- A **flatbed scanner** works in a manner similar to a copy machine except it creates a file of the document in memory instead of a paper copy. Once you scan a picture or document, you can display the scanned object on the screen, modify its appearance, store it on a storage medium, print it, fax it, attach it to an e-mail message, include it in another document, or post it to a Web site or photo community for everyone to see.

- Many scanners include OCR (optical character recognition) software, which can read and convert text documents into electronic files. OCR software converts a scanned image into a text file that can be edited.

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Scanning Devices

- An optical reader is a device that uses a light source to read characters, marks, and codes and then converts them into digital data that a computer can process.

- **Optical character recognition** (**OCR**) involves reading typewritten, computer-printed, or hand-printed characters from ordinary documents and translating the images into a form the computer can process. Most **OCR devices** include a small optical scanner for reading characters and sophisticated software to analyze what is read.

- **Optical mark recognition** (**OMR**) devices read hand-drawn marks such as small circles or rectangles. A person places these marks on a form, such as a test, survey, or questionnaire answer sheet.

- A **bar code reader**, also called a bar code scanner, is an optical reader that uses laser beams to read bar codes. A **bar code** is an identification code that consists either of a set of vertical lines and spaces of different widths

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Scanning Devices

- A **magnetic stripe card reader**, often called a magstripe reader, reads the magnetic stripe on the back of credit cards, entertainment cards, bank cards, and other similar cards. The stripe contains information identifying you and the card issuer. Some information stored in the stripe includes your name, account number, the card's expiration date, and a country code.

- **MICR READERS MICR** (magnetic-ink character recognition) devices read text printed with magnetized ink. An **MICR reader** converts MICR characters into a form the computer can process. The banking industry almost exclusively uses MICR for check processing.

- **Biometrics** is the technology of authenticating a person's identity by verifying a personal characteristic. Biometric devices grant users access to programs, systems, or rooms by analyzing some physiological or behavioral characteristic. Examples include fingerprints, hand geometry, facial features, voice, signatures, and eye patterns.

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Audio Input Devices

- **Voice input** is the process of entering input by speaking into a microphone. Uses of voice input include instant messaging that supports voice conversations, chat rooms that support voice chats, Internet telephony, and voice recognition. Recall that Internet telephony, or Voice over IP, enables users to speak to other users over the Internet.

- **Voice recognition**, also called **speech recognition**, is the computer's capability of distinguishing spoken words. Voice recognition programs recognize a vocabulary of preprogrammed words. The vocabulary of voice recognition programs can range from two words to millions of words.

- Voice input is part of a larger category of input called audio input. **Audio input** is the process of entering any sound into the computer such as speech, music, and sound effects. To enter high-quality sound into a personal computer, the computer must have a sound card. E. g. MIDI

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Video Input Devices

- **Video input** is the process of capturing full-motion images and storing them on a computer's storage medium such as a hard disk or DVD. Some video devices use analog video signals. A **digital video (DV) camera**, by contrast, records video as digital signals instead of analog signals.

- Many DV cameras have the capability of capturing still frames, as well as motion. To transfer recorded images to a hard disk or CD or DVD, users connect DV camera directly to a USB port or a FireWire port on the system unit.

- A **PC video camera**, or **PC camera**, is a type of digital video camera that enables a home or small business user to capture video and still images, send e-mail messages with video attachments, add live images to instant messages, broadcast live images over the Internet, and make video telephone calls.

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Output Devices: Display Devices

- A **display device** is an output device that visually conveys text, graphics, and video information.

- Desktop computers typically use a monitor as their display device. A **monitor** is a display device that is packaged as a separate peripheral.

- Display devices usually show text, graphics, and video information in color. Some, however, are monochrome.

- Monochrome means the information appears in one color (such as white, amber, green, black, blue, or gray) on a different color background (such as black or grayish-white).

- Some PDAs and other mobile devices use monochrome displays because they require less battery power.

- Types of display devices include LCD monitors and screens, plasma monitors, and CRT monitors.

- The following pages discuss each of these display devices.

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Display Devices

- A **CRT monitor** is a desktop monitor that contains a cathode-ray tube (Figure 5-33). A cathode-ray tube (CRT) is a large, sealed glass tube. The front of the tube is the screen.

- CRT monitors produce a small amount of electromagnetic radiation. Electromagnetic radiation (EMR) is a magnetic field that travels at the speed of light.

- The quality of a CRT monitor depends largely on its resolution, dot pitch, and refresh rate.

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Display Devices

- An **LCD monitor**, also called a flat panel monitor, is a desktop monitor that uses a liquid crystal display to produce images.

- Mobile computers, such as notebook computers and Tablet PCs, and mobile devices, such as ultra personal computers, portable media players, smart phones, and PDAs, often have built-in LCD screens.

- A **liquid crystal display** (**LCD**) uses a liquid compound to present information on a display device. Computer LCDs typically contain fluorescent tubes that emit light waves toward the liquid-crystal cells, which are sandwiched between two sheets of material.

- The quality of an LCD monitor or LCD screen depends primarily on its resolution, response time, brightness, dot pitch.

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Display Devices

- Large business users or power users sometimes have plasma monitors, which often measure more than 60 inches wide.

- A **plasma monitor** is a display device that uses gas plasma technology, which sandwiches a layer of gas between two glass plates.

- Plasma monitors offer larger screen sizes and richer colors than LCD monitors but are more expensive. Like LCD monitors, plasma monitors can hang directly on a wall.

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Printers

- A **printer** is an output device that produces text and graphics on a physical medium such as paper or transparency film. Many different printers exist with varying speeds, capabilities, and printing methods.

- The following pages discuss producing printed output and the various printer types including ink-jet printers, photo printers, laser printers, thermal printers, mobile printers, plotters, and large format printers.

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Impact Printers

- An **impact printer** forms characters and graphics on a piece of paper by striking a mechanism against an inked ribbon that physically contacts the paper.
- Impact printers are ideal for printing multipart forms because they easily print through many layers of paper. Two commonly used types of impact printers are dot-matrix printers and line printers.
- A **dot-matrix printer** is an impact printer that produces printed images when tiny wire pins on a print head mechanism strike an inked ribbon. When the ribbon presses against the paper, it creates dots that form characters and graphics.

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Impact Printers

- **Dot-matrix printers** typically use continuous-form paper, in which thousands of sheets of paper are connected together end to end. The speed of most dot-matrix printers ranges from 300 to 1100 characters per second (cps), depending on the desired print quality.
- A **line printer** is a high-speed impact printer that prints an entire line at a time. The speed of a line printer is measured by the number of lines per minute (lpm) it can print. Some line printers print as many as 3,000 lpm.

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Non Impact Printers

- A **nonimpact printer** forms characters and graphics on a piece of paper without actually striking the paper. Some nonimpact printers spray ink, while others use heat or pressure to create images.
- An **ink-jet printer** is a type of nonimpact printer that forms characters and graphics by spraying tiny drops of liquid ink onto a piece of paper. Ink-jet printers have become a popular type of color printer for use in the home. Ink-jet printers produce text and graphics in both black-and-white and color on a variety of paper types.
- As with many other input and output devices, one factor that determines the quality of an ink-jet printer is its resolution. Printer resolution is measured by the number of dots per inch (dpi) a printer can print. Most ink-jet printers can print from 1200 to 4800 dpi.
- The speed of an ink-jet printer is measured by the number of pages per minute (ppm) it can print. Most ink-jet printers print from 6 to 33 ppm. Graphics and colors print at a slower rate.

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Non Impact Printers

- A **photo printer** is a color printer that produces photo-lab-quality pictures. Some photo printers print just one or two sizes of images, for example, 3 X 5 inches and 4 X 6 inches. Others print up to letter size, legal size, or even larger.
- Many photo printers use ink-jet technology. With models that can print letter-sized documents, users connect the photo printer to their computer and use it for all their printing needs. Most photo printers are PictBridge enabled, so you can print pictures without a computer.
- **PictBridge** is a standard technology that allows you to print pictures directly from a digital camera by connecting a cable from the digital camera to a USB port on the printer.

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Non Impact Printers

- A **laser printer** is a high-speed, high-quality nonimpact printer. Laser printers for personal computers ordinarily use individual sheets of paper stored in one or more removable trays that slide in the printer case.

- Laser printers print text and graphics in high-quality resolutions, usually ranging from 1200 to 2400 dpi. While laser printers usually cost more than ink-jet printers, they also are much faster.

- A laser printer for the home and small office user typically prints black-and-white text at speeds of 12 to 35 ppm. Color laser printers print 8 to 30 ppm. Laser printers for large business users print more than 150 ppm.

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Non Impact Printers

- A **thermal printer** generates images by pushing electrically heated pins against heat-sensitive paper. Basic thermal printers are inexpensive, but the print quality is low and the images tend to fade over time. Self-service gas pumps often print gas receipts using a built-in lower-quality thermal printer.

- A **mobile printer** is a small, lightweight, battery-powered printer that allows a mobile user to print from a notebook computer, Tablet PC, PDA, or smart phone while traveling. Barely wider than the paper on which they print, mobile printers fit easily in a briefcase alongside a notebook computer. Mobile printers mainly use ink-jet or thermal technology.

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Plotters

- **Plotters** are sophisticated printers used to produce high-quality drawings such as blueprints, maps, and circuit diagrams.
- These printers are used in specialized fields such as engineering and drafting and usually are very costly.
- Using ink-jet printer technology, but on a much larger scale, a **large-format printer** creates photorealistic- quality color prints.
- Graphic artists use these high-cost, high-performance printers for signs, posters, and other professional quality displays

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Storage Devices

- A **storage medium** (media is the plural), also called **secondary storage**, is the physical material on which a computer keeps data, instructions, and information. Examples of storage media are hard disks, floppy disks, CDs and DVDs, tape, PC Cards and ExpressCard modules, flash memory cards, USB flash drives, smart cards, and microfilm.
- **Capacity** is the number of bytes (characters) a storage medium can hold. A typical hard disk has 250 GB (approximately 250 billion bytes) of storage capacity.
- A **storage device** is the computer hardware that records and/or retrieves items to and from storage media.
- **Writing** is the process of transferring data, instructions, and information from memory to a storage medium.
- **Reading** is the process of transferring these items from a storage medium into memory.

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STORAGE TERMS

Storage Term	Approximate Number of Bytes	Exact Number of Bytes
Kilobyte (KB)	1 thousand	2^{10} or 1,024
Megabyte (MB)	1 million	2^{20} or 1,048,576
Gigabyte (GB)	1 billion	2^{30} or 1,073,741,824
Terabyte (TB)	1 trillion	2^{40} or 1,099,511,627,776
Petabyte (PB)	1 quadrillion	2^{50} or 1,125,899,906,842,624
Exabyte (EB)	1 quintillion	2^{60} or 1,152,921,504,606,846,976
Zettabyte (ZB)	1 sextillion	2^{70} or 1,180,591,620,717,411,303,424
Yottabyte (YB)	1 septillion	2^{80} or 1,208,925,819,614,629,174,706,176

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- **Magnetic disks** use magnetic particles to store items such as data, instructions, and information on a disk's surface. Depending on how the magnetic particles are aligned, they represent either a 0 bit or a 1 bit.

- Magnetic disks store data and instructions in tracks and sectors (Figure 6-3). A track is a narrow recording band that forms a full circle on the surface of the disk. The disk's storage locations consist of pie-shaped sections, which break the tracks into small arcs called sectors. On a magnetic disk, a sector typically stores up to 512 bytes of data.

- Two types of magnetic disks are hard disks and floppy disks. Some disks are portable; others are not. With respect to a storage medium, the term portable means you can remove the medium from one computer and carry it to another computer.
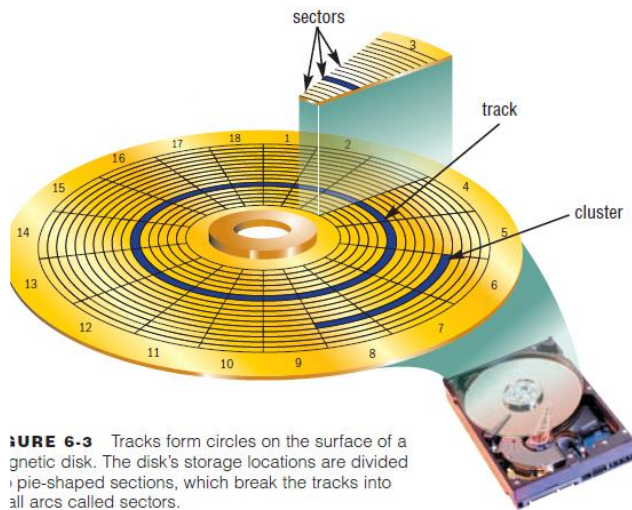
Magnetic Disc

FIGURE 6-3 Tracks form circles on the surface of a magnetic disk. The disk's storage locations are divided into pie-shaped sections, which break the tracks into small arcs called sectors.

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Hard Disk

- A **hard disk** is a storage device that contains one or more inflexible, circular platters that store data, instructions, and information.

- The system unit on most desktop and notebook computers contains at least one hard disk. The entire device is enclosed in an airtight, sealed case to protect it from contamination. A hard disk that is mounted inside the system unit sometimes is called a fixed disk because it is not portable.

- Traditionally, hard disks stored data using **longitudinal recording**, which aligned the magnetic particles horizontally around the surface of the disk. With **perpendicular recording**, by contrast, hard disks align the magnetic particles vertically, or perpendicular to the disk's surface, making much greater storage capacities possible.

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Floppy Disk

- A **floppy disk**, also called a **diskette**, is a portable, inexpensive storage medium that consists of a thin, circular, flexible plastic film with a magnetic coating enclosed in a square shaped plastic shell.

- A typical floppy disk is 3.5 inches wide and has storage capacities up to 1.44 MB. Floppy disks are not as widely used as they were 15 years ago because of their low storage capacity.

- A **floppy disk drive** is a device that reads from and writes on a floppy disk. A user inserts a floppy disk in and removes it from a floppy disk drive.

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Optical Disk

- An **optical disc** is a type of optical storage media that consists of a flat, round, portable, disc made of metal, plastic, and lacquer. These discs usually are 4.75 inches in diameter and less than one-twentieth of an inch thick.

- Optical discs primarily store software, data, digital photographs, movies, and music. Some optical disc formats are read only, meaning users cannot write (save) on the media. Others are read/write, which allows users to save on the disc just as they save on a hard disk.

- Optical discs store items by using microscopic pits (indentations) and lands (flat areas) that are in the middle layer of the disc. A high-powered laser light creates the pits.

- A lower-powered laser light reads items from the disc by reflecting light through the bottom of the disc, which usually is either solid gold or silver in color. The reflected light is converted into a series of bits the computer can process.

CD-Rs and CD-RWs

- Many personal computers today include either a CD-R or CD-RW drive as a standard feature.
- A **CD-R** (compact disc-recordable) is a multisession optical disc on which users can write, but not erase, their own items such as text, graphics, and audio. Multisession means you can write on part of the disc at one time and another part at a later time. Each part of a CD-R can be written on only one time, and the disc's contents cannot be erased. Writing on the CD-R requires a CD recorder or a **CD-R drive**. A CD-R drive usually can read both audio CDs and standard CD-ROMs.
- A **CD-RW** (compact disc-rewritable) is an erasable multisession disc you can write on multiple times. To write on a CD-RW disc, you must have CD-RW software and a **CD-RW drive**. Using a CD-RW disc, users easily back up large files from a hard disk

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DVD ROM

- A **DVD-ROM** (digital versatile disc-read-only memory or digital video disc-read-only memory) is a high-capacity optical disc on which users can read but not write or erase. Manufacturers write the contents of DVD-ROMs and distribute them to consumers. DVD-ROMs store movies, music, huge databases, and complex software

DVD, BD, AND HD DVD STORAGE CAPACITIES

Sides	Layers	DVD-ROM	BD-ROM	HD DVD-ROM
1	1	4.7 GB	25 GB	15 GB
1	2	8.5 GB	50 GB	30 GB
2	1	9.4 GB	50 GB	30 GB
2	2	17 GB	100 GB	60 GB

- A DVD-ROM uses one of three storage techniques. The first involves making the disc denser by packing the pits closer together. The second involves using two layers of pits. For this technique to work, the lower layer of pits is semitransparent so the laser can read through it to the upper layer. This technique doubles the capacity of the disc. Finally, some DVD-ROMs are double-sided. Two newer, more expensive competing DVD formats are **Blu-ray** and **HD DVD**.

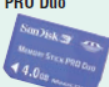Wasif Ali Govt. Zamindar Graduate college Gujrat

Tape

- **Tape** is a magnetically coated ribbon of plastic capable of storing large amounts of data and information at a low cost. Tape no longer is used as a primary method of storage. Instead, business users utilize tape most often for long-term storage and backup.

- A **tape drive** reads and writes data and information on a tape. Although older computers used reel-to-reel tape drives, today's tape drives use tape cartridges. A tape cartridge is a small, rectangular, plastic housing for tape. Tape cartridges that contain quarter-inch-wide tape are slightly larger than audiocassette tapes.

- Tape storage requires sequential access, which refers to reading or writing data consecutively.

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Flash Memory

- Common types of flash memory cards include **CompactFlash** (**CF**), **Secure Digital** (**SD**), **xD Picture Card**, and **Memory Stick**.

- The table in Figure 6-23 compares storage capacities and uses of these miniature mobile storage media. Depending on the device, manufacturers claim miniature mobile storage media can last from 10 to 100 years.

Media Name	Storage Capacity	Use
CompactFlash	64 MB to 16 GB	Digital cameras, PDAs, smart phones, photo printers, portable media players, notebook computers, desktop computers
Secure Digital	64 MB to 4 GB	Digital cameras, digital video cameras, PDAs, smart phones, photo printers, portable media players
xD Picture Card	64 MB to 2 GB	Digital cameras, photo printers
Memory Stick	256 MB to 4 GB	Digital cameras, digital video cameras, PDAs, photo printers, smart phones, handheld game consoles, notebook computers
Memory Stick PRO Duo	128 MB to 4 GB	Digital cameras, smart phones, handheld game consoles

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Flash Memory Cards

- To view, edit, or print images and information stored on miniature mobile storage media, you transfer the contents to your desktop computer or other device.

- Some printers have slots to read flash memory cards. If your computer or printer does not have a built-in slot, you can purchase a **card reader/writer**, which is a device that reads and writes data, instructions, and information stored on flash memory cards.

- Card reader/writers usually connect to the USB port or FireWire port on the system unit. The type of card you have will determine the type of card reader/writer needed.

USB Flash Drives

- A **USB flash drive**, sometimes called a pen drive or thumb drive, is a flash memory storage device that plugs in a USB port on a computer or mobile device.

- USB flash drives are convenient for mobile users because they are small and lightweight enough to be transported on a keychain or in a pocket. USB flash drives have become the mobile user's primary storage device, making the floppy disk nearly obsolete because they have much greater storage capacities and are much more convenient to carry.

- Current USB flash drives have storage capacities ranging from 1 GB to 4 TB, with the latter being extremely expensive.

THE END