

1) Introduction to Multimedia Technology

- a) **Multimedia:** (Halimah Badioze Zaman) A **seamless integration** of various types of media: **text, numerics, graphics, images, video, animation** and **sound** in a digital environment besides its interactive ability to enable users to obtain information in a **non-linear** way.
- i) **Features of Multimedia:**
- (1) **Interactivity:** When the **end-user** is able to control the elements of media that are required, and subsequently obtains the required information in a **non-linear** way
 - (2) **Navigation:** Enables the user to explore and navigate from one page to another.
 - (3) **Hyperlink:** **Non-linear** navigation of “jumping” for the required information.
 - (4) **Easy to use, Easy to understand:**
- ii) **Types of Multimedia:**
- (1) **Text:** The **basic element** for all multimedia applications. **Directly informs** the user about the information that it wishes to convey.
 - (2) **Graphics:** Pictures as visuals in **digital form** used in multimedia presentations. **2 types of graphics:**
 - (a) **Bitmap Graphics (Image Raster):** Formed by **pixels** arranged in specific ways in a matrix form
 - (b) **Vector Graphics:** Formed by **lines** that follow mathematical equations called vector.
 - (3) **Animation:** **Movements** added to **static images** through various methods.
 - (4) **Audio:** Sound in **Digital form** used in Multimedia Presentations.
 - (5) **Video:** Moving Pictures in **digital form** in Multimedia Presentations

2) Multimedia Technology Applications

- a) **Video Teleconferencing:** Transmission of **synchronised video and audio** in **real-time** through computer **networks** in between two or more multipoints (or participants) separated by locations.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Reduces travelling cost and saves time; • Increases productivity and improves the quality of teaching and learning; • Make quick and spontaneous decisions; • Increases satisfaction in teaching or at the workplace 	<ul style="list-style-type: none"> • Video requires more bandwidth than audio. Therefore, Video teleconferencing is expensive. (Use Video compression to solve) • Requires a network to support short-delay as audio and video are asynchronous and it is real-time. (Use Optimum multimedia network; fibre optics or ISDN)

- b) **Multimedia Store and Forward Mail:** Allow users to **generate, modify** and **receive documents** that contain **multimedia**. *Eg. Gmail, Hotmail, Yahoo etc*
- c) **Reference Source:** Using multimedia to **obtain information** that we require. *Eg. Multimedia Encyclopedias, directories, electronic books and dictionaries etc.*
- d) **Edutainment and Infotainment:**
- i) **Edutainment:** The inclusion of **multimedia** in the field of **education** gave birth to edutainment, which is a new learning approach combining **education** with **entertainment**. *Eg. Math Blaster, Fun Maths etc.*
 - ii) **Infotainment:** Combination of **information** and **entertainment**. *Eg Prodigy, America Online, MSN*
- e) **Advertising and Purchasing:** Most of the web sites visited have many **advertisements with multimedia** features with the objective of marketing merchandise or offering services online.
- f) **Digital Library:** With the existence of the digital or **virtual library**, students no longer need to go to libraries but can search and **obtain information** that they require through the **Internet**.
- i) **Features enabling Digital library:**
- (1) **National and international telephone networks** with speed and bandwidth which can transfer big and complex text files and graphic digital images.
 - (2) **Protocol and standards** which facilitates ease of connection among computers
 - (3) **Automated digital instruments** such as scanners and faxes which can transfer data and information in real-time.

g) Education and Health Applications

i) **Education:** Distance learning, using interactive multimedia while teaching, multimedia training products

ii) **Health:** Information shown using multimedia like graphics or video are more meaningful, **telemedicine**

h) **Other Applications:** Video on Demand (VOD), Kiosks, Hybrid Applications, Applications for; recreation, commerce, training etc.

3) Multimedia Hardware

a) Basic Hardware of a Multimedia Computer System:

i) **Microprocessor:** **Heart** of a multimedia computer system. It performs all the **data processing** in the computer and displays the results.

ii) **Main Memory (RAM):** The **higher the RAM**, the **higher the capacity** of the computer.

iii) **CD-ROM Drive:** **Replaced the floppy disk** as the medium of storage and **distribution of media** software.

(1) **Advantages over floppy disk:** include its **speed** and **ability to store more data**.

(2) **Speed of CD-ROM:** measured in rotational speed "X" unit. **X = 150 KB/s**, 2X = 300 KB/s

iv) **Digital Versatile Disk (DVD):** Successor of CD-ROM, can store upto 4.7 GB per surface.

(1) **Advantages of DVD:** It can store **data on both sides** (storage dbl) and is **much faster** than a CD-ROM.

v) **Video Capture Card:** (Graphics Card) is the hardware used to **support multimedia applications** especially **video and graphic displays**.

(1) **No. of Colours = 2^n** , where **n** is the **bit** amount. Eg. 8-bit card supports 256 (2^8) colours only.

(2) **Resolution:** 800x600, 1024x768, 1152x1024 pixels etc

(3) **Memory** in the video capture card is used to **keep video data** which has been processed by the microprocessor for the **smooth display** of video or graphics on screen. **The larger the memory**, the **better the quality** of the video or graphics displayed.

vi) **Sound Card and Speakers:** Enables us to **listen to music or songs** on a multimedia computer.

vii) **Communication Device - MODEM:** Abbreviation of modulation-demodulation. Modulation is converting digital signals to analog while vice-versa is for demodulation. Modem allows **computers to communicate with each other** via **telephone lines**. In order to access **internet** we need a **modem** or **ISDN** or **DSL** or **cable modem** or **satellite connection**. Modem Speed is in Kbps.

b) **Input Devices:** Collect data and programs that are **understandable by humans** and **convert them into forms** that can be **processed by computers**. We require input devices to **enter the multimedia elements** such as sound, text, graphic designs and video, **into the multimedia computer**.

i) **Digitising Tablets:** A device that can be used to **precisely trace** or **copy** a picture or a painting. While the **stylus** is used to **trace** the material, the **computer records** its **positions** through the digitising tablet. After which the image will be displayed on screen.

ii) **Digital Camera:** Enables images or graphics to be **transferred** directly from the **digital camera** to a **computer** with just a cable extension.

iii) **Digital Video Camera:** **Record movements digitally** onto a disk or in the camera's memory.

iv) **Voice Input Devices:** Converts **human speeches to digital code**. Eg. *Microphone*

c) **Output Devices:** Converts information that can be **read by machines** to a **form** that can be **read by humans**.

i) **Monitor:** Used for **display**.

(1) **Size:** **Diagonal** length of the display area. Eg 14, 15, 17 and 21 inches

(2) **Clarity:** Measured in **pixels** (picture elements that form the image on screen).

(3) **Resolution:** **Density** of the **pixels** on the **screen**. The **higher the density**, the **higher the resolution** and **more clarity**.

(4) **Dot Pitch:** Distance between each pixel. The **smaller the dot pitch**, the **more clarity**.

(5) **Refresh rate:** **Speed** of the monitor to **refresh** the **image** being displayed. **The higher the refresh rate**, the **lower the disruption** of display on screen.

- ii) **Projector:** A tool that enables a multimedia presentation to be displayed to a large group of audience. There are two kinds of projectors:
 - (1) **Liquid Crystal Display Panel projector:** Has an LCD panel, light source, computer and video input, and internal speakers that can operate computer signals and video. It is cheap and a high-quality.
 - (2) **Three-Gun Video Projector:** Capable of displaying high-quality images and is usually used in large halls. However, such projectors are very expensive.
- d) **Storage (Secondary):** Saves your work to be used later to be shared with others or to modify. Secondary storage enables data, instructions or computer programs to be kept permanently, even after the computer is switched off. There are 3 types of hard disks:
 - i) **Internal Hard Disk:** Permanent disk placed inside the systems unit. Stores all the programs (Eg. OS, word processors etc) and data of the systems file. Fixed storage and not easily removable.
 - ii) **Hard Disk Cartridge:** Easily removable just like retrieving a cassette from a video recorder. Total storage of the computer is limited by the number of cartridges. More easily used as a backup copy.
 - iii) **Hard Disk Pack:** A portable storage medium. Its capacity far exceeds other hard disk types.
- e) **Criteria for choosing to purchase a computer system:**
 - i) **Price:** First you must decide on an estimation of the money needed for the system.
 - ii) **Systems Performance:** The computer hardware that you select must be suitable with the system performance you require.
 - iii) **Needs:** You should know your real needs when planning to purchase a multimedia computer so that you can get a computer that not only meet your requirements and taste, but also one with a reasonable price.

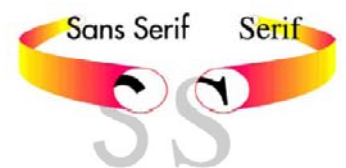
4) Development and Future of Multimedia Technology

- a) **Factors Contributing towards the Development of Multimedia Technology:**
 - i) **Price:** The drop in the prices of multimedia components assures us that multimedia technological development will be more rapid in the future. Today the price of a multimedia products are dropping rapidly, this increases the demand for them as they become more affordable.
 - ii) **MMX Technologies:** Enabled the computer systems to interact fully with the audio, video elements and compact-disc drive, more effectively.
 - iii) **Development of DVD Technology:** DVD technology has replaced VHS technology and laser disk in the production of digital videos or films because DVD pictures are clearer, faster, higher quality, contain higher capacity and has a lower price.
 - iv) **Erasable Compact Discs (CD-E):** Since it is re-writable, it enables us to change data, to archive large volumes of data and also to backup copies of data stored in the hard disk.
 - v) **Software Development:** Software applications for education, games and entertainment became easier to use with various additional elements in the MMX Technologies, which enabled Visual programming which made multimedia software development easier, faster and increased rapidly.
 - vi) **Internet:** Brought dramatic changes in the distribution of multimedia materials.
 - vii) **Increased usage of Computers:** Previously, computers were used for just Word Processing, with the development of multimedia technology, text is not the only main medium used to disseminate information but also graphics, audio, video, animation and interactivity. Hence, computers role has diversified and now act as the source for education, publication, entertainment, games etc.
- b) **Challenges faced by Multimedia Technology**
 - i) **Computer Equipments:** Multimedia software can be developed successfully, but if there is no equivalent equipment to support it, then these efforts are all in vain. The equipment issues that are the focus for research and development are the computers performance, mobility and speed.

- ii) **Operating Systems:** The Windows XP operating system is an example of a system that can support multimedia applications. However, the development of operating systems still requires further research and progress.
- iii) **Storage:** main focus of computer developers is to obtain a faster way of processing and a high capacity but smaller sized storage medium. **Upcoming probable storage mediums of the future:**
- (1) **Holograms:** Can also store a large batch of data. In the near future, holograms would not only take over the place of a hard drive but may even replace memory chips. However, the use of holograms as storage mediums still requires extensive and detailed technological research.
 - (2) **Molecular Magnet:** Recently, researchers successfully created a microscopic magnet. In the near future, one may be able to use the molecule magnet, in the size of a pinhead, to keep hundreds of gigabytes of data.
- iv) **Virtual Environment:** If this virtual technology can be developed rapidly, you would no longer require spending so much on overseas tours. You only have to sit at home and visit the country that you like through virtual technology! Virtual environment is mostly used in flight training or in the military.
- (1) **Web3D Consortium** is working hard to bring virtual environment technology to the Web.
 - (2) **VRML** (Virtual Reality Modelling Language) language development program which is an object based language that enables you to create a 3D navigational space on the Web.

5) Text

- a) **Text:** A combination of letters that form sentences or words to explain or discuss a topic which is known as text information.
- i) **Text (In Information Technology):** A sequence of readable alphabets and constructed words that can be encoded into a computer readable format such as ASCII format. Basic element for all multimedia applications.
 - ii) **Importance of Text:** Without text, information conveyed might be lost during interpretation of other media elements such as graphics, sounds and video. Text is considered the best and safest form of communication medium to deliver messages effectively so that **misunderstanding** will not arise.
 - iii) **Ways to Make Text Attractive:**
 - (1) Use of suitable type and size of fonts; and
 - (2) How text is displayed on the screen.
 - iv) **Ways Text are used in Multimedia Applications:**
 - (1) **Plain Text:** Text files are developed using word processing that later can be imported into multimedia authoring programs.
 - (2) **Paragraph Text:** A paragraph is a text block, usually containing more than one sentence. It is used in multimedia applications that require in depth explanations.
 - (a) **Left-Justify:** Text is aligned **evenly on the left** margin
 - (b) **Right-Justify:** Text is aligned **evenly on the right** margin
 - (c) **Centre:** Text that is **centered** on a specified line length
 - (d) **Full-Justify:** **Both margins** on the left and on the right are the same
 - (3) **Bullet Text:** A sentence that explains concepts or as help signs and usually use the **bullet** symbol.
 - (4) **Scrolling Text:** A feature provided by some authoring tools to facilitate reading and control of large text blocks in multimedia applications
 - (5) **Navigational Text:** Interactive Sentences or phrases in a paragraph, which upon clicking, users can 'jump' from one location to another, within or outside the application. (Eg. *Hypertext - can sound effects and animation.*)
 - (6) **Animation & Special Effects:** Text made into a more dramatic, interesting and funny form, when you use graphics and text manipulation software such as Flying Fonts and Fontographer.
- b) **Typeface:** A family of graphic characters that usually includes many type sizes and styles.
Eg. Times New Roman, Courier and Arial
- i) **Categories of Typeface:**
 - (1) **Serif:** Serif refers to the line or curve that exists at the end of a character.
Eg. Times New Roman
 - (2) **Sans Serif:** "Sans" means "without" (French). So Sans serif means a typeface without serif. *Eg Arial*
 - (3) **Decorative:** Typefaces with old literature and flowery elements and look like ancient writings.
- c) **Font:** A collection of characters of a single size and style belonging to a particular typeface family.
Eg Times New Roman 12 point italic
- d) **Guidelines on the Use of Text in Multimedia Presentations:**
- i) **Minimal Use of Text:** Text should fill less than half the screen.
 - ii) **Suitability of Typefaces and Fonts:** Selection of typeface and font must depend on the objective, content, concept and the intended audience.
 - iii) **Choice of Text:** Make sure that the typeface chosen is clear and readable.
 - iv) **Styles and Colour of Text:** Styles & Colour are regularly used to emphasise or to distinguish the contents from another section of the presentation.
 - v) **Consistency:** Size, font, typeface and style must be consistent with the design and concept of the project



e) **Text intensive Multimedia Applications:** In certain circumstances, the multimedia application being developed requires a lot of text such as encyclopaedias or databases applications.

Text Authoring Software	Uses
Microsoft Word Corel Word Perfect	Word processing software to develop an application that requires a lot of text.
Adobe Authorware Toolbook	Is used for an application that does not require a lot of text. Can be used directly to type the required text.
Adobe Photoshop Adobe Illustrator Adobe FreeHand Fontographer	Can be used to form text in the form of attractive graphics. Normally, can be used to create text with various special effects such as shadows, bright text, three dimension text (3D) and others.

i) **Two methods to make a large amounts of text less overwhelming or minimal:**

(1) **Hypertext:** Users would be supplied with a minimum text or contents and additional information needed will only be displayed when you click or activate the word of your choice.

(2) **Other methods:** Besides hypertext, you can use related graphics, audio, video or animation to replace a few paragraphs of text with the same information.

6) Graphics

a) **Graphics:** Lines, circles, boxes, shadows, colours, and others, made by a drawing program. (Agnew and Kellerman, 1996). Graphics also mean the use of visuals to explain concepts that are not able or difficult to be described with the use of text.

i) **Computer graphics can be divided into two categories:** **Vector** graphics and **Bitmap** graphics.

ii) **Uses of Graphics in Multimedia:**

(1) **Complementary element:** Graphics are usually used as background and texture, whereby it acts as a complement towards the intended meaning through its display.

(2) **Main focus:** Logos, images, paintings, figures and photographs in an application play a vital role in the delivery of the meaning or concept of the multimedia application.

(3) **Object**

iii) **Categories of Graphics:**

(1) **Vector Graphics:** (Object Oriented OR Structured Graphics) Refers to any **image produced with the use of certain software and computer technology**. Vector graphics are formed from lines that follow the mathematical equations called vector.

Advantages of Vector	Advantages of Bitmap
<ul style="list-style-type: none"> Requires only a small size data Quality of the Vector graphics remains the same even though the size and the position change. Requires only a small storage space. 	<ul style="list-style-type: none"> Produces real quality image. Capable of storing a large amount of information. Capable of being modified with a high quality modifier.

(2) **Bitmap Graphics:** (Raster Images) produced from dots (pixels) arranged specifically in metric form.

iv) **Vector vs Bitmap:** Vector graphics are regularly used in technical areas such as CAD/CAM (Computer Aided Design/ Manufacture), scientific modelling, architecture, arts design and others. On the other hand, for an image that needs to look realistic, a bitmap application is encouraged.

b) **Graphics Card:** Converts digital images to analogue form and then display it on the monitor screen.

i) **A graphics card is also responsible for:**

(1) Your computer's **resolution**

(2) The **number of colours that your monitor can display** and the **depth of colour**.

c) **Graphics File Formats**

i) **Window's Bitmap (.bmp):** This BMP's file is a file format that is most efficiently used in the Windows environment.

ii) **Graphics Interchange Format (.gif):** developed by CompuServe to be used in computer networks. GIF is one of the most common graphics format used for images on websites.

- iii) **Joint Photographics Experts Group (.jpg):** JPEG's image; named after the standard committee that developed it, aimed to be a graphics format that is not platform specific (Platform Independent). This is the most popular graphics file format used on websites.
- iv) **Photo CD (.pcd):** based on Photo CD technology from Kodak. Consists of five types of sizes for each picture, from "wallet" to "poster" size.
- v) **Picture (.pict):** Standard format for an image in the Macintosh environment. It is used for the development of cross-platform.
- vi) **Portable Network Graphic (.png):** (called ping) developed as a patent and license-free format and is an alternative format to GIF.
- vii) **Tagged Image File Format (.tiff):** is developed by Aldus Corporation and consists of many file versions. Usually used in desktop publishing software packages and is a file format favoured by printing companies.
- viii) **Encapsulated PostScript (.eps):** A file format used in PhotoShop and can contain both bitmap graphics and vector graphics. It is supported by many graphics programs, illustrations and layout pages. It is also used to transfer PostScript's language artworks between applications.

d) Sources of Graphics:

- i) **Scanner:** An equipment that is able to change images, text, drawings and photographs from analogue to digital forms.
- ii) **Digital camera:** The captured images are in digital form and can be uploaded into a computer instantly.
- iii) **Clip art, and Stock photography:** The easiest way to obtain an image is through the use of ClipArt, and stock photography.
- iv) **Self-produced images:** With the aid of sophisticated graphics software available in the market, graphic designers can produce attractive images with unlimited creativity.

7) Animation

- a) **Animation:** Technology that enables a still image to look as though it is alive, able to move, act and talk.
 - i) Originates from the Latin word which means "bring to life."
 - ii) An act or process of making something seem realistic or alive – Bahasa Dictionary
 - iii) Animation is a technology that enables a still image to look as though it is alive, able to move, act and talk. This is made possible by cinematography graphics and plastic art techniques to create or to give the illusion of movement and life to cartoons, handdrawing, statues and three dimensional objects
– Neo & Neo (1997)
- b) **Persistence of Vision:** A fundamental principle of animation. An object seen by the human eye remains chemically mapped on the eye's retina for a brief time after viewing. Combined with the human mind's need to conceptually complete a perceived action, this makes it possible for a series of images that are changed very slightly and very rapidly, one after the other, to seemingly blend together into a visual illusion of movement
- c) **Difference between Digital Video Clips and Animation:**
 - i) Video clips capture real live movement whereas animation is just a simulation of the real world.
 - ii) Digital video files are larger than animation files.
- d) **Applications of Computer Animation:** Education, Medicine, Advertising, Chemistry, Architecture, Films, Entertainment and games.
- e) **Animation Techniques:**
 - i) Traditional Animation
 - ii) Computer Animation

f) Techniques in Traditional Animation:

- i) **Keyframes:** After the storyboard is completed, the chief graphics artist or animator will draw the main frames (usually the first frame and last frame for an action). These main frames are known as keyframes. It will be the key or the reference frame for all the other frames. Other junior graphics artists will take over the task of drawing the frames between the first frame and the last frame (tweening).
- ii) **Tweeing:** The process of producing an image or object in between the keyframes so as to give the illusion of movement.
- iii) **Onion Skinning:** By drawing on transparent paper, the graphics artist can see the rough outline or the cell outline and use it as his guide for drawing or producing the next cell image.
- iv) **Cell animation:** (*cell= transparent celluloid sheet*) Uses a series of drawings or pictures that overlap one frame with another frame. Employs the three major techniques which are the keyframes, tweening and onion skinning.

8) Computer Animation

a) Difference between Computer animation and Traditional (Cell) Animation:

- i) Cell animation uses **drawings arranged in frames**; starting from the keyframes until all the pictures are arranged completely. The pictures on each frame are then recorded using a method called **cinematography**. On the other hand, computerised animation **uses computer to organise the frames** and records them in the **computer memory**.
- ii) In computerised animation, it is **no longer necessary to draw images by hand** to generate the frame images **between the keyframes**. Instead, computers with selected animation software will **automatically calculate and insert or draw relevant images** to be inserted in between the keyframes.

b) Two categories of computer animation:

- i) **Two-dimensional animation (2D):** (*Linear*) 2D animation is a flat animation. Meaning, the motion produced or the object being animated uses only two dimensions of space: the x-axis and the y-axis.
 - (1) **Path animation:** Path animation only needs a specific path that has been predetermined.
 - (2) **Cell animation:** Cells that are hand drawn can be scanned into graphics software packages, coloured and exported as suitable file formats to be animated. *Eg Software for Animation: Adobe Director.*
 - (3) **Screen or object transition:** During a multimedia presentation, sometimes transitions on the screen or object are required for the audience to rest their eyes or to inform the audience visually that something is changing or going to happen on the presentation.
 - (4) **Font and icon animation:** Font animation refers to animation on fonts or selected characters.
- ii) **Three-dimensional animation (3D):** Uses three dimensions, the **height, width** and **depth**. The z-axis represents the depth of the image. Three dimensional objects seem more animated and realistic and give the illusion as if it is a real world. Usually formed through modelling or mathematical formulas.
 - (1) **Main process involved in producing 3D animations are:**
 - (a) **Storyboard:** Sketch that shows the story line and the scenes that will be included
 - (b) **Modelling:** **Wireframe** and **solid object** modelling
 - (c) **Mapping:** Adding **texture, colour** or **action** to the **3D surface model** and its **environment**
 - (d) **Lighting:** Types are **ambient** light, **directional** light, **positional** light, **spot** light
 - (e) **Rendering and animation:** All the models with the **selected mapping** and **lighting**, together with the **imported environment**, will be **combined together** at the same time **in one presentation screen** to form the **animation** as planned by the storyboard.

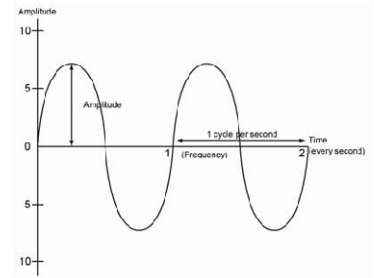
c) Special effects of animation are:

- i) **Morphing:** Morphing is the process of transforming one image into another.
- ii) **Warping:** Warping let you manipulate the images according to your taste.

d) Animation file formats: Adobe Director (.DIR), Animator (.FLI, .FLC), and 3D Studio Max (max).

9) Audio in Multimedia

a) **Audio:** (Analogue Sound) is a **physical phenomenon** generated by the **vibrations of an object**, for example, a guitar. When the object vibrates, **different pressure variations** would exist in the **surrounding air**. High and low pressures will develop within the environment and the **resulting movement is called a wave**. When this wave is **perceived by the hearing sense**, it will be heard as **sound**. (Steinmetz and friends (1995))



Rajsh 12.3
Attributes of analogue sound

- i) **Frequency** refers to the number of cycles a sound wave creates in one second.
- ii) **Amplitude** is the volume or loudness of the sound being produced.

b) **Audio (Multimedia):** **Any sound in digital form** such as **voice, music, narration** and **others that may be heard**.

c) **Digital sound:** Computer recognizes sounds in digital format. Usually the computer will process data into electronic form and not from the physical movements in the air.

- i) **Audio Conversion:** The process of **transforming analogue sound into digital sound** is performed by the analogue converter (**Analogue-to-Digital Converter-ADC**) which has been built-in inside the sound card.
- ii) **Sampling:** The **process** by which an **analogue wave is captured by the sound card** and then **converted into digital format** is known as digital sampling.

d) **Roles of Audio in multimedia**

- i) Warnings and reminders,
- ii) Background music,
- iii) Sound effects,
- iv) Narration and
- v) Data that is related to sound.

e) **Factors that need to be Considered when Using Audio:**

- i) **Compatibility:** The use of audio has indeed been proven in the sense that it increases the effectiveness of most multimedia applications.
- ii) **Users:** When using audio you should also take into account your target audience.
- iii) **Playback system:** Playback system is one of the conditions that should be taken into account during the use of audio.
- iv) **Users controls:** Users rights to start the audio, on or off the audio, control the volume according to desire, or provide an alternative such as using text display to replace sound.

f) **Advantages of Audio:**

- i) The main advantage of audio is that it ensures the **delivery of vital information**.
- ii) It also has the unique capacity to **provide caution or reminder** to the users about some **specific information**.
- iii) The other advantages of audio is that it **increases the multimedia attraction** where music, narration or sound effects **further enhance** the **multimedia application** that was previously quite static.
- iv) Sound **has made video or animation more real and memorable**. Good visuals and information would not be perfect if the music that accompanies does not match what is being conveyed.

g) **Disadvantages of Audio:**

- i) One of the most obvious disadvantages is **overuse**.
- ii) It **requires special equipment** to generate high quality products.

10) Audio in Multimedia

a) Audio File Formats:

- i) **AIFF format** (Audio Interchange File Format): Used to store and send sound samples. By Apple. Usually not able to do data compression; therefore bigger file size than other formats.
- ii) **MP3**: This audio format is extremely popular now and it is often used to record a large number of songs and music onto compact discs.
- iii) **AU**: AU audio format was specially created to be used on the Sun Microsystems workstation. It is a 16 bit audio format that is compressed and used for distribution via the Internet.
- iv) **MIDI** (Musical Instruments Digital Interface): MIDI is a standard language used for communications between musical instruments and computers.
- v) **WAV**: A WAV file is the main and popular audio format in the Microsoft Windows operating system environment.

b) Sources of audio files:

- i) Pre-packages,
- ii) Buying or borrowings,
- iii) Own invention.

c) Audio Software: Sound Forge and SoundEdit 16.

11) Video in Multimedia

- a) **Video**: A digital media that show the arrangement or **sequence of static pictures** that give an **illusion** as though we are looking at **moving pictures**. This illusion depends on two **physiological phenomena** called, "**persistence of vision** and **flicker fusion**" - Agnew and Kellerman (1997). There are two types of video:

- i) **Analogue Video**: Analogue video consists of video or a **sequence of images** produced by **continuous analogue waves**.
- ii) **Digital Video**: Digital video consists of **images with discrete values** (binary digit 0 and 1).

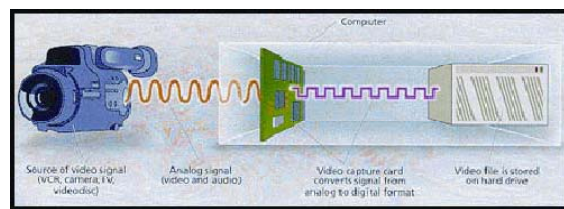
Unlike analogue video which is continuous,

every point on a digital image has an accurate value. The digital image on a computer comprises of individual dots known as pixels or pictorial elements. These collections of pixels form the image which is seen on the computer screen.

Advantages of Digital Video	Disadvantages of Digital Video
<ul style="list-style-type: none"> • Easy to edit video sequence. • Easy to add special effects. • The quality of the copied file is the same as the original file. • Better audio and image quality. • Long lasting. 	<ul style="list-style-type: none"> • Requires a storage device with large capacity. • Copies can be pirated. • Requires a powerful computer system for capturing and playback. • Requires knowledge of digital technology.

b) Basic components of Video Production Process:

- i) **Personal computer system**: A personal computer or desktop is needed to record or to produce a digital video.
- ii) **Video source**: You should ensure that your video's source is in good condition.
- iii) **Large storage**: You also need a hard drive with a large storage space and faster speed because video takes up a lot of memory space.
- iv) **Video capture card**: A video capture card is an add-on card required for digital video production.



c) Factors that determine the file size of digital video:

- i) **Screen size**: Basically, the bigger the screen size, the bigger the memory and the processing power required to play back the digital video on the computer.

- ii) **Frame rates:** The higher the frame rate of the digital video, the smoother the movement of the video and the larger the file size or the storage required for the video.
- iii) **Colors:** Colors make your video more attractive and realistic.
- iv) **Duration:** The duration of a digital video-clip will add or reduce the file size.

d) Video Compression (CODEC)

- i) **Compression:** Changes video sequence that has been digitized in the form of pixel into mathematical equation.
- ii) **Decompression:** Converts back the mathematical equation to the original digital video.

e) Two main methods of compression:

- i) **Lossless Compression:** Lossless compression means that files that have been compressed can be decompressed exactly the same as the original file. This type of compression maintains the original image during both the compression process and decompression process.
- ii) **Lossy compression:** Lossy compression on the other hand, eliminates some of the data of the image. Hence, this technique has a better compression ratio than lossless compression. This method helps to reduce the digital video file size. However, the bigger the compression ratio, the lower the decompression quality of the resulting image.

f) Two more techniques of video compression:

- i) **Intraframe compression:** occurs within its own frame.
- ii) **Interframe compression:** occurs between frames.

g) The role of video in multimedia are:

- i) **Attracting attention:** Video is a media that attracts the users attention immediately because it provides visual satisfaction with colourful displays and attractive videos.
- ii) **Display of physical procedure:** Video can be used to show procedures or operation manuals that cannot be described by text or graphics alone.
- iii) **Scenario Presentation:** Sound and movement has made video a good and effective tool to depict a real life situation or scenario in our daily lives.
- iv) **Movement Analysis:** One of the special qualities of video, that is not available in other media, is its ability to pause an action, show an action in slow motion and fast mode. This quality makes video very useful for analysis.

h) Advantages of video:

- i) Video can **captivate the users:** Various combinations of colour, movements and sounds.
- ii) Video can **increase the memory of users.**
- iii) Video can **explain physical actions and complex relationships:** The video's ability to show real-time movements enables users to have a clear picture regarding a relationship or physical action compared to what is conveyed through descriptions or illustrations.
- iv) Video **can combine with other media:** Sounds, text, graphics and movements, can all be combined together with video, for use in a presentation. This is a core factor, as to why video is the most suitable media, for delivering complex information.

i) Disadvantages of video:

- i) Video production involves **higher cost.**
- ii) Video requires a **large memory and storage space.**
- iii) Video requires **special equipment for production and presentation:**
- iv) Video **is not able to visually explain abstract concepts or static situations, effectively:** Video is specially used to show movements but it is not suitable for illustrations of abstract concepts, showing objects or static situations. In these circumstances, text or graphics can convey the abstract concepts more effectively than video.

12) Video Formats & Software

- a) Four main formats and standards for broadcasting and video are:
- i) **NTSC** (National Television Standards Committee).
 - ii) **PAL** (Phase Alternate Line).
 - iii) **SECAM** (Sequentiel Couleur avec memoire).
 - iv) **HDTV** (High Definition TV).
- b) **Codec Formats:** An algorithm to compress and decompress. It is a mechanism that is used to compress digital video
- i) **CinePak:** Formerly known as, Compact Video. It is the most popular codec for the Quick Time file. It is a lossy compression format. Supports frame differencing. It is asymmetrical whereby it requires a longer time for compression.
 - ii) **Indeo (also known as DVI):** A codec format developed by Intel. Generally, Indeo can be in lossy or lossless compression forms and can support frame differencing. However, it is less asymmetrical compared to CinePak.
 - iii) **JPEG (Joint Pictures Expert group)** Assumes that each of these video frames as static images. This produces a rather large file size and a sizeable drop in terms of quality with a corresponding large compression ratio.
- c) **Main digital video file formats are:**
- i) **QuickTime:** QuickTime does not require a high cost as the files required to replay video clips in QuickTime format are circulated free of charge by Apple computer.
 - ii) **Microsoft's Video for Windows:** The Microsoft's Video for Windows program is based upon the .AVI (Audio Video Interleave) file format where the audio and video is "interleaved." This enables audio and video to be played simultaneously.
 - iii) **MPEG (Motion Picture Expert Group):** There are many MPEG versions in the market such as MPEG 1, MPEG-2 and MPEG-4. MPEG-1 is the original format designed for quality VHS pictures at CDROM data rate.
- d) **Video Software:** Lately, the role of video has been receiving a lot of attention in multimedia systems. Including the video element in multimedia presentations is one of the effective ways to deliver information that other media failed to do. The reasons for this development are:
- i) **Demands** from **users for video**;
 - ii) **Multimedia technology** has **progress** to a stage where video is **easily integrated into multimedia systems**;
 - iii) The emergence of **sophisticated hardware** such as video capture cards, video RAM and AGP cards.
- e) **Adobe Premiere:** A video Software where users can edit long or short video formats, online or offline more productively and effectively for the purpose of broadcasting, film production, story boards or preparation of web based videos.